1. Introduction

General background:

Before discussing the methods adopted in the first population census of the Sudan, it is necessary to give a short survey of social background which had some bearing on them. If countries similar to the Sudan are to make use of the methods used in this census, a descriptive account is relevant if only for comparative purposes.

The Sudan is very sparsely populated. In an area of just under one million square miles, there is a population of 10.3 million, as arrived at by this census.
Lying between latitudes 4° and 22° North, the country consists mainly of uniform plains with a few mountains of little importance. The vegetation, on the other hand, is most varied-ranging from complete arid desert in the North to forests and swamps in the South.

The peoples of the Sudan are diverse. There are about 570 different tribes and a number of different languages. The population of the six northern provinces is predominantly Arab, and the three southern provinces are predominantly Negroid.

The following brief survey of the urban and rural populations serves to illustrate the varied modes of living of the Sudanese people.

Of the total population, 8% live in towns. There is only one town – namely Omdurman, with a population over 100.000; there are three towns with 50.000 or more; nine towns with 20.000 or more; nineteen towns with 10.000 or more; and thirty five towns with 5.000 or more. The rest are merely large sized villages.

In the three southern provinces, the people (27% of the total population of the Sudan) live mainly in huts made of interlaced bamboo and grass. These huts are often widely scattered throughout the bush and reflect little, if any tendency to develop villages. Any grouping of huts, if found, is on a tribal, rather than on a geographical basis. The degree of diversification in the three southern provinces is more pronounced than in the six northern provinces, from the evidence of a greater number of languages and tribes. This diversification, however, is likely to disappear gradually as the money economy replaces the subsistence economy in the South.

In upper Nile province almost all the inhabitants are cattle-owning Nilotics (mainly Nuer), and their tribal organisation does not fit into the nomadic and village patterns of the North of the Sudan. With the exception of the shilluk and Annuak – on the Ethiopian frontiers , they do not live in villages. During the dry season they move in the direction of water and grazing, and in the

rainy season they return to the higher areas above flood level where their cattle barns are scattered about the area. (The permanent domestic units of the Nuer are separated by distances varying from one hundred yards to as much as two miles.) The Shuluk and the Annuak live in more clearly defined villages, although by no means as well defined as those of the Northern Sudan.

The Bahr El Ghazal and Fquatoria provinces are mainly inhabited by various tribes of Dinka who form the largest group. The next important tribe is the Zande who do not coincide with political boundaries , there are large numbers in the Belgian Congo and French Equatorial Africa as well as in the Sudan. They have migrated over the borders at different times. Recently, the Zande have been settling on forty acre plots in hamlets. Each hamlet contains about 150-200 people. There are also the Eastern Southerners who are mainly Nilo- Hamitic and composed of Bari, Latuka and Didinga speaking tribes.

The tribes of Bahr el Ghazal and Equatoria provinces can be divided into two groups. Some tribes stay at home throughout the year; others divide. And their permanent residents remain behind while the rest of the tribe are away during certain seasons for example, the Zande of the south- west are cultivators and do not usually have cattle. The prevalent tsetse fly prevents them from even keeping sheep or goats. They are normally at home throughout the year and their area has a long rainy season. Then there are the Dinkas and a few other tribes in the north, north-west and east, where the tsetse fly is not prevalent, who are mainly cattle owners. The men, young women, boys and girls are away during the long dry season from their permanent settlements where the old men, women and young children live throughout the year. The former live in cattle-camps, moving with the cattle in search of grazing but they return to the settlements at the beginning of the rainy season to help with the cultivation. They leave after the harvesting as the grazing recedes towards the rivers. In the north-east the whole population lives in cattle-camps except during the cultivation season.

A considerable number of the middle belt of tribes are cultivators who kept cattle in the past but who are now prevented from doing so because of the spread of the tsetse fly. They do, however, possess small numbers of sheep and goats, and to some extent they spend time away from their homes at certain seasons hunting and gathering forest products.

The towns in the south are still few in number. None of them appear to have been “natural products”; they are accretion to administrative centres, for example province and district headquarters, hospitals and educational establishments. The largest are Juba and Wau and others are only the size of villages.

Quite different from the dwellers of the scattered huts in the south are the Arab tribes of the north who are partly nomadic (about 15% of the total population) and partly sedentary (the remaining 50%).

In the six northern provinces the degree of diversificat is less pronounced although the rural population varies from complete settlement, as in the case of the Gezira (Blue Nile Province), and a narrow strip along the Nile in the Northern province, to the part sedentary, part nomadic population in parts of Kordofan and Darfur provinces, and the completely nomadic population as is the case of the Kababish tribe in Northern Kordofan and the Beja tribes in Kassala province.

The nomadic population in the northern Sudan cover greater distances than the movements of the population in the South. The rainy season in the south is fairly long and this determines the movement of the population which is usually for short distances and not exceeding one hundred miles. In the northern Sudan the rainy season is very much shorter and seasonal migration is much more pronounced as, for example, is the case of the Rezigat tribes of Darfur province who move from El Fasher in the north to Bahr el Arab in the south.

Not all nomads are cattle owners, although this is the case for most of the nomads of Kordofan and Darfur provinces and the three southern provinces. On the other hand, the nomads of Kassala are primarily camel owners.

This Therefore, is the background to be taken into consideration when the peculiarities, scope and limitations of the first population census of the Sudan are examined.

The conditions which have been briefly surveyed determined to some extent the enumeration techniques that were adopted, the type of supplementary data used, the most suitable dates for enumeration, and finally the quantity and quality of information that was collected.

Many difficulties arose when applying the population census methods to the local conditions, and various ways and means were devised to obtain the best results in adverse circumstances. Some shortcomings are apparent when this census is compared with those of countries experienced in the art of census-taking and in the field of statistics. Nevertheless, the positive results obtained show the value of such an experiment in as underdeveloped country, and it is hoped that other underdeveloped countries will benefit from this experience in the Sudan.

1.1 Scope of the report:

The taking of a census in a vast country like the Sudan is complicated but varying climatic and geographical conditions, a number of different tribes, races, and languages, poor communications and administrative machinery which is in a continual state of evolution.

The 1955-56 census was the first census undertaken in the Sudan. It is fact the first of its kind , a census conducted by sampling methods in a vast underdeveloped country.

The main purpose of this report is to facilitate the taking of second census of the Sudan. It describes the methods of the first census, and the problems and difficulties encountered and it concluded with suggestions for the future, a great deal can be learnt from the report despite the rapid development of the country which will inevitably give rise to different conditions and problems facing the takers of the next census.

The methods are covered in chapter 2 to 7. Chapter 6 deals with the tabular matter produced in the nine interim report and in the final report. The problems met and how they were solved are discussed in chapter 8, and chapter 9 deals with suggestions for the future.

1.2 Purposes of the plot census:

It was essential to test the methods to be used before embarking upon the main census, in order to change, adopt and perfect them as far as possible. A pilot census was launched in 1953 in nine selected areas which represented the different modes of life in different parts of country.
The questionnaire was tested to ensure that the questions were clearly understood and could be answered with accuracy.

The sampling methods were tested to determine the most suitable sample size, the degree of correlation of the supplementary data with population size, and the different enumeration techniques to be used according to the mode of living, in well defined villages, in scattered tukls, or in nomadic areas. The completeness of the frame was also checked.

The suitability of the available field personal was investigated for service as enumerators, supervisors, census officers and field inspectors. The training and number of field personnel and personnel required for the proceeding of data, the amount of work to be undertaken at the Census Office in Khartoum, and the amount to delegated to the district headquarters, and an idea of the total cost of the main census covering work in the field and headquarters, plus the cost of transport involved, were all estimated after the Pilot Census.

The processing of the pilot census data involved testing the efficiency of the coding, editing and computing methods, as well as the machine scheme. The standard classification of occupations, tribes, languages, schools etc, were also tested in the field in order that additions, deletions or re-classifications could be made where necessary. For example, the pilot census revealed a number of unrecorded tribes and a number of others were reclassified.

1.3 Existing demographic information in the Sudan:

A part from the 1953 pilot Census was conducted in preparation for the main 1955/56 population census, very little had been done previously in the field of demography in the Sudan. A number of minor censuses were taken in the past covering small areas of the country (mainly towns) for a specific purpose, and in most cases were initiated by the district commissioner. A fairly comprehensive list of previous demographic researches in the Sudan can be found in the Report on the Six Annual Conference of the philosophical Society of the Sudan, page 48.

1.4 Case for sampling:

Such intractable problems as the scarcity of suitable enumerators and supervisors. The shortage of transport, the difficulties of enumerating nomads and people living in widely scattered tukls (as they do in south), all these, and many other, problems were overcome by the use of sampling methods. In addition, sampling methods made possible a much closer supervision of the work of enumerators and supervisors. This was undoubtedly a part of great practical experiment.

1.5 A de jure census:

Owing to different climatic conditions and the inaccessibility of some areas at different times of the year, people were enumerated according to their normal place of residence and not according to where they were found at the time of the enumeration. The census was thus "de jure" and not "de facts", with the above conditions a de facts census might have resulted in double counting or alternatively in people being missed out altogether. This would have applied more particularly in areas between which there was a large ebb and flow of labour, as is the case in the Gezira and surrounding areas. For example, if there is an ebb and flow of labour between areas A, B, C &D it is clearly describe to enumerate the people in these areas at the same time. But this was not always possible. With a "de jure" census, only those people in area A, into which labour flows, are enumerated who live there permanently, the temporary people from B, C & D being considered as temporary visitors [i)].

---

i) See paragraph 1.6 c) below.

In areas B, C & D not only are the permanent residents present enumerated but also the people who normally reside there but who are temporarily away in area A. Thus even when it is not possible to enumerate such areas at the same time the danger of double-counting is avoided by taking a "de jure" census.
The census include all sedentary people who spent six months or more in the country in the twelve months preceding the enumeration. For example, in a district or census areas, only those people who lived there for six months or more during the preceding year, were included. In the case of nomads, only those were included who owed allegiance to a nomadic sheikh of the Sudan (i.e. a sheikh responsible for administration or the collection of taxes).

Sudanese living aboard either permanently or on long courses were not included if they had lived abroad for more than six months during the preceding year. However, children under six months of age were included.

During the census, geographic boundaries were not considered. People were enumerated in accordance with their tribal and administrative allegiance.

1.6 Definitions:

a) Household:

The concept of a household as understood in western countries (i.e, as a dwelling unit) cannot be applied in the Sudan owing to the nomadic nature of much of the population and the fast that families in the south may live in more than one tukl scattered in the such a household was defined, therefore, as a group of persons who stared for their main meals the same cooking pot including temporarily absent number of the household. The precise definition of "main meal" created difficulties; the term had to cover households run by young housewives who were still in the process of having separate households from their mothers, or mothers-in-law, cases where individuals moved from one household to another, and communal eating which is a custom to many parts of the Sudan.

b) Institutional household:

This referred to hotels, prisons, boarding schools etc. these necessitated special instructions during the analysis owing to their size and in some instances the use of different language in the same institution.

c) Permanent residents, temporary visitor and temporarily absent

Custom and conditions wary greatly in the different parts of the country, and it was not possible to have uniform definitions in all areas.

In regions where a poll-tax is levered, the district headquarters keep a list of the name of all taxpayers in each sheikhship. Once a man's name is on the tax-list of a particular sheikh, it is practice, so long as he remains able-bodies, for the name to remain on the list, even although the man and his

family leave the area and stay away for a considerable period. Eventually the district headquarters will transfer him from one sheikh's list to another, or , if he has migrated to a non poll tax area, omit his name altogether. It is impossible for a name to be on two sheikh lists at the same time. Accordingly, in districts where such tax lists exist, permanent residents of a specific sheikhship can be easily defined as all those people who owe the sheikh in question. Should people who owe allegiance to another sheikh, that is, if they are not on his tax list or are member of such a taxpayer's household, they are counted as temporary visitors.
Therefore, a man and his family are "de jure" numbers of sheikhship even although they have been away for several years, so long as they remain on their original sheikh's tax-list. Thus a temporarily absent member of such households was defined as somebody who owed allegiance to that particular sheikh and although away at the time of enumeration, shared the name cooking pot when present.

These definitions were also applied to nomadic sheikhship in view of the fact that nomadic families separate ` and the young people may go to different grazing areas while the elders stay behind.

In villages and where the poll-tax dose not exist, there is a looser tie between the sheikh and his followers. The sheikh may or may not keep a list, but all persons in the villages over which he is in charge are under his jurisdiction. In such villages, a permanent resident is defined as anybody who lived in the village for six months or more during the twelve months preceding the enumeration, or "temporary visitor" as anybody who had lived there less than six months during the twelve months preceding the enumeration, and "temporarily absent person" as somebody who, although a ways at the time of the enumeration, lived with the household for six months for more during the twelve months preceding the enumeration, and who at the time of the enumeration did not have a separate household i.e., who did not maintain separate cooking pot in a different part of the village. These definitions also applied in towns.

The definitions could not cover following cases; sometimes a person from a poll-tax area migrated to a non poll-tax area; this man and his family might easily have been double counted. The application for the above definitions would have resulted in his being counted as a "de jure" member of the original sheikh's area, for he would stay on his sheikh's tax-list possibly for several areas years. He would also be counted as a "de jure" member for his new village artery he had stayed there for ,ore than six months during the twelve months preceding the enumeration. Similarly nomads who had given up nomadic and settled in villages a would also be double counted for they would be included as members of their nomadic sheikhship and also as part of the settled population in the village, since they had lived there for six months or more during the twelve months preceding the enumeration. To

deal with such cases a question, applicable only in well-defined villages and towns was included in the questionnaire asking whether the person in question paid a poll-tax to a sheikh other than the sheikh of the villages, or paid a tax a nomadic sheikh. This avoided double-counting.

Special instructions had also to be made in the case of de-tribalised persons from the north of the Sudan who live in the scattered tukls in the south. These were included under the special categories to which reference is made in chapter 3. There was also the case Westerners who for example did not stay in one place more than four months, and who might have been missed altogether. The special rules which applied to them are discussed in chapter 6.

d) Guessed population:

The strength of the population of each district was at one time guessed by the districts commissioner applying a certain multiplier to the number of tax payers or other suitable lists. These figures are referred to in this report as guessed population.

e) Population estimates:

There are estimates resulting from correct application of sampling methods.

f) Enumerated population:

The enumerated population was that part of the population which was enumerated in towns, 68 towns were estimated fully and separately, or as part of the sample in rural areas.

g) De facto population of towns:

Although the census was conducted on a "de jure" basis, "de facto" figures have also been available for some towns.

h) Special categories:

There was defined as that part of the population in sampled areas which not and could not be covered by the supplementary data. Under this category in rural areas came for example timber camps, hospitals, boarding schools, prisons, police posts, Sudanese Army camps, Ministry of Agriculture Mechanical Crop production Schemes, experimental farms, trading centers ect. Such persons did not come under the omad/ sheikhship organization.

i) Sheikhship:

The sheikhship was the unit chosen as the second stage sampling unit. The sheikhship as understood in the northern parts of the Sudanese equivalent to headmanship in the southern parts of the country. In fact, in some cases in the south the sub-cheiftainship (under which come headmanships) was accepted as equivalent to a sheikhship for second stage sampling unit.

j) Omodia:

Omodia in the northern, or chieftainship in the south, or their equivalent in other part1s of the country, was the first stage sampling unit.

k) Group:

Census areas often contained omodias in which the modes of life differed. A census area might consist of one or more urban group, i.e. towns or towns and one or more rural groups. The rural groups consisted of one group of nomadic omodias another of sedentary omodias and a third of compound omodias. The last type might consist of number of mixed omodias where one omodia might contain both nomadic sheikhship and sedentary sheikhships. In fact there were cases where one sheikhship might be partly nomadic and partly sedentary. There were even the extreme cases of mixed households.

l) Census areas:

The Sudan was divided for census purposes into 94 census areas, almost equivalent to the constituencies of the 1953 House of Representatives. A census area might be completely urban, completely rural, or a mixture of both in which case as mentioned above, it was divided into groups. Most districts contained more than one census area. Where a district itself constituted one census area, and in some cases one group, it was defined as a "whole district".

The coding system adopted for the census division was as follows; A group had a four digit code. The extreme left digit referred to the province, the next referred to the district in province, the next to the census area in the district, and the digit to the extreme right referred to the group in the census area. For example group 2441 means group 1 in census area 4 in district 4 in province 2. Thus the provinces had one digit code, districts two digits codes, census areas 3 digit codes and group had 4 digit codes.

m) District of rural council:

A district is an administrative division which comes under the authority of district commissioner. There maybe between three and eight districts in a province, (the Sudan is divided into nine provinces). With the development of local government, local government authorities i.e rural council and their urban equivalents are being created under the authority of executive officers in the case of rural councils, and town clerks in the case of towns. These authorities are now rapidly replacing the district commissioner. Usually there is more than one rural authority in a district.

1.7 Some special rules:

Special rules were devised to avoid double-counting owning to the following prevalent habits and customs in some parts of the country.

(I) Husbands with several wives:

A man with several wives (the latter living in separate households in different parts of a villages) could be enumerated as a present "head of household" in one wife's house and as a temporary absent "head of households" in other wives houses, and in this way be counted more than once. To avoid this it was decided to enumerate him with his most recent wife.

(II) Young children living with their grandmothers:

In some parts of the country it is customary for mother when she is having a child to send her other children to their grandmother in which case they could be counted as present members in their grandmother's and temporarily absent members in their father's household. A rule was therefore made that such children would be enumerated with their grand-parents' households if they had been present there for six months or more during the twelve months preceding the enumeration.

2. General Description of the Census

2.1 Administrative units:

Sudan is just under one million square miles or two and half million square kilometers in area. It is divided into nine provinces, each province being sub-divided into between four and nine districts, for census purposes some districts have been further sub-divided into between two and four census areas, the precise number depending on the size of population of the district and on consideration of organizational convenience. There are ninety-four census areas which closely correspond to the 1953 parliamentary constituencies and they make up the basic census frame. A district is administrated by a district commissioner and consequently all the census areas in the district come under him. Under the district commissioner , for census purposes, come omdas.

There are between 5 and 45 omodias in a census area. It is not always necessary in census areas with a large number of omodias for the omodias to have small populations. Lastly, under the omdas come sheikhs who rule over a number of households irrespective of their geographical location, for in the case of nomads he may be in charge of a group of families roaming together or spread over a large area, the common bond being sometimes the family ties and in others the sub-tribal allegiance. They sometimes meet during tribal gathering to scatter again after grazing. In the case of dwellings to scattered tukls again the headmen (equivalent of a sheikh) in the southern provinces may have his followers scattered over some hundred miles.

It may be useful in this respect to point out that the development of local government is now proceeding at a high pace. Rural councils and their urban equivalents are being created under the authority of executive officers in the case of rural councils and town clerks in the case of towns.

2.2 Areas sampled:

A part from 68 towns (enumerated fully and separately) and the special categories, to which reference will be made later, enumeration for the remaining parts of the Sudan was conducted by sampling.

2.3 Questions asked:

The questionnaire contained 28 columns of ten rows, the particulars of each person being recorded in a separate row. Enumerators were instructed not to record more than one household on one questionnaire.

If a household consisted of more than 10 persons, more than one questionnaire was to be used. During the sixth Annual Conference of the Philosophical Society of Sudan [i)], while discussing the "size of households in the Sudan", it was argued that "enumerator's bias" had resulted from the fact that the questionnaire had room for 10 persons only. It was stated that "quite a sharp and unwarranted drop in many distribution curves after ten seems to indicate that there was some resistance to turn the page and start an new one, in order to enumerate one or two additional persons in the same household. Furthermore, having started a new page, the enumerator might have regarded it as a waste of paper to enter one person on the new page. To make the turning to a new page worth his while, he might have exerted himself to find one or two more persons in the same household. This would account for the fast that in so, census areas, households with twelve and thirteen persons occur more frequently than household with eleven persons". However, households with ten or more persons appeared towards the end of the tail of the curve, furthermore, the writer agreed that the enumerator's bias was very insignificant. The quality of training as well as the quality of enumerators and supervisors presumably had some bearing on such a phenomenon.

Room was also made on the questionnaire for the coding work as well as other analysis requirements, analysis squares on the questionnaire were in yellow, to distinguish them from the enumerator's squares which were in black.

Question 1. Consecutive number:

The questionnaire form was numbered from 1 to 10. if there were more than 10 persons in a household, enumerators were instructed to insert the extra name on the following page [ii)], but changing 1 to read 11, 2 to read 12, etc.
Enumerators were also told to leave the remaining rows of a second or a third page blank, that is if more than one page was required by one household. The head of household whether a man or a woman, was always shown in the first row and the remaining members of the household followed. The order in which the remaining members of the household were shown was left to the discretion of the enumerator.

---

i) Report on the Sixth Annual Conference, society of the Sudan, Khartoum, 1958, page 61.

ii) Some questionnaire books consisted of 100 pages and were used in towns, others made of 50 pages were used in rural areas. The method of dispatching questionnaire books to the field is discussed in chapter 2.9.8.

Question 2,3 and four. Names:

In column 2 (question2), the name of the person was interested, while in column 3, his father's name and in column 4 , his grandfather's name. recording of names and sorting out of family relationships created a difficult problem for the field worker and the analysis editors owing to the various customs of naming in different regions of the Sudan. The most common custom is that of Arabic naming prevalent in the northern provinces. These consist of the person's name, the father's name and the grandfather's name. In some cases, however, there may be amongst one's own ancestors a person famous for his faith or political beliefs etc., in which case such a name may follow the grandfather's name, or even replace the father's or the grandfather's and thus become a surname. Similarly, the name of the area in which a person is added to his name and also be used as a surname. This happens mainly amongst the sophisticated classes.

A woman does not adopt the name of her husband, she uses her name birth followed by her father's and grandfather's. tjis made it difficult in the case of large households, during the analysis stage, to tell which was the wife of which man.

In the southern parts of the Sudan a person may have more than one name, or even a number of changing names which may or may not be common to one sex, one family or one class. As there is no agreed way of spelling, the names are subject to change as time passes. The problem is further aggravated by the fact that many of the original names are not dissimilar. On the other hand a person may see an aeroplane for the first time in his life and choose to call himself "tayara" (the Arabic translation of "aeroplane"). A few months later on hearing a train, he may will change it to "gutter" (train). In some areas, such as the Nuba mountains, the first

Born baby boy is always given the same name, this also applies tn girls. In other areas all boys born in one year or within a period of years, or on attaining puberty, on manhood in a certain year given the same name.

Near the Christian missions stations, however , people are often given Christian names.

In the case of newly born babies who had not yet been named, enumerators were instructed to write "baby" in column 2, and showing the proper relation to the head of household as described below. In some cases the head members of the head household refused to give the name of the female of the household; again the enumerators were instructed to be very careful to describe precisely the relation to the head of household of the person in question.

Sometimes the head of household was temporarily away, and the wife would not give his name [i)], in which case the enumerator obtained the same from the sheikh. In the case of adult males (also females in areas where they paid animal taxes) the impossibility of getting the correct names of such people caused a great deal of trouble, for unless the correct and full names were given, they could be traced on the lists of supplementary data, and resort was made to the sheikh who usually knew the names of his taxpayers.

Question 5. Relation to the head of household:

This question was not asked for any demographic purpose. In the first place, it was necessary to show the head of household information in the row of the head of household and also punched into the corresponding card. Secondly it helped both the enumerators in the field and the editors during the analysis to sort out complicated households as the relationship clarified other characteristics. Finally if this information was reliable it could of use for further research work in the field of sociology and social anthropology. As difficulties were encountered by enumerators when filling in this answer, a comprehensive list of all possible relations was issued to them.

Question 6. Number of months during the 12 months preceding the enumeration, that the person being enumerated spent in the village or vicinity of the village.

Nomads who were not staying in one place for any length of time were not asked this question. In the case of tribes who spend part of the year in their villages and part in their cattle camps, enumerators were required to ask the time they spent in both combined. For young children under one year old, the same number of months was shown as that of the mother. This question was asked, as explained above, to secure correct "de jure" coverage.

Question 7. present or absent:

This question was also asked to secure a correct de jure coverage. It asked whether the person enumerated was present or temporarily absent, provided that such absent members of the family lived with the household for six months or more during the twelve months preceding the enumeration shared the same cooking pot, and provided that such persons did not have separate home of their own in the village or sheikhship being enumerated. Whole household who were temporarily away were also included in the questionnaire and information was supplied in such cases by the sheikh.

---

i) It is not customary in some parts of northern Sudan for the wire to mention the name of her husband. She refers to him as "he".

Question 8. Nationality:

There were only two answers possible. The enumerator inserted either Sudanese or foreigner. In areas like the Gezira where there are many west Africans, some of whom had been granted Sudanese citizenship, it was difficult for the enumerators to determine which west African had been granted Sudanese citizenship and which had not. They were, therefore, instructed to accept the person's answer.

Question 9. Tribe or country of origin:

The person was asked about his tribe if the answer to question 8 was "Sudanese", and his country of origin if the answer to question 8 was "foreigner". In the case of tribes, enumerators were instructed to be as precise as possible and to quote the exact tribe rather than the group of tribes. For this purpose enumerators were given as comprehensive a list as possible of all the tribes in the areas. Persons who had acquired Sudanese citizenship were asked their country of origin. In the case of west Africans it was often possible to also record their tribe and include them in the tribal classification. Foreigners were asked about their country of origin and not their nationality or citizenship, in so far it is possible to distinguish between these three concepts. In the case of detribalized Sudanese enumerators were instructed to write "No tribe".

Question 10, 11, 12 and 13. Place of birth (internal migration):

Question 10 asked for the country of birth; 11 the province of birth, 12 the district of birth; and 13 the village (or town) of birth. If the person was born of nomadic parents, question 13 was not asked and it was not always possible to answer this question for a person born in scattered tukls areas as in some cases such as areas had names and in other not. In such cases enumerators wrote "unknown". The term "unknown" was also used in the case of persons who did not know their province, district villages because of the similarity in spelling. It was not always possible to determine whether two villages with slightly different spelling were actually different or whether they had been spelt differently by two enumerators.

Question 14. Sex:

This question was simple. Enumerators were asked to "M" for male and "F" for female, or their equivalent in other languages.

Question 15. Married or single (marital statue).

Enumerators were asked to write "s" for single or "M" for married, or their equivalent in other languages. Single referred to people who had never been married, and if they were widowed or divorced at the time of enumeration , they were to be considerer as married.

Question 16. number or wives (polygamy).

This question asked for the number of wives a man had at the time of the enumeration, not including dead, divorced or deserted wives. Strictly speaking this question applied to married males only. But in certain areas it applied to those widows or sons who inherited the husband's or father's wives on his death,

Question 17 and 18. main [i] occupation and subsidiary [ii] occupation.

Enumerators were instructed to state a person's occupation as precisely as possible, for example they were told to write "typist" ,"clerk" ,"book-keeper" and not "office worker", if the person had more than one occupation's most important occupation in answer to question 17 and his next most important to question 18. most important was defined as that occupation to which a person devoted most of his time. Where a person had no subsidiary occupation "nil" was shown in column 18.

To distinguish between voluntary and involuntary unemployment, enumerators were told to put down "unemployed" in column 18.for people who were looking for work and the person's occupation when working in column 17 signifying involuntary unemployment. If a person did not work from choice "Nil" was shown in columns 17 and 18. if a person was too old or was crippled and so could not work , enumerators wrote "incapacitated" in column 17 and 18. Detailed instructions were issued for dealing with pensioners , unemployed persons ware issued for dealing with pensioners, unemployed persons ,schoolboys , prisoners , housewives, etc. these rules applied to man , woman and children alike.

Question 19. Highest school attended (literacy).

Owing to a prevailing tendency towards vagueness in the field of academic attainments, it was impossible to record details about the number of years completed at school or the certificate obtained. Beside the name of highest school attended.

Enumerators were also asked to name the controlling authority of the school in question.

Question 20. Age.

If was not possible under the circumstances prevalent in the country to ask about the s specific year in which a person was born or even to ask about his approximate number of years to show the age by age group.

---

i) Referred to in the English questionnaire as "Primary".

ii) Referred to in the English questionnaire as "Secondary".

In the case of males there were four age groups namely, under 1 year, from 1 to under 5 years, females there were 6 age groups namely, under 1 year, I to 5 under 5 years, 5 to under puberty, over puberty and not past child bearing age, over puberty and past child age, and over puberty but unknown whether past or not past child bearing age.

