



BEAN (P. VULGARIS) DISTRIBUTION IN AFRICA



FIRST APPROXIMATION

⁰
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BEAN (PHASEOLUS VULGARIS) DISTRIBUTION MAP OF AFRICA

SUMMARY

These notes are intended to accompany the bean distribution map. They include comments on the production and limitations of the map, detail of the data sources, and notes on the perceived accuracy of the map for each country. There are also brief summaries of the cultivation methods and practices for some of the countries.

In its current state the map is regarded only as an approximation of bean (P.Vulgaris) distribution in Africa. The data, particularly for the south and west of the continent is not very reliable (Appendix 2).

Data for Cameroon is as yet, unavailable. It is known however, that sizeable areas of beans are grown in the north and north-west of the country. It is expected that there are also areas of beans in western and south-western Africa, however data is unavailable.

Throughout, 'beans' refers exclusively to Phaseolus Vulgaris.

The map gives a relatively accurate impression of the bean distribution pattern across the continent. For the countries in which CIAT currently works, the data and back-up information is good and enables relatively accurate maps to be plotted at any scale.

Overall, the map is as detailed and accurate as possible, given the current availability of data.

Method and Assumptions in the Production of the Map.

I.

-The map was drawn using the most recent and detailed information available for each country. Where possible data was checked against other sources for consistency.

-The data was in the form of hectares of beans grown per unit area. The level of unit area varied from country to country, those used were as follows:

COUNTRY > PROVINCE > REGION > DISTRICT > COMMUNE

-On the distribution map one point represents 500 hectares .

-A map was compiled showing the age and quality of the data (Appendix 1). This should always accompany the bean distribution map.

-When the most recent detailed data available was pre-1975, the FAO estimate of total bean hectarage for 1988 was used as the country total. This figure was distributed amongst the units of area according to the weightings of the original data. This assumed that the relative hectarage for each area had not changed with time.

II.

-The bean data was initially mapped at a scale of 1:1,000,000 using ONC relief maps (1982). The maps were divided into administrative divisions for each country, and the road network sketched in using the Michelin Road Map of Africa (1988).

-The data was mapped using topography, elevation and drainage information directly off the map sheets, plus any additional sources available that gave indication of bean growing areas, relief, drainage, landuse and population distribution. At this stage soil information was

deliberately not used, so that soil information could be overlaid at a later date.

-Unless otherwise stated, it was assumed that beans are cultivated between 700 and 2000 metres, and concentrated between 1200 and 1500 metres (CIAT, 1981). This general rule had to be waived however for some countries where information suggests a high percentage of their area below 700 metres. For example Mozambique and Togo.

-It was assumed that beans are not cultivated in areas of forest, marsh or desert. Where possible very steep land was avoided when placing individual points.

-As bean production in Africa is principally for subsistence, it was assumed that beans are largely cultivated near settlements or lines of communication (road, rail, river) and are therefore accessible as a food source.

-Once the points had been plotted by hand they were digitized using ATLASDRAW. The digitized points were transformed from table coordinates to latitude-longitude using the Fortran programme ONCTRAN.

-The points were re-plotted at country level, checked for errors against the originals, edited if necessary and finally collated to a continental scale.

Limitations of the Maps

-Much of the map is based on assumptions and estimates. Even when data is available at a detailed level, plotting of a point is subjective.

-The 1988 FAO estimate is used for some countries as the annual total, but can only be assumed to be more accurate than earlier data.

-There are problems both with countries having a very large or very small total hectarage when plotting the beans.

If total hectarage is very large, there is often congestion and overlapping when the map is scaled down, with

individual points being difficult to define. There is also the logistic problem of fitting the requisite number of beans within a specified space, which can result in beans being allocated to unsuitable locations.

When total hectarage is low, there are problems of having to position one or two plots within a large area. The placement of these points is particularly subjective.

-Each point on the map represents 500 hectares, however in reality the majority of beans are grown in plots of two or three hectares. In many areas a thin blanket covering of beans over a large area is more likely than point concentrations.

