INTERAFRICAN COMMITTEE FOR HYDRAULIC STUDIES

OUAGADOUGOU
UPPER VOLTA

SAVANNA REGIONAL WATER RESOURCES AND LAND USE

VOLUME 6
EXISTING LAND USE

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INTRODUCTION

In the first three Volumes of the "Savanna Regional Water Resources and Land Use Project" report, an overview is given of the availability of both ground and surface water in West and Central Africa. The overview is intended to serve as a basis for future planning efforts in water resource development, both at CIEH and at other organizations in the region.

This Volume 6 and the accompanying map (at scale 1:5 million) provide a general assessment of existing land use and agricultural production in the Savanna Region. A larger scale edition of this map was produced at 1:2.5 million scale for use as a working document at CIEH. Two positive transparent masters of this map edition are available at CIEH for reproduction.

This report is intended to be used in conjunction with Volume 5, which deals with existing water use in the Savanna Region. The combined evaluation of existing use of the Savanna's land and water resources is an essential phase in CIEH's planning operations aimed at formulating new project proposals for the effective conservation and utilization of water and related land resources in the region.

Volume 6 provides information on current crop production in the region and leads the way to the identification of areas where agriculture production could be increased most readily.

Estimates of future food production under rainfed farming (see also Study Proposal TP 05 in Volume 4 of this report series) and estimates of future food demand are essential in determining to what extent food should be produced under irrigation and hence the water requirements for irrigation. Future water requirements for the Savanna Region are dealt with in Volume 7.

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It should be recognized that this land use/land cover map represents the first attempt ever to map Western and Central Africa using satellite-acquired data. As a result of this mapping effort, an ecological framework has been established which relates directly to actual ground conditions at the regional level.

This satellite derived map was produced by Earth Satellite Corporation, Washington, D.C., under a subcontract to TAMS. Staff assigned to the preparation of this Volume are listed in Figure 1.

Scientists Assigned to Preparation of Volume 6 of the
"Savanna Regional Water Resources and Land Use" Report

Mr. M.G. Gagara	:	Secretary-General C.I.E.H.

Dr. John Buursink	:	Project Manager, TAMS
Mr. Donald Garofalo	:	Project Manager, EarthSat
Mr. Fred R. Weber	:	TAMS, Map unit classification
Mr. Kodjo Ativon	:	CIEH Map unit classification
Mr. Charles J. Dorigan	:	EarthSat, Map unit classification
Mr. David Nichols	:	EarthSat, Map unit classification
Mr. Edmund A. Schantz	:	EarthSat, Map compilation
Mr. Michael M. Douglass	:	EarthSat, Legend design
Mr. J. William Stohlman	:	EarthSat, Collateral data collection
Dr. P. Ahn	:	TAMS, Land use
Ms. Emily T. Candelmo	:	TAMS, Documentation

Figure 1

1.0 METHODOLOGY

1.1 Mapping Procedures

The following methodology was used by EarthSat to produce the 1:5 million scale land use/land cover map (Map 1) of the Savanna Region.

Three-hundred forty-two (342) Landsat images were purchased from the U.S. Agricultural Stabilization and Conservation Service providing complete satellite coverage of the project area. Only those images with less than 20% cloud cover were selected. Of the total number of images obtained, approximately 70% were completely cloud-free, 92% had less than 10% cloud cover. Of the total number of Landsat images acquired, approximately 4% were taken in 1972; about 4% in 1973; about 15% in 1974; and the remaining 77% in 1975 and 1976. Approximately 80% of the image coverage is for the months of December and January. The remaining images were taken by the satellite during November, February, and March. The 70mm positive transparencies for Multispectral Scanner (MSS) bands 4, 5, 6, and 7 were obtained for each Landsat image. These transparencies are available for use at the CIEH Documentation Center in Ouagadougou.

On the basis of image quality, the best 230 images were selected and used to prepare a Landsat laydown (uncontrolled mosaic) of the project area at 1:2.5 million scale. Multispectral Scanner (MSS) band 5 was selected as the most suitable Landsat band for the preparation of this product. MSS band 5 is excellent for showing areas of agricultural activity and variations in natural vegetation.