Detailed instructions were given to enumerators to sure the correct answers. One year was easily defined as that age when a baby could just walk. It could also be related to the season in which the baby was born. The 5 years concept might not on the other hand have been reliable. Puberty was easily defined in the case of both sexes. The question of whether a female was past or not past child bearing age was found to be a delicate one. It was usually possible to find out related questioning in different ways, by finding out discreetly from neighbors.

In areas where enumerators were not allowed to see the women, the information had to be obtained from the head of household, in which case it was more difficult to obtain the correct age groups. The enumerator tried to check the head of household's statements by asking him for example whether a certain child could walk. The enumerator classified the child as under 1 year or 1 year to under 5 depending on the man's answers. In many cases the enumerator knew the households personally; otherwise the sheikh accompanied him and gave help as the knew most of his followers.

Question 21, 22, 23 and 24. Fertility and infant mortality:
These questions were applicable to females over puberty only. Question 21 asked for the number of live babies a woman had given birth to during her life-time. To avoid incorrect answer enumerators asked this question in several stages involving all the names of all the children, those who were present, those who were absent, those who had died, and those who had died at so young an age that they had not been given names.

Question on 22, was connected with fetidity and asked how many live babies a women had given birth to during the twelve months previous to the enumeration. She might not be certain whether her most recent child was born previous to or during the past twelve months. If the child was still alive , the enumerator asked her whether be could walk , should the child have died , the enumerator tried to help determining when the child had been born by referring to the seasons of the year , for example the rainy season , the dry season ,or the plantation season , or at the time or a religious feast etc.

Question on 23. child mortality.
This asked whether any of a woman's children regardless of their ages , died during the twelve months preceding the enumeration . it was not asked for any demographic purpose but merely as a preparatory question to the infant

mortality question which follows. Also, it was used to check the general mortality question.

Question 24. Infant mortality:

This question was asked only if there was a positive answer to question 23. it merely asked the woman, how many of her children who died during the last twelve months were under 1 at the time of death. Stress was put here on the walking stage, i.e. "could the child walk when he died?" "did he die before learning how to walk?".

Question 25. Language spoken at home:

This was a household question and the answer was recorded against the head of household only. If more than one language was spoken enumerators were instructed to record the language spoken by most of the members most of the time. In institutional households such as prisons, hotels, hospitals etc., this question was answered by each persons, members of the institution.

Question 26. Mortality:

This question asked about the number of people in the household who had died during the twelve months preceding the enumeration. This again was a household question and the information was obtained from and recorded against the head of household only. It was stressed that permanent members of the family who died during the twelve months preceding the enumeration, when temporality away were also to be included. Enumerators were instructed to include persons who died while members of another household, this household having broken up in the meantime and the remaining members having joined the household enumerated. This question did not provide information about specific mortality. Such information being unobtainable in circumstances where people do not have a precise notion about years and ages. Even such a simple notion as the twelve months preceding the enumeration had to be explained in this question as well as others by referring to the last season of the year, i.e. whether it was the rainy season, the dry season, or the harvesting season etc.

Question 27. De jure census:

This question in addition to questions 6 and 7 was included in the questionnaire to secure correct de jure coverage. It asked whether a person was on the tax list of another sheikh and it applied to all persons enumerated. Usually only adult males or females if they were heads of household appeared on the list of supplementary data, but sometimes very young children appeared on the death of their parents. Enumerators were instructed to ask whether a person paid a poll-tax or tribute tax to any sheikh other than the sheikh whose followers were being enumerated. Those who answered "yes" were disregarded together with their families at the analysis stage.

Question 28. Supplementary data:

This question was not asked. This is in order not to suggest to the people that the census had anything to do with taxation. The purpose of this question was to see who of the persons enumerated appeared on the lists of supplementary data. Enumerators filled in this question at the end of a day's work referring to the lists of supplementary data for the sheikhship being enumerated. These lists were alphabetically arranged. The enumerators resorted to the sheikh when a name on the list of supplementary data was not similar to that being enumerated. The problem of names has already been referred to under questions2, 3 and 4.

2.4 The sampling method:

The sampling method used was multi-stage ratio sampling. The first stage unit was the omodia of its equivalent, the second stage was the sheikhship or its equivalent, and the third stage was the household. The sampling fractions intended were those calculated to give in each census area a specified degree of accuracy at minimum cost. It so happened that the most appropriate first stage sampling fraction was unity and consequently - with the exception of a few unavoidable cases [i)] all omodias were included in the sample. Before the sample was taken sheikhship within omodias were classified according to size, mode of living, and in some cases according to the estimated percentage of Westerners [ii)] in the population of the sheikhship [iii)].

In any ordinary census area the number of selected sheikhships was between 70 and 120, depending on the intended second stage sampling fraction. In each of these selected sheikhships the enumerators was instructed to enumerate a certain number of people in the case of nomads and people living in scattered tukls, and in the case of people living in well defined villages a certain proportion of households depending on the intended third stage sampling fraction [iv)].an enumerator detailed to enumerate a particular sheikhship took with him the lists of supplementary data for that sheikhship. When he had enumerated the specified number of people or the specified proportion of households, he then checked to see which of the people enumerated were on the lists of supplementary data. He then recorded his number all persons on the lists of supplementary data were alphabetically arranged and numbered consecutively in column 28 in the questionnaire. If a name was not there he simply wrote "No". thus from the sample of selected sheikhships a ratio was obtained of the number of all people enumerated to those enumerated and found on the list. This ration suitably weighted was then applied to the total number of persons on the lists of supplementary data in the census area.

---

i) The cases are discussed in chapter 5.

ii) A group of tribes that migrate in large numbers into the Sudan from Nigeria and French Equatorial Africa.

iii) For a further discussion of the method of selection at each sampling stage see chapter 3.

iv) The extent of the deviation between the intended and actual sampling fractions at all stages is shown in Appendix 9.

The fact that the supplementary data might not have contained all the people it should have contained in no way invalidated the sampling method; for if the tax lists were deficient, the ratio of persons to taxpayers obtained from the sample were correspondingly higher, thus compensating for the deficiency in the tax lists. Consequently the population estimated was not affected. The fact that the number of persons in sheikhship and the number of persons on the list of supplementary data for the sheikhship were closely correlated, ensured the efficiency of the method.

The same basic method was used throughout the rural part of the country differing only in the method of selecting households. The selection of households varied according to the mode of living of the people depending on whether they lived in well-defined villages, in scattered tukls, or whether they nomads, or a mixture of all three. The different enumeration techniques will be fully discussed in chapter 3.

2.5 Preparations

2.5.0 Introduction

A population census of the Sudan was first considered in the late forties and planning was a spare time task of one or two senior officials of the Department of Statistics. For this purpose, practically all districts in the country were visited. The opinion of district commissioners and governors was asked, as to the feasibility of taking a census in their respective districts or provinces, and as much data as possible was collected about their respective areas for example the movement of the different tribes during the different seasons [i)] of the year, their modes of living, the possibility of finding enumerators and supervisors, the most suitable supplementary date, the tribal organization, the language spoken, a population guess of their areas, and the language in which the questionnaire should be printed etc. In addition all province monthly diaries and annual reports and other information about districts were filed in the respective district files. As part of the preparatory work for the main census, the pilot census was launched in 1953 to try out in the field the various enumeration techniques planned for the main census. Little was found wrong with the pilot census and preparation for the main census went ahead.

---

i) District commissioners were asked to show these movements on small maps.

2.5.1 From Pc 5, list of sheikhships in an omodia

In April 1953, preparation were made to obtain as much information as possible about census frame. All district commissioners were required to complete Form Pc 5 [i)] , a list of sheikhships in each omodia in their respective districts. The form showed the name of the omda and his tribe. Against the three names of the sheikh (i.e. his name, his father's name and his grandfather's name), the number of taxpayers were shown in one column and a guess at the population of the sheikhship in another column. There were also columns to show the percentage of followers, who lived in well-defined villages, in scattered tukls and who were nomads. District commissioners were requested to complete these forms within one year from April 1953 [ii)] . these forms were afterwards used as the basis for the census frame, and for the selection of the second stage sampling unit, i.e. the sheikhship as well as the third stage sampling fraction.

District commissioners were asked to forward with devision Form Pc5, Form Pc1, which was a list of omodias in their district. The division of the Sudan into census areas was based on the 1953 House of Representatives Parliamentary Constituencies and District commissioners were therefore requested to indicate on Form Pc 1 which omodias came under which constituency.

2.5.2 Form Pc 43 comprehensive questionnaire

The next stage was called the Form Pc 43 comprehensive questionnaire stage. One questionnaire was prepared for each census area in the district. It was a bulky document of about 40 pages. The purpose of the questionnaire was to check the information so far collected by the Department of Statistics, and to obtain information on points that were as yet not covered.

Accompanied by the questionnaires, the Director, the Census Controller and the Census Analyst, covered between them the whole country discussing the points contained in the comprehensive questionnaire with the district commissioners. They discussed for example a rough sampling plan which was included in the questionnaire. It was thought that unless the visiting official from the Department of Statistics had some idea of a rough sampling plan, it would have been impossible to give district headquarters any guidance to the extent of the work. This rough sampling plan was based on the information available from form Pc 5; it was to be perfected and made final in the light of the information obtained. Also discusses, were the proposed arrangements for enumeration of town whether they could be conveniently divided into suitable units and whether there were town plans available in the district headquarters.

---

i) All population census Forms had the prefix Pc (for population census).

ii) The final date was eventually extended to September, 1954.

The question of special categories was also discussed, for example whether special arrangement would be necessary for their enumeration and the date or dates when boarding schools would be open etc.

The most suitable date for enumeration had to be finalized. For this purpose, a number of circumstances had to be taken into account whether people were in their permanent homes and the nomads accessible, the condition of roads, whether schools could be closed if they were open during the enumeration period, and the likelihood of large numbers of temporary visitors.

The availability of enumerators and supervisors was also discussed. In this respect tentative figures as to the number of persons who could be enumerated in one day under each enumeration technique [i)], were given to District Headquarters with the approximate number of persons to be enumerated. The number of school teachers and other potential enumerators and supervisors available was enquired into. The potential census officers and the date of the census officers' course were discussed and later decided upon.

A tentative budget for each census area was prepared covering such matters as personnel, transport requirements and any special equipment that might necessary in view of the special circumstances prevailing in the area.

Detailed questions were asked to discover whether the supplementary data covered all the sheikhships and was the same for each sheikhship in the census area or whether there were two or more types of data. Enquires were also made to find out whether there was correlation between the supplementary data and the population size and whether there was a possibility of duplication of names in a sheikhship or between sheikhships, omodias or between different types of supplementary data.

The most suitable sampling technique was also discussed. In the case of well-defined villages, omodias, information about overlapping sheikhships and complicated village h youts were required. In the case of scattered tukls areas it was necessary to know to what extend the followers of sheikh in these areas intermingled with the village or town population.

Enquiries were made concerning foreigners and detribalised persons in the area and list of special categories and a population guess for each unit was made.

---

i) Information obtained from the experience of the pilot Census

The possibility of bias arising from the use of supplementary data was also investigated, that is, whether for one reason or the other some sheikhships were more fully listed than others or whether sheikhships were grouped according to wealth or some other characteristics which might have some bearing on the randomness of selection and therefore result in bias.

Other points that were discussed in detail were the preparations for conducting the post-enumeration survey, propaganda, the collection of names of heads of households in the case of unsuitability of the available supplementary data, and administrative points such as the dispatch of enumeration boxes containing the enumeration material.

With the completion of the first stage of the preparatory work of the comprehensive questionnaire, it was possible to select the sample both at the second and third stages [i)] and then proceed to form Pc 56, the second and last stage of preparation.

2.5.3 Form Pc 56/1 – The Notification Sheet

All necessary data for each census area being available, it was then possible to prepare a plan of work for the district commissioners and their census officers, ranging from preparing the lists of supplementary data to conducting the post-enumeration survey and the final return of enumeration material to the Department of Statistics in Khartoum.

For this purpose Form Pc56/1 - the notification sheet was completed for each district, covered all census areas and all groups. The notification sheet was in the form of very detailed instructions to the district commissioners and their census offices, advising them how to complete the necessary forms and perform all the necessary tasks required for the completion of the census operations in their respective areas. There were as many census officers as census areas in a district. Although most of the tasks were performed by the census officers yet the ultimate responsibility for the work was that of the district commissioner. Such matters as the officials to act as census officers, as well as the exact date for their courses were finally given to the district commissioners. The enumeration date for each group in a census area was also finally determined.

The notification sheet also explained the time-table, Form Pc 56/2, which accompanied it, and it showed the boundaries of the census areas and listed the omodias in each group.

---

i) The first stage sampling fraction was equal to unity.

Detailed instructions were given for the revision of tax lists, and electoral rolls and, if no suitable supplementary data existed, there were instructions for the collection of names of heads of households [i] . instructions were included indicating which supplementary data should be used for each omodia in a group. Having completed the revision the district commissioners had to complete Form Pc1 (a list of all omodias in a group), and Form Pc2 (a list of sheikhships in each omodias together with the number of taxpayers in each sheikhship). For each selected sheikhship the names of persons on the lists of supplementary data were to be shown on Form Pc4. detailed instructions were given for filling the forms Pc1, Pc2 and Pc4 [ii].

The notification sheet provided further information on engagement of enumerators, supervisors, the number required, and the date or dates of the training course for each group in the census area. Suitable persons to act as enumerators, supervisors, and post-enumerators were suggested and permission from the Ministry of Education was sought to close the schools in certain areas so that schoolmasters could be employed.

Instructions for the enumeration in towns, categories, the post –enumeration survey, the transport requirement for each census area and the final budgetory proposals were included in the notification sheet. Census officers were to be provided with a series of progress report which were completed for them as far as possible on the Department of Statistics. Census officers were to dispatch these reports to the Department of Statistics notifying the date a certain task was started and the date when it was completed.

2.5.4 Form Pc56/2 – Time-table

A time-table (Form Pc 56/2) accompanying the notification sheet to each group in the census area showed all the necessary steps from the time the notification sheet reached the district headquarters to the completion of field work, thus conveying an idea of the magnitute of the work to the census officers. The latter were asked on the notification sheet to read the time-table carefully and study the exact requirements in the relevant paragraphs of the "Methods for the Census" [iii]. The relevant paragraphs were marked in a column in the time-table.

The time-table had columns representing time intervals. One column, marked "D" represented the calendar month in which the enumeration was to take place; that marked "D-1" represented the previous calendar month, etc.

---

i) The collection of names of heads of households will be described in detail in Chapter 3.

ii) Forms Pc4 were either completed in Arabic or in Latin letters depending on whether the questionnaire form was to be completed in Arabic or in English.

iii) This comprehensive document was distributed to all governors and district commissioners. It described in simple language the sampling methods used.

Each of these columns was again divided into four sub-columns representing weeks. The relevant time spaces were filled with crosses; the first x indicating when a task should be started and the last x when it should be completed. The last x indicated the date by which the various tasks had to be completed and if the census officer thought that insufficient time was allowed for a particular task, he advised to start it sooner.

It was stressed to the District commissioners that strict adherence to the time-table was vital as any delay in the completion of a certain task in the allotted time would have resulted in confusion and consequent increase in cost. All the steps mentioned in the time-table were important. In a sense the various steps in the whole census operation are like links in a chain. If one of the links breaks – if one of the steps is not properly done, it will affect all subsequent steps. Census officers were instructed to be particularly conscientious in carrying out the following steps :-

i) **Revision of tax lists or electoral rolls or where suitable tax did not exist, the collection of names of heads of households.**

Census officers were asked to being this task approximately seven month before the enumeration, and finishing about three months before the enumeration started. Where the collection of names of heads of households was necessary a longer period was normally required.

ii) **Preparation of Forms Pc1, Pc2 and Pc4.**

Six weeks were usually required to complete this task. These forms were to be despatched to the Department of statistics not later than four months before the enumeration started, allowing the Department sufficient time to arrange alphabetically the names on the lists of supplementary data. Form Pc4 (which contained the names of persons in the lists of supplementary data) was to be completed only for the selected sheikhships. These sheikhships were only made known to the district commissioners after the latter had completed the revision of the tax lists or their equivalent. Thus the revision was systematically accomplished for all sheikhships alike, and no special care would be given to the selected sheikhship which would result in introducing bias to the sample. Where the collection of names of heads of households procedure was resorted to, Form Pc4 for all sheikhships was completed in the field, and Form Pc1 and Pc2 were completed from the data in Form Pc4 in the Department of Statistics.

iii) Engagement of enumerators, female post-enumerators, supervisors, and their training

These were engaged one month before the enumeration allowing sufficient time for training, and choosing suitable persons. Other steps stressed in the time-table were the enumeration of selected sheikhships and the post-enumeration survey.

2.6 Census dates

Owing to different climatic conditions and the nomadic nature of many parts of the country, it was not possible to hold a census at the same time in all census areas. In many parts of the country the roads are cut off or are made impassable by the rains which occur at different times of the year in different regions. In the case of nomads the census would only be taken at a time when they congregated around wells or were in accessible grazing areas. Usually the nomads congregate for only a short period in the year although the length of time differs according to the tribes and areas. In south a certain amount of nomadism is prevalent although the people do not travel for long distances as the nomads of the north. Even the settled population migrate at certain time of the year for grazing or for finding temporary work in the neighboring areas. These times also differ according to different tribes.

In order to select the most suitable for the enumeration it was therefore necessary to obtain information about the movement of different tribes at different times of the year. In addition to taking into account the time when people would be in their permanent homes or in known and accessible grazing areas, the state of the roads and the availability of enumerators had to be considered.

The enumeration of the whole country was scheduled for twelve months from June 1955. In actual fact it took just over fourteen months owing to difficulties enumerated in one census areas, eastern Nuer. Six to fourteen census areas were enumerated each month. The enumeration in the individual census areas took from two to six weeks depending on the size of the census area and the distances that had to be covered especially in the case of nomadic areas.

As can be seen from Appendix 2., found in volume 11 of this Report, it was not possible- with few exceptions – to conduct the enumeration in all the groups of one census area at the same time; the most suitable date for enumerating a nomadic group in census area was not necessarily the most suitable for the non-nomadic population.

A appendix 2 referred to above shows the date which the enumeration started in each group, the date it was completed and the middle date for the enumeration of the group. The census area date of enumeration is simply an average of its group dates weighted by the group population, the district dates are also averages of the census area dates weighted by the census area populations and similarly the provinces are averages of the district dates weighted by the district population. Finally the enumeration date for the Sudan is an average of the provinces dates weighted by the province populations. There was a chosen date – 1 January, 1956 – from which the middle dates of the enumeration deviated. These deviations were calculated in numbers of days, those before 1 January 1956 had a minus and those after that date had a plus.

The impracticability of holding census in all census areas simultaneously over the whole year was not without advantages. Spreading the enumeration over the whole year intensified the supervision of the field work as less work was undertaken at any one time.

2.7 Budget

As part of the preparations a detailed census budget was prepared in mid 1954, based on the assumption that a total of 1.850.000 [i)] persons were to be enumerated. The budget was in the form of a departmental budget, except that it covered the complete period of the census instead of a financial year. For the sake of convenience it was divided into three sections , Khartoum head office expenditure, field expenditure and analysis work expenditure. All costs of the census were included at full rate, except for the services of the Director, Assistant Director of the Department of Statistics, and the administrative staff in district headquarters when assisting in census work. A margin was allowed for the normal risks of project of this size.

2.8 Propaganda

The all important propaganda campaign for he census was conducted both before and during enumeration. The greatest efforts had to be made by the district commissioners by their direct conducts with omadas and sheikhs particularly at tribal gatherings [ii)] . it was believed that if omdas and sheikhs could be convinced of the uses of the census the battle would be half won. The best line of approach was progress, and that it was impossible for the government to plan new dispensaries, schools, agricultural development and water supplies without accurate information. This was the suggested line of approach, together with photographic, coloured, and descriptive posters and propaganda leaflets in Arabic, English, Bari, Dinka and Nuer languages [iii)].

---

i) For actual number of persons enumerated see Appendix 7.

ii) A list of tribal gatherings was prepared by the Department of Statistics from information given by district commissioners.

iii) A lottery scheme to encourage giving correct answers was devised but was never used.

The Prime Minister sent circulars to all heads of departments, governors and district commissioners advising them that the census work should have priority.
Arrangements were also made for broadcasts on the census by the Prime Minister and the leader of the Opposition. Speeches were also prepared for Chairman of local Councils [i)] and headmasters of schools and a "short Description of Sudan's First Census" was sent to the press and broadcasting station. The public Relation office and the Ministry of education were also asked to co-operated in the propaganda campaign. The latter instructed all teachers to give talks in schools on the census thereby on the propaganda to the parents.

2.9 Method of collecting the data

2.9.1 The role of the district commissioner

During the early preparatory stages all contact from the Department of Statistics were made with the district commissioners and until the completion of the Form pc 43 (the comprehensive questionnaire stage) the latter was the only existing authority in the field. He was responsible to his governor and the Department of Statistics for all aspects of the census in this district and correspondence and queries were addressed to him.

District headquarters had to decide at the start the appropriate degree of decentralization in their areas, e.g. in a district with four census areas, each area being synonymous with a rural area, the best policy was to make the executive officers responsible for census matters in his census area. Even in such case it was not always possible to decentralize completely. The district headquarters had therefore to be responsible for certain parts of the preparatory work, e.g. the revision of tax lists or electoral rolls leaving the preparation of Form pc 1, pc2 and pc4 for example, to the census officer in his area. Whatever the degree of decentralization, district commissioners were ultimately responsible for the completion of the preparatory work accurately and to schedule. All forms prepared by the individual census officers had to be scrutinized and countersigned by the district commissioners to indicate that they were satisfied that they were correct.

Changes in the relation between Central and Local Government would necessitate a change in decentralization for further census purposes. If Local Government takes over completely from the Central Government , direct contacts would be made with Local Government authorities.

---

i) Special speeches were prepared for "More sophisticated Areas" and "Less sophisticated Areas" in different Languages.

If the existing arrangements of government prevails it would be advisable to concentrate all responsibility in the hands of one man, the district commissioner. Such matters as public relations with tribal leaders, transport, propaganda and budgetary control can be handled more economically and efficiently by one authority.

2.9.2 The role of the census officer

The census officer was appointed by the district commissioner from amongst the senior officials of the district. The Department of Statistics anticipated that the census officers would normally be drawn from among assistant district commissioners or mamours, and where the boundaries of a census area coincided with that of rural council, from among executive officers, and in the case of towns, to be enumerated separately and fully, from the town clerks.

It was stressed that the census officers should be from the administrative and professional class, as on them largely depended the success of the census. During the enumeration period they were required to move from one team of enumerators to another clarifying the questionnaires and dealing with any problem that arose.

Even although the dated of enumeration for two census areas were well apart it was still impossible for one census officer to be in charge of two census areas in one district, owing to the fact that in each census area there might be two groups and the enumeration dates of each of the two groups might be well spread apart. A census officer could just cope with such two groups as the work in each group was spread over approximately twelve months, from the time the notification sheet (Form pc 56/1) and the time-table (Form pc 56/2) were sent to the district until the post-enumeration survey and the final despetch of the enumeration material to the Department of Statistics. During this period a great number of tasks had to be completed, including the revision of tax lists, the completion of the frame forms pc1, pc2, and pc4, conducting the propaganda campaign, transport arrangements, the appointment and training of enumerators and supervisors, the dispatch of progress reports to the Department of Statistics and the conducting of enumeration and post-enumeration survey. The work might be increased if the census officer had to arrange for the collection of name of names of heads of households in one or both of the groups in his census area, in the absence of suitable existing supplementary data. It was possible that a census officer might be arranging the enumeration proper in another. One of the main difficulties in the case of census officers was their continual transfer from one district to another when half way through the preparations for the census. The Department of Statistics obviated this as far as possible by approaching the Ministry of Interior. Transferring was not however

without advantages as the census officers acquired a great deal of knowledge which was supplied in the districts to which they were posted.

A study of the personnel used as census officers shows a preponderance of executive officers (36) who asked as census officers, added to these were the assistant executive officers of another 9 census areas and the 5 town clerks and 1 assistant town clerk of 6 urban census areas. Cut of a total of 94 census areas 51 were supervised, therefore, by official from the newly created Local Government Authorities. The next important category was that of sub-mamours Who performed the functions of census officers in 16 census areas. District commissioners acted as census officers in seven areas, mamours in another seven and assistant district commissioners in the case of five census areas. When the above categories were exhausted resort was made to officials such as the assistant province education officer, the public health inspector, the central services officers, a rates supervisor, a headmaster of an intermediate school and a district accountant. In 5 census areas nobody was done in one case by a man hired for this purpose by the Department of Statistics and in the remaining 4 census areas no census officer was appointed and the field inspectors had to complete the operation.

2.9.3 The role of the field inspector

The field work was the responsibility of the district commissioner. He was assisted in each census area by a census officer appointed by him from amongst the senior officials of the district and by a field inspector who was appointed by the population census office.

The district commissioner was connected with the census from the early stages of the preparatory work. Almost one year before the enumeration the census officer appear. To deal with the propaganda, revision of tax lists, completion of the frame forms, transport arrangements, engagement of enumerators and supervisors and other aspects of the later stages of the preparatory work. The field inspector did not begin work until about one month before the enumeration was scheduled to start. His main task was to conduct the training programme for the enumerators and supervisors, launch the enumeration in the area, inspect the enumerators and supervisors, satisfy himself that the enumerators were filling the questionnaire correctly, and then complete his final report on the census area in question before moving to another census area on a similar assignment.

2.9.4 The role of omdas and sheikhs

As the full cooperation of the omdas and sheikhs was essential for the census, personal letters were addressed to them by the Director of the Department of Statistics. Some sheikhs were displeased when their sheikhships were not selected for enumeration and the census personnel had to explain the sampling method to them. District commissioners gave lectures about the uses of census to the omdas and the more influential

sheikhs, as well as the selected sheikhs in their districts. The omdas themselves contributed by their influence on their sheikhs.

The role of the sheikhs was important apart from their contribution to the propaganda campaign for the census, they also accompanied the enumerators until the enumeration was completed in their respective sheikhships. Gratuities were paid to some sheikhs whose sheikhships were selected for enumeration, but not to the omdas because all the omodias fell in the sample and this would have added to the cost of the census. In addition, the omdas did not take an effective part as the sheikhs did in the census operations. Only in a enumerator during the enumeration.

2.9.5 Enumeration supervisors

Approximately three hundred men of character and initiative were appointed to act as supervisors, each being responsible for the work of about four enumerators. Most of them were intermediate school teachers and headmasters of elementary schools. The pilot census had shown that it was not advisable to choose the supervisors from among friends and relatives of the enumerators.

One supervisor was able to supervise the work of four or five enumerators if the villages or sheikhships in the sample were not far apart. If they were far apart, and also if there were scattered tukls sheikhships, one supervisor only was able to supervise the work of about three enumerators. The proportion was lower still with nomadic sheikhships. The suggested number of supervisors for a group was shown on the notification sheet. The enumeration was planned in accordance with an enumeration plan [i)], which showed the allocation of sheikhships to be enumerated and the lists of enumerators and supervisors.

Each supervisor was provided with a diary which was divided into three parts; instructions for supervisors, common mistakes made by enumerators, and the actual diary. Supervisors were asked to make a plan of the order in which they visited their enumerators. The plan was determined by various factors for example the ability of the enumerators, whether they had any particularly difficult tasks, and the layout of the roads in relation to where the enumerators were working. In the case of towns he made a sketch map on which he marked the enumeration areas allotted to him. It was the supervisor's duty on visiting an enumerators to make a thorough scrutiny of the questionnaire form and to point out the mistakes made by the enumerator at the outset to avoid repetition.

---

i) See paragraph 2.9.7 below

For this purpose he had to re-enumerate a certain proportion of the households already enumerated, carrying with him a list of the common mistakes made by enumerators during the pilot census.

Supervisors were instructed to pay special attention to the supplementary data question. Furthermore the supervisor checked the field work. In the case of well-defined villages he prepared a route plan which took him past all the houses. In the scattered tukls areas he was guided by the taxpayers selected at random and marked in red on the lists of supplementary data. In nomadic areas he had to make sure that the enumerator had enumerated households from all parts of the cluster. The supervisor had also to verify that the enumerator had enumerated both Sudanese and foreigners in well-defined villages and only followers of selected sheikhs in scattered tukls and nomadic areas, finally the supervisor's diary had to be completed regularly.