-Beans are largely grown in association with other crops, however the information is not good enough to indicate where cropping associations exist or where different varieties of P.Vulgaris are grown.

- Two or three crops of beans are often produced each year. The map however, only shows total annual hectarage cultivated for each country, and there is no distinction as to how much of the land is used for more than one crop.

-There is little detailed information available on cultivation methods or dating of planting and harvesting.

NOTES FOR SPECIFIC COUNTRY MAPS.

ANGOLA:

Inaccessibility of Angola during the civil war means that data is likely to be of dubious quality. The data used to determine district ratios was collected prior to the war. It is probable that these ratios have altered due to the effects of the war.

NB: Joaquim Cezar at 'Instituto de Investigacao Agronomica', Huambo, Angola has been written to for more information (March 1990).

GHANA:

The map was plotted using data from the mean of two conflicting FAO estimates for 1986 and 1988. The accuracy is thus likely to be weak.

LESOTHO:

The delimitation of districts is approximate as no administrative division map was available. The districts were drawn from an inaccurate sketch map provided with the data using roads, rivers and contours as guidelines.

MOZAMBIQUE:

Three districts in the south (Lourenco Marques, Gaza, Inhambane) are at altitudes of less than 300 metres and mainly consist of marshland. The data states, however, that a total of 34,900 hectares are cultivated in these areas.

SOUTH AFRICA:

The map was drawn using the 1988 FAO estimate, which was the only information available. The total hectarage was considered sufficiently significant to merit mapping even if the data quality was weak. The areas of bean growth had to be approximated using landuse and population distribution

maps. Eighty percent of the beans were mapped on the high veld covering virtually all of Orange Free State and a large section of the Transvaal. This was the area with the highest concentrations of arable land and rural population. The area mainly lay between 650 and 1700 metres.

RWANDA:

The data used gave detail of mixed and pure cropping for a first and second season culture. The data was aggregated into an annual total, but it was not clear how much of the same land was used for both cultures.

SUDAN:

In R.Kirkby's trip report of January 1990, it is suggested that there are more beans than official statistics state. Data for the south is virtually non-existent. The Ministry of Agriculture has production figures for only one in the last twenty years and the data mapped is probably an underestimate.

TOGO:

Recent administrative division maps were not available and district delimitation was approximate using a sketch map by 'Ministere du Plan et de la Reforme Administrative du Togo'. Lines of communication and contours were used as guides. Approximately eighty percent of the area where beans are cultivated is below 240 metres in elevation.

UGANDA:

The districts listed with the data did not correspond with all those shown on the political division map (1978). As a rule however, the listed districts corresponded to place names within the old districts. The old districts were hence subdivided, with the listed districts being delimited by approximation using contours and lines of communication as guides.

ZAIRE:

The data arrived very late and there was not time available to scrutinize it in any detail. Data for Kasai Oriental and Kasai Occidental was unavailable but it is known that beans are produced in both regions.

It is probable that the quantities mapped are understatements.

ZAMBIA:

As a result of mapping at district level with one dot representing 500 hectares, only 17,500 hectares of the total 23,500 hectares were plotted. The remaining six thousand hectares were divided between districts in units of less than 500 hectares.

ZIMBABWE:

The data provided was for communal farming areas only, that for commercial farms was unavailable (estimated by B. Grisley to be between five and eight thousand hectares).

Although the data was listed at commune level, only eleven of the hundred and twenty one communes had more than 500 hectares. Therefore the province total was mapped using commune concentrations as indicators of bean location.

BEAN CULTIVATION IN AFRICA

Phaseolous Vulgaris as a pure crop is usually sown at the start of the rainy season, as it requires a moist soil throughout most of its growing period. In ideal situations dry weather is required for the last three or four weeks prior to harvesting.

When beans are grown in association with other crops, they are usually sown at the same time, which is at the beginning of the other crop's growing season.

-P.Vulgaris matures in approximately three months below 1200 metres, four months below 1800 metres and five below 2400 metres (Acland, 1971).