A copy of the 1:2.5 million scale CIEH basemap of the Savanna Region was produced as a clear plastic overlay. This product was

suitable for overlaying and registering with the Landsat laydown. On the overlay, the project area was then sub-divided into 154 map units based on obvious tonal and textural differences as interpreted on the underlying Landsat band 5 laydown.

A "Delineation Documentation Sheet" (Figure 2) was developed which identifies each of the 154 delineated map units by number, size, location, and Landsat image coverage. The sheet is separated into four sections. The first three sections describe the agriculture and natural vegetation of the map unit based on:

1. Collateral data

2. Consultant input

3. Landsat analysis

The fourth section on the documentation sheet gives the final map unit classification based on the total integrated data input.

All collateral data are listed in the References section of this volume and are available for consultation at the CIEH Documentation Center. Data in map form on natural vegetation, agriculture, and national parks were transferred to a 1:2.5 million scale basemap of the project area using either:

1. Visual transfer which uses map detail, e.g., towns, boundaries, physical features, etc., to insure accurate transfer of information from the collateral map to the basemap.

2. Projection equipment which brings the collateral map to the same scale and map projection as the basemap and allows for direct transfer of information. Equipment used in this category were overhead and 35mm slide projectors and a Zoom Transfer Scope.

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DELINEATION DOCUMENTATION SHEET

Area (Polygon) Number _____ Size _____ Square km.

Location _____

Image I.D. _____

Area description (collateral data)

_____
_____
_____
_____
_____
_____
_____

Area description (consultant)

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Area description (Landsat analysis)

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Final classification

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_____
_____

Figure 2

Information from reports was keyed to each area using geographically specific reference data, e.g., location of agricultural activity around a given town, or the natural vegetation occurring within a given mountainous area.

Each map unit was then described in terms of its agricultural activity and natural vegetation cover in Section 1 of the "Delineation Documentation Sheet."

The project consultant (Mr. Fred Weber), a staff member of CIEH (Mr. Ativon), and EarthSat scientists working on the Regional Onchocerciasis Area Planning (ROAP) project in the Upper Volta, Ghana, and Benin area, all familiar with actual ground conditions in the project area, provided information on agriculture and natural vegetation cover for each delineated map unit. This is recorded in Section 2 of the Delineation Documentation Sheet.

Landsat band 5 images were visually analyzed. For selected images which contained a variety of tonal and textural signatures indicative of varying ground conditions throughout the project area, color composites were prepared and analyzed. Color composites were useful for enhancing image information, thus improving upon interpretation accuracy. An Addcol color viewing system was used to produce color composite scenes. Information on natural vegetation cover and agricultural intensity were recorded in Section 3 of the Delineation Documentation Sheet.

Based on an integration of the information contained in Sections 1, 2, and 3, each Landsat delineated map unit was categorized according to agricultural crop type, cultivation intensity, and natural vegetation cover in Section 4. All 154 "Delineation Documentation Sheets" are available for reference at the CIEH

Documentation Center. The final legend of the map includes these three principal categories: 1) natural vegetation cover; 2) cultivation intensity; and 3) agricultural crop types.

Alpha-numerical map symbols identify these three categories for each map unit. For example, map symbol 76.4MiMsACt*3 indicates that the area concerned is map unit #76, lies in vegetation zone 4 (Wooded Savanna), with millet, maize, and groundnuts as the main crops and cotton at selected, relatively limited locations only, with a high intensity of cultivation (over 60% of the total land area cleared for cultivation). For ease of reference, the natural vegetation categories are color coded and the cultivation intensity is shown as differing zip-a-tone patterns.

1.2 <u>Map Accuracy</u>

In order to insure that produced maps were of the highest accuracy obtainable consistent with the scale of the maps produced and the data used, two categories of quality control procedures were employed:

1. Those dealing with the mechanics of data transfer and delineation.

2. Those relating to the accurate analysis of Landsat data.

1.2.1 <u>Accuracy of Mechanical Procedures</u>

The mechanics of data transfer involved the transfer of both point and area data in all categories of information mapped from either existing maps or Landsat images to the 1:2.5 million scale and 1:5 million scale basemaps. The accuracy of data transfer and placement depends on the accuracy

of existing maps, and the method used to transfer information from maps and images of varying scales to a consistent basemap scale.