2.9.6 Enumerators

About 1.300 enumerators were recruited mainly from amongst the secondary schoolboys, elementary school teachers, local authorities clerks, court clerks and sub-grade school headmasters. Before the enumeration started in a villages or sheikhship, the enumerator asked the sheikh or the headman to gather the more important people together in order to tell them about the census and that it was in their interest to answer the questions truthfully. To guard against the tendency for some of the heads of households to understate the number of their children, because of superstition, he asked whether custom allowed him to see the family himself. This was preferable as they helped by prompting each other. Sheikhs who always accompanied the enumerators gave invaluable help, particularly in areas where the enumerators were allowed to see only the head of household, as was more frequent in sophisticated areas of the northern parts of the Sudan.

As the sheikh knew all the families in his sheikhship he could verify the head of household's answers. Reliance on the word of the head of household was the main reason why resort was made to the post-enumeration survey in both rural and urban areas of the North. In the southern parts of the country, the enumerator was able to see all members of the family and by repeated questioning, correct answers were ensured.

When filling the questionnaire, the enumerator was guided by what was called the "Four Points Procedure"; the first step was to tell the members of the household what the census was for; secondly, he wrote on the questionnaire the names of the members of the household who were present, as well as their relation to the head of household. Thirdly, he asked about the members of the household who were temporarily absent, writing down their names and the relation to head of household and finally he completed the questionnaire for each member in turn. Before moving to another household, the information had to be checked carefully. It was not enough for the

enumerator to ask the head of household whether there were temporarily absent persons. He was instructed to take positive steps to help the head of household to remember by asking him whether there were any members away cultivating, in prison, hospital or in boarding schools etc.

The question of language was difficult as there are more than one hundred languages spoken in the Sudan. Only in the northern parts (Arabic speaking) did the problem of the interviewing present no difficulties. In non-Arabic speaking areas, the problem of interpreting arose when the enumerator and the enumerated spoke different languages. In this case the questionnaire form was completed in English, and although Bahri, Dinka and Nure forms were printed, they were never resorted to. In order to avoid mistakes arising when translating the non-figure answers from these languages to either Arabic or English.

For this purpose certain forms were designed , Form pc 48/49. "art-translation for Non-English and Non-Arabic forms". For each non-Arabic non-English questionnaire book, there was an equivalent book of form pc 48/49. form pc 48 had rows for translating answers to question (5) "relation to head of household" and questions (17) and (18) "main and subsidiary occupations" . form pc 49 dealt with the sheikh, omda, group, census area, district, and provinces names and codes as well as the instructions for using the two forms.

It was considered unnecessary to provide for the translation of "answers to question (19) "highest school attended" as the answer was likely to be the same for the whole sheikhship. If the answers differed, they were to be shown together with their translation in a special place in Form pc 49. although in fact these forms were never used, resort to them may be necessary in future census.

2.9.7 The enumeration plan

Census officers were required to prepare an enumeration plan designed for the purpose by the Department of Statistics. All the particulars relating to a team of enumerators were shown thus enabling control over their work by the census officer and supervisor. For each team one page was prepared in triplicates showing the sheikhship or sheikhships allotted to each enumerator. On a map also supplied by the Department of Statistics, the census officers plotted the approximate geographical location of the sheikhships to be enumerated. The followed points had to be considered when allocating teams to sheikhships.

The enumerators' knowledge of the language spoken in the sheikhships allotted to them, and the most effective use of transport in distributing the teams. Census officers were asked to include the special categories in their planning as well as the odd strangers living in the villages to be enumerated.

In the case of towns census officers had to prepare a plan for enumerating the town in question at least six months in advance. A map of the town had first to be studied if no map existed, a sketch map was made. The map was to cover the whole town, including any scattered houses or settlements which, although outside the town boundary, were part of the town, coming under the jurisdiction of the municipality. The next step was delineate on the map the major divisions (electoral wards, rubes or blocks) for which separate population figures were required. Each of these divisions was further sub-divided into enumeration areas. Each enumeration area was to contain about 100 households. In fixing the enumeration areas the census officer was influenced by topography of the town and the languages spoken. In the case of towns divided into plots with serial numbers, enumeration areas were designated by the serial numbers of the plot. Care had to be taken to prevent the overlapping of enumeration areas and to ensure that every block of houses was included.

A certain number of enumeration areas were allotted to each enumerator and shown on the officer's map. A description of each area was inserted in the enumerator's diary by the census officer and to avoid misunderstandings about enumeration areas, each enumerator was taken to his area and shown them. One or more questionnaire book was allotted to each enumeration area but there were never two enumeration areas on one questionnaire book.

2.9.8 The questionnaire book

The questionnaire book contained instructions which covered the most important and difficult questions on the questionnaire forms. There was also list of the likely tribes to be found in the sheikhship assigned to the enumerator. A completed questionnaire was inserted as an example. In rural areas, questionnaire books with 50 pages of the questionnaire were used. Towns were provided with questionnaire books with 100 pages in Arabic speaking areas and 50 pages in non-Arabic speaking areas, the reason being that Arabic is spoken in all the large towns that were enumerated fully and separately. At the end of the questionnaire book there were two pages which were the enumerator's diary. In rural areas two copies were prepared of lists of names of taxpayers or heads of households arranged alphabetically; one list firmly attached to the questionnaire book, and the other was loose; instructions were attached to both.

2.9.9 Transport

The type of transport used by enumerators and supervisors varied with the census area and the time of the year. Camels were used in desert areas, bulls were used during the rains, in areas like the Nuba Mountains. In well defined villages enumerators walked while supervisors were sometimes provided with bicycles or donkeys to facilitate movement from one village to another. In nomadic areas either camels or motor transport were used if the enumerators and supervisors had to travel very long distances from one

group of nomads to another. In some cases it was literally impossible to use any form of transport and enumerators had to travel through marches.

The Department of Statistics was provided with 32 vehicles from the Mechanical Transport Department. These were either used by the field inspectors or lent to the district headquarters who supplemented their transport requirements either from the district headquarters or from other government departments. In towns transport presented no difficulties. During the preparatory stages of the census when transport was discussed and planned district commissioners were asked to be as self-suffering as possible as regulars transport. When all the above means were exhausted, district commissioners were authorized to hire lorries at the cheapest rates. About two hundred lorries were hired.

2.9.10 Diaries

Instructions to enumerators for enumerating a sheikhship were shown on the enumerator's diary. If the village technique was used the sampling fraction was shown, and if the scattered tukls or nomadic techniques were used the total number of persons to e enumerated was recorded. Similarly, the necessary instruction were given for any of the compound techniques. In the case of towns and special categories, the enumeration area or the special category unit was described in great detail. The enumerator kept a diary record of difficulties arising from slight changes in the mode of living in the sheikhship and difficulties arising from certain questions in the questionnaire forms. When the questionnaire book were returned from the field all enumerator's diaries wee filed together. The analysis wing staff referred to them if a problem arose relating to the area in question. Supervisors were instructed to male similar page 57 and also to make notes on the work of enumerators where necessary in order that the work in question would receive special attention at the analysis stage.

2.9.11 Inspection of the field work

The field work of the enumerators and supervisors was checked by the following personnel : the field inspector, the chief field inspector, a senior official from the analysis wing, and the census officer. This also afforded the senior members of the analysis wing an opportunity to acquaint themselves with the data they were to work on. Bach or these officials submitted at the end of his inspection tour a comprehensive report on the area visited. The reports were designed by the Department of Statistics and the officials were asked to add to them any special points that occurred to them. The various points of view were taken into consideration during the analysis work.

The forms completed by the above officials differed slightly but they had following requirements in common: a progress report on the enumerations; the inspection of supervisors and general comments on their work, success and difficulties; a list of enumerators visited and a repot on their understanding of the questionnaire forms; comments on the training of

supervisors and enumerators, and comments on the enumeration equipment provided and its usefulness or otherwise. On the question of supplementary data the officials were asked to state whether the lists of supplementary data (Form pc 4) were adequate for sampling purposes whether they had discovered anything about the way were compiled, the way they were being used, and the way in which the enumerators were trying to bring them up to-date as a result of discussions with the sheikhs which might result in a biased sample, inadequate coverage, double counting or omissions. They were also asked to try to count the number of names on the original lists of supplementary data for both selected and unselected sheikhships to see whether the selected ones were revised more accurately than the unselected ones.

The officials' opinion was also required as to whether bias might have arisen from the way the questions were formulated or the way they were asked, from the selected of sheikhships, or from the selection of households. Finally they were asked to report on the post enumeration survey and the work of the census officers and the field inspectors [i)]. The reports were of value during the analysis stage and will serve as references for future census.

2.10 Training

2.10.1 Introduction

Connected with preparations was the training programme. Training was required for the field personnel, the census officers, field inspectors, enumerators and supervisors undertaking the collection of names of heads of households, and the enumerators and supervisors for the enumeration proper. Training for the analysis stage was also necessary for the editors, coders, computers and machine operators.

2.10.2 Training Programme Part I.

A training manual called "Training Programme Part I" was prepared for the collection of names of heads of households. This was applicable only to groups where supplementary data, such as lists of poll-taxpayers, animal-tax payers or electoral rolls did not exist, and where lists of names of heads of households had to be prepared. This involved a considerable amount of work prior to the beginning of the census.

In these areas, the names of all heads of households in each village or sheikhship had to be recorded on Form pc 4 . This was a formidable task as there were about 20 omadias in a census area and each omadia contained about 15 villages or sheikhships.

---

i) This was only applicable to the chief field inspector and the senior official to the analysis wing.

The same type of person was engaged as enumerators and supervisors for this task as those that were later engaged for completing the questionnaire during the enumeration proper. The time taken to prepare the lists of names of heads of households for all the villages or sheikhships in a census area depended on the number of collection enumerators and supervisors, the distance they had to travel, and the number and size of the villages or sheikhships.

On average 16 collection enumerators and 4 collection supervisors were recruited and given a thorough training for each census area subjected to the procedure of collection of names of head of households. They were divided into four teams, each under a collection supervisor and they all worked under the close supervision of the census officer in charge of the census area in question. Usually two lorries carried them from one omodia to another. On arrival at an omodia the teams dispread and collected the names of heads of households in the shiekhship allotted to them and then moved to the next, accompanied by census officer.

This work began about nine months before actual enumeration was due to start, allowing ample time for the engagement of the collection enumerators and supervisors and their training. It was planned originally that summarizing Form pc 4 on Forms pc 2 and pc 1 would be done in the district headquarters but in most cases, owing to difficulties, it had to ve done in the Department of Statistics.

The method for collecting the names of heads of households differed according to the mode of living of the people and according to whether the lists of the heads of households were required by village of sheikhship. When the names were required for each village in a census area the task was straight-forward. A list of villages in the census area was prepared beforehand and the name of the sheikh of the village was written on Form pc 4 before listing the names. If there was more than one sheikh in the village the names of the other sheikhs were shown on a separate row on the Form and if thy were in charge of other villages as well, the names of the latter were also recorded.

In census areas where the people lived in scattered tukls, different methods were required to prevent the headman missing out deliberately a whole block of tukls. The collection enumerator was instructed to list the names of heads of households according to the headman, recording them on a "check list". He then visited the tukls accompanied by the headman, and listed the names of heads of households on Form pc4. The two lists were then compared. It was emphasized that only the names of the followers of the sheikh in question were to be recorded. Only in one scattered tukls area was to be recorded. Only in one scattered tukls area the collection of names of heads of households resorted to.

The Training Programme Part I include a procedure for collecting the names of heads of households in nomadic areas; this was not required as all the nomadic groups had animal tax lists which afforded suitable supplementary data.

2.10.3 Training Programme Part II

This document included amongst other aspects of the field work – "how to complete the questionnaire". It was a comprehensive formidable document of about 250 pages. For a sampling census, the problem of training is vital if bias due to error is to be reduced to minimum. The sample must be as perfect possible. Great pains were therefore taken to select the best enumerators and supervisors and then give them a thorough training. Bulkness of which can also be traced in the organization of the field work and the number of the enumeration techniques used.

The district commissioner – as mentioned earlier was responsible for the enumeration in his district. He appointed one of his best officials as a census officer for each census area in his district. These census officers were given a few weeks before the enumeration, a thorough three days training course by a senior official from the Department of Statistics. Just before the enumeration began a field inspector was sent from the Department to train the teams and to assist the census officers in launching the enumeration of which the field inspector was withdraw for a similar assignment elsewhere. It was therefore essential that the census officers had a manual which referred separately and fully to the method to be used in each group in his census area. Ten different enumeration techniques, were used in the census, but seldom more than three or four in any one census area. Thus, although there were many points in common, amongst the different techniques , to be avoid confusion by the census officers it was considered essential that each is described separately. This made the field inspectors' task of training the teams much simpler, and more successful as reference was made to only the instructions relevant to the group of a census area in question and thus avoiding confusion. It necessitated, however, a large volume.

The Training Programme Part II document is a record of the field procedure used in the first population census of Sudan. It was first published in December 1954 and distributed to all officials concerned both in Khartoum and the provinces, well in advance of the beginning of the enumeration in July 1955. The method for interviewing, completing the questionnaire, and the field sampling procedure were based the 1953 pilot census Manual and the experience gained at the time.

To ensure that the confidence of the local population be gained without which the census could not succeed local enumerators were employed where possible. Education facilities are only beginning to be provided on a broad scale in the Sudan; consequently it was often necessary : employ

enumerators with three or four years schooling; and in some cases there were no literate enumerators available who spoke the local language and interviews had therefore to be arranged with interpreters using a simple "Lingua Prance".

It was essential that the language used in training be as simple as possible and the method of training suited to people with limited education. Each lecture was divided into three parts , the lecture, recapitulations, questions and answers, each being a repetition of the other which resulted in a long but thorough training.

The Training Programme Part II covered the field work organization, the different enumeration techniques and how they should be conducted, "common mistakes made in completing the questionnaire" and an analysis or the mistakes. The duties and the diaries of the enumerators and supervisors were described and also the post-enumeration survey.

The language difficulties were mentioned earlier. The training programme was therefore written in both Arabic and English. Only in the Arabic speaking parts of northern Sudan could interviewing and recording be done in the same language. In other parts of the country the procedure varied. Sometimes the interview was carried out in the local language but recording was done by a bi-lingual enumerator. In one cases interviewing was done in the local language by illiterate interpreters, translated to the enumerators in very simple Arabic and recorded by the enumerators in English.

2.10.4 Training courses for field inspectors

Similar courses were organized for the field inspectors to acquaint them with the internal organization in the Population Census Office, the forms connected with the field work and the contents of the enumeration boxes containing the enumeration material. They were trained to prepared enumeration plans, and to organize transport. This was in addition to their thorough knowledge of the two training programmes previously described. Finally they had to be first class administrators and organizers, capable of taking quick decisions.

2.10.5 Training courses for district commissioners and census officers

A preparatory course for all district commissioners was conducted either in Khartoum or in the province headquarters for those district commissioners who could not attend the course in Khartoum. The same arrangement was made for pre-enumeration course for census officers, held just before the enumeration. Refresher courses were given to the latter if there was a laps of time between the enumeration in two or more groups in a census area.

These courses were intensive, as the success of the census depended a great deal on the district commissioners and their census officer understanding the questionnaire and the tasks allotted to them.

2.10.6 Training courses for analysis personnel

The junior members of the analysis wing also underwent some training. Editors were trained to scrutinize the questionnaire, coders to do the coding work in such a way as to facilitate punching for the punch operator, and computers were trained to use the different calculation sheets. Similar training was given to the punch and machine operators. A census area was chosen from the Pilot Census area and used for training purposes including all aspects from editing to the production of interim report tabulation. This experiment also covered the passage or the questionnaire books between the different sections of the analysis wing.

Large progress charts were prepared showing the various stages of work in the field and at the Khartoum headquarters with the dates when the steps had be completed. A hold up in the plan could be located immediately and prompt action taken. Other charts showed the number of personnel of the administrative, field and analysis wings and the expected period of their employment. Control forms showed all the provinces in the Sudan, the district, the census areas, all the groups and all omodias in a group.

A printing order was made in mid 1954 for all the forms, almost one year before the beginning of the enumeration in July 1955. some had to be printed in five languages.

3. Design of the census

3.1 The census frame

3.1.1 Production of the census frame

The Sudan was divided for census purposes into 94 census areas. With the exception of a few cases the boundaries coincided with the 1953 Parliamentary Constituencies. District commissioners were requested to complete Form pc 5 which was a list of sheikhships in an omodia showing the number of taxpayers against each sheikhship and by using an appropriate multiplier, the number of the followers for each sheikhship was guessed. They were also required to prepare a list of omodias in each census area in the district on Form pc 1. On the same form the especial category units in the census area were to be shown. These units were made equivalent to sheikhships in ordinary omodias, ten of the census areas were completely urban, namely census area 261 - Wad Medani Town, census area 531 - Kassala Town , census area 541- port Sudan Town, census area 542 - Suakin Town, census area 611 - Khartoum Town, census area 621 - Khartoum North Town, census area 631 – Omdurman Town, census area 712 – Elobeid Town, census area 811 – Atbara Town, census area 942 – Malakal Town. Other census areas were partly rural and partly urban and others were completely rural.

On Form pc 5, district commissioners were asked to show against each sheikhship the percentage of followers who lived in well defined villages, the percentage in scattered tukls, and the percentage who were nomads. Therefore when the forms area received, it was possible for selection purposes to stratify the omodias by mode of living. This resulted in dividing a census area into, for example, a well defined village group of omodias, and a nomadic group of omodias etc. if there was a town in the census area which happened to be one of the 68 to be enumerated separately and fully, it was made a separate group in the census area.

There were two other categories of persons which were not covered by the omodia/sheikhship organization or by towns. The first were the "special category omodias". These were the timber camps, hospitals, boarding schools, prisons, police posts, Sudanese Army camps, Ministry of Agriculture Mechanical Crop Production Schemes, experimental farms, trading centers etc. Each group in the census area was allotted a special category omodia. If there were two census areas in a district and two groups in each census area, the first group was allotted special category omodia 99, the second group, was allotted special category omodia 98, then 97 etc. all special categories were therefore included.

The second category of persons were foreigners or detribalized people living amongst the village population. In order that they should not be overlooked during the enumeration, the enumerators were instructed to enumerate such

persons in the case of villages, with the followers of the sheikh. The "foreigners" in the questionnaire book were separated from the followers of the sheikh by two blank pages. During the analysis stage the foreigners in the whole omodia were copied into a separate questionnaire book and allotted sheikhship code 99, 98, 97 etc. different calculation on sheets were used for them.

This was the basic frame for the census at the Form pc 5 stage for selecting the sample and dividing the omodias into groups. This frame was checked with the district commissioner at the Form pc 43 (comprehensive questionnaire stage) and also when district commissioners were advised on Form pc 56 (the notification sheet) to produce Form pc 2 for each omodia in each group (the groups having by this time been decided) of their census areas.

At the Form pc 2 stage district commissioners decided whether it was necessary to have a special category omodia or not. As the stratifying of omodias by mode of living for selection purposes was completed by this time, the Form pc 2 did not include the percentages of followers of a sheikh living in well-defined villages, tukls or omodic areas. Instead against the name of each sheikh was shown the village or villages where the followers of the sheikh lived. Otherwise, Form pc 2 was similar to Form pc 5. Form pc 2 was intended to show the final picture of the frame after the revision of the tax lists, about four months before the enumeration. Once these forms were received in the Department of Statistics they were subjected to a thorough and detailed check against Form pc 5. in the case of discrepancies with Form pc 5 or with other available information, queries were sent to the district commissioner from the Department of Statistics.

The frame was checked finally after the completion of the field work. The field inspectors then collected the revised tax lists and forwarded these to the Department of Statistics, where they were subjected to close scrutiny to ensure the completeness and the correctness of the census frame.

3.1.2 Complications at the district, omodia and sheikhship levels

The production of the census frame was different in practice owing to complications at district, omodia and sheikhship levels. With the development of local government, local authorities were being created which might or might not come under the authority of the district commissioner, if they did, they did so with varying degrees of dependence on him. If they did not, they came under the district authority of the province governor. Furthermore, some districts had subdistricts under the authority of an assistant district commissioner, again with varying degrees of dependence or independence of the district commissioners.

In the case of omodias the situation was more involved; in some instances there was a nazir [i)] of a tribe directly under whom came omodias. In other cases the nazir had chiefs (of khmts) who controlled the omdas, or their equivalent who were (meks, sultans or shatais or chiefs). For census purposes they were considered as equivalent to omdas.

The same confusion occurred at the sheikhship level, as omodias might be divided into sheikhships or headman ship. In some cases , especially in the southern parts of the Sudan , the chief (equivalent to omda) might have sub-chiefs under him who, in turn, might rule over headmen. The determining factor in deciding the second stage sampling unit in such cases was the unit for which tax-lists were available, that is, whether the tax-lists were prepared by headman ship or sub-chieftainship. Furthermore, a sheikhship or its equivalent, might consist of a few taxpayers with perhaps no more than 15 or 20 followers whereas others might have literally thousands of followers. However, it was always possible to find in all parts of the country a smaller unit under the omodia or its equivalent which was considered, for census purposed as a sheikhship and, the second stage, sampling unit.

The census area map may give the impression that the frame was on a geographical basis. This most certainly was not the case. The census frame was mainly based on the omodia/sheikhship organization which was meaningful only in the case of the geographical location of the settled population. In the case of nomads who wandered for hundreds of miles from one census area to another and even crossed the boundries of the country, it was not meaningful.

3.2 Supplementary data

3.2.1 Introduction

It was not practicable to attempt to estimate the population of each area by taking a sample and multiplying the average number of persons per village (or per sheikhship) by the number of villages (or sheikhships) in the census area. With such a method, to obtain any reasonable degree of accuracy, it would have been necessary to include nearly all villages (or sheikhships) in the sample. In order to reduce the size if the sample, the use of supplementary data which was highly correlated with the population size was introduced. Such data existed in the shape of animal tax-lists in the case of nomads poll tax-list in the case of people who live in the south and west; in other parts of the country there were other sorts of tax lists which were sometimes suitable.

i) Head of tribe

When no suitable tax lists existed, the collection of names of heads of households procedure was conducted. The question of supplementary data constituted almost half the field work, and it was therefore essential to ensure into this subject from the very early days of preparation.

3.2.2 The suitability of supplementary data

The suitable of supplementary data depended of the sampling technique to be used. The requirements were:

Well-defined village technique

(i) A high correlation of the supplementary data with the population size. Provided larger villages had proportionately longer lists and smaller villages proportionately shorter lists, the actual dispersion of names on the lists of supplementary data was no great importance. It should be stressed that even if the tax lists understated the correct number of taxpayers, the sampling method was in no way invalidated. If the tax-lists were deficient , the ratio of persons to taxpayers obtained from the sample was corresponding higher thus compensating for the deficient in the tax lists. The accuracy of an estimate omodia population was therefore unaffected.

Scattered tukls and nomadic techniques

(i) a high correlation of the supplementary data with the population size.
(ii) There had to be no duplication in the names of tax-payers.
(iii) The lists should not contain the names of dead persons or of persons who had left the area for goods, or fictitious names.
(iv) The lists were not be out-of-date.

It was essential that the supplementary data should be highly correlated with population size whatever the sampling technique. This could not be so if there were great variations between sheikhships in the degree of understatement of the number of taxpayers. The fact that the number of taxpayers was understated was not in itself important.

For this reason it was stressed throughout the preparatory stage that the revision of tax-lists should be done with a uniform degree of thoroughness, and that no performance should be given to listing the names for the sheikhships included in the sample. The Department of statistics checked on this when senior officers inspected the enumeration.

With the well-defined village technique, it did not matter if the tax-lists contained duplicated or fictitious names, if the tax-lists were correlated with populations size. Therefore, usher tax-lists, which generally contain a

duplication of names, were suitable for the well-defined village technique but not for the scattered tukls or nomadic techniques.

In areas were neither tax-lists, nor electoral rolls existed, or where the existing tax-lists or electoral rolls were not suitable for any of the reasons mentioned above, the collection of names of heads of households was resorted to.

The importance of supplementary data and role in sampling need not be over emphasized. The Department of Statistics therefore arranged for the dispatch of revised tax-lists to Khartoum where they checked against other available documents.

3.3 Sampling techniques

The following sections deal with the sampling techniques as used during the Pilot Census, the defects of these techniques, the modifications to them in the light of experience gained from the Pilot Census and finally, the techniques as used during the main census. Different sampling techniques had to be used according to whether the people lived in well-defined villages, in scattered tukls or whether they were nomads.

3.3.1 Well-defined village techniques

A certain number of the villages in a given omodias were selected at random and fully enumerated. From the supplementary data the number of taxpayers (or heads of households) in these villages was obtained and the total number of taxpayers (or head of households) in the omodia was also known. The enumeration of the sample villages, together with the supplementary data, provided the ratio of the number of people enumerated to the stated number of taxpayers (or heads of households) in the omodia, and the total population of the omodia could then be estimated. As a safeguard and check against the two-stage and three-stage methods the enumerators used the names on lists of supplementary data questions. They were instructed to enumerate every body in the village, both Sudanese and foreigners no matter whether they lived there for one day or ten years. In addition they enumerated all people who were temporarily absent. Enumerators were warned against missing out the latter, and also against missing out houses because they were situated outside the village boundary or because the village layout was complicated. Labels were attached on houses already enumerated.

3.3.2 Scattered tukls technique

A different sampling technique was required in scattered tukls. The headman in such cases was in a much stronger position if deliberately wished to miss out a large proportion of the tukls in his headman ship. The sample would consequently have given a false ratio of persons to taxpayers. This difficulty was overcome by having additional supplementary data, in addition to number of taxpayers (or heads of households), the names of taxpayers in the

headmanship included in the sample were collected. In the given chieftainship- equivalent to omodia in the north a certain number of headman ships were selected at random. The enumerator detailed to enumerate a specified headman ship, made no attempt to enumerate everybody, instead he was told to enumerate a certain number of people (the third stage sample fraction was about half in the case of scattered tukls). The enumerator took with him the lists of supplementary data for the headman ship in question. When he enumerated the specified number of people, he checked for all adult males to see whether they appeared on the lists of supplementary data. If they did, he recorded the number against the person in the space provided for this purpose on the questionnaire form.

From the sample of headmanships, a ratio obtained of the number of persons enumerated to the number of those persons who were on the tax-lists. This ratio was then applied to the total number of people on the tax-lists (or on the lists of heads of households) in the chieftainship, to obtain an estimate of the total number of people in the chieftainship. It was important that the families enumerated were selected at random. The enumerator was given a list of taxpayers [i)] in the headmanship which he was detailed to enumerate. In one column on these forms (Form pc 4) serial numbers were inserted, in red ink, after the name of some taxpayers. The serial numbers corresponded to the order in which the names were randomly [ii)] selected by the Department Statistics. On arrival at the headmanship, the enumerator completed the questionnaire form for that person and the members of his household. Tukls are usually in clumps. The enumerator was then instructed to enumerate all the other persons in that clumps which he could see. Having enumerated the inhabitants of the three clumps of tulks, he proceeded with the headman to the tulk in which the taxpayer with the serial number (2) lived and repeated the procedure.

This technique continued unit one-half of the guessed population of headmanship had been enumerated. If the enumerator having enumerated the first clump of tukls did not see any other clump, as in the tukl of the person with the next highest serial number, instead of doing so when he had enumerated three clumps of tulks. The enumerator had been warned not to ask the headman to lead him to nearest clump if he could not see another clump. If at any time the person with the next highest number of Form pc 4 happened to live in a clump of tukls already enumerated, his name was ignored and the person with the next highest serial number was selected.

---

i) These names were alphabetically arranged in the Department of Statistics.

ii) Any random numbering method was used.

These elaborate methods of selecting tukls were necessary for two reasons. First to prevent the headman leading the enumerator to the tukls the thought he ought to go to i.e. to the tukls of taxpayers. If this had happened the sample would have been biased. Secondly, it ensured that people were enumerated from all parts of the headmanship.

The enumerator was asked, as he visited the clumps of tukls, to enumerate everybody who owed allegiance to the specified headman including all people who were temporarily absent.

3.3.3 Nomadic techniques

This was similar in some respects, to the scattered tukls technique. A certain number of sheikhships in the given omodia were selected at random and each enumerator was instructed to enumerate approximately one-fifths of the sheikhship to which he was assigned. It was important that the date for the census was chosen at a time when a proportion of the people in the sheikhships were congregated round wells, or in a grazing area.