-Because of the relatively short growing season there are often two or even three cultures grown each year. For the same reason, sometimes when another crop fails beans are planted as a replacement.

-There is a minimum of labour and mechanical input in the cultivation of the crop. Fertilizer application is uncommon.

-A crop usually requires, if not receives, two or three weedings before harvesting.

The following summarizes cultivation practices for individual countries. The summaries are not complete as only a limited information search was possible within the time available:

BURUNDI: (CIAT. 1981)

Planting dates: October, February and June
Altitude: Often unfavorable due to
 cropping associations.

Crop Associations: Maize, pigeon peas and bananas.

Additional: - The first rainy season culture is most productive.
- 70-75% of the beans are for local consumption.
- Average farm size is less than one hectare (CIAT Bean Programme Report, 1986)

CAMEROON: (IRA. 1985)

Planting dates: March and September (80 day season)

Altitude: 1000-1700 metres.

Crop Associations: 1st season - maize and tubers
2nd season - tubers

Additional: -Beans are usually grown in the western and northwestern regions.

(NB: As yet data is unavailable, but expected from Cameroon Agricultural Service).

ETHIOPIA: (Ohlander, LJR. 1980)

Planting dates: June and October

Altitude: 1400-2000 metres

Crop Associations -Mainly pure stand

and Systems: -Seeds are sown by broadcast and covered by ploughing.

-A large haricot bean export industry accounts for about half of total bean production.

KENYA: (CIAT, 1981)

Planting dates: West Kenya - February and August
Remainder - March and October

Altitude: 1500-2500 metres

Crop Associations and Systems: -Interplanted mostly with maize
-In conventional rotation beans usually follow a cereal crop.
-1976
44% Eastern province was pure stand
17% Central province was pure stand
(Schonherr and Mbugua 1976)

Planting Density: Approx. 150,000 plants per hectare

Additional: -Fertilizer is used on approximately a quarter of fields in Central and Eastern provinces.
- Commercial production is negligible or absent.

MADAGASCAR: (Howard Gridley - Trip to Madagascar, 1990)

Altitude: 1400-2000 metres.

Crop Associations: About half the beans produced are intercropped into cassava, sweet potatoes and maize (in descending order of importance)

MALAWI: (CIAT, 1981)

Planting dates: South - Mid-November and February/March
North - Mid-January

Altitude: 1000-2000 metres

Crop Associations and systems: -Thylo:First season- Beans planted and with maize.
Second season- Relay planted after maize.

and systems: association with two or more crops such as maize, sweet potatoes, sorghum and sunflowers.

Additional: -South and centre: bush beans predominate.

North and highlands: climbing beans predominate.

(Pachico and Calderon, 1984)

-Sown by broadcasting.

-Land is rarely, if ever, left fallow due to land pressure.

-There is limited manure application close to farming facilities.

SUDAN: (R.Kirkby, 1990)

Planting dates: North - November (irrigated zone)

Altitude: 1200-1800 metres

Crop associations: -In the south beans are mostly intercropped with sorghum or finger millet. They are sown by broadcasting.
-On an irrigated strip, 150km south to 100km north of Hudeiba, beans are grown as a pure crop and are hand cultivated. (120 day maturity).

Additional: -Throughout the north, medium sized white beans are the only variety.

-Kirkby reports that in the north, beans are being displaced to poorer soils by new cash crops (banana and onion).

TANZANIA: (CIAT, 1981)

Planting dates: -Makungu and Arusha - April

-Southern Highlands - December

Lilongwe: Grown in a mixture of three crops, with pumpkins, groundnuts or sweet potatoes.

Central Plateau: Mixed cropping.
-99% mixed cropping over the whole country.

(Pachico and Calderon 1984)

Planting Density: Mixed - approx. 20,000-60,000
plants/hectare.

Pure - approx. 50,000-80,000
plants/hectare.

Additional:

- >70% are climbing beans, adapted to intercrop with maize.
- 90-100 day maturity except in the south where 140 day maturity is more common.
- No fertilizers or irrigation techniques are used on beans, but maize is often fertilized when grown in association with beans.