It was assumed that existing maps used as data sources in this study were accurate with respect to information content as well as data location, unless otherwise indicated by Landsat interpretation.

Among the techniques and equipment used, a Bausch and Lomb Zoom Transfer Scope (ZTS) was employed which allows the operator to view an image and map in superimposition. The image can be optically magnified 1x to 14x with a continuous zoom system. It also has an optical stretch to compensate for image displacements. The ZTS is a precision device, capable of achieving United States National Map Accuracy Standards in transfer operations. Additional optical projection equipment also was used which enabled the transfer of collateral map data to the basemap.

As part of the quality control procedure, care was taken to insure that:

- The source (existing data, Landsat, etc.) for the mapping was documented.
- Map legends and border information were properly presented.
- Relevant data were transferred from existing maps or Landsat to the 1:2.5 million and 1:5 million scale basemaps.
- Delineated areas were classified with the correct identifying symbol, and delineated areas were closed.

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* Available point data were properly identified.
* Area and point identifying symbols were readable.

1.2.2 Accuracy of Landsat Analysis

Landsat analysis was an interactive process intended to extend, update, and/or verify existing map data. In this respect, Landsat in some cases provided information for improving upon the accuracy of existing maps. Conversely, existing land use/land cover maps were required in order to enhance the accuracy of the Landsat image analysis. The degree to which data was extracted through image interpretation depended upon the land use/land cover category being interpreted, the adequacy of existing collateral data (since no field work was conducted), image season and overall image quality, and method of image interpretation.

Standard bulk processed Landsat images, black-and-white at 1:2.5 million scale and color composites at 1:1 million scale, were interpreted using manual interpretation methods. The subsequent reduction of the interpreted data to the 1:5 million scale further minimized possible inaccuracies.

Interpretation accuracy deals with the classification or identification of features on the ground from their appearance on imagery. Interpretation accuracy has two parts: the actual interpretation of the feature, and the classification of the feature. Landsat imagery showed new land use/land cover features heretofore unmapped or incorrectly mapped because of lack of ground control.

This mapping effort did not allow for in-field verifi-
cation of the final map. The accuracy of the final map therefore
is considered as accurate as the original available data
sources.

As a test of accuracy, a comparison was made between
map unit delineations for the map accompanying this report and
those produced from computer-enhanced color composite Landsat
scenes (at scale 1:200,000) for the Regional Onchocerciasis
Area Planning project.

2.0 NATURAL VEGETATION COVER

The Savanna Region is divided into eight natural vegetation zones. Each vegetation zone is derived from a classification of African vegetation types created in 1956 by the Commission for Technical Cooperation in Africa, South of the Sahara/Scientific Council. This international meeting of specialists in phytogeography was held at Yangambi. The method of classification is based on Keay and Aubreville's "Vegetation Map of Africa," and several United Nations agencies and the FAO now apply the Yangambi classification (Weber, 1977).

The 1:2.5 million scale Landsat MSS band 5 laydown which was the principal data source for delineating the vegetation zones within the project area illustrates in both striking and subtle gray tones the natural vegetation zonation which occurs when moving from north to south across the area. The location of the boundaries between adjacent vegetation zones represents actual ground conditions and thus real changes in vegetation as viewed from 920 kilometers above the Earth's surface. The ground detail as viewed from the satellite has enabled the Landsat analyst to refine and greatly improve the vegetation boundary detail and locational accuracy which is frequently generalized in other regional, small scale, vegetation mapping efforts. In view of CIEH's aim to improve the utilization of water resources in the development of the entire region, the value of geographically accurate information at the regional level cannot be over-emphasized.