Before starting out each enumerator was given a copy of the lists of supplementary data for the sheikhship in question with names (alphabetically arranged). When enumerating the specified number of people, he checked to see whether the names of the adult males were on the lists of supplementary data and recorded the fact on the questionnaire form. From the sample of these partially enumerated sheikhships, a ration was obtained of the number of people enumerated to those who were on the tax-lists. An estimate was then obtained of the total number of persons in the omodia.

An enumerator was detailed to enumerate each sheikhship in the sample; he was instructed to get the sheikh to lead him to the largest cluster of followers where his first task was to find out around which wells or in what area the sheikh's followers were mainly congregated. Areas occupied by followers of other sheikhs were disregarded. The enumerator was instructed to begin with any arbitrarily selected area and enumerate all the followers of the specified sheikh which he came across. He was to continue enumerating people until he had covered one-fifth of the estimated number of people in sheikhship. Two important points had to be remembered. First, he had to cover as far as possible all parts of the cluster and not just one part.

Secondly, his attitude was to be absolutely independent throughout. If he allowed the sheikh to influence his choice of persons to be enumerated, it was likely that the sheikh would deliberately lead him to persons who he knew paid animal taxes. If the first cluster did not contain on fifth of the sheikhship, the enumerator moved on to the next largest cluster and enumerated a sufficient number of people to bring up to the specified requirement.

3.3.4 The revised techniques

The well-defined village technique proved to be very costly. The Pilot Census showed that the most economical sampling in any census area would require the enumeration of a high proportion at first stage and a lower proportion at third stage, i.e. more omodias and less households. This phenomenon was most apparent in the case of well-defined village technique, for the main census it was decided that where the villages were small, all the households in the selected villages were to be fully enumerated (i.e. well-defined village technique described above) but where villages were large a certain proportion of households in the selected village were to be enumerated. The precise sampling fraction was indicated in a special place in the enumerator's diary. Another deviation from the Pilot Census was necessity for completing the supplementary data question in the questionnaire form which, although adopted during the Pilot Census, had been considered unnecessary.

The threefold classification described above was also found to be insufficient. The idea of dividing a census area into groups with homogenous omodias was realized only after the Pilot Census. The threefold classification did not take into consideration the intermingling of people of different types of sheikhships, or of the overlapping of sheikhships. Here intermingling meant that a portion of followers of a nomadic sheikhship, or a scattered tukls headmanship, lived in a well-defined village intermingled with followers of a village sheikh. The following example illustrates the overlapping of sheikhships: the followers or sheikhs A and B may live in villages A,B and C; those of sheikh C in villages C and D; and those of sheikh D in villages D,E and F. when the sheikhships overlapped in this manner, it as impossible to obtain from the lists of sheikhships and taxpayers in an omodia, the number of taxpayers in any village. Overlapping was quite different from the straight forward case of followers of two sheikhs living in the same villages. When the followers of a given number of sheikhs lived in the same village, and there was no overlapping. It was not difficult to obtain the number of taxpayers in the village.

In some groups the sheikhships were mixed in the sense that some of the followers of number of sheikhs lived in villages, some in scattered tukls and some were nomads and some were combination of all three. These problems resulted in the introduction of 5 new types of compound techniques which are discussed below. These new techniques were a combination of the new version of the well-defined village techniques (based on random choice as in the scattered tukls techniques) and the scattered tukls techniques or the nomadic technique, or both. The following paragraphs deal with each in turn.

3.3.5 Well-defined Villages with no intermingling or overlapping

In this case it was preferable not to use the well-defined village techniques as described above; the enumerator might have missed some of the houses inside or outside the village if the layout complicated or if the enumeration had no taken place at a time of the year when many families were temporarily away. When deciding whether to use the compound technique or not, it had to be born in mind that this technique would not be effective if the lists of supplementary data contained fictitious names or a duplication of names, or if the lists were out of data. Nor would it work if the headman omitted from his tax lists a whole block of people who lived apart from the rest. The scattered tukls technique, and the proved version of it the compound technique assumed random omissions by the headmen.

3.3.6 Well-defined villages with heavy intermingling

In well-defined villages were there was heavy intermingling with the followers of nomadic sheikhs, or with the followers of scattered tukls headmen, the village sampling technique was feasible, if a poll tax (or animal tax) existed. These followers of the nomadic sheikhs or scattered tukls headmen living in villages would be included on lists of supplementary data. Question 27 [i)] would exclude them from the village populations.

There was always the danger that question 27 would not be answered correctly. Consequently, although it was possible to use the village technique, the compound technique was more reliable.

Where electoral rolls or lists of heads of households constituted supplementary data the compound technique was essential, because it was impossible, by means of question 27, to eliminate the necessary people from the village populations. One solution might have been to eliminate from the lists of supplementary data of nomadic sheikhs or scattered tukls headmen, all those heads of households who lived in well-defined village. Another within the area of headmanship for six months or more during the past year; but the term "area of headmanship" is vague, and would difficult to explain to headmen. Another possible solution would have been to eliminate the followers of nomadic or scattered tukls sheikhs from the village populations, not by question27, since this was only possible where poll taxes or animal taxes existed but by means of their tribes . if it was know that in a certain group the nomadic or scattered tukls interminglers were all of certain tribe, they would have been eliminated by means of their tribes. If it was know that in a certain group the nomadic or scattered tukls intermingles were all of a certain tribe, they would have been eliminated by means of tribe question.

---

i) On the tax-list of another sheikh.

This however, could not work of the same tribe had well-defined village sheikhships and also nomadic or scattered tukls sheikhships; and this happened to be the case.

Consequently whenever there was heavy intermingling, it seemed advisable to use the compound technique regardless of the type of supplementary data.

3.3.7 Well-defined Villages, with overlapping sheikhships

(i) Sheikhships Clearly demarcated

It was impossible to obtain from pc 2 [i)] the number of taxpayers (or heads of households) in the sample villages in overlapping sheikhships. The appropriate sampling technique depended on whether the sheikhships were clearly demarcated within the village boundaries. If the followers of the different sheikhs in the village lived within well-defined boundaries, then the village sampling technique could have been used. The test was similar to that for a well-defined village: how many followers of the specified sheikh would the enumerator be liable to miss if the sheikh deliberately intended to deceive?. If he missed out less than 10 percent of the sheikhship, then the village technique could be used.

(ii) Sheikhships not clearly demarcated

Where followers of the different sheikhs within villages were not clearly demarcated, it was impossible to use the supplementary data. There were two alternative solutions: either lists of heads of households could be prepared, for villages, and not on the basis of sheikhships, or the compound technique could be used. It was likely that some of the villages would be left out if Form pc 4 had to be prepared for each village. It was therefore preferable to use the compound technique, unless there were strong objections to it.

3.3.8 The main census compound techniques

There were two main problems that came to the surface in connection with the sampling technique in the Pilot Census. In the first place the well-defined village technique could only be applied when the villages were small and there was no heavy intermingling or overlapping. Otherwise one form of the compound technique had to be used, namely, an improved form of the original well-defined village technique based on random choice. Secondly, many of the areas were mixed, in which case a combination of well-defined village technique or the improved well-defined village technique (depending on whether the village element was made of large villages or whether there was heavy intermingling, or overlapping, or not) was used together with the original scattered tukls technique or the nomadic technique.

---

i) Lists of sheikhships in an omodia showing the number of taxpayers in each sheikhship.

The following paragraphs describe the five different compound techniques:

Case (1) **Where some of the followers of the specified sheikhs lived in a well-defined village and some were nomads.**

The enumerator was provided with a copy of the list of supplementary data showing the names of taxpayers, heads of households or voters or electoral rolls in the sheikhship. The enumerator had to enumerate (a) all the followers of the specified sheikhs who lived in village; (b) all the foreigners who lived in the village; and (c) a stated number of the nomadic population in the sheikhship, the stated number was given in the enumerator's diary. If the villages were large, with heavy intermingling or overlapping, the enumerator was instructed to enumerate under (a) above a proportion of all the households owing allegiance to the specified sheikh. The sampling fraction was also shown in the enumerator's diary. Instructions for (b) and (d) remained unaltered.

The enumerator began with the village population and chose a route which took him past all the houses in the village. Then having enumerated the households who owed allegiance to the specified sheikh he left two blank pages of the questionnaire and proceeded to enumerate all the foreigners in the village. He then checked to see whether the adult males or females if they were heads of households were listed on Form pc 4, and recorded the answer in the appropriate place on the questionnaire form.

The second part of the enumerator's task was the enumeration of the stated number of the sheikh's nomadic followers for which the nomadic technique was used.

Case (2) **Where some of the followers of the specified sheikh lived in a well-defined village and some lived in scattered tukls.**

Case (3) **Where some of the followers of the specified sheikh lived in scattered tukls and some where nomads.**

Case (4) **where some of the followers of the specified sheikh lived in a well-defied village, some lived in scattered tukls and some were nomads.**

The same basic method as above but with the appropriate combination of sampling technique.

Case (5) **Where all the specified sheikh's followers lived in a well-defined village, but were heavily intermingled with the followers of other village sheikhs.**

The same as in paragraph 1 of case (1) above.

In all of the above cases, the sheikhships included in the sample provided the ratio of the total number of persons enumerated to those enumerated and found on the lists of supplementary data. The ratio was then applied to the total number of people on the lists of supplementary data in the group to obtain an estimate of the total number of people in the latter.

3.3.9 Improvements to the scattered tukls technique proper.

The concept of "clump of tukls" was found difficult to define and a different method was resorted to. Having enumerated the household of the persons marked (1) in red, the enumerator then enumerated the people in the nearest five tukls, and afterwards proceeded to the tukls of the persons bearing the next highest number in red etc.

3.3.10 Foreigners and the sampling technique

Foreigners were all persons in the village who did not come under the omodia/sheikhship organization, i.e. they did not owe any tribal allegiance. Under this category came the detribalized persons as well as foreigners proper if they lived in the village.

The number of foreigners in any village was correlated with the total number of people in the village and not with the total followers of sheikh. One method of estimating the number of foreigners in a rural group was to multiply the average number of foreigners per sample village by the total number of villages in the group. A more reliable estimate of foreigners could have been obtained by a stratification of villages by approximate size, as the number of foreigners was likely to be proportionately higher in the larger villages. This refinement, however, seemed unnecessary as the number of foreigners was expected to be very small.

3.3.11 Supplementary data and the improved sampling techniques

The use of the compound technique in well-defined villages presupposed that the supplementary data did not contain fictition names or duplication of names; and it was essential that it should not be out-of-date.

For this reason it was emphasized to district commissioners that the revision of tax lists should be thorough and systematic enumerators were asked to "discuss" the lists of supplementary data with the sheikh and to write "dead" against the names of any deceased persons, and "L.A." for "Left Area" against the name of anyone who had permanently left the area, etc. This ensured that the lists of supplementary data were perfected as far as possible and suitable for the adoption of the compound technique.

3.3.12 Definition of a well-defined village

The difference between well-defined villages and scattered tukls was not as distinct as might be supposed. In fact a settled village where the houses conglomerated into one or two groups might have scattered houses outside

the village boundary; and there might be a tendency to conglomerate into groups in a scattered tukls. For the purpose of the census, the essential distinction was: how many houses or tukls would the enumerator be liable to miss were the sheikh deliberately intending to deceive?. It was for this reason that in the case of scattered tukls, a different sampling technique was required. A well-defined village was defined, therefore as one with boundaries so clear that despite the sheikh's dedeit, the enumerator could not miss more than 10 percent of the houses. Whenever this condition prevailed the village sampling technique was appropriate. On the other hand, in all cases where the enumerator might miss more than 10 percent of the houses, the scattered tukls technique or the appropriate compound technique [i)] was used.

3.4 Method of selecting sample units

3.4.1 Introduction

The sampling method used was multi-stage ratio sampling. The first stage units were omodias, the second stage were sheikhships and third stage were households. Uniform sampling fraction were intended at the second and the third stages. The intended sampling fractions were those calucated to give in each census area a specified degree of accuracy at minimum cost. It so happened that the first stage sampling fraction was unity and thus all omodias fell within the sample. The exceptions from this rule are discussed in a following chapter. In these cases owing to a deficiency in supplementary data or incomplete enumeration as was the case in the East Equatoria census area, it was necessary to drop some omodias from the sample and calculate the first stage raising factor.Column 13, 14, 15 and 16 of Appendix 8 to this report show how far the actual sampling fractions at all levels deviated, from the intended sampling fraction and how in most cases, more were enumerated than was originally intended. To do this the reciprocal of the intended sampling fraction was obtained for each census area and was compared with the actual raising factor at each level. In the case of the first stage, less fell within the sample than was intended, on account of Dar Masalit jouth census area in Darfur province, and western Equatoria census area in Equatoria province, which resulted in a drop from 1.00 in both cases to 0.56 and 0.93 respectively as can be seen in column 13 for these two census areas.

Column 16 for the Sudan shown the overall picture. The figure 1.26 may throw some light on the degree of the difference between the intended and actual sample sizes. Six out of the nine provinces, namely Bahr El Gazal, Blue Nile, Darfur, Khartoum, Northern and Upper Nile follow the same trend. The only exceptions are Equatoria, Kassala and Kordofan provinces. The same trend is apparent in respect of 50 census areas out of the 84 census areas [ii)].

i) This is apart from other considerations such as heavy intermingling, overlapping and the available supplementary data, discussed earlier.

ii) The remaining 10 census areas being fully urban census areas.

3.4.2 Method of selecting sheikhships (second stage)

The second stage were sheikhships in an omodia and were classified according to one or more of the following characteristics :

(a) Order of magnitude of total followers.
(b) Percentage of nomads
(c) Percentage of Westerners [i].
(d) Degree of sophistication.
(e) Type of animals [ii]

At this stage all sheikhships with 90 percent of the followers living in a town to be enumerated separately, were excluded from the draw. In cases where the approximate size of sheikhship was not know, a multiplier of 5 was applied to the number of taxpayers in the sheikhship.

In each omodia, no more than one characteristic was used. The information was obtained from the comprehensive questionnaire completed in the early Planning stage of the census. After coding, use was made of the Powers Samas instillations to stratify the sheikhships of an omodia in accordance with the characteristic chosen. The second and third stage sampling fractions and already been calculated and by using a table of random numbers the sheikhships were selected. Between 21 sheikhships (census area 951 Pibor) and 122 sheikhships (sensus area 512 Hadendowa) were selected in each census area. Out of a total number of 29.098 sheikhships in the country 7.182 sheikhships were selected for enumeration [iii].

3.4.3 Methods of selecting households (third stage)

The actual method of selecting households depended on the sampling technique adopted in the sheikhships in question. This subject has already been discussed above. Out of an estimated total of 1.878.152 households, 171.442 were selected for enumeration [iv].

---

i) People immigrating to the Sudan with their sheikhs from West Africa.
ii) The classification by type of animals is an example of the precise classification of sheikhships :
   1- Predominantly goat owners
   2- Predominantly sheep owners
   3- Predominantly cattle owners
   4- Predominantly camel owners
   5- Mixture of sheep and camel owners
   6- Mixture of cattle and camel owners
   7- Mixture of goat and cattle owners
   8- Mixture of goat and sheep owners
   9- Mixture of goat and camel owners
   10- Mixture of cattle and sheep owners
iii) See columns 6 and 7 of Appendix 22A to this report.
iv) See columns 3 and 4 of Appendix 22 A to this report.

3.4.4 Method of selection for post-enumeration survey

Where the post- enumeration survey was not conducted as in the case of some omodias in a census area, and some census areas it was either impossible to do so, or it was not necessary. In scattered talks areas in the three southern provinces, it was unnecessary to conduct the post-enumeration survey 3.8 it was possible for the enumerator to see all members of a household and cheek the a answers by repeating the questions to the different members. It was also found unnecessary to adopt this procedure in the less sophisticated parts of the country. On the other hand a post-enumeration survey was impracticable, in the case of the Arab nomads although it was necessary. Finally the post-enumeration survey was conducted either in towns or in the settled villages i.e. where it was both necessary and practicable. Census areas or omodias that were not, or could not, be subjected to post-enumeration survey, were known in advance at the comprehensive questionnaire stage. About one fifth of all sheikhships in an omodia were selected for the post-enumeration survey of which every other household was post- enumerated. The odd numbered households in sheikhships with odd code numbers were post enumerated and the even numbered households in sheikhships with even code numbers were post-enumerated. Out of 209 groups in the country (both rural and urban), it was possible to conduct the post enumeration survey in only 101 groups. Appendix 10 to this report gives a general picture of the post enumeration survey raising factors by age, group and by household.

4. Personnel and equipment

4.1 Introduction

The population census offices was divided into three wings, the administrative wing, the field wing and the analysis wing. Each wing was divided into sections and each section into sub-sections.

4.2 Organization of the administrative wing

The function of this wing was the administration and organization of 209 groups covering 1.000.000 square miles. As the dates of enumeration were spread over twelve months the tasks in the groups were at different stages of completion.

The work of the wing fell into two main categories the administrative work proper, and the administrative work directly connected with the census organization. In the first category may be grouped the following six sections: Transport and buildings; personnel; stores and equipment; accounts and budgetary control, translation section and typing pool. There were two sections in the second category namely flow of documents and amendments; and the alphabetical arrangements of names. The administrative wing was the responsibility of the Census Administrators.

The extent of the work which come within the first category can be gauged from the strength of its personnel as shown in Appendix 20 to this report. What follows is a description in some detail of the two sections that come under the second category, namely that connected directly with the census organization.

In this respect the Census Administrators was assisted by two administrative officers.

Previous to the establishment of the census office a great deal of preparatory work had already been completed by the Directors of the Department of Statistics assisted by the Census Controller and the Census Analyst. This included a budget, the designing and order for printing of all the basic forms required by the administrative, the field and the analysis wings. The touring and surveying of the country, the comprehensive questionnaire and the preparation of notification sheets, and time-tables for district headquarters. In other words the road was paved for the census and the work of the three wings could start on schedule. Appendix 20 to this report shows the organization of the census office after the preparatory work had been done. It dose not apply to the period when the preparatory work was in progress and therefore dose not reflect the magnitude of the preparatory work.

4.2.1 Flow of Documents and amendments

This sub-section was concerned with the opening of hundred of files and their movement between the different sections of the census office. The following example illustrates the process: the Form pc 4 which was listed of supplementary data for the selected sheikhships was received together with Form pc 2 which was a list of sheikhships (both selected and unselected) in any one omodia. The forms were received by group for 1345 rural omodias. On arrival the sub-section checked that Form pc 2 was received for all omodias in the specified group. This was done by referring to Form pc 5 and other documents in the Department of Statistics such as Form pc 56/1 (notification sheet) and a control form which was already prepared showing the omodias in each group. Then the number of sheets of Form pc 2 and their arrival dates were recorded on another control form (pc 10/3) which showed the group names and codes in the country.

The sub-section also checked that Form pc 4 was received for all selected sheikhships, reference was made in this case to Form pc 9 which showed the selected sheikhships in each omodia. A copy of pc 9 was in the Department of Statistics and another had already been sent to the census officer in accordance with which the Form pc 4 for the selected sheikhships were prepared. To ensure that no Form pc 4 was missing, the number of persons on these forms was compared with those on Form pc 2. strict instructions were always given that no work should be started unless the documents were filed first to avoid losing papers. Some 5400 files were opened by this sub-section to accommodate the Form pc 4. there were 4 sets of Form pc 4. the reason for this is that when these forms were received from the district headquarters, all forms in respect of one omodia were files together and called "original district copy". The forms were then arranged alphabetically and prepared in triplicate for filing. An office copy was kept in the Department of Statistics and the two others of "book copy" and "pocket copy" remained in the two sets of files until inserted in the appropriate place in the questionnaire book before dispatch to the field for the enumeration.

This sub-section was also responsible for the movement of the files between the following sections or sub-sections:

(a) The pre-analysis sub-section, the function of which will be discussed later.
(b) The alphabetical arrangements section.
(c) The machines section.
(d) The external flow of documents sub-section.

A form pc 31 procedure was adopted to control the movement of thousands of files. For each file two Forms pc 31 were prepared; one was attached to the file itself, and the second was kept in a master file. When the file moved from the internal flow of documents sub-section to another section, a

signature and the date to that effect were recorded on both copies of Form pc31. however, this procedure proved cumbersome and not altogether successful as a number of files were lost between the different sections and sub-sections of the Population Census Office.

4.2.2 Pre-analysis sub-section

This sub-section was composed of a number of computers from the computing section of the analysis wing. The work in this sub-section namely the checking of Form pc 1, form pc 2 and Form pc 4 was assigned to computers to ensure a thorough check of the supplementary data. Careful scrutiny of the forms was necessary and any queries were sent to the district headquarters. Dealing effectively with queries depended on strict adherence to the use of control forms showing the date the query was sent, the group name and code, and a brief account of the query etc. the control forms were essential in cases where district commissioners failed to deal with queries immediately.

The following example illustrates the type of problems this sub-section had to deal with. Form pc 4 was received from some non-selected sheikhships, instead of from selected sheikships; the number of persons on Form pc 4 were not in agreement with the number on Form pc 2 and the names of sheikhs on Form pc 4 were non-existent on Form pc 2 etc. a second problem arose when Form pc 2 had to be checked against Forms pc 5, a similar form to pc 2 except that it was prepared as part of the preparatory work for drawing the sample. In many cases the two forms were not similar. This was not unexpected as the situation had often changed by the time the Form pc 2 (the forms as used for the enumeration) were prepared. One sheikhship mignt have been split, a second might have joined another omodia, and a third might have left the other omodia to join the first omodia etc. with the result that a partial re-drawing of the sample was necessary.

Other checks and counter-checks were necessary for this aspect of the work and forms were devised outlining the necessary steps for checking each form connected with the supplementary data.

4.2.3 Alphabetical arrangements sub-section

The lists of supplementary data had to be arranged alphabetically to facilitate the task of enumerators in the field when answering the supplementary data question.

Form pc 4 containing the names of taxpayers, selectors, or heads of households were received in Arabic or English, depending on whether the questionnaire was be filled in either of these languages.

The alphabetical arrangements process was started when the pre-analysis sub-section had finalized the forms and solved queries etc. The forms were

filed on arrival by omodis, and as they were either received in Arabic or in English, the method of arranging the names alphabetically depended on the language used.

(i) Arabic forms

These forms were subjected to a lengthy process, described in steps, on a special form designed for the purpose. It is sufficient to mention the following points:

(a) The Form pc 4 was designed to accommodate 20 names on each page. This was checked by this section.
(b) The names were to be checked for legibility.
(c) The names were numbered consecutively and the last number had to coincide with the number of persons in Form pc 2.
(d) The sheikhships codes and names had to be checked with Form pc 2.
(e) The Form pc4 which had room for each letter of the name.
(f) The coded Form pc4 a was then sent to the machines for punching, verifying, sorting alphabetically, and tabulating.
(g) The tabulated Forms pc 4 were then de-coded and prepared in triplicate copies.

(ii) English forms

These were subjected to the name procedure above except for the coding. The forms (with space for each letter of the name) were prepared by the district headquarters in such a way that punching could be done directly from them.

4.2.4 External flow of documents

This sub-section was responsible for all dealings with district headquarters as summarized below:

(i) Despatch of the notification sheet and timetable.
(ii) Despatch of propaganda material.
(iii) Receipt of all supplementary data forms.
(iv) Receipt of progress reports in accordance with the timetable.
(v) Dispatch of reminders if the work in a certain group lagged behind.
(vi) Preparation of control forms with dates etc. to ensure that all steps shown on the timetable for each

of the 209 groups were progressing according to schedule.

(vii) Dispatch and receipt of collection of names material.

(viii) Dispatch and receipt of enumeration equipment.

With reference to enumeration equipment the following points should be mentioned:

(i) The requisite number of questionnaire books had to be calculated depending on the number of omodias in the group, the number of selected sheikhships in each omodia, and the number of persons to be enumerated in each sheikhship.

(ii) The name and codes of the sheikship, omodia, group census area, district and province had to be shown on each questionnaire book.

(iii) The names of the most common tribes in the area under consideration were shown in an appropriate place in the questionnaire book.

(iv) The sampling techniques; the number of persons to be enumerated in sheikhship or the sampling fraction, or both depending on the technique to be adopted were to be shown in an appropriate place in the enumerator's diary at the end of the questionnaire book.

(v) Two sets of Form pc 4 the "Book copy" and the "Pocket copy" were to be attached to the questionnaire book. The second copy was to be used if the first was lost.

(vi) Training equipment had to be prepared, such as training questionnaire books, training programmes etc.

(vii) The requisite number of supervisor's diaries had to be prepared and supervisor's and enumerator's armbands, stationary, questionnaire book covers etc.

(viii) Questionnaire book numbers had to be registered on a special form and all other equipment on another. A copy of each of these two forms was dispatched to the district headquarters with the equipment, and a second was kept in the office.

(ix) Iron boxes with padlocks were used for dispatching the enumeration equipment.

This section was also responsible for the receipt of the above equipment from the district headquarters after the enumeration, and finally the delivery of the following to the analysis wing:

(a) The completed questionnaire books.
(b) The lists of supplementary data (Form pc 4).
(c) The completed enumerator's and supervisor's diaries after filing, as well as other reports from the district commissioners and the census officers.

4.3 Organization of the Analysis Wing

4.3.1 Introduction

The work of analysis wing can be divided into the pre-reports stage and the production of reports. Under the first stage came the editing, coding, the computing, punching and balancing [i)]. balancing had to be completed before the production of reports was started. The second stage covered the production of interim reports as well as some final report tabulations connected with them, and lastly, the production of the remaining final report tabulations.

The Census Analyst in charge of the analysis wing was assisted by a Chief Editor, a Chief coder, a Chief computer, an Inspector of Machines who assisted with the machine analysis work and a Chief Reporter who assisted with the production of reports.

4.3.2 The Editing Section

There were six editing sub-sections, each with two checkers, three editors and two junior editors, all of whom came under a senior editor. Editors were responsible for scrutinizing the questionnaire, and the more difficult coding work which could not be dealt with by coders. Consequently editors were required to be of much higher caliber than coders. One other sub-section came under the Chief Editor, namely the full-listing sub-section. It was necessary before embarking on the machine analysis to full-list all the cards for a certain group on the tabulator with all items shown. These full-listings were then scrutinized by the best editors, called checkers of full-listings, to ensure that no mistakes got through. There were four full-listers under a Senior Editor.

4.3.3 The Coding section

There were four sub-sections in the coding sections. Each sub-section had a senior coder in charge, two checkers of codes, and five coders.

---

i) By balancing it is meant the process through which the machine figures which are arrived at by addition are agreed with the computors' figures which are arrived at by multiplication.

4.3.4 Computing section

In this section there were three sub-sections each with one senior computer, two computers and four junior computers. The work was done in two stages. The first stage primary computing was begun immediately the questionnaire books were edited. They were then sent for coding and returned to the computers for secondary computing. Primary computing covered the calculation of raising factors, and secondary computing the insertion of raising factors on the questionnaire books. The computing work was divided into two stages because extractions were taken first from the questionnaire books calculating the raising factors, and as the questionnaire books were being coded, the calculations of the raising factors were being made, thus by the time the questionnaire books returned from the coders, the raising factors were ready for insertion into the questionnaire books.

4.3.5 The Machines sections

The machines section was sub-divided into three sub-sections: the punch room with twenty five punch operators, three checkers and a supervisor of punch room; the machines room with a morning shift of ten sorters and tabulators under a supervisor, and an afternoon shift with eight sorters and tabulators, under a supervisor. The morning shift supervisor had three extra workers as he was also responsible for the production of full-listings as well as the balancing of tabulations. Thirdly there was the balancing room with one person who in conjunction with the computing section was responsible for the balancing referred to earlier.

The strength of the different sections quoted above refer to the peak periods of each section. For example, the editing section started with three sub-sections, gradually expended to six sub-sections, and then was reduced to two sub-sections. Meanwhile the peak period in the coding section and the full-listings sub-section of editing section had started, with the result that the better editors joined the full-listings sub-section, and the rest joined the coding section. Later some of the editors worked on the reports. Similarly in the machines section, the work reached a peak in the punching room and then in the machine room, the most efficient punch operators became temporary machine operators.

5. Method of processing the data

5.1 Introduction

Before the final report was sent for printing, the questionnaire books and other documents passed through a number of stages summarized in the following paragraphs.

As the questionnaire books for a particular group returned from the field, they were unpacked and sent to the central registry of questionnaire books were they were recorded and stored in a particular place allocated to the group in question. As all the groups in a census area were not always enumerated at the same time of the year, it was ruled that the analysis work on a group should not being until the questionnaire books for all the groups were returned from the field.