MOZAMBIQUE: (Anon: Common beans in Mozambique.)

Planting dates: North - February/March.

South - March/May.

Crop Associations and systems: -72% ridge intercropped, mainly with maize and some potatoes.

Additional: -Some irrigation used in the south (Limpopo and Incomati rivers).

RWANDA: (CIAT, 1981)

Altitude: 1000-2300 metres.

Crop Associations -Crops are grown in rotation, beans in

- Tanga - October/November and March/May
 - Morogoro - November/December and March/May.
- Altitude: 1000-2400 metres
- Crop Associations and systems: -Beans are intersown with non-legumes, maize being most common.
- Kagera region- banana/coffee/bean associations predominate.
 - Export beans (white haricot) are extensively grown on the plains west of Arusha and around Kilimanjaro. (Ohlander, LJR., 1971)
- Additional: -Climbing varieties are most common in the short rainy season (Oct.-Dec.). Bush varieties are most common in the long rainy season (March-May).
- Cow dung is used exclusively as a fertilizer.
 - 72 day maturity. (Ohlander, LJR., 1971)

UGANDA: (CIAT, 1981)

- Altitude: 900-2000 metres.
- Crop associations and systems: -More than half the beans produced are intercropped, mainly with cereals.
- Buganda - Intercropped with sweet potatoes.
 - Rift Valley - Beans are grown under furrow irrigation.
 - South-west - Beans are intercropped with maize, sorghum and bananas.
 - Beans are usually planted in fields previously used for other crops.
- Additional: - 70 to 90 day maturity.
- The area around Lake Victoria has

almost continual cultivation due to the virtually continuous rain.

ZAIRE: (U. Scheidigger, CIAT Rwanda, 1990)

Planting dates: September and March.
Altitude: 500-2400 metres.
Crop Systems: Beans are intercropped in the first season but grown in pure stand in the second season.

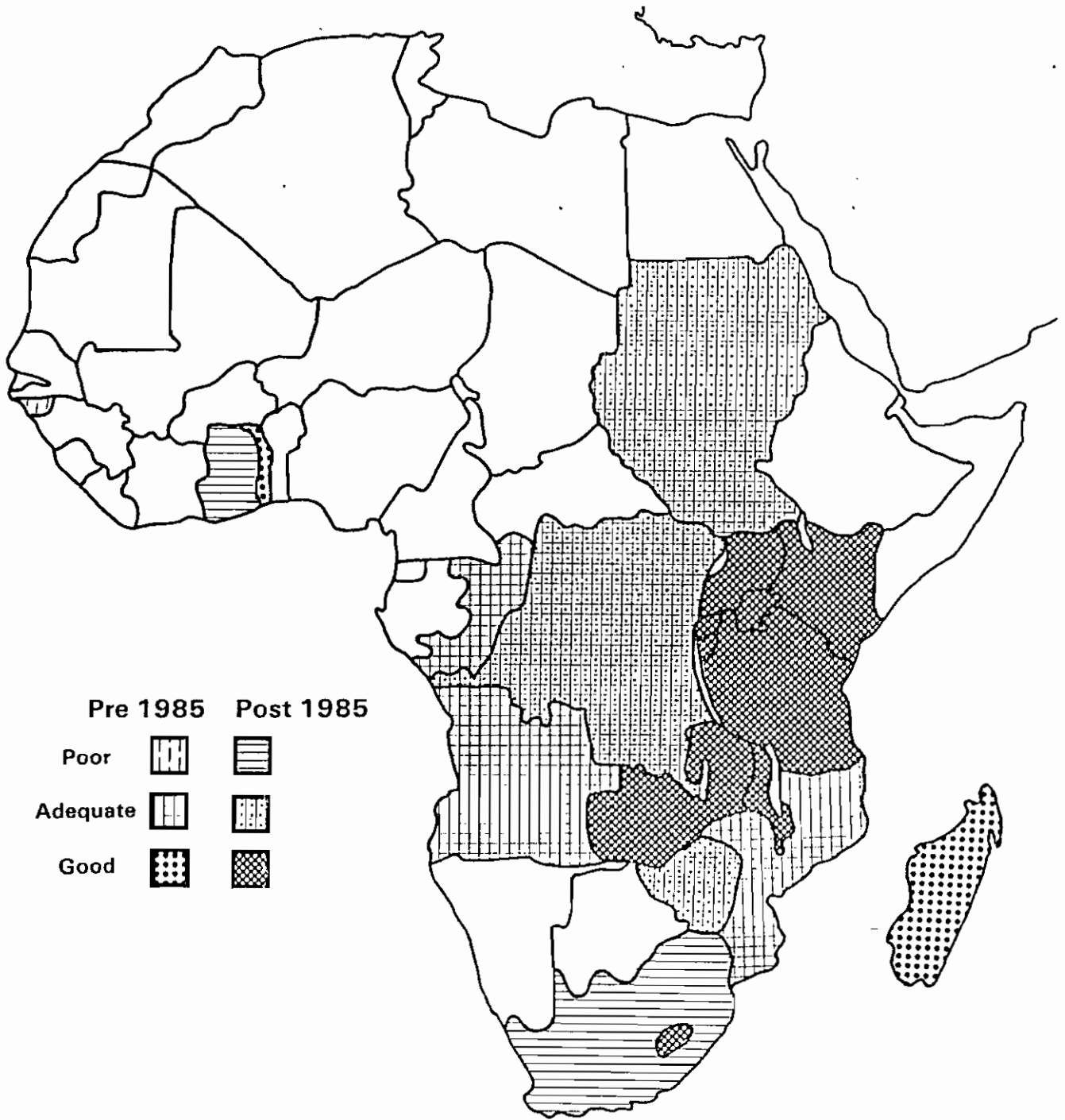
ZAMBIA: (CIAT, 1981)