The legend of the map also contains a table which, for each vegetation category, lists those trees, bushes, and grasses which are most characteristic of that category (VITA, 1977). Grasses listed are taken from a map and publication by J.M. Rattray (1960) entitled "The Grass

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Cover of Africa." The table also contains a series of phytosociological
sketches representing a ground perspective of the vegetation habitat.

Six major east-west zones or belts of vegetation are identified in
the West African Savanna Region. In addition, areas of Tropical Rainforest
were found to exist north of the southern limit of the Savanna Region.
This in fact constitutes a refinement of that limit. Also, areas of
Mangrove forest are separately shown. The extent of each of the eight
vegetation areas as measured on the 1:2.5 million scale map edition is
shown in Table 1.

Table 1: Extent of Natural Vegetation Zones in the Savanna Region

Map Symbol	Vegetation Description	Extent (1000 ha)	Percentage of Savanna Area
1	Grass Steppe	10,687	2.3
2	Tree Steppe	49,055	10.8
3	Shrub Savanna	84,209	18.5
4	Wooded Savanna	88,124	19.4
5	Woodland	144,441	31.8
6	Mosaic	57,067	12.6
7	Tropical Rainforest	6,925	1.5
8	Mangroves	1,059	0.2
PN	National Parks	12,984	2.9
TOTAL	Savanna	454,549	100.0

Note: The total land area is slightly less than the area used in Volumes 1
to 3 (4,562,547 km^2) as major surface water areas are excluded here.

It appears that in all zones, the natural vegetation is replaced to
a varying degree by agriculture. The map provides information on how much
land is currently cleared for cultivation. Calculations based on average
values of cultivation intensity (resp. 15, 45, and 70 percent for categories

1, 2, and 3 of cleared land) allow for an estimate of the surface area cleared for cultivation. Table 2 indicates how much land in each vegetation area still has its natural cover of forest and range.

Table 2: Actually Existing Forest and Range Vegetation

Map Symbol	Vegetation Description	Estimated Area Not Cleared For Cultivation (1000 ha)	Percentage of Vegetation Zone Not Cleared For Cultivation
1	Grass Steppe	9,084	85
2	Tree Steppe	45,202	92
3	Shrub Steppe	54,766	65
4	Wooded Savanna	46,613	53
5	Woodland	79,230	55
6	Mosaic	28,242	49
7	Tropical Rainforest	4,907	71
8	Mangroves	848	80
PN	National Parks	12,984	100
TOTAL	Savanna Region	281,875	62

Even though it appears that about 62 percent of the Savanna Region is not cleared for cultivation, it should be noted that in vegetation zones 3, 4, 5, and 6, which constitute 80 percent of the Savanna Region, the forest and range vegetation only exists on slightly more than half of the land.

3.0 AGRICULTURAL LAND USE

3.1 Crop Type Identification

Because Landsat coverage of the project area was principally for the months of December, January, and February, most agricultural fields were fallow. Crop type identification for the project depended entirely upon collateral map data and the knowledge of project personnel familiar with actual ground conditions.

The reader should not be misled into believing, however, that had high quality Landsat imagery been available during the height of the agricultural growing season, it would have been possible to identify crop types using Landsat data alone. Any effort to identify crop types using Landsat would undoubtedly require, at a minimum, multi-temporal data (i.e., Landsat coverage for an entire growing season), high quality color enhanced images, and associated ground checking to establish and verify image signatures.

Selected color composite Landsat images of the project area were interpreted as a check on the black-and-white interpretation and to resolve questions which arose during the MSS band 5 image analysis. The color composites provided more detailed information on ground conditions than the black-and-white scenes. Because of the larger number of colors and subtle hues, the color composites did, therefore, improve the overall accuracy of the Landsat analysis.

Each map unit contains one or more letter codes, each code related to a specific crop type. From one to seven crop types may be listed for a given map unit. The order in which two or more crop type codes are listed for a map unit is unrelated to crop dominance or economic importance for that unit.

In general, the type of land use, i.e., the crops grown, and to some extent the methods employed, is adapted to and reflects the latitude and length of the growing season. In the wetter areas of the southern Savanna - the range of crops is greater, and with a relatively long growing season, higher yielding varieties are planted. Crops