The questionnaire books passed first of all to the edit in the analysis wing. The senior editor in charge of the sub-section who was allotted the census area in question had previously prepared a resume on the area. Information was collected from a number of sources, including district files, the reports by field-inspectors and the diaries of the census officers, supervisors and enumerators. Information about the tribes in the area and the habits and customs of the population was included in the resume. A copy was passed to all the editors in the sub-section to ensure that they understood the material they were to work on, and that they knew which questions, of any, required special attention.

When the whole census area was passed to the editors it was not necessary for the questionnaire books to remain with them until the whole area was completed, usually, questionnaire books moved between the different sections of the analysis wing in groups but they could if necessary move in units as small as omodias or even sheikhships. This was avoided as much as possible.

When the editing was completed, the questionnaire books returned to the central registry for record purposes before they were recalled by the computing section. The questionnaire books did not move automatically from one section to another. They had to be "called for" to avoid chaos in any section resulting from lack of space etc. Computers calculated the raising factors (primary computing); the books then moved to the coders for coding, and then back to the computers for entering the raising factors onto the questionnaire books (secondary computing). They were then sent to the central registry of questionnaire books to await "calling for" by the punch room.

Questionnaire books did not go back to the central registry after primary computing and before moving to coding, because they were required once

more after coding for entering the raising factor. This was also the reason why both computers and coders were placed in one building. Editors and the central registry for questionnaire books were also in a separate building and the punchers and machine operators were in a third. In view of this arrangement a rule was made that questionnaire books always passed through the central registry whenever they moved from one building to another, but not when they moved between two sections in the same building. The latter was controlled in the editor's building by one of the staff (the editor's paper chaser) who also did the necessary recording; in the computer's and coder's building there was another "paper chaser" for the same purpose.
Keeping the analysis staff in different buildings was arranged purposely to prevent verbal questioning which might result in inaccurate careless replies. A queries procedure was adopted in order that all queries and answers would be officially recorded.

After the editing, computing and coding, the questionnaire books were ready for punching and verifying. At this stage the questionnaire books were returned once more to the central registry. The cards were full-listed i.e. all items were shown, and then the "full listings" were forwarded to the "full listers" who recalled the questionnaire books for the group in question. The full listings were checked thoroughly for the last time to ensure that the facts on the cards were a correct copy of the questionnaire books, and that they were ready for the machine analysis stage. After checking the full listings were returned to the machines, and the questionnaire books were returned finally to the central registry for questionnaire books. They were not taken out again, with the exception of special investigations which proved necessary when the tables were produced.

Also at this stage was the production of the balancing tabulations which were required to balance the machine work with that of computers. The machine analysis could not start until the full listings had been checked and the balancing tabulations had been cleared.

The machine analysis was divided into, the interim report tabulations stage and the final report tabulations stage. Tabulations from the two stages were checked by reporters i.e. the people responsible for the production of the interim and final reports.

The following paragraphs deal in more detail with aspects mentioned in the above summary of the analysis work.

5.2 Unpacking

At this stage every questionnaire book had to be accounted for. All the questionnaire books for a certain group were checked. A thorough check was also made on the spare books that were sent to the field to find out

which of them was used and which was not. Consequently, no questionnaire book was left behind in the field, and no other was used in another district without the knowledge of the Department of Statistics. When the unpacking was done, the office of the Census Analyst prepared control forms for each section (Form pc 61) showing the process of each questionnaire book.

5.3 Colour ink

Editors used green ink, coders purple, computers blue, and assumed information was marked with a red circle.

5.4 Editing

5.4.1 Introduction

The editors, or scrutinizers, were responsible for preparing the work for the first stage of the analysis i.e. the questionnaire books stage, including coding, computing and punching. Secondly, they were to facilitate the work for these sections which were working at speed, and thirdly they did the more difficult coding.

Included with the first category was the problem of "assumed information"; this refers to those parts of the questionnaire which were not completed by the enumerators. After examining other answers on a questionnaire the editors filled in the blank spaces. An analysis of the "assumed information" was not produced owing to shortage of time, but the machine scheme catered for it and a card-column was reserved for this purpose.

The editors were instructed to do the editing horizontally. When there were two conflicting answers for example a positive number and a negative blank, the positive number was accepted as the correct answer. Editors were also instructed not to condemn facts that appeared to be impossible or unlikely, as customs vary considerable/ throughout the country. Finally the editors were instructed to write clearly and legible the enumerator's writing.

The second and third categories of the editors' work are discussed jointly in the following paragraphs.

5.4.2 Household Number

The combination of letters and figures in the coding system of these two card columns complicated the coding which was, therefore, done by the editors.

5.4.3 Personal Number

Similarly, the personal number was complicated and was coded by editors. In both cases it was essential to let the editors decide where a households began and where it ended.

5.4.4 Relation to head of household

Editors were to make sure that that description of the relationship of numbers of the household to the head agreed with the codes files. In cases where entries on the questionnaire form showed that the relation to the head of household was entered incorrectly by the enumerator, the editors was to correct it. Also the editors had to check that the language and mortality questions were answered in the same row as the head household. If the head of household was shows on a row other than the first , or if the editor decided that a person other than the one shown in the first row was the head of household, the whole page (or pages) were to be re-copied in green ink.

5.4.5 Number of months in village or with sheikhship during last 12 months

This was also coded by editors. Detailed instructions were issued covering nomads, babies born during the past 12 months, and people who, because of the nature of their occupations did not stay in one place long enough to be included. The following: is an extract from the editing instructions on this question:-

"When by mistake, enumerators have left this column blank throughout, in general, assume code 6 (i.e. 6 months and more), but first make certain that the occupation entered in question-column 17 (main occupation) and/or question-column 18 (subsidiary occupation) is a possibility in that area. For instance, if there is no railway in the vicinity, a person with the entry of "station master" should be given code 1. Reference should also be made to the neighboring pages of the questionnaire book. In areas where there is known to be migrant labour (for instance the Gezira) several complete households often have code 1, and if this is the case it might be reasonable to assume cod 1 for the household left blank. A positive entry in the question-column 27 (whether on another sheikh's tax-list) would strength this decision".

The importance of reference to other questions can be seen from the following extract from instructions on the same question :-

"When only one, or possibly two entries have been left blank on page, refer to the age group in question-column 20 as well as the occupation, and again assume code 6 unless there is definite evidence to the contrary. Persons with an entry 1 to 5 in this column who have an entry "A" (for absent) in column 7, and it is obvious from question-column 5 (relation to head of household) and question-column 28 (whether on list of supplementary data), that they are not followers of the specified sheikh nor members of families of such followers, should of course be crossed out by editors "etc ..

detailed instructions were given to the editors for referring to other question columns when checking the information given. A part from the household number which was allotted two columns on the card, the personal number,

relation to head of household, and number of months in village were allotted one column each.

5.4.6 Present or absent

One column was allotted on the card to this answer, which was checked by the editors and compared with answers to other questions.

5.4.7 Sudanese or foreigner

The editors had to decide whether a person was Sudanese, a foreigner, or a Sudanese of foreign origin. If he was Sudanese, the editors checked that the tribe which was mentioned in the answer to the question following, appeared on the "Tribal-list". If the person was a foreigner, or Sudanese of foreign origin, the country of origin was checked on the "list of Countries".
One column was allotted to this question which was coded by editors primarily because the answer to the question following depended on the answer to this question.

5.4.8 Place of birth

Four part columns were allotted to this question. The country of birth, province of birth, or district of birth were straightforward and presented no difficulty. The coding of villages was more complicated. Long before the actual editing of the questionnaire books for a particular census area or group, the basic codes for places of birth (towns and villages in Sudan) were produced from survey maps, (scale 1:1.000.000) and by copying village names from Form pc 2 "list of sheikhships in an omodia" and the actual questionnaire books. Each district was divided into groups (there being always one group for a town and its vicinity) and the villages within each group were listed and coded. As two card columns were allotted to these codes on the alphanumerical columns, there were 32 possibilities for the first card-columns (group code), and for each of the 32 possibilities there were another32 possibilities on the second card-column for villages within the group. In all, therefore, there were 352 combinations; but not all the possibilities on the second card-column were utilized as it was intended on the second card-column were utilized as it was intended to publish migration statistics from the first card-column only. Even then, not all 32 groups were made use of as they would have been too many for publication purposes. If there were more than 31 villages in a group the others were all given code "Z". finally, for each district there was a group called "Nomads, Unknown Locality and Unspecified" with group code "9", in the case of persons born to omadic parents, editors were to use code "9" if in addition on the enumerator entered "No village" for a sheikhship or part of sheikship which was nomadic. Code 98 was used for any village which had no name or was unspecified. Code 99 was reserved for any village which could not be placed in any of the groups in the district.

The above account illustrates the difficulty of getting migration statistics in a country where villages are too small and numerous and where in most

cases they do not have permanent names. In fact even villages may not be permanent in many cases owing to lack of water. A village is deserted and the population finds a settlement elsewhere.

5.4.9 Sex, married of single

"M" was written for males, "F" for females. "M" for married and "S" for single, or their equivalents in other languages. Editors checked that the answers were sensible and in agreement with answers to other questions. There was one card-column only for these two questions, and a code was punched straight into the card for each of the four combinations.

5.4.10 Number of wives

Editors checked that the information was sensible and in agreement with answers to other questions. Coding, using alphas was used in the case of a person with ten or more wives.

5.4.11 Main occupation and subsidiary occupation

Six card-columns were allotted to these two questions. The coding was done by coders but the editors checked that the occupations appeared on the "list of occupations". Detailed instructions were given for dealing with the gainfully employed.

5.4.12 Socio-economic group

One card-column was allotted to the answer which was coded by editors from the main occupation, and not asked during the enumeration. In many cases the socio-economic group was the same for the whole household if the household was a family unit engaged on the same or similar occupation, and all the members living at a similar standard. There were deviations from the rule, as for example in the case of households with a servant, where the occupation of the head of the household was different in status from that of the servant. It was ruled, however, that in the case of unskilled occupations in rural areas, the father, the mother and at least the younger children under puberty were of the same socio-economic group.

The following shows the socio-economic grouping of occupations:-

- Nomadic animal owners
- Secondary animal owners
- Cultivators
- Unskilled in rural area
- Unskilled in urban area
- Skilled in rural area
- Skilled in urban area
- Managerial and professional

Editors were given the following socio-economic group ready reckoner which showed the socio-economic group within which a certain occupation came depending on the mode of living :

Occupational Group 1)	**Occupation 1)**	**Sub-occupation 1)**	**Socio-economic group code**	**Socio-economic group**	**Remarks**
0 1 2 3	0- 1- 2- 3-	0- 1- 2- 3-	5	Managerial and Professional	None
4 5 6 7 8 9	4- 5- 6- 7- 8- 9-	4- 5- 6- 7- 8- 9-	F OR U	Skilled in rural areas	Applicable in rural areas
				Skilled in urban areas	Applicable in urban areas
A	AD	AD-	2	Cultivators	None
	AR	AR-	E T	Unskilled in rural areas Unskilled in urban areas	None
B	B9	B9-	1	Sedentary animal owners	None
	BD	BD-	0	Nomadic animal owners	None
C	C-	C--	E OR T	Unskilled in rural areas	Applicable in rural areas
				Unskilled in urban areas	Applicable in urban areas
D	D-	D--	F OR U	Skilled in rural areas	Applicable in rural areas
				Skilled in urban areas	Applicable in urban areas

1) The meaning of the codes is given in Appendix 45 to this Report.

Occupational Group 1)	Occupation 1)	Sub-occupation 1)	Socio-economic group code	Socio-economic group	Remarks
E	E-	E--	E OR T	Unskilled in rural areas	Applicable in rural areas
				Unskilled in urban areas	Applicable in urban areas
F	F-	F--	F OR T	Unskilled in rural areas	Applicable in rural areas
				Unskilled in urban areas	Applicable in urban areas
H J	H- J-	H-- J--	E T	Unskilled in rural areas Unskilled in urban areas	None
K	KU	KUO	5	Managerial and Professional	None
		KU2 KU4	F OR U	Skilled in rural areas	Applicable in rural areas
				Skilled in urban areas	Applicable in urban areas
	KV	KVO KV1	5	Managerial and Professional	None
		KV2	F OR U	Skilled in rural areas	Applicable in rural areas
				Skilled in urban areas	Applicable in urban areas
		KV4	F OR U	Skilled in rural areas	Applicable in rural areas
				Skilled in urban areas	Applicable in urban areas
	KW	KWO	5	Managerial and Professional	None
		KW4	F OR U	Skilled in rural areas	Applicable in rural areas
				Skilled in urban areas	Applicable in urban areas

Occupational Group	Occupation	Sub-occupation	Remarks
N--	NX-	NX0 NX1 NX2 NX3	By definition these occupations carry the SEG of the head of household or another senior person in the household.
		NX4	This sub-occupation being entered in question column 18 only will not determine the SEG. Before to the answer in question-column 17.
	NY-	NY0	This sub-occupation being entered in question column 18 only will not determine the SEG. Before to the answer in question-column 17.
		NY1	These sub-occupations should be placed under SEG of the head of household or another senior member in the household. Should this prove to be impossible, SEG code E or T, as the case may be, ought to be used.
	NN-	NN0 NN1 NN2	These sub-occupations should be placed under SEG of the head of household or another senior member in the household. Should this prove to be impossible, SEG code E or T, as the case may be, ought to be used.

As the above ready reckoner shows the unproductive occupation i.e. students, household duties, unemployed, beggars, unknown and no occupation, were not allotted to any socio-economic group as they were included in the head of household was a housewife (by the main occupation), then the socio-economic group was determined by reference to the occupation of the other members of the household. In some cases it was possible to determine, from the names of children for example, the name of the husband, in which case his socio-economic group was given to the household in question.

5.4.13 Highest school attended

Two column were allotted to this question on the card. Although coders were responsible for the coding, the editors were again responsible for checking that the description of the school was available on the codes files. This question applied to both sexes in the five years and over age groups only.

5.4.14 Age

One column was provided for this question. As it was different for both the enumerated and the enumerators to understand the age group classification, detailed instructions were issued to editors to ensure correct answers. The problem was especially difficult in the case of female, whether they were past or not past child bearing age.

5.4.15 Fertility and infant mortality questions

One column was allotted for the number of "all live births" a second for the number of "birth during the last twelve months and a third column for infant mortality. The answers to these questions were the complete responsibility of the editors. No coding was required except in the case of the number of "all live birth" where alphas were used for ten children or more. Detailed instructions were prepared for editors to ensure correct and sensible answers. The following in an extract from "Editors Instruction" on "live births during the last twelve months".

The question asked here was , Did you have a child born alive during the past twelve months? How many if more than one?- only in every exceptional cases will the answer here be two or more than two. Be on the look-out for mistakes made by enumerators and see that the number entered by them dose not too often exceed one. Of there is a positive entry in question column 22 (all live births), check that there is no child under 1, in question column 20 (age group). If there is no such child it must have died and there should be positive entries in question columns 23 (number of children who died during the last 12 months). 24 (infant mortality) and 26 (overall mortality). There might be a child "under" 1 in question column 20 (age group) and no entry in question column 22 (live birth during last twelve months) if the mother had died, or the child is being looked after by the

grand-parents. This will only be wrong if it occurs very frequently, as enumerators have been asked to enumerate children under 1 in their parents' household except for the every cases when an infant is present at the time of the enumeration in grand-parents' house and moreover was either born there and never lived elsewhere or lived there for at least six months during the last twelve months etc."

5.4.16 Language spoken at home

Three columns were allotted on the card for the language. The coding was done by coders, except in the case of households occupying more than one page, and in the case of questionnaire pages occupied fully by persons discovered during post enumeration survey. Editors also did the coding in the case of institutional household i.e. schools, hospitals, hotels etc. as different languages might be used by different persons. Otherwise, editors checked that the languages shown on the questionnaire could be found by the coders in the codes files.

5.4.17 Mortality

This information was obtained from heads of households only. The actual question referred to the number of persons who had died in the family, or in the families who joined the family under consideration during the previous twelve months. One card column was allotted to the answer, and the coding was done by editors for cases of ten persons and over, using alpha codes. Editors checked that the number shown in this column was at least equal to the total shown in question-column 24 (infant morality).

5.4.18 Form pc 15

This form which was attached inside the questionnaire book office cover [i)] was originally devised as a questionnaire book control from showing the steps within each section of the analysis wing. As each step was completed the person who had completed it signed on the form. This procedure was repeated when the questionnaire book was passed for checking, thus the stage reached by each questionnaire book was immediately clear. If a mistake was later discovered this made it easier to trace its origin and the checker who had overlooked it. The form was found to be more useful for recording information covering the whole questionnaire book either because there was no space provided for it on the questionnaire form or although there was space for the information it was shown on pc 15 rather than on the questionnaire because it was common to all households and could therefore be "ganged in" by the punch operators.

---

i) Each questionnaire book had one office cover and a filed cover.

Information covering the whole questionnaire book included the province, district, census area, group, omodia, sheikhship, mode of living [i)] and technique. Information common to all households included such items as place of birth, tribe and language. When they were repeated throughout the whole questionnaire book the repeated item was recorded once on the first page of the questionnaire book and an entry was made to this effect in a special place on the Form pc 15 referring to the question-column as well as the card column.

5.4.19 Province, district, census area and group

Four columns were allotted to these four questions. Their respective codes were inserted on pc 15 by the editors.

5.4.20 Mode of living

One card column was provided for mode of living and the coding was done by editors on pc 15. the editors were instructed to study all relevant information to enable that they could insert the correct code.

Urban large areas and urban small areas presented no problem, but difficulty arose in determining a rural sedentary area or a rural nomadic area, specially in cases where compound technique was used. Only after reading the relevant information from documents such as the enumerators' and supervisors' diaries, in conjunction with the technique adopted, was it possible to determine the mode of living.

5.4.21 Omodia and sheikhship

The codes for the omodia and sheikhship were shown on Form pc 15, and two card columns were allotted on the card.

5.4.22 Number of taxpayers in household

One card-column was provided for the number of taxpayers in the household. Editors were to add up taxpayers i.e. persons with number entered in question-column 28 (whether on list of supplementary data) and enter the total in the place provided for the purpose. Any persons included during the post enumeration survey were not to be added to this total.

Before the computing started, the Chief Editor checked that the enumerators and his editors were using the right lists of supplementary data. For this purpose the number of enumerated persons in the sheikhship were divided by the number of enumerated taxpayers.

---

i) In cases where there was more than one omde of living in the questionnaire books, the questionnaire pages were coded accordingly.

In case where y/x provided extremely variable or equal to infinity (there was one or two such cases) a decision had to be taken as to whether the given sheikhship should be deleted from the sample, or whether efforts should be made to obtain the correct lists of supplementary data. The editors calculated y/x roughly before passing the books to the computers. The actual calculation of raising factors was done by the computing section.

5.4.23 Number of persons in household

This information was applicable to the head of households only and punched on the head of household card. Two columns were provided on the card for this information. Editors were not to include persons added during the post enumeration survey or to exclude persons deleted during the post enumeration survey. Special instructions were included to cover households with more than ten persons.

5.4.24 Whether no another sheikh's tax-list

One card-column was allotted on the card for this question. First the editors checked whether the enumerators had discussed the tax-lists with the sheikh, and had inserted "unknown", "dead", or "L.A" (left area) in the appropriate places. This was to ensure that the lists of supplementary data were as up-to-date as possible.

In areas enumerated under the scattered tukls, nomadic, or the non-well-defined village part of compound technique with "yes" entered against a person in this column, but no number in question-column 28 (whether on list of supplementary data), that person and the more closely related members of his family were to be eliminated by the editors. Sometimes the whole household had to eliminated for reasons other than the above. Eliminations and disregarded are dealt with in a later paragraph [i)].

5.4.25 Taxpayer's number

This was the supplementary data question. Two columns were allotted on the card. Editors had to check the work of the enumerators, and check that the same name was not credited with the same tax number more than once. They entered the person's household number in an appropriate place on the Form pc 4. This practice made referring back easier during checking.

In areas enumerated under the well-defined village technique, or the well-defined village part of any of the compound techniques with "yes" entered against a person in question-column 27 (whether on another sheikh's tax list) a number inserted in question-column 28 (supplementary data question),

---

i) See paragraph 5.4.25 and ???? 5.???

which was found to be correct when checking the list of supplementary data, editors were to cross out the "yes" entered against the person and the members of his family. In this way the person or persons would not be disregarded on account of question-column 27 (whether on another sheikh's tax list) as is explained later.
If, on the other hand, a "yes" had been entered in question-column 27, and no number in question-column 28, and on checking the list of supplementary data no number was found, then editors entered "yes" in question-column 27 for the close members of the family of person in question.
If in areas enumerated under the scattered tukls and nomadic techniques, as well as the non—well-defined village part of any of the compound technique, a "yes" was entered in question-column 27, but no number was entered in question-column 28, that person and the closely related members of his family were to be eliminated by the editors.
The enumeration techniques adopted and the type of supplementary data used both in areas under consideration and in the neighboring areas account for these detailed instructions. In the case of scattered tukls and nomads, enumerators were to enumerate the followers of the sheikh ONLY. In the case of the well-defined village technique everybody in the village was to be enumerated.
In areas where no suitable lists existed, and lists of heads of households or electoral rolls were used, the use of different types of supplementary data created difficulties in connection with question 27, as people with a "yes" in that question-column were eliminated without having a chance of appearing on the supplementary data of another sheikh. Subject, therefore, to the primary importance of question-column 28 (whether on the supplementary data of this sheikh), a positive answer to question-column 27 (whether on the tax lists of another sheikh) held good if the supplementary data in the given census area were not names of heads of households or electoral rolls, and if the supplementary data in other areas in the same district was not the names of heads of households or electoral rolls.

5.4.26 Persons eliminated and persons disregarded

Eliminated persons were those who should not have been enumerated and who were subsequently eliminated by editors, in green ink. Disregarded persons, were those who were legitimately enumerated, but who were subsequently disregarded by computers as a result of the "de jure" definition. Eliminations were done by editors and disregarded persons were dealt with by computers.

5.4.27 Rules on foreigners and odd strangers

The census sampling frame was the omodia and sheikhship, but in settled villages, living side by side with the followers of the sheikh were people who did not owe allegiance to the sheikh or sheikhs, and they therefore fell outside the omodia/shekhship organization. They might be detribalized

persons (Northerners living in Southern Provinces) or Westerners, or genuine foreigners i.e. Greeks, or other nationalities.

With the well-defined village technique when everyone was enumerated [i)] this situation did not arise because the foreigners and odd strangers were enumerated fully even though they did not come within the frame and the supplementary data. The raising factors which applied to those covered by the frame and supplementary data applied to them also.

With the nomadic or the scattered tukls techniques, enumerators were instructed to enumerate only followers of the specified sheikh. Nomads consisted only of the followers of one sheikh or group of sheikhs living together. Where foreigners or detribalized persons lived in scattered tukls areas, they were treated as special category units of special category omodias. Thus special rules applied only where sampling was adopted in well-defined villages i.e. the well-defined village part of a compound technique.

Enumerators were instructed to enumerate the required proportion of the followers of the specified sheikhs, leave two blank pages of the questionnaire, then enumerate all the foreigners in the village and leave another two blank pages. The required proportion of the followers of the sheikh who did not live in the well-defined village part of the sheikhship, but in scattered tukls or nomadic groups were then enumerated. The foreigners in all the villages in an omodia were then copied by editors into one or two questionnaire books and called extracted foreigners , sheikhship and given code 99. they were not, therefore, subjected to the same raising factors (i.e. g^{i}, g^{ii} , g^{iii}, g^{iv}) which were applied to those people who were covered by the frame and supplementary data. The special treatment they had (by computers) is discussed later under computers instructions.

In some instances the definition of "foreigner" was understood and people of foreign origin (westerners) who were on the lists of supplementary data, were included as "foreigners". The editors were given special instructions to look out for such mistakes by checking the names of foreigners against the lists of supplementary data.

There were cases of where followers of more than one sheikh lived in one village, and it was possible for more than one sheikh to be selected for enumeration in the village under one of the compound techniques. In such circumstances, each enumerator enumerated only the followers of the sheikh allotted to him, but only one of the enumerators was instructed to enumerate all the foreigners and odd strangers in the village.

---

i) This technique was rarely adopted.

5.5 Coding

5.5.1 Introduction

Coders were reminded that their codes had to be legible otherwise time would be wasted at the punching stage and mistakes in punching wrong codes would occur. A number of inconsistencies were in fact discovered at the reports stage, which were traced back to illegible handwriting at the coding stage.

In order to understand the area they were dealing with the Chief Coder and senior coders were asked to study and summarize the tour notes prepared by field inspectors and other visiting senior officers from the Department of Statistics; also relevant information contained in the district files and the enumerators' and supervisors' diaries. The summarized information was then circulated to the coders and checkers of codes.

General principles of coding were issued to coders to ensure that they would refer to the codes files when coding, and not rely on memory. Even the most frequently used codes were to be checked against the codes files occasionally. Changing codes was arranged systematically so that the punchers always knew where to look for a new code when the old one had been crossed out.

5.5.2 Order of coding

Coders were trained to code all the relevant parts of the questionnaire book but only job was coded at a time throughout the book. This ensures a high speed of work as the coder became familiar with that particular aspect. As some jobs required longer time un-occupied coders helped to complete the work.

5.5.3 Method of checking

The checkers of codes adopted the opposite procedure to the one used by the coders. They started with the codes and checked that the counterpart was the same in the questionnaire form. The numerical list version of the standard lists was used for this purpose, and decisions that had to be taken were made by the editors for the coder.

5.6 Computing

5.6.1 General principles of computing

The computing was done in such a way that in the absence of the original computers new computers would carry on. Computers were instructed to see that sample space was provided for all entries on the working sheets and forms. The use of scrap paper and erasing was disallowed. If a mistake was made the figure or figures were to be crossed through and the new figure or figures inserted above. Zeros were to be made use of , for example, if a figure was less than one a zero was to be put on the left of the decimal point. If computers worked up to four decimal points for example, and some of the

figures had two or three decimal point only, blank spaces were to be filled with zeros so that all figures in the same piece of work always had the same number of decimal pieces. Rounding off was to be taken to the nearest significant figure. If the last figure to be rounded off was less than five, it was ignored, if it was more than five one was added to the first significant figure. If it was exactly five the first significant was increased if it was odd and ignored if it was seven. Computers were warned against making mistakes as a result of hasty work. They were not to do by hand, or by memory, what a machine could do quicker. All addition slips were to be retained so that the checkers could trace mistakes.

5.6.2 Computers' timetable

As soon as the computing section had dealt with the disregarded and post-enumeration survey form, the questionnaire book was returned promptly to the coders. The calculation of raising factors did not have to be completed until the questionnaire books returned from the coders; the raising factors were entered. It was intended to calculate the variance not later than the beginning of the process of edition the tabulations, as they might be required at the time the tabulations were produced. In fact this did not happen; the calculation of variances was completed several months after the completion of all other calculations.

The computing was carried out in the following steps :

Step (1) production of Forms pc 18

Firstly, disregarded persons were excluded and the "de jure" figure arrived at. For this purpose Form pc 18 was used. The following persons were disregarded :-

(a) persons with the enumerator's entry under question-column (6) of the questionnaire form of Nil, 1, 2, 3, 4 or 5 or the editors' code 1. in some cases editors allotted code 6 to a certain category of persons who were termed as having nomadic occupations i.e. were likely not to stay in one place for more than four months and who would, therefore, have been excluded wherever they were found. This category included such persons as lorry drivers, locomotive drivers, pilots, ticket collectors, train conductors, etc. Nomads were not of course excluded on this account as they had dashes (for inapplicable) in this question column. Nor were persons and their relatives excluded if they were found on the lists of taxpayers. Boarding school children presented a problem if the enumeration was conducted at the time when the schools were closed; as the children had spent less than six months in the parents' households they would have been disregarded. For this purpose a note was included in the "summary for analysis personnel" indicating whether schools were opened or closed at the time of enumeration

and this decided whether or not school children were to be disregarded or otherwise from their parents' households.

(b) Persons with the enumerator's entry "yes" in question-column 27 on the questionnaire form, irrespective of the entry in question-column 6. Also the closest members of the family of these persons were to be disregarded. The responsibility of entering "yes" was left to the editors. Closest members of the family of these persons were defined as follows :-

(i) wife (or wives) of the taxpayer or head of household.
(ii) Children under puberty.
(iii) Children under puberty not married, and according to the questionnaire form clearly and undoubtedly economically dependent on the member of the household, to be disregarded.
(iv) Incapacitated members who were economically dependent on the member of the household, to be disregarded.
(v) In the case of special category units, persons with the enumerator's entry of "yes" in question-column 27. irrespective of the entry in question-column 6.

Step (2) Production of Form pc 40

This form was dealt with in the early stages of the computing. It covered persons added or deleted during the post enumeration survey; appropriate weights were arrived at for each group, and were applied to the g-8 (the raising factors). Only households included in the post enumeration survey were listed on this form. They were marked in hard blue pencil by the post enumerators at the top of the questionnaire forms, irrespective of whether or not any changes were necessary. If the raising factor was uniform for the whole sheikhship, (not subjected to the post enumeration survey) it was punched by the punch operators. The same idea applied to household raising factors.

Step (3) production of calculation sheets forms pc 23

These forms were divided into those forms used for the calculation of raising factors, and those used for the calculation or variances, although part of the former calculation sheets contained preparatory calculations for the variances. The use of forms coving the calculation of raising factors is described in the following paragraph. The calculation of variances is not within the scope of this report and may be referred to in any taxbook on sampling.

Form pc 23/1. This form was used in the rare cases where g^1 (first stage raising factor) had to be calculated. The most appropriate sample size was such that the first stage sampling fraction had to be unity i.e. each omodia had to fall within the sample. Owing to a deficiency of supplementary data in a certain omodia within a group, it was sometimes necessary to drop that omodia from the sample and calculate a first stage raising factor for the omodias in question. The following is a list of census areas and omodias where the first stage raising factor had to be calculated :

Census area 262 El Madina : Omodias 41, 42, 48. census area 312 Dar Masalit South : Omodia 49, 50, 52, 53.
Census area 411 Eastern Equatoria : Omodia 07.

In the first and second cases the calculations of the first stage raising factor was necessary because of a deficiency of supplementary data; in the third case, it was cased by the disturbances in the South which interrupted the enumeration. To summarize; Form pc 23/1 was used when one or more omodias in census area (or a group which was part of a census area), had either not been enumerated or had been enumerated so badly that the results had to be discarded. It also covered instances where the supplementary data were so defective that a part from the omodia total they could not be used. This first stage raising factor was called

$$^{gi}ca = \frac{xca}{xca - {}^{Z}\sum x_o}$$

Where xca = Total number of names on the lists of supplementary data in all omodias in the census area.

$^{Z}\sum x_o$ = Total number of names on the lists of supplementary data in all omodias in the census area not included in the sample.

Z = Number of omodias not included in the sample.

Form pc 23/2 : This form was used to calculate :

(a) $g^{ii}o = \frac{xo}{Xos}$ = second stage of raising factor where

Xo = Number of taxpayers in omodia.

Xo = Number of taxpayers in selected sheikhships.

(b) $g^{iii}os = \frac{Xs}{xs}$ = Third stage raising factor where

Xs = Number of taxpayers in selected sheikhship.

xs = Number of enumerated taxpayers in selected sheikhship.

(c) $g^{iv}os = \frac{xc}{x}$ = A correction factor resulting from the discussion with the sheikh as to the taxpayers in sheikhship, where

xc = Number of taxpayers after discussion.

x = Number of taxpayers before discussion.

As result of this discussion deceased persons, and those who had left the area etc. were crossed out. This explains why $g^{iv}os$ was always less than unity.

This calculation sheets was used to arrive at the values of $g^{ii}o$, $g^{iii}os$ and $g^{iv}os$ and by multiplying the number of persons enumerated for each sheikhship (Y_{os}) by $g^{iii}os$. $g^{iv}os$, the corrected estimated population for all sheikhships was arrived at i.e. $\sum Y^{c}_{os}$.

To arrive at the corrected population estimate for the omodia $\sum Y^{c}_{o}$, $\sum Y^{c}_{os}$ was multiplied by the second stage raising factor ($g^{ii}o$) and the group population estimate was reached. One form pc 23/7 was used for this purpose for whole group. This form was also conveniently used for some computations of between omodia variance (V ϒ□) where $ϒ□ = \frac{\sum^{c} Y_o}{\sum^{c} X_o}$.

problems sometimes arose with g^{iii} , the third stage raising factor in a sheikhship. In some cases g^{iii} fell considerably away from the reciprocal of f^{iii} (third stage sampling fraction) and an investigation was made to find out if it was genuine. Otherwise, resort was made to calculating the $ϒ = \frac{Y}{X}$

for all sheikhships, and if the ϒ was also unreasonable the sheikhship for which the unusual g^{iii} was unreasonable was either dropped from the sample or $\bar{g}^{iii}$ was calculated from other sheikhships and used for this sheikhship, so that use was made of the data collected in this sheikhship. These cases were too rare to be of any significance.

Form pc 23/3. This form was only used in cases where post enumeration survey was conducted and it was, therefore, necessary to calculate the individual raising factors by ages (i.e. the G = $g^{i}o$,$g^{ii}o$, $g^{iii}os$, $g^{iv}os$) was multiplied by the correction factors obtained from the post enumeration survey by age groups.

Form pc 23/4. This form applied only in the case of omodias enumerated under one or more of the compound techniques. It was used to find the value of g^{F}_{G} = the raising factor for foreigners enumerated in the village part of the compound technique and who did not come under the omodia/sheikhships organization.

5.7 Machine Analysis

5.7.1 General

The following paragraphs describe briefly the procedure from the time questionnaire books arrived in the punch room to the production of the final tables. A description of the machine analysis then follows,

(a) **Pre-Punching.** When the questionnaire books arrived in the punch-room they had passed through the editing, primary computing and secondary computing procedures. Meanwhile, computers had partially completed pc 78/1, pc78/2 and pc78/3 (balancing forms) and forwarded them through the flow of documents to the balancing room.

(b) **Punching.** When questionnaire books were called to the punch-room by group and then punched. One card was allotted to each person including persons disregarded and persons added during the post enumeration survey, but excluding persons eliminated by editors. Columns to be ganged were indicated on p c 15 and remaining columns punched from the questionnaire forms.

(c) **Verification.** After punching and check-punching, the cards were auto-verified and the error cards extracted repunched, checked and agreed, and the correct cards put in the place of the marker cards; the latter were returned for use again in the auto-verifier. Where cards for a group were completed and correct they passed to the machine room for interpretation.

(d) **Statement 1.** The Universal Printing Counting Sorter (referred to as U.P.C.S) was used to produce Statement 1 which showed the number of households, number of cards, number of disregarded and persons added during the post enumeration survey, for each questionnaire book. At the same time, the cards for the disregarded and persons added during the post enumeration survey were extracted.

(e) **Full-listings.** The tabulator was then used to list the cards with all items shown. No totals were to be shown in between the cards. One full-listing was produced for each questionnaire book giving totals of the number of persons, individual raising factor and household raising factors.

Disregarded persons and persons added during the post enumeration survey were excluded. For each questionnaire book a list of post enumeration survey additions and listing of disregarded persons were produced showing all relevant information.

When the Statement 1 and the full-listins were produced for a group, they were then sent to the checking room together with the cards. These two items were then met by the questionnaire books which were sent directly from the punching room. A preliminary balancing operation of machine questionnaire book totals on Form pc 15 took place before the cards were sent to the store-room for temporary safe keeping, and the full-listings to full-listers for checking. The full-listings were then returned to machine room for correcting and the cards were punched where necessary.

(f) **Statement 2.** The U.P.C.S was again used to produce Statement 2 which showed the net number of households, the net number of persons, the net number of disregarded persons and post enumeration survey additions.

(g) **Preliminary Tabulations.** These were listings of summary cards. Whereas Statement 2 showed persons and households, the preliminary tabulations showed number of persons in head of household cards, individual raising factors and households raising factors. Two listing of summary cards were produced and one listing the "disregarded" persons and "post enumeration survey" additions

(h) **Balancing.** When Statement 2 and the preliminary tabulations had been produced, and a preliminary check had been made against Form pc 78 in the machines balancing room, they were sent, together with pc 78/1, pc 78/2 and pc 78/3 to the computers for balancing. Whereas the computers arrived at population estimates by multiplications, the machines arrived at them on the tabulator by additions. There should be no discrepancy between the two processes.

(i) **Interim and Final Report Tabulations**. When balancing was reached between computers and machines for all groups in a

census areas, the interim and some final report tabulations were produced. Remaining final report tabulations were then produced. The detail cards were first fed through the sorter controlling on the necessary characteristic for a certain step.

(j) **Preparatory Tabulations.** The detail cards which might have been all detail cards or for certain age groups only were then fed through the tabulator which produced the preparatory tabulations for a certain step.

(k) **Intermediate Tabulations.** The summary cards produced by the summary card punch were listed on the tabulation and the grand totals of individual raising factors and/or household raising factors were checked back to the preparatory tabulation. There might have been more than one intermediate tabulation produced, depending on the number of "snags" met by the machines when balancing the totals of the intermediate tabulation with the preparatory tabulation. Difficulties with the summary card punch might also bring into existence more than one intermediate tabulation.

(l) **Full-listings of summary cards.** When the intermediate tabulations had been approved and declared correct, the summary cards were listed on the tabulation in as many different ways as were required. For each listing the summary cards were first sorted according to the characteristic or characteristics for which sub-totals or grand totals were required. Grand totals for each listing were checked with the relevant preparatory tabulation.

(m) **Reporting.** When the interim and some final report tabulations and the remaining final report tabulations had been produced, they were then sent to reporters for general scrutiny. Special attention was paid to the following :

(a) Impossible or non-existent codes
(b) Alpha codes
(c) Cross-checking between interim and final report tabulations and cross-checking within final report tabulations.
(d) Checking of preparatory and intermediate tabulations.

(n) **Final tabulations.** Certain changes might have been effected either by machines or reporters on the produced interim/final report tabulations which necessitated repunching some cards. However, once the reporters were satisfied that the summary cards were prepared for all 94 Census Areas, then the summary cards were used to produce the final tabulations from which the final report tables were drafted.

5.7.2 Punching.

Punching was done from English and Arabic questionnaire forms, and in both cases the individual codes were read from left to right; the Arabic forms had to be coded in English. However, the punching necessitated reading the Arabic forms from right to left and the English forms from left to right.

5.7.3 Form pc 15 and punching.

Form pc 15 was used to indicate the name of the puncher who attended to the punchers of the questionnaire book; it was also used to indicate to the punchers which card-columns were to be ganged in. this indication was made either by editors, in the case of information that covered the whole questionnaire book, or by computers in the case of uniform individual raising factors and household rising factors.

5.7.4 Direct-punching.

In a number of card-columns, punching was made direct from the original information entered by enumerators, or from a combination of entries made by enumerators and editors. For example, taking question-column 6 (number of months in the village), editors coded 1 for less than six months and 6 for six months or over. In question-column 7 enumerators were to write P for present and A for absent or their equivalent in other languages. One card-column was allotted for these two questions and the punchers punched 1 or 6 together with over-punch N or A for P and A respectively, or their equivalents. Similarly, for question-columns 14 and 15 (sex and marital status) a code was punched for each of the four combinations as entered by enumerators.

The following questions were also dealt with by punchers : question-column 16 (number of wives), question-column 21 (all live births), question-column 22 (live births during the past twelve months), question-column 24 (infant mortality) and question-column 26 (over-all mortality).

5.7.5 Machine work.

When the editing, coding, computing and punching were completed, it was necessary to take two steps before embarking on the machine analysis i.e. the production of the interim report and final tabulations.

Firstly, it was necessary to full-list the cards on the tabulation, with all item shown. These listings were then scrutinized by the checkers of full-listings, to ensure that no mistakes were allowed to pass. For example, the enumerator may have inserted "M" for male (or its equivalent in other languages) when in fact it should have been "F" for female (or its equivalent in other languages); the editors might not have corrected it. This, together with similar mistakes in age group coding, caused age groups and sex discrepancies, which caused trouble at the balancing stage. Another type of

error which may be quoted is that a certain tribe might not have been clearly written by the enumerator, for example, a Nilo-Hamitic tribe might have appeared to the coder as an Arab tribe and be coded as such by him. A number of similar error were discovered only when the interim report tabulations were produced for a census area. No logical explanation could be found for the presence of about one thousand Bisharin person. In census area 743, Dar Hamid west of Kordofan Province. Bisharin are found mainly in Kassala Province. After referring back to the questionnaire books and the full-listings it was discovered that the correct tribe was Bishariya and not Bisharin. In other cases great discrepancies were discovered between the tribes and the languages spoken in the same census area. This was the result of wrong coding, which had also been overlooked by the checkers of full-listings.

The second necessary step was the balancing process, referred to earlier, the cards were then ready for the machine analysis.

5.7.6 Interim report tabulation and some final report tabulation.

This stage covered the progress of the interim report tabulations and some final report tabulations for the purpose of :-

(a) the production of interim report tables,
(b) the production of some relevant (to interim report tabulations) final report tabulations.

Whereas final report tables showed in most cases the classification of the different characteristics either by mode of living or by socio-economic group for each census area and Province for the Sudan, the interim report tables were primarily required to show census areas information only. This did not prevent the production of characteristics for the provinces and the Sudan in the 94th Interim Report as well.

The machine analysis, at this stage therefore dealt with the interim report tables by characteristics only, and also some final report tables which required the figures for a census area to be classified by that characteristic and mode of living, as well as by that characteristic and socio-economic group. Thus when all the census areas were subjected to the procedure referred to in (a) and (b) above, it was then possible to produce from the census area cards, by the characteristic and mode of living and socio-economic group, further tabulations for the provinces and the Sudan by the characteristic in question as well as by mode living and socio-economic group.

The following were the characteristics required for the interim report tables :

(1) Age group and sex
(2) Omodias in rural areas and major divisions in towns classified by sex
(3) Language spoken at home
(4) Highest school attended, age-group and sex
(5) Tribal group or nationality group
(6) Main occupation (but not subsidiary occupation).
(7) Marital status of persons over puberty.
(8) Number of wives of married males over puberty.
(9) Crude birth, death and infant mortality rates
(10) Number of children of women past child-bearing age.
(11) Measures of fertility.

With the exception of (2) above, all the remaining tabulations produced by this procedure served the purposes of both the interim report and the final report.

This procedure, however, did not include arrangements for the production of some final report tabulations not connected with the interim reports, firstly because this procedure catered for the production of tabulations by census area only ,and not for provinces and for the Sudan, and secondly because it was not intended to include certain characteristics in the interim reports.

The whole of the machine analysis may therefore be grouped under the following three main stages :

(a) Form pc 162/1, interim report and some final report tabulations.
(b) Form pc 162/2, final report tabulations not connected with interim reports.
(c) An un-numbered procedure to provide tabulations from census area cards produced under (a) and (b) above, for the purpose of provinces and Sudan tabulations.

It was necessary before producing tabulations by age group (e.g. for schools, occupations, fertility and infant mortality) to produce the tabulations for the census area by age group and sex. These figures, once checked and agreed upon, were used as control totals for further tabulations whose totals were to be checked against these control totals.

Once the census area detail cards had been sorted by age group (and sex), it was possible to produce what was referred to as age group jobs [i)]. detail cards for age group 8 were to produce tabulations by birth and infant mortality, both by mode of living, socio-economic group, "people" tribal group or nationality group. Detail cards for age group 4 and 8, 9, 0 were then used to produce marital status tabulations, again by mode of living, socio-economic group, "people", tribal group or nationality group. Age group 4 detail cards were then sorted to extract the cards for married males those were then used to produce "number of wives" tabulations. Again by the characteristics mentioned above. Age group 9 detail cards were used to produce average size of completed families, also by these characteristics. The detail cards for age groups 3, 4, 7 and "8, 9, 0" were used separately to produce tabulations once by schools, mode of living, socio-economic group, "people", tribal group or nationality group, and once by main occupation and subsidiary occupation.

When the age group job were completed, the work on all census area cards could begin.

As some census areas had more than one group (i.e. a sedentary group of omodias, a nomadic group of omodias and a town that was enumerated separately and fully), the detail cards were sorted by omodias and sex, and these figures were shown for each group for the purposes of table 3 of the interim report; this table had no counterpart in the final report.

If there was a town enumerated fully and separately in the census area being machine analysis, the detail cards were used to produce the town tabulations. The same general principle as above was adopted i.e. producing age group figures, then treating the detail cards for each age group to produce whatever tabulations necessary for the town in question.

---

i) It may be easy to refer to these age groups by their codes :

	Males		Females
Code	Name	code	Name
1.	under 1	5.	under 1
2.	1 to under 5	6.	1 to under 5
3.	5 to under puberty	7.	5 to under puberty
4.	over puberty	8.	over puberty not past child-bearing age
		9.	over puberty past child-bearing age
		0.	over puberty unspecified.

When the town tabulations were completed all the detail cards for the census area in question were used together to produce the following tabulation for the whole census areas :

(a) Languages
(b) Over-all mortality.
(c) Tribal group or nationality group.

Finally, some tabulations were required for "people", "foreigners". At this stage it was easy to extract their detail cards and produce the necessary tabulations for this "people".

Detailed instructions were issued to the machine operators in the shape of standard forms, showing how each job was produced as far as both sorting and tabulating. They worked according to the control totals referred to earlier.

5.7.7 The work of the reporters

All the tabulations were then forwarded to the reporters. The reporting section was divided into two sub-sections; one dealt with the interim report part and the other with the final report part.

A great deal of cross-checking was necessary. For example, tabulations in respect of the same age group had to add up to the same total as shown on the control totals, and sub-totals for the same characteristic had to be the same in all tabulations showing the characteristic under consideration. Reporters were instructed to watch for machine mistakes which might produce, for example, "non-existent" codes.
Interim report tabulations were then processed to produce the interim report tables, including the calculation of percentages etc.

5.7.8 Final report tabulations not connected with interim reports.

These tabulations were not connected with the interim reports because it was technically difficult to incorporate them with the earlier machine scheme, or because it was thought urgent to publish information at the interim report stage showing the absolutely important. These tabulations covered internal migration, the de facto figures and the subsidiary occupation and the main and subsidiary sub-occupation.

5.7.9 Provinces and the Sudan tabulations

Stages (a) and (b) above were concerned with productions of tabulations at the census area levels. Summary cards were produced showing the characteristics required by mode of living and socio-economic group or "people", tribal group or nationality group. It was now necessary to produce provinces or whole country figures for a certain characteristic, for example, schools, or mode of living or socio-economic group.

Up to this stage, all tabulations were produced with their two decimal points. For the purpose of the interim report tables, these two decimal points disappeared through rounding at the interim report tables processing stage. For the purpose of producing the provinces and whole country figures, the census area summary cards tabulations were used for rounding off purposes, using the decisions that were taken at the interim reports stage. New sets of summary cards were then used to produce tabulations for a certain characteristic or a combination of characteristics for the provinces and the whole country.

Similarly, this procedure was adopted at the provinces and the Sudan level and tabulations were cross-checked with the same characteristic for a certain age group. In fact, the last (9^{th}) interim report had to agree with similar totals in the final report. For example, the total number of persons in a certain tribal group or nationality group, or the number of married males over puberty with "one wife" etc.

6. Scope of the tabulat matter

6.1 Introduction

The purpose of this chapter is to define the different characteristics as shown in the tables and craw the limits within which they may be interpreted.

6.2 Comparison with interim reports.

The interim report tables with the exception of one table, namely, interim report table 3, were produced as a by product of the final report tables. To produce province and whole country tabulations, it was necessary to do the work at census area level first. But, once this information was available it was decided to publish it in the shape of interim reports covering the 94 census areas.

Most of the provinces and whole country final reports tabulations were produced by the main characteristic which may be, for example, literacy by mode of living and socio-economic group or "people", tribal group and nationality group. All these characteristics were available at the interim report tabulations stage, but only the main characteristic, in this case literacy, was published for each census area.

The 9th interim report was simply the additional information of all the census areas to the provinces and all provinces to the Sudan. To distinguish between the 9th interim report and the final report as far as provinces and whole country information is concerned, it must be explained that information contained in the 9th interim report was again by one characteristic (i.e. the main characteristic), whereas that of the final report was by all three characteristics (i.e. the main characteristic by mode of living and socio-economic group or by "people" and tribal group or nationality group.

All interim report tables included in both the 8 interim reports at the census area level and the 9th interim report (provinces and whole country level), were repeated in the final report. It was found essential to have all the tables, both interim and final, in one document.

Secondly, the interim report tables contained no information about migration statistics, as the latter were mainly a whole country job and it was not found convenient to fit them (as far as the machine scheme was concerned), into the interim report tabulations stage.

There was a few other minor differences. Whereas it was enough at the interim report tables stage to show the table by "people", tribal group or nationality group; at the final report tables stage figures were shown also by tribe and nationality. The same happened in the case of occupations where tables by main sub-occupations were produced for the final report as well as tables by subsidiary occupation and subsidiary sub-occupation. All this

information was available at the interim report tabulations stage, but in order to publish some statistical data quickly only the essential information by census area was used.

6.3 Signs used

The following signs were used in the final reports :

-	=	nil
xxx	=	not applicable
0.0	=	insignificant percentage or ratio, less than 0.05

The above signs as well as the following signs were used in the interim reports :

	=	figures of doubtful accuracy for reasons of bias or mistake, i.e. not connected with errors of statistical sampling.
blank	=	figure plainly absurd on commonsense grounds and publishing would have been highly misleading.

These last two signs were used in the interim reports in order not to delay publishing the ready information. Before completing the final report tables the figures were corrected , after the necessary investigations were made.

6.4 Age group

The influence of age composition of a population on its rate of natural increase is self-evident. A population containing a large percentages of young adults is likely, other things being equal, to have a higher birth-rate and a lower death-rate than a population containing relatively more infants and old people, groups which do not reproduce and which are subject to relatively high risks of mortality.

In most countries the actual age in years of each person is recorded, either by asking the age , last birth (as in America) or by asking the date of birth, as in Europe. The population is then divided into age groups which is more convenient for international comparability.

In the Sudan, however, such data cannot be obtained by asking either of these two standard questions, as most of the population do not understand such concepts as age or date of birth. Birth registration is comparatively new to the Sudan. For census purposes, therefore, reference had to be made to the seasons, of the year, or tribal events. Only four age groups were differentiated depending on physical distinction rather than age in years.

Under 1:

In cases of doubt or when any evidence was lacking, a child was considered as under 1 if he had not learnt to walk. Usually however the "date of birth"

question was used here with success. A description of the time of the year when the child was born e.g. "before the wheat harvest" or "after the cotton-picking", enabled the enumerators to decide the exact month of birth.

Over 1 to under 5 :

A child was considered to be over a year and under 5 if he could walk. The upper limit was arbitrary; the supposition being that over 5 a child either goes out to help with the goats or starts looking after younger children.

Over 5 to under puberty :

Although the lower limit to this group was arbitrary, the upper limit was definite.

Over puberty :

This was definite. The attaining of puberty is generally celebrated publicly, and often by some personal markings and/or change in dress or adornment. On medical advice, fourteen years of age was accepted as the attainment of puberty in boys and twelve years of age for girls.

In the case of female an attempt was made to subdivide women over puberty into those "past" and those "not past" child-bearing. If there was no evidence as to whether a woman was past or not past child-bearing age, she was recorded as "over puberty". This group was not more than 4 per cent of the total number of women over puberty. No woman was classified as past child-bearing unless there was indisputable evidence. For this reason, and because of natural reluctance of a women to admit that she was past child-bearing age, this category was probably under enumerated.

6.5 Nationality.

The answer to the first question "are you a Sudanese or a foreigner" was accepted and never queried. This was followed by a second question, which in the case of Sudanese was "what is your tribe", and in case of foreigners "what is your country of origin".

Acquired Sudanese nationality was recorded when the answer to the first question was "Sudanese" and a foreign country and not a tribe was the answer to the second.

This probable dose not give the correct official picture as far as Westerners are concerned, as there are a number of Nigerian and French Equatorial Africans, who have lived in the Sudan for more than two generations and who consider themselves Sudanese, although officially their nationality is not Sudanese.

6.6 Tribe

If no specific name was readily given in answer to "what is your tribe", "no tribe" was recorded. In the case of intertribal marriages the name of the wife's tribe was accepted, and not altered to that of the husband.

In a developing country like the Sudan, tribal differences are bound to disappear as a result of migration, improved communications, the growth of towns and intermarriage. Nevertheless, at the present stage of development tribal information may still be useful to reflect the differences in fertility and mortality rates, the habits of the different tribes, their bearing on income and expenditure and their mode of living etc.

There are about 570 tribes in the Sudan. For census purposes they were grouped under "tribal groups" and the "tribal groups" under "races". As explained in the supplement to interim reports, "race" dose not mean more than a group of "tribal groups" and it has no relation to the definition of race" as understood by anthropologists. However, owing to a number of objections after the term appeared in the interim reports, it was replaced by "people". This term appeared in the final report tables.

In many parts of the Sudan the tribes are well defined and little difficulty was anticipated over the question of who belonged to which tribe. Exceptions were scattered individuals and scattered families in some parts of the southern Sudan and in towns, and migrating labourers in the Gezira. Another problem was the segmentary nature of the tribal society of the Dika, Shilluk, Nuer and others, where it was difficult in many cases to distinguish between "tribe" and "sub-tribe".

For this reason the tribal classification which gave birth to some 570 tribes is subject to criticism from various points of view, e.g. anthropological, historical, ethnological, administrative and linguistic.

There were three editions of the tribal lists and the last edition was used during the main census. The first, which was compiled from several anthropological and other sources, was circulated to many interested bodies, inside and outside, the Sudan. On the basis of comments and advice received, the second edition was produced and tested during the Pilot Census. As a result, it was improved further and circulated for further criticism; the third and final edition was then compiled.

During the actual enumeration, enumerators were provided with a list of the main tribes in the area for which they were responsible. If they were in doubt as to the tribe to which a person belonged, they entered the sub-tribe on the questionnaire form. These sub-tribes could be grouped at the coding stage into tribes. They were instructed not to enter any division higher than a tribe as these could not be sub-divided. If a tribe was known by two or more

names and the question of different spelling arose, the Sudan Government Gazetteer spelling was used.
There races or people were as follows :-

1. Arab
0. Miscellaneous
A. Nuba
2. Beja
3. Nubiyin
4. Central Southerners (mainly Nilotic)
5. Eastern Southerners (mainly Nilo-Hamitic)
6. Western Southerners (mainly Sudanic)
7. Westerners
8. Foreigners with Sudanese status and
9. Foreigners with non-Sudanese status.

"people" 8 and 9 were added to the list for the sake of completeness. "people" 9 included all persons of non-Sudanese origin by blood and who had not been granted Sudanese status. "people" 8 included all persons of non—Sudanese origin by blood and who had been granted Sudanese status. Both were sub-divided by country of origin. There were also groups of nationalities such as Western European, Eastern European etc.

"people" 0 (Miscellaneous) consisted of "no tribe", "Muwalled" and "people unknown". Although of Sudanese origin, or part-Sudanese origin, they could not be classified in any of the other groups. The "no tribe" group included detribalized persons, the "Muwalled" included descendents of Egyptians who had settled in the Sudan and married Sudanese women, and the "people" unknown" included persons who did not belong to either of the above and whose "people" group, and tribe were unknown.
These who could be classified by "people" but not by group were included in "group unknown", at the end of the lists of groups within each "people".

The nationality of "Westerners" was difficult to determine. Many of these people from Nigeria, French Equatorial Africa and West Africa lived in the Sudan for years without applying for Sudanese citizenship, and they could not give reliable answers as to whether they or their parents arrived in the Sudan before 1898. their answers had to be accepted. If the answer was "Sudanese", the person was asked about his tribe. The tribal system covering these persons was incorporated in the Sudanese tribal system. If he claimed to be Sudanese and, instead of giving a tribe he gave country of origin, he was treated as West African, Nigerian etc., but with Sudanese status. If he claimed to be a foreigner, he was treated in the same way as other foreigners. Under the first category, Nigerian tribes were given code 72 in the tribal system classification and included under "people 7, Westerners". Those in the second category were included under "nationality group 8A Sudanese of West African origin", who, in turn, were included under

"people 8, Foreigners with Sudanese status. In the case of the third category the Nigerian tribes came under "nationality group 9A West Africans" and this in turn was included under "people 9 Foreigners" with Sudanese status. Both nationality group 8A and 9A were further sub-divided into nationalities. In this particular case Nigerians with Sudanese status and Nigerians without Sudanese status were given codes 8A2 and 9A2, respectively.

6.7 Languages.

The list of languages spoken in the Sudan, which was used for the census, was also circulated to interested bodies and their ideas were incorporated in the final edition. The classification was not entirely geographical or ethnological. This may be illustrated by comparing the number of people who are considered Arab according to the tribal classification with those who speak Arabic according to the languages classification. The following examples illustrate how far the classification of languages for the census was based on geographical and ethnological basis :

Languages 14 Nuba, which was part of the language Group 1 "Non-Arabic languages spoken in Northern and Central Sudan" [i)], is spoken by the Nuba which are divided into small hill communities in the Nuba Mountains. Almost every community has its own language or dialect, usually bearing the name of the locality such as the "Heiban" and "Un Heitan". The classification of the dialects was taken from "Sudan Notes and Records" [ii)] . Nadel status that a few of the dialects are Nubian but others are Sudanic of Bentoid. This accounts partly for placing the Nuba language in languages group 1.

Sub-languages 21 "Northern lwo" and 22 "Southern Lwo" of the Nilitic language group are two sub-divisions aeparated geographically by a belt of Bari and Moru Madi languages of the Nilo-Hamitic and the Sudanic language groups. Northern lwo has more in common with the Dinka and Nilotic languages group than the Southern lwo. The latter appears to be influenced by the Eastern Sudan.

Owing, therefore, to the segmentary nature of tribal societies in many parts of the Sudan, and in the absence of previous comprehensive survey of languages, it was difficult if not impossible to make a clear distinction between the many languages in the Southern Provinces. To distinguish between a dialect and a languages was particularly difficult, as many of the dialects and the languages, in the three Southern Provinces in particular, are spoken and not written.

---

i) See classification below.

ii) Volume XIV, 1931.

Three columns were allotted on the card to the "Language spoken at home". The left hand digit was reserved for the language group, this was divided into languages, and the latter into sub-languages. There were 10 languages groups as follows :

0. Arabic
1. non-Arabic languages spoken in Northern and Central Sudan.
2. Nilotic
3. Nilo-Hamitic
4. Sudanic
5. Darfurian
6. Other African languages (not classified in the above groups but spoken with some frequency in the Sudan)
7. Other African languages (not included elsewhere)
8. European
9. Other languages (mainly Asian).

In groups 2, 3 and 4 there were four classification stages, namely :-

(a) the language group
(b) the language written within the language group
(c) the sub-language or the dialect
(d) the cluster dialect, when known or needed.

Groups 2, 3 and 4 were based on the works of Bryan and/or Tucker. Languages group 6 was intended to cover large groups of people generally known as "West Africans" that is the Borgu, the Burno, the Hausa and the Fellata. Language group 7 covered odd groups and it was used when necessary. Groups 8 and 9 included other languages which occur frequently in the Sudan.
In language group 0, 5, 6, 7, 8, and 9 there were three stages in the classification, but the distinction between the second and third stages was less significant as it was introduced mainly for coding and punched-cards machine purposes.

6.8 Main and subsidiary occupations.

In the Sudan, the collecting of information about occupations for the census was difficult owing to the nature of the subsistence economy in many areas which necessitated that they have more than one job, and often different jobs at different times of the year. This made difficult the task of distinguishing the main occupation from the subsidiary occupation. Some of the occupations could not be fitted into the international occupational classification.

The following case illustrates the difficulties that arose over definitions; owing to difficulty of finding appropriate equivalents between English and

Arabic for involved family relationships in some households, it was doubtful whether the distinction between the cultivator (i.e. owner or tenant) and agricultural worker was clear to the field workers, there were similar cases of confusion despite intensive field training.

The occupation tables were produced in both the interim and final reports for four age-groups only, namely, male and females in the 5 and over, to under puberty, and the males and females over puberty.

The purpose of the occupation codes for the main census was to produce codes of occupations with a social bias. The occupational groups were to be arranged in such a way that persons from the same social stratum were grouped together. This approach resulted in only six groups which, for publications purposes, was regarded as too concise a list. The original six groups were, therefore, increased to twenty groups.

The following are the 20 occupational groups, together with the component occupations :-

GROUP 0. PROFESSIONAL NON-TECHNICAL .

Accountancy, Economics, Statistics	00
University and secondary school teachers	01
Ministers, senior civil and local Government service	02
Senior religious occupations	03
Miscellaneous professional, non-technical	04
Other professional, non-technical	09

GROUP 1. PROFESSIONAL- TECHNICAL

Professional, medicine	15
Professional, Engineering, Surveying, Architecture	16
Professional, Natural Sciences	17
Other professional, technical	19

GROUP 2. MANAGERIAL COMMERCE AND INDUSTRY

Owners of large commercial undertakings	28
Managers of, and in large commercial undertakings	2A
Owners of large industrial undertakings	2B
Managers of, and in large industrial undertakings	20

GROUP 3. FARM OWNERS AND FARM MANAGERS

Other farming occupations	39
Farm owner, farm managers	3D

GROUP 4. SEMI-PROFESSIONAL –NON- TECHNICAL

Book keepers, cashiers etc.	40
Intermediate and primary school teachers	41
Junior administrative in civil and local Government service	42
Junior religious occupations	43
Other semi-professional, non-technical	49
Entertainment	4E

GROUP 5. SEMI-PROFESSTIONAL TECHNICAL

Semi-professional, medicine	55
Semi-professional, Engineering, surveying Architecture	56
Semi-professional, Natural Sciences	57
Other semi-professional, technical	59

GTOUP 6. SHOP AND WORKSHOP OWNERS, SUPERVISORS IN COMMERCE AND INDUSTRY

Shop-keepers	68
Other semi-supervisory occupations	69
Supervisors in shops	6A
Workshop owners	6B
Foremen	6C

GROUP 7. SENIOR CLERICAL AND KINDRED

Senior clerical in civil and local Government service	72
Other senior clerical and kindred	79
Senior clerical in commerce and industry	7A

GROUP 8. CRAFTSMEN, MECHANICS

Other craftsmen	89
Metal industries craftsmen	8F
Metal industries mechanics	8H
Wood-working craftsmen	8J
Building and kindred craftsmen	8K
Textile craftsmen	8L
Light industries craftsmen	8M

GROUP 9. SKILLED PERSONAL SERVICES

Other skilled personal services	99
Shop assistants	9A
Domestic servants	9P
Servants (other than domestic)	9Z

GROUP A. FARMERS, HUNTERS, FISHERMEN

Other occupations allied to farming, hunting, etc.	A9
Farmers	AD
Hunters and fishermen	AR

GROUP B. ANIMAL OWNERS

Other animal owners	B9
Nomadic animal owners	BD

GROUP C. JUNIOR CLERICAL AND KINDRED

Sub-grade school teachers and equivalent	C1
Junior clerical and in civil and local Government service	C2
Other junior clerical and kindred	C9
Junior clerical in commerce and industry	CA

GROUP D. MACHINERY OPERATIVES

Other machinery operatives	D9
Operatives of stationary machinery in industry	DF
Operatives in transport	DH

GROUP E. SEMI-SKILLED AND UNSKILLED PERSONAL SERVICES

Other semi-skilled and unskilled personal services	E9
Sanitary services	EZ

GROUP F. LABOURERS EXCEPT FARM LABOURERS

Other labourers except farm labourers	F9
Building and construction labourers	FK
Road and railroad labourers	FT

GROUP H. FARM LABOURERS AND FORESTRY WORKERS

Farm labourers	HD
Forestry workers	HQ

GROUP J. SHEPHERDS

Shepherds	JT

GROUP K. PROTECTIVE SERVICES

Armed forces	KU
Police and prison warders	KV
Fire Brigade	KW

GROUP N. UNPRODUCTIVE OCCUPATIONS

Students, schoolboys, household duties	NX
Unemployed, beggars	NY
Unknown and no occupation	NN

With the exception of the protective services group and the unproductive group, these occupational groups were arranged adjacent to one another according to the social stratum to which they belong. The first digit has a socio-economic bias and the second has an industrial. The same occupations , in the technical sense of the word, were given the same code (the second digit from the left) regardless of the level of training or education. Therefore, doctors, matrons, nurses or dresser etc. were given the same occupation code within each occupational group. This is illustrated in the re-grouping of the above occupational groups and the component occupations.

GROUP 0. BOOK-KEEPING AND ALLIED

Accountancy, economics, Statistics	C0
Book-keepers, cashiers etc.	40

GROUP 1. TEACHING

University and secondary school teachers	01
Intermediate and primary school teachers	41
Sub-grade school teachers and equivalent	C1

GROUP 2. PUBLIC SERVICE

Ministers, senior civil and local Government service	02
Junior administrative in civil and local Government service	42
Senior clerical in civil and local Government service	72
Junior clerical in civil and local Government service	C2

GROUP 3. RILIGION

Senior religious occupations	03
Junior religious occupations	43

GROUP 4. MISCELLANEOUS PROFESSIONAL NON TECHNICAL

Miscellaneous professional – non-technical	04

GROUP 5. MEDICINE

Professional, medicine	15
Semi-professional, medicine	55

GROUP 6. ENGINEERING AND ALLIED

Professional, Engineering, Surveying, Architecture	16
Semi-professional, Engineering, Surveying, Architecture	56

GROUP 7. NATURAL SCIENCES

Professional, Natural Sciences	17
Semi-professional, Natural sciences	57

GROUP 9. COMMERCE

Owners of large commercial undertakings	28
Shop-keepers	68

GROUP 9. UNSPECIFIED

Other professional, non-technical	09
Other professional, technical	19
Other farming occupations	39
Other semi-professional, non-technical	49
Other semi-professional, technical	59
Other semi-supervisory occupations	69

Other senior clerical and kindred	79
Other craftsmen	89
Other skilled personal services	99
Other occupations allied to farming, hunting, etc.	A9
Other animal owners	B9
Other junior clerical and kindred	C9
Other machinery operatives	D9
Other semi-skilled and unskilled personal services	E9
Other labourers except farm labourers	F9

GROUP A. MANAGEMENT

Managers of and in large commercial undertakings	2A
Supervisors in shops	6A
Senior clerical in commerce and industry	7A
Shop assistants	9A
Junior clerical in commerce and industry	CA

GROUP B. INDUSTRY

Owners of large industrial undertakings	2B
Workshop owners	6B

GROUP C. SUPERVISING IN INDUSTRY

Managers in and of large industrial undertakings	2C
Foremen	6C

GROUP D. AGRICULTURE

Farm owners, farm managers	3D
Farmers	AD
Nomadic animal owners	RD
Farm labourers	HD

GROUP E. ENTERTAINMENT

Entertainment	4E

GROUP F. HEAVY INDUSTRY

Metal industries craftsmen	8F
Operatives of stationary machinery in industry	DF

GROUP H. TRANSPORT AND ALLIED

Metal industries mechanics	8H
Operatives in transport	DH

GROUP J. WOOD INDUSTRY

Wood-working craftsmen	8J

GROUP K. BUILDING AND ALLIED

Building and kindred craftsmen	??
Building and construction labourers	FK

GROUP L. TEXTILES

Textile craftsmen	??

GROUP M. LIGHT INDUSTRIES

Light industries craftsmen	8M

GROUP N. NO OCCUPATION

Unknown and no occupation	NN

GROUP P. DOMESTIC SERVICE

Domestic servants	9P

GROUP Q. FORESTRY

Forestry workers	??

GROUP R. HUNTING AND FISHERING

Huntsmen and fishermen	??

GROUP T. ROAD BUILDING AND SHEPHERDING

Road and railroad labourers	FT
Shepherds	JT

GROUP U. ARMY

Armed Forces	KU

GROUP V. PUBLIC ORDER

Police and prison warders	KV

GROUP W. FIRE BRIGADE

Fire Brigade	KW

GROUP X. UNPRODUCTIVE

Students, Schoolboys, household duties	NX

GROUP Y. UNEMPLOYED

Unemployed, beggars	NY

GROUP Z. NON-DOMESTIC SERVICE

Servants (other than domestic)	9Z
Sanitary services	EZ

Rules were laid down in the training manual for enumerators and supervisors to cover voluntary and involuntary unemployment, and such categories as students and schoolboys, pensioners and incapacitated. The tables on main and subsidiary occupations should be read in the light of the following extract from the instructions to field staff :-

If a person is unemployed, write "unemployed " in column 18 [i)]. but this term should only be used for people who are looking for work; their occupation when working should be written in column 17. if a man dose not work from choice write "nil" in columns 17 and 18. if he is too old to work, or he is a cripple so cannot work, write "incapacitated" in columns 17 and 18. he may live on a pension, in which case write "pensioner" in column 18. if he has a job beside his pension, write his occupation in column 17. if he lives only on his pension write "nil" in column 17 and pensioner in column 18. if children do a substantial amount of work outside the house, state the occupation in column 17. If they go to school, state "day-school" or "boarding school", as the case may be, in column 18.

---

i) Columns 17 and 18 are "main occupation" and "subsidiary occupation" respectively.

By showing the occupation of an "unemployed" person who was looking for work, in the main occupation column, it was possible to include such persons in the economically active population. This also applied to students, schoolboys and household duties.

The number of gainfully employed and the percentage of gainfully employed were shown in the interim reports and the final reports, as far as the main occupation was concerned. Similar information for the subsidiary occupation was shown in the final report only. The gainfully employed covered all occupations except those in the unproductive occupations, namely, students, schoolboys, household duties; unemployed, beggars and unknown and no occupation. The armed forces were then included in the "gainfully employed", but women engaged only in household duties in their own homes were excluded. This is in agreement with international practice. In Sudan, however, the housewife has a unique position in the sense that she dose a great deal of work outside the house, to help out her husband. She collects fire wood, looks after the cattle and generally speaking she helps in the field if he is a cultivator.

The International Labour Office published its International Standard Classification of occupations in 1957, by this time the analysis work for this census was already well in advance. In order that it might be used for future census, the occupational classification for the present census is compared with the International Standard classification of occupations of the International Labour Office in Appendix 46 to this report.

The same list of occupational codes was used for both the main occupation and the subsidiary occupation. Six columns were allotted on the card for the occupation, three for the main, and the other three for the subsidiary occupation.

6.9 Socio-economic group

A simplified classification by socio-economic groups did not necessitate additional questions on the questionnaire forms, as it could be derived partly by reference to the occupation of the head of household and partly by reference to the mode of living. The socio-economic group of the head of household was in most cases applied to the remaining members of the household, with the exception of servants, who were naturally classified in a different socio-economic group from that of the household in which he/she served. A repetition of the socio-economic groups through light on the scope of tables by this characteristic.

- Nomadic animal owners
- Sedentary animal
- Cultivators
- Unskilled in rural areas

- Unskilled in urban areas
- Skilled in rural areas
- Skilled in urban areas
- Managerial and professional

The above list shows how the mode of living had some bearing on the allocation of a person in a certain occupation to a certain socio-economic group. The majority of animal owners were nomadic, and a few were settled in rural sedentary areas. Cultivators were found mainly in rural sedentary areas. Both of these categories could be found in urban areas but they were a minority. It was accepted that managerial and professional persons, irrespective of where they were living, belonged to the one socio-economic stratum. In fact, they were found mainly in large urban areas. The remaining categories, namely skilled and unskilled, were further classified according to whether they were in rural or urban areas.

No tables were reduced by socio-economic group or mode of living at the interim report tabulations stage, and when the final tabulations stage was reached, errors were discovered in the editing. For example, a rural socio-economic group had been allotted to a person in an urban area. To avoid such contradictions at a late stage in the next census (if the above classification is adopted), the socio-economic group code should be checked with the mode of living code at the full listings stage, referred to earlier.

It is accepted that the classification adopted in this census divided the population into reasonably homogeneous socio-economic groups which were reasonably distinguishable from each other occupations. As with the occupations classification, an international classification by socio-economic groups may not be suited to conditions in the Sudan. In fact, if there is a tendency for homogeneity to prevail amongst, for example, industrial countries, this is not likely to be the case for under developed countries. It seems necessary therefore for each country to have its own divisions of socio-economic groups i.e. a classification which fits into the mode of living of population of the country under consideration.

The extra cost of processing data should be weighed against the advantages of a socio-economic classification if the latter is to be adopted for a future Census. Alternative data may be obtained in place of the socio-economic groups, such as additional information on occupations, industry or unemployment.

6.10 Mode of living

Internationally comparable statistics of the urban and rural population are needed for many purposes. The measurement of economic and social development is often a function of urbanization; the distinguishing of urban-rural patterns of fertility, mortality and so forth, as well as their relationship to levels of living in also a large area where urban-rural distributions of populations are required.

The exact definition of what constitutes an "urban" locality as distinguishable from "rural" locality is necessarily arbitrary, since there is no

obvious dividing line between large villages and small towns, in terms either of size or other criteria. Census practices vary in different countries and definitions of what is urban and what is not consequently varies according to the definition adopted. Many countries classify, not by the population size, but by other criteria such as, population density, predominant from of economic activity, legal or administrative status, the presence or absence of certain services or facilities associated with cities. Furthermore, the criteria used by economists, sociologists, housing and town planning experts and others concerned with urban problems from professional or technical points of view, may differ both from the official criteria and from each other; the same locality may be urban according to one set of criteria and rural according to another. [i)]

In most countries the dividing line is, in effect, somewhere between 1.000 and 5.000 inhabitants, but it may be considered that local ties of this size range are often more rural than urban in character, particularly in economically less developed countries like the Sudan where villages may reach a fair size.

In the Sudan, for the purpose of the 1955/56 population census, certain towns were selected by the Distract commissioners, as they were considered from an administrative point of view to be urban areas. Further, some of the towns were selected by the Department of Statistics using the criterion of size, as theses towns were though to have 5.000 persons or more. These two categories added up to 68 towns in the whole country. Of these 68 towns, the following towns were classified as urban large and the rest were treated as urban small. The seven towns were Wad Medani, PortSudan, Khartoum, Khartoum North, Ommdurman, El Obeid and Atbara.

In the production of urban material in the final report tables, the 68 towns referred to above were not given the same degree of importance. There were three categories of towns :-

a. 68 towns
b. 35 towns (which were part of the 68 towns)
c. 12 towns (which were part of the 35 towns)

the third category of twelve towns was considered of importance because of their intrinsic value, and they received most attention. The 35 towns were next in importance as they had more than 5.000 de jure inhabitants. The remaining 33 towns had less than 5.000 de jure inhabitants.

---

i) Report on the World Social Situation, U.N. New York 1957, part II, Chapter VII, Social Problems of Urbanization in Underdeveloped Areas. pp 111-112.

With the development of local Government and the establishment of the Ministry of Local Government, there is a greater need for information about towns and particularly regarding housing for town planning purposes.

Provision should be made in a future census for obtaining more information on this aspect.

The Sudan in vast country with varied modes of life and not only was the distribution of population between rural and urban areas required for the census but also between rural sedentary and rural nomadic areas, on account of importance of nomadiam in the Sudan and its consequent effect on the characteristics of the population.

Four categories of mode of living were used for the purpose of the final report tables. These categories were :-

Urban large	Rural sedentary
Urban small	Rural nomadic

The mode of living as regards rural sedentary or rural nomadic was determined mainly by the enumeration technique used. It may be argued that the enumeration technique was itself determined by the mode of living, but, in fact, it was not as simple, and this should be taken into account when reading tables by mode of living as one of the characteristics, and it should also be considered further during the next census. The explanation is that some of the inhabitants do not follow one mode of living throughout the year. During the rains and immediately afterwards when they can cultivate, they are settled, and during the dry season when they search for grazing they are nomadic. For enumeration purposes it was found easier to enumerate them when they were settled in temporary.

The following were the characteristics required for the interim report tables :

1. Age group and sex
2. Omodias in rural areas and major divisions in towns classified by sex.
3. Language spoken at home
4. Highest school attended, age-group and sex.
5. Tribal group or nationality group.
6. Main occupation (but not subsidiary occupation).
7. Merital status of persons over puberty.
8. Number of wives of married males over puberty.
9. Grade birth, death and infant mortality rates.
10. Number of children of women past child-bearing age.
11. Measures of fertility.

With the exception of (2) above, all the remaining tabulations produced by this procedure served the purposes of both the interim report and the final report.

This procedure, however, did not include arrangements for the production of some final report tabulations not connected with the interim reports, firstly because this procedure catered for the production of tabulations by census area only, and not for provinces and for the Sudan, and secondly because it was not intended to include certain characteristics in the interim reports.

The whole of the machine analysis may therefore be grouped under the following three main stages :

a. Form pc 162/1, interim report and some final report tabulations.
b. Form pc 162/2, final report tabulations not connected with interim reports
c. An un-numbered procedure to provide tabulations from census area cards produced under (a) and (b) above, for the purpose of provinces and Sudan tabulations.

It was necessary before producing tabulations by age group (e.g. for schools, occupations, fertility and infant mortality) to produce the tabulations for the census area by age group and sex. These figures, once checked and agreed upon, were used as control totals for further tabulations whose totals were to be checked against these control totals.

Once the census area detail cards had been sorted by age group (and sex), it was possible to produce what was referred to as age group jobs [i)]. detail cards for age.

---

ii) It may be easy to refer to these age groups by their codes :

	Males		Females
Code	Name	code	Name
1.	under 1	5.	under 1
2.	1 to under 5	6.	1 to under 5
3.	5 to under puberty	7.	5 to under puberty
4.	over puberty	8.	over puberty not past child-bearing age
		9.	over puberty past child-bearing age
		0.	over puberty unspecified.

6.11 Infant mortality

This refers to the number of deaths under 1 year of age per 1.000 live births, which occurred during the twelve months preceding the enumeration. This includes number of deaths of infants who were born during the preceding year. It must be added that at one time "infant mortality" was understood by the field staff and even by the analysis staff to mean that number dead during the last twelve months should never be larger than the number of births during the last twelve months implying that the infant deaths and births are related only at one and the same year. An investigation was begun to discover the extent of this misunderstanding but it was never completed. No attempt was made to collect data on birth rates specifically related to the age of the mother.

6.12 Crude death rate

The crude death rate measures the total decrease of population in an area, due to death. As the age and sex composition of the population is not taken into consideration and as mortality is highest at the older and younger ages, crude rates are not strictly comparable from area to area. This could have been useful in an extensive country like the Sudan where the different modes of living, habits and customs would explain difference in mortality rates. Figures on overall mortality exclude still births but include infants.

6.13 Ordinary households, institutional households, size of household and population density.

There are two principals concepts upon which most definitions of private households are based. The first defines the household as the total number of inhabitants of a dwelling unit. The second concept defines the household as a housekeeping group consisting of one or more persons living together. The first presupposes the prior adoption of a dwelling definition and it affords a unit of enumeration which serves to facilitate and control the collection of census data. This concept fails however, to provide information on separate housekeeping groups sharing the same dwelling.

The second concept is not primarily based on dwelling definition and is designed to provide information for the direct analysis of separate housekeeping groups within one dwelling. The use of this concept necessitates specific enumeration instructions for the identification of such separate housekeeping groups.

The main difference between the two concepts lies in the fact that the first concept a admits only one household per dwelling unit, whereas the second admits one or more households per dwelling unit. The second concept is more suited to conditions in the Sudan and was, therefore, adopted. For example, it could cover nomads, who in fact have no dwelling units in the proper sense of the word.

It also covered the inhabitants of the scattered tukls in the three southern provinces, where a household may live in one, two or more tukls. In

addition, it covered those who sometimes lived in tukls and who sometimes were nomadic. Specific instructions were therefore given to enumerators regarding the definition of a household.

Figures on households also covered institutional households which were defined as groups of persons who lived together but who did not constitute private households, e.g. hotels, schools, prisons.

Then the number and size of households were necessarily affected by the type of concept used. The adoption of the second concept is reflected in the large size of the average household as shown in the tables. The average size was simply reached by dividing the total de jure population in the census area, province or the whole Sudan by the number of households in those areas. similarly, the population density of the census area, province or the whole Sudan was calculated by dividing the total de jure population by the relevant area. Averages can be misleading; for example, in Northern Province, the strip by the Nile is one of the most densely populated areas in the country but this density appears to be less so, when compared with the average densities for the census areas in the Northern province.

6.14 Highest school attended

Difficulties arose when attempting to arrive at a principle, which would be a suitable working basis for a comprehensive classification of schools in the Sudan. The Egyptian system of six years primary and six years secondary differed from the Sudan Government system of twelve years divided into four years elementary, four years intermediate and four years secondary. Other governing authorities such as the catholic and protestant missions had a similar course to that of the Sudan Government in some cases; in other cases, it differed slightly. The majority of these were found mainly in the southern villages of the Sudan. Coptic schools which were not completely governed by the Egyptian Government adopted the same syllabus. Khalwas (indigenous Koranic schools) were prevalent in the northern villages of the Sudan. These religious schools are tending to diminish in number. In most "Khalwas" the boys simply learn passages from the Koran by heart, in others they read and write.

Under the circumstances, it was decided to list all categories and in some cases the stages of education, varying from Khalwas and religious education to academic and technical education. These main groups were further divided into nine governing authorities including one "unspecified". A number was allotted to each governing authority and was repeated whenever a specific one was found in practice, and any of the main groups; namely the category or the stage of education.

The schools lists, with a 2-digit code, lists all educational stages differentiated by governing authority. The school-groups list, with a 1-digit code, lists all educational stages irrespective of governing authority.

Finally, for publishing purposes, the school categories, also with a 1-digit code, were used; the school groups being divided into four main categories. The school category code was not punched in the detail card, nor was it normally punched into the summary cards. The following is a group list of schools in the Sudan :-

Khalwa	1
Sub-grade	2
Sub-grade –southern village	3
Elementary	4
Elementary- southern villages	5
Elementary- religious	6
Intermediate - academic	7
Intermediate - technical	8
Intermediate - religious	9
Secondary – academic	A
Secondary – technical	B
Secondary – religious	C
Post- Secondary – academic	D
Post- Secondary – technical	E
Post- Secondary – religious	F
Teachers training – sub-grade	H
Teachers training – elementary	J
Teachers training – intermediate	K
Teachers training – secondary	L
Teachers training – technical	M
Religious institutes	N
Technical institutes	P
Orphanages	Q
Unspecified	R

Reference was made above to the grouping by school category, which categories were used for publication purposes. The types of schools included in each category of school are :-

Category of school	Codes of Schools included	Schools included
Sub-grade	1	Khalwa
	2	Sub-grade
	3	Sub-schools in the South
Elementary	4	Elementary
	5	Elementary in the South
	6	Elementary, religious
	H	Teachers' training, sub-grade
	Q	Orphanages
	R	unspecified
Intermediate	7	Intermediate, academic
	8	Intermediate, technical
	9	Intermediate, religious
	J	Teachers' training, elementary
	N	Religious institute
Secondary and above	A	Secondary, academic
	B	Secondary, technical
	C	Secondary, religious
	D	Post- secondary, academic
	E	Post- secondary, technical
	F	Post- secondary, religious
	K	Teachers' training intermediate
	L	Teachers' training Secondary
	M	Teachers' training technical
	P	Technical institute

A persons highest school is shown as the school last attended, even if he (or she) did not stay the full period of the course. In the case of the two male and female age-groups under puberty, any persons registered as having attended secondary and above schools had been included in the intermediate category.

7. The Degree of Accuracy

A description of the sampling plan has already been given. A multi-stage ratio sampling design was used. The firat stage units were omodias, the second stage sheikhships and the third stage households. The supplementary data usually were, tax-lists and occasionally, the names of heads of households.

In each census area the aim was to take samples of a size sufficient to limit the sampling error of the estimated total population of census area to within fiducial limits of 10% (at the 0.05 probability level), i.e. to a size sufficient to keep the standard error within 5 per cent. The sampling fractions used at the various stages were those which would give the required degree of accuracy at minimum cost. It so happened that it was appropriate to include all the omodias in census area in the sample.

In fact, the degree of accuracy achieved was greater than that aimed at. The table given below states the standard error of the estimated total population of various census areas :-

Standard error of the estimated total population of various census areas

Province	Census Area	S.E.
Bahr el Gazal	A well East	0.033
	A well West	0.035
	Jur River North	0.026
	Jur River South	0.021
	Yirol	0.049
Blue Nile	Ed Dueim North East	0.036
	Ed Dueim South	0.028
	Ed Dueim West	0.033
	Southern Fung	0.030
	Kosti North	0.024
	Kosti South	0.030
	El Kamlin	0.032
	El Meselemia	.0064
	Halawiyin	0.022
	Ruffaa Shukria	0.043
	Wad el Haddad	0.048
	Sennar and Kawahla	0.030
	El Hosh	0.051
	Fung Nazirates	0.041
Darfur	Eastern Darfur	0.035
	Kutum	0.088
	Kutum Centre	0.030
	Nyala Baggare West	0.057
Equtoria	Eastern Equatoria	0.051
	Juba	0.034
	Moru	0.036
	Torit	0.035
	Zande East	0.033
kassala	Kassala Rural	0.023
	Hadendowa	0.040
	Amarar and Bisharin	0.050

Province	Census Area	S.E.
Khartoum	Khartoum Rural North Khartoum Rural South	0.023 0.022
Kordofan	Gawamma East Dar Kababish Dar Hamid East Dar Hamid West Tegale North	0.025 0.055 0.033 0.055 0.027
Northern	Berber Merowe Shendi	0.070 0.017 0.052
Upper Nile	Zaraf valley Eastern Nuer	0.025 0.048

There standard error of the estimated total population of a province was, of course, less than the errors of estimate of the component census areas, since the errors of estimate offset each other.

Province	**co-efficient of variation**
Bahr el Ghazal	.013
Blue Nile	.021
Darfur	.009
Equatoria	.014
Kassala	.015
Khartoum	.008
Kordofan	.011
Northern	.010
Upper Nile	.014

Thus, the average co-efficient of variation was about 1.5 per cent. It was highest for Blue Nile province presumably because the supplementary data was not very satisfactory.

For the Sudan as a whole, the co-efficient of variation was .0068 considerable less than 1 per cent.

The post enumeration survey, a description of which was given, added a negligible component of variance. The co-efficient of variation of the estimated total population of Sudan , without taking the post enumeration

survey into account, was .0067. when it is taken into account co-efficient of variation was .0068.

It is interesting to break down the variances into those attributable to the various sampling stages. Since all omodias were included in the sample there was no first stage variance. The figures given below ignore the effects of the post enumeration survey, which were negligible.

Rel-Variances

Province	**Second stage**	**Third stage**	**Total**
Bahr el Ghazal	.00013	.000049	.00018
Blue Nile	.00036	.00011	.00046
Darfur	.000043	.000039	.000081
Kassala	.00013	.000097	.00023
Khartoum	.0000275	.000042	.000069
Kordofan	.000042	.000083	.00013
Northern	.000049	.000053	.0001
Upper Nile	.00014	.000050	.00019

By rel-variance is meant the (co-efficient of variation) . The square roots of the figures in the total column are the co-efficients of variation, which were given in the previous table. Generally, the co-efficients made by the third stage was considerably less than that made by the second; but this was not always so.

Normally the analysis would have been taken further. From the detailed analysis of costs and variances; the most appropriate sampling design could have been determined by means of the usual formula. But such calculations would be of little value as the supplementary data used in the next census may be very different.

8. Difficulties met

8.1 Introduction

The first difficult enumerated was the vastness of the Sudan itself and the poor communications, which be came more apparent during the Pilot Census. Ways and means were devised to overcome the difficulty before the main census had started. The disturbances in the Southern provinces in August 1955 dislocated the time table and the limited means of transport available, as well as the personnel and caused considerable movement among the local population. This was in addition to technical difficulties, for example, how to make use of incomplete data resulting from incomplete enumeration, as was the case in the Eastern Equatoria census area.

The difficulties are dealt with as follows, under four main headings, namely, superstitions, enumerators, headquarters staff, transport and census data.

8.2 Superstition

Superstition prevails in many parts of the country. In some parts of the north, it is considered bad luck to disclose the correct number of one's children, and in some parts of the south people do not like talking about their dead as they believe that it might bring bad luck to the living. The problem of superstition was dealt with in two ways - firstly by the propaganda campaign, both at headquarters and the local authorities, and mainly to deal with incomplete coverage in these respects, as well as in others.

The post enumeration survey, as mentioned earlier, consisted of re-enumerating a certain proportion of the households (about one-seventh). These households were re-enumerated by school-mistresses or other female post-enumerators. The female post-enumerators, unlike the male enumerators who did the original enumeration and this was the crux of the matter were able to enter the households and talk to the women and children [i].

The school-mistresses were instructed to work slowly and thoroughly and by talking to the women and children to find out whether any members of the household had been omitted from the original enumeration. If there were omitted from the original enumeration. If there were omissions, they added the names and particulars of such people, writing with a coloured pencil to distinguish these entries from the original entries in the questionnaire books.

---

i) There were not enough female enumerators for the original enumeration to be done by them.

From the post enumeration survey a measure was obtained of the degree to which children and others were originally understated.
This measure was used to correct the results.

The post enumeration survey was not held universally. It was rarely held amongst nomads. The physical hardships would have been too much for the school mistresses; they would often have had to travel long distances by camel. Nor, for quite different reasons, was it held in Equatoria, Bahr el Gazal or Upper Nile Provinces. The superstition about it being unlucky to disclose all one's children was not supposed to exist amongst the population of the south. In any case, to hold it would have been pointless; for male enumerators had no difficulty in entering the house holds and talking to the women and children in marked contrast to the conventions of the population of the north.

The following table states, for those households included in the post enumeration survey, the ratio of the number of persons finally enumerated (including persons added by the female post-enumerators) to the number originally enumerated by the male enumerators.

That the rations are so small is surprising. Even more surprising at first glance is that they should be so uniform over the various sex and age groups. True, for children under 1, for both boys and girls (particularly for girls) the ratio is slightly higher than for those in other age groups. But the differences are not large. Nor is there any discernible tendency for the ratios to be higher in the less sophisticated provinces.

In the order age groups it seems likely that some people were not physically present when the enumerator called. They may have been tilling the fields or temporarily away in another area. The head of the household, when questioned by the enumerator, should certainly have mentioned them, but doubtless sometimes "out of sight out of mind". In the post enumeration survey such people were included either because they were then physically present or because the closer questioning of the school mistresses revealed them as members of the household. This explanation, however, of being over-looked during the original enumeration because not physically present could hardly have applied to children in the age groups under 1 and 1 over to under 5. for such children would generally be present in the home. Occasionally, when a mother is about to have another child, the children are sent to live with their grand-parents, but in that case they would be enumerated there.

It does seem then, that with children in the first two age groups the superstition still exists; that a small proportion of heads of households do deliberately understate their children (whether for fear of subjecting them to the perils of "the evil eye" or for some other reason).

RATIOS

	MALES				FEMALES						
								Over puberty			
Provinces	Under 1	1 & over to under 5	5 & over to puberty	Over puberty	Under 1	1 & over to under 5	5 & over to puberty	Not past child bearing age	Past child bearing age	Unspecified	Males and females of all ages
BLUE NILE	1.06	1.04	1.02	1.03	1.04	1.04	1.03	1.03	1.04	1.04	1.03
DARFUR	1.03	1.01	1.02	1.01	1.03	1.02	1.02	1.01	1.02	1.00	1.02
KASSALA	1.05	1.03	1.02	1.03	1.02	1.02	1.05	1.03	1.06	1.19	1.04
KHARTOUM	1.03	1.02	1.01	1.02	1.04	1.02	1.01	1.02	1.01	1.00	1.02
KORDOFAN	1.03	1.04	1.03	1.04	1.09	1.03	1.04	1.02	1.04	1.07	1.04
NORTHERN	1.00	1.01	1.01	1.01	1.03	1.01	1.01	1.01	1.02	1.01	1.01

How accurately do the percentages in the first two age groups reflect the strength of the superstition? That, unfortunately, is something we shall never know. Without the very through propaganda campaign the ratios might haven been markedly higher [i)]. nor can we be sure that the post enumeration survey was always fully effective. Did the school-mistresses by talking to the women and children, always discover all the children missed at the time of the original enumeration" the school-mistresses were taught to use oblique methods as well as direct ones; to talk about food, clothing, sickness, schools, what the children hoped to do when they grew up. There are few mothers given a little encouragement who do not like to talk about their children in relation to such topics. It is, therefore, believed that the post enumeration survey was effective. This view is supported by the fact that a high percentage of the Sudan's population at the time of the census was under 5. but of course this is not proof; the age distribution of population is influenced by specific fertility and mortality rates and by immigration over many years.

Percentage of population under 5.

	Sudan	**Representative Underdeveloped country**
Males	19.5	13.8
Females	20.4	14.0

The figures for the representative underdeveloped country were taken from "Economic backwardness and Economic Growth" by Harvey leibenstein. they were averages for 14 underdeveloped counties in all of which male expectancy of life was 40 or below.

Doubtless the comparative bulge in Sudan in the low age groups was due to high fertility and a sudden downward shift in mortality. Better drugs and improved medicine services must have sharply reduced mortality in recent years. According to the census, the crude birth rate was 51.7 per thousand and the crude death rate 18.5. The Sudan thus has one of the fastest growing populations in the world. Errors by the enumerators may also explain the high proportion of the population under 5; some children who were over 5 may have been wrongly shown as under.

Our conclusions, to sum up, are : that the census figures certainly do not indicate any obvious understatement of children just the reverse; that the post enumeration survey was probably effective; that, although without the post enumeration survey the basis in the various age groups would have not been unduly large , the post enumeration survey was still worth undertaking.

---

i) A controlled experiment would have been necessary to measure the relative effectiveness of the propaganda campaign and the post enumeration survey.

The component of variance added by the post enumeration survey was small. If the total estimated population of Sudan is given by Y' = Y.P where Y = estimated total population of Sudan before post enumeration survey and P the overall ratio of increase caused by the post enumeration survey. Then (on the assumption that Y and P are independ) (where V stands for the co-efficient of variation and the subscript indicates the variable. Since the post enumeration survey was a sub-phase sample, the calculation of the variance was that appropriate to this type of sample).

For the estimated total population of Sudan V_y was .0067 and $V_{y'}$ .0068 . The error added by the post enumeration survey was thus negligible.

In a country taking a census for the first time in which the superstition about children is alleged to exist, a post enumeration survey seems a reasonable insurance policy. In some countries of the Middle East the superstition may be more prevalent than in Sudan.

8.3 Enumerators

As to quantity, there were not sufficient numbers of the right caliber to do this kind of work, even by adopting sampling method. This was one of the reasons why the census could not be conducted in all places at once. There were also problems of language. Although, in some cases, an adequate number of enumerators were found, it was often discovered that they did not talk the language of the people, and if they came from a different tribe they were not accepted by the local population. In such cases English speaking by enumerators were used with the help of interpretors from the tribe being enumerated. The questionnaire and a number of other forms required in the field were printed in five languages, namely, English, Arabic, Bari, Dinka and Nuer. Eventually, only English and Arabic were used and efforts were made not to male use of other languages in view of both the extra administrative expense as well as the probable mistakes that would arise during translation.

As for the quality of enumerators, report was made to the following categories of personnel, in order of preference :-

- Secondary school teachers.
- Intermediate school teachers
- Elementary school boys
- Government clerks
- Local authorities clerks.
- Court clerks and sub-grade
- School headmasters and masters.

Most of the enumerators were elementary school teachers and the supervisors were mainly intermediate school teachers. Intensive course which lasted for a week or ten days were required to train the personnel.

Reference was made to the necessity for training courses and training programmes in chapter 2.

8.4 Headquarters staff

The population census office was divided into three wings, the administrative wing, the field wing and the analysis wing. Staffing the administrative wing was less of problem than that of staffing the analysis wing. The work of the later was completely new and specific in nature and temporary in chapter. Resort was, therefore, made to pensioners who proved to be efficient and hard working than younger people, who once engaged and given intensive training, left the job as soon as they found permanent work. Means had to be devised to complete jobs in accordance with the timetable. This and other problems will be discussed with some detail in the next chapter.

8.5 Transport

The type of transport used by enumerators and supervisors varies with the census area and the time of the year. Camels were used in desert areas and bulls were used in others, such as the Nuba Mountains during the rains. In well-defined villages enumerators walked, and supervisors were sometimes provided with bicycles or donkeys to facilitate moving from one village to another. Camel or motor transport was used when enumerators and supervisor had to travel very long distances in nomadic areas. in such cases the enumerators with their supervisors, moved from one group of nomads to another. In some cases it was impossible to use any form of transport and enumerators had to walk through marshes. Circumstances determined the means of transport in each area.

9. lessons for the future

9.1 What supplementary data for the future

The following summary of appendix 16 to this report shows in descending order the popularity of supplementary data as used throughout the whole country. In column 2 the total number of persons on the lists of supplementary data in the whole country was taken as 100 per cent while column 3 takes the total number of persons enumerated from the lists of supplementary data as 100 per cent.

Type of supplementary data used	% of total number of persons on lists	% of total number of persons on lists and enumerated
1	2	3
Poll Tax-lists	26.5	23.4
Tribute tax-lists	25.5	24.1
Electoral rolls	18.6	21.2
Heads of households	12.5	14.4
District combines tax-lists	8.5	9.4
Herds tax-lists	5.1	4.5
Local Government electoral rolls	3.2	2.9
Animal tax-lists	0.1	0.1

Poll tax lists, in conjunction with the scattered tukls technique were the most common type of supplementary data, especially in the three southern provinces and in certain parts of the north. However, there are doubts as to whether these lists will be available in future owing to opposition and a desire to replace them with other forms of taxation. Most of the tax lists available in the north suffer from a duplication of names owing to variety of available employments. A person may be both a taxpayer for land cultivated and a taxpayer for animals in the same area, or in another area. On this account, the collection of names of heads of households was resorted to in a number of areas in the northern Sudan, but not in the southern provinces and some parts of the north, where poll-tax lists were both available and suitable, and where the collection of names of heads of households was complicated.

In view of the above, it may be suggested that the most suitable form of supplementary data to be used in future censuses are the lists of heads of households.

These provide to be most suitable as supplementary data in the areas where this procedure was adopted. There is no question of duplication or unsystematic coverage or other defects which ordinary tax-lists were subject to with consequent effects on the correlation of the supplementary data with

the population size. The revision of tax lists which was conducted at various stages before the enumeration by the census officers, during the enumeration by the visiting officials from the Department of Statistics, and before analysis by members of the analysis wing , can be done without. This, however, could only be achieved at a cost as the procedure of collecting the names of heads of households proved to be expensive in the few areas where it was conducted.

However, if the procedure is adopted on a large scale throughout the country, some economies could be made. Added to these are the benefits of adopting only one type of supplementary data throughout the whole country, and the advantage of facilitating the organization of that part of the operation both in the field and at headquarters in the Department of Statistics.

However, it is doubtful whether in view of the magnitude of the task of collecting the names of heads of households for the whole country (judging from the experience of a few census areas where this procedure was adopted) whether it is in fact feasible. The collection of names of heads of households must be conducted as near as possible to the data of enumeration, and preferably not more than six months previously. Assuming that the enumeration would spread over a period of twelve months as in the case of the 1955/56 census, that would mean that both operations (i.e. the collection of names of heads of households and the enumeration proper) would have to be rushed through in a period of eighteen months. This would increase the burden on the field personnel. A census officer cannot effectively supervise the collection of names of heads of households in one group of his census area and conduct the enumeration proper in another. Further, it is doubtful whether enough personnel would be available in one census area to act as enumerators and supervisors for both the collection of names and the enumeration proper at the same time. The situation would be equally frustrated at district level. Further, in the administrative wing of the population census office, it is doubtful whether the processes of packing and unpacking, dispatching and receiving the collection of names material and the enumeration proper could be done at almost the same time. Finally it is doubtful, whether the collection of names of heads of households could be conducted successfully in the scattered tukls areas or in other areas where people are nomadic; there was no experience of this procedure in practice.

In view of the above, it seems that the most suitable form of supplementary data to be used in a future census are the electoral rolls. If properly revised, they would serve the purpose equally as well as the lists of heads of households. But electoral rolls are not always available by sheikhship or headmanship; and sometimes they are available for units larger and sometimes smaller than the sheikhship. As for the south, there is as yet no direct representation, therefore, supplementary data in the form of electoral rolls in not available. This, together with the difficulty of collecting names

of heads of households accounts for the problem of finding an alternative to poll-tax lists. One solution might be to adopt local government electoral rolls as supplementary data for the three southern provinces, assuming that by the next census, the three southern provinces will be covered completely by local government.

9.2 Popularity of sampling technique

The first row of appendix 33 to this report shows the number of persons enumerated under each technique. If, from the total number of persons enumerated (1.883.380 persons) the 902.343 enumerated in towns, 144.477 enumerated in special categories and 4.632 enumerated during the post enumeration survey, are subtracted, a figure of 861.928 persons is derived, which is the number of persons enumerated under the rural technique with the exception of special categories. Thus sampling covered only 46 per cent of the persons enumerated. A part from those found during the post enumeration survey, the rest were fully counted. If the figure 861, 928 is taken at 100, the following percentages of the number of persons enumerated under each rural technique are obtained :-

Technique	Number of persons	Percentage
Total number of persons enumerated	861.928	100
Well-defined villages	4.759	0.6
Scattered Tukls	215.875	25.0
Nomadis	85.339	9.9
Compound		
Well-defined village – nomads	49.182	5.7
Well-defined village – scattered tukls	26.315	3.1
Scattered tukls –nomads	32.765	3.8
Well-defined village –scattered tukls –nomads	3.201	0.4
Well-defined large village	444.492	51.6

As can be seen from the above table the well-defined village techniques as used during the Pilot Census [i)] was applied to less than 1 per cent of the enumerated population in rural areas.

During the main census, the revised technique (termed compound well-defined large village) was applied to about 52 per cent of the enumerated population in rural areas.

i) This point was discussed at some length in para. 3.3.1

The scattered tukls technique accounted for 25 per cent of the enumerated population and the nomadic technique accounted for 10 per cent. Not all nomads were enumerated under the nomadic technique. Many of them were enumerated at the time of the year when they were settled and were actually carrying out a settled way of life, for example, cultivation. In these cases the nomads were enumerated under one of the applicable mixed techniques [i)]. The latter, in addition to the compound, village-scattered tukls, accounted for the rest of the enumerated population in rural areas, which was less than 13 per cent.

The popularity of technique by province may be examined by excluding the persons enumerated in towns, in special categories and those found during the post enumeration survey. Thus, when the figures in columns 12, 13 and 14, in the case of each province are deducted from column 3 on page 1 of appendix 33, the following two tables are arrived at and may be found useful for future censuses.

---

i) These techniques were :- Compound-village –nomadic
Compound-scattered tukls-nomadic
Compound village-nomadic scattered tukls.

NUMBER OF PERSONS

Province		Number of persons enumerated under Technique								
Code	Name	Total	1	2	3	4.1	4.2	4.3	4.4	4.5
1	2	3	4	5	6	7	8	9	10	11
1	Bahr El Gazal	70.884	-	70.884	-	-	-	-	-	-
2	Blue Nile	199.768	-	3.933	12.180	4.761	2.938	-	-	165.956
3	Darfur	112.073	-	292	11.558	12.857	8.369	9.242	568	69.187
4	Equatorial	50.130	-	27.715	-	-	-	-	-	22.415
5	Kassala	70.648	-	-	39.457	5.177	-	15.811	-	11.203
6	Khartoum	30.432	-	-	3.006	5.929	-	486	-	21.011
7	Kordofan	141.739	-	35.898	13.717	5.875	4.411	5.282	-	76.556
8	Northern	87.545	-	1.956	6.421	4.583	3.446	1.944	2.633	66.562
9	Upper Nile	98.709	4.759	75.197	-	-	7.151	-	-	11.602

PERCENTAGES

Province		Number of persons enumerated under Technique								
Code	Name	Total	1	2	3	4.1	4.2	4.3	4.4	4.5
1	2	3	4	5	6	7	8	9	10	11
1	Bahr El Gazal	100	-	100	-	-	-	-	-	-
2	Blue Nile	100	-	2.0	6.1	7.4	1.5	-	-	83.1
3	Darfur	100	-	0.3	10.3	11.5	7.5	8.2	0.5	61.7
4	Equatorial	100	-	55.3	-	-	-	-	-	44.7
5	Kassala	100	-	-	54.4	7.3	-	22.4	-	15.9
6	Khartoum	100	-	-	9.9	19.5	-	1.6	-	09.0
7	Kordofan	100	-	25.3	9.7	4.1	3.1	3.7	-	54.0
8	Northern	100	-	2.2	7.3	5.2	3.9	2.2	3.0	76.0
9	Upper Nile	100	4.8	76.2	-	-	7.2	-	-	11.8

The scattered tukls technique was most popular in Bhr el Gazal (100 per cent, Upper Nile (76 per cent) and Equatoria Province (55 per cent). Bhr el Gazal is still wild country whereas in Equatoria Province a number of settlement schemes and projects have been started. This explains why the compound large-villages-technique was adopted in the case of 44.7 per cent of the enumerated persons in rural areas.

The compound large villages technique was the most popular in the Gezira and along the banks of the Nile, in Blue Nile and Northern provinces respectively; these being the most settled part of the Sudan.

The nomadic technique was used in the case of about 54 per cent of enumerated persons in rural areas in the nomadic province of Kassala. Darfur and Kordofan provinces are not so nomadic, after all, only 10 per cent were enumerated under the nomadic technique. The majority were enumerated under the compound large village technique, 62 per cent and 54 per cent respectively.

In kordofan 25.3 per cent of the people were enumerated under the scattered tukls technique. This was adopted mainly in the Nuba Mountains where the people lead a similar life to the people in the three southern provinces.

The compound large village technique was also most popular in Khartoum province where it accounted for 69 per cent. In this province 20 per cent of the persons enumerated in rural areas were enumerated under the compound village-nomadic technique.

9.3 Mode of living

Reference was made in paragraph 6.10 above to the fact that the mode of living was determined by the enumeration technique used. It was also said that some inhabitants of the country settle in temporary villages cultivating, during a certain part of the year, and then go nomadic for the remaining part. If they were enumerated at the time of the year when they were settled, and this happened in many cases, the village technique was used and thus came under the mode of living category "rural sedentary". This procedure of determining the mode of living by the enumeration technique, therefore, distorted the picture. The degree as well as the pattern of nomadiam may be different from reality.

Another category of people that were called "rural sedentary" are those who were enumerated under the scattered tukls technique in the three southern provinces, who made up 27 per cent of population of the country. They lead, no doubt, a completely different mode of life from that of the settled population of the north and it is misleading to lump them under the same category. In fact it is these areas in the three southern provinces that make up the good part of the subsistence sector in the Sudan.

It may, therefore, appear necessary in a future census, to reserve a separate category of mode of living for the dwellers of the scattered tukls in the three southern provinces. They represent a certain stage in economic development, namely the subsistence economy, and as such they should have different characteristics of their own, which should not be confused with true settlers in other provinces. If they are kept as a separate category it might be possible to measure the degree of change from the subsistence economy to a more developed one. Such a change can be seen in the movement from scattered tukls to proper villages when analyzing internal migration figures by mode of living.

A separate mode of living should also be allotted in future to the other category of persons , the half sedentary and half nomadic , as they have certain characteristics which should not be confused with the sedentary people or the nomads depending whether they are to be enumerated with the former or the latter. It is suggested, therefore, that the mode of living should not be determined by the enumeration technique, but should be determined in advance from the knowledge of the country and the information available about each area, or alternatively, a question should be included in the questionnaire.

Secondary, the following tentative classifications may be found useful :

Urban large
Urban small
Rural sedentary
Nomadic
Sedentary –nomadic
Scattered tukls

9.4 Bottlenecks in the Analysis Wing

The major mistakes were made in connection with the staff in the analysis wing. Whereas only three of the sub-sections of the editing section were installed, almost the full strength of coders, computers and punch operators were recruited at the same time. Training courses were given to all of them and editing (the first step) was started. However, owing to an insufficient number of persons suitable as editors, and insufficient training, together with lack of senior personnel to supervise their work, a bottle-neck occurred in the editing section and the subsequent sections (coding, computing and punching) received no work.

Errors, which were not apparent until a late stage, when the reports were ready for printing, were often the result of bad editing. In one case there were two different tribes, one living in the north of the Sudan and the other living in the south of the Sudan, but with similar names. The editor's job was

to facilitate the coder's work, as the latter was required to work at speed, and if the enumerator did not write the names of the tribes clearly the coder was liable to give the code for the southern tribe to the northern tribe. Despite the checking of "full listers" a number of mistakes passed un-noticed until the reports were ready for printing. The process of correcting the detail cards was itself cumbersome and punch operators were liable to make mistakes in other parts of the detail cards.

These delays held up the publication of the reports and upset the time-table. Investigations involved referring back to questionnaire books and generally delayed the production of reports.

A second bottleneck at the machines stage both in the punching room and later in the machine room, caused by similar circumstances as those of the editing work. A similar hold up in the punching room meant that all the subsequent work dealing with cards was delayed. This section also required more intensive training.

The solution to these problems would appear to be as follows :

All the members of the editing section should be recruited well before the questionnaire books start arriving in the Department of Statistics from the field. A thorough training course should extend for a period of one month, during which all the indicate editing instructions are explained. Special attention should be given to the type of problem that could arise during the analysis work in order that they can be avoided from the start.

Using experimental questionnaire books, the editors, as well as the other members of the analysis wing, should then follow the analysis work step by step to the production of the final report tables. Two census areas from the present census should be selected and used for practice purposes and the results compared with existing results. These two basic ideas were adopted but not developed.

The editing proper should not be started until sufficient questionnaire books have been received from the field to ensure a steady flow of work both for the editors and subsequent sections. Apart from the training of coders, coding should not being until a steady flow of work is received from the editing and computing sections. Slack periods without work upset planning and control as well as the staff.

9.5 Some organization devices

A number of devices were adopted in the analysis wing to control both quantity and quality of work as well as the smooth running of questionnaire books from one station to another. No questionnaire books were allowed to pass from one section to another except through the "CRQB" (central

registry for questionnaire books). This section, originally part of the administrative wing, was the control centre of the analysis wing. The numbers of all the questionnaire books in each group and the omodias and sheikhships were checked on entering and again on leaving the "CRQB". Each section had a Form pc 61 (there was one for each section prepared for each group in the Census Analyst's office) which showed the questionnaire book number, the omodia, the sheikhship and whether it was subjected to post enumeration survey. Also, the appropriate steps for each section were shown on this form, together with space for dates and initials recording the date on which a stage was started and when it was completed and by whom. This applied to all sections of the analysis wing. Finally, there was a comprehensive Form pc 61 in the Census Analyst's room showing the progress by group as far as all sections. The Census Analyst also recorded on a control form all the groups in the country and the stages they had reached, for quick reference. Planning ahead was facilitated by meetings each week (later on they were held every fortnight) to discuss the progress of each group.

Some specialization was required in the editing, coding, computing and the punching sections although all the staff were well enough acquainted with all steps, in the event of their having to assist if a bottleneck appeared in that section. A certain proportion of each section were employed on each step in order to complete the work in the allotted time. In the machine room only one census area was dealt with at a time, therefore no specialization was possible.
One machine operator sorted and tabulated one step for one census area, then repeated the process for the second step for the same area etc. it was found more convenient to complete two or three census areas rather than work on five or six at the same time with a greater chance of mixing the cards up in the limited space available. Also, one supervisor could not possibly attend to the problems of more than three census areas at a time.

Bonus schemes were devised for the editors, coders, computers, punchers and machine operators. Different performance schemes were prepared in each section depending on the nature of the work. The work was divided into steps, and a minimum of "names' equivalents" was decided upon for each step. The bonus was calculated over this minimum.
Marks were given to each step according to its relative easy or difficulty. These bonus schemes were adopted in conjunction with the "mistakes records"; deductions, therefore, could be made from the bonus earnings. Without the "mistakes records" the quality of the work would have deteriorated although the quantity increased.

The editors and coders were required to practice calligraphy exercises to ensure uniformity of handwriting.

9.6 Decimal points

Computers were instructed to work to two decimal points, which were not rounded off until just before the production of the tabulations for the provinces and the whole Sudan from the census area summary cards. This covered a period of about three years from the time of the analysis work started to the time it was almost completed. In addition to the extra work the decimal points entailed, during the process, the final balancing proved to be complicated.

It is recommended that the two decimal points should be cleared at an earlier stage before punching and as soon as the raising factors have been calculated. The raising factors should be either rounded up or down according to an accepted rule and punched onto the cards. An experiment on these lines might be useful.

Acknowledgement

I was assigned to produce this report by the Department of Statistics. The work was started while I was in the service of the Department, and completed in the University of Khartoum. I wish to thank Mr. C.H. Harvie, the former Director, and Sayed Ahmed Osman Ishag, the present Director, for their assistance and moral encouragement.

Roushdi A. Henin