Planting dates: December -February.
Altitude: 1200-1700 metres (Central, South and East)
1100-1500 metres (North and Copperbelt).
Cropping systems: -Beans are usually ridge intercropped with maize, sweet potatoes, cassava and groundnuts.
-No fertilizers are used.
-A dry season crop is not uncommon.
-At a commercial level beans are grown as a pure crop in rotation with other crops.

ZIMBABWE: (Warren, A. 1985)

Cropping systems: -Most areas are not intercropped due to strong extension campaigns for pure maize. However, in the eastern mountains a maize/bean mix is not uncommon and for subsistence, beans are often planted with maize or pumpkins.
-Seed beans for export are planted within 100km of Harare. These beans are usually planted late February or early March.

APPENDIX 1.



African Bean Distribution: The Quality of Information

APPENDIX 2 : DATA SOURCES FOR THE BEAN DISTRIBUTION MAP

ANGOLA:

1. Area by district (1969/70) from Estatística Agrícolas Correntes de Angola.

2. FAO Production estimate (1988).

Total mapped: 110,000 hectares.

BURUNDI:

1. Area by province from Cellule Planification Regionale et Amenagement du Terroitoire, Burundi (1987).

Total mapped: 388,105 hectares.

CAPE VERDE ISLANDS:

1. Area by island from Agricultural Statistics, Praia (1969).

2. FAO production estimate (1988).

Total mapped: 29,000 hectares.

GHANA:

1. Breakdown of bean hectarage by region (source and date unknown).

2. Atlas of African Agriculture (1986).

3. FAO production estimate (1988).

Total mapped: 67,000 hectares.

GUINEA BISSAU:

1. Area by zone from the Agricultural Census, Guinea Bissau (1960/1).

2. FAO production estimate (1988).

Total mapped: 3,000 hectares.

KENYA:

1. Area by district from 'Agriculture and Livestock Data Compendium' (Gutu, W and Ngalyuka, CAK). Kenya Ministry of Planning and National Development, Nairobi (1989).

Total mapped: 540,533 hectares.

LESOTHO:

1. Area by district from Lesotho Agricultural Situation Report (1986/7).

Total mapped: 18,456 hectares.

MADAGASCAR:

1. Area by district from Statistique 'Mpara', Madagascar (1981-4).

Total mapped: 90,000 hectares.

MALAWI:

1. Area by administrative district from National Rural Development Programme : Malawi Ministry of Agriculture (1988/89).

Total mapped: 92,381 hectares.

MAURITIUS:

1. Total island area from Mauritius Chamber of Agriculture (1979).

2. FAO production estimate (1988).

Total mapped: 2,000 hectares.

MOZAMBIQUE:

1. Area by district for 1970 from Anuario Estatístico, Mozambique (1972).

2. FAO production estimate (1988).

Total mapped: 125,000 hectares.

RWANDA:

1. Area by district from Resultats de l'enquete nationale Agricole Vol.1, Rwanda (1984).

Total mapped: 463,658 hectares.

SOUTH AFRICA:

1. FAO production estimate (1988).

Total mapped: 87,000 hectares.

SUDAN:

1. Roger Kirkby: Trip Report (1990). Area by province.

Total mapped: 30,000 hectares.

TOGO:

1. Area by region from Enquetes et Statistiques Agricoles, Togo (1984).

Total mapped: 123,800 hectares.

TANZANIA:

1. Area by district from 'Basic Data: Agricultural and Livestock sector 1982/3 - 1986/7'. United Republic of Tanzania, Planning and Marketing division, Ministry of Agriculture and Livestock Development. (1987).

Total mapped: 375,790 hectares.

UGANDA:

1. Area by district from data provided by Bill Grisley (CIAT, Rwanda) (1988).

Total mapped: 445,065 hectares.

ZAIRE:

1. Area by region from Service d'Etude et Planification du Departement de l'Agriculture et du Developpment Rural (1989).

Total mapped: 121,720 hectares.

ZAMBIA:

1. Area by district from data provided by Bill Grisley (1986/7).

Total mapped: 23,637 hectares.

ZIMBABWE:

1. Area by province for communal farming areas. Data provided by Bill Grisley (1987).

Total mapped: 16,869 hectares.

APPENDIX 3: BEAN DISTRIBUTION MAP: MAINFRAME FILES

- All files are on Tape 756.
- AFRICA PLOT = Africa boundaries, coasts, islands and lakes (1:1,000,000).
 - BEANS PLOT = All bean points plotted for Africa (all points represented by an asterisk '*')
 - AMEND PLOT = Larger scale map of the area around Lake Victoria (1:5,000,000).
- The bean points for each country are in their relevant named file eg. TANZBN POINTS. The identifiers are in the form of country letter followed by district number (identified on tracing paper) eg. TA14 = Tanzania, district 14.
- The bean points for each ONC sheet are in the files with format BONCM5 BNA etc. The identifiers are the same as for the country files.

NB. Some plotting and exec files for the ONC maps are subdivided into A and B (eg. BONCL5A PLOTTING) for purpose of paper size when plotting the maps.
- The files named L5BAN are for bananas in Uganda which have so far been digitized and transformed but not plotted. Maize and sweet potatoes for Uganda are plotted on tracing paper but are not yet digitized.

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Scale: 1:5,000,000
Sheet: 1,2,3,4
Edition: 3-GSGS
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2. Title: AFRICA
Scale: 1:2,000,000
Edition: 4-AMS
Prepared by the Army Map Service (LU), Corps of Engineers, US Army, Washington D.C
Compiled 1968.

3. Title: CARTE TOURISTIQUE ET ROUTIERE: REPUBLIQUE RWANDAISE
Scale: 1:420,000
Published and compiled by L'office Rwandais du Tourisme et des Parcs Nationaux (ORTPN).

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Scale: 1:250,000
Series: Y503
Edition: 3-SK
Compiled and drawn by GSGS, 1962.
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Scale: 1:4,000,000
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Edition: 13
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Scale: 1:1,000,000
Series: 1301
Sheet : NA-36
Edition: 2-USD
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Series: 504164 7-79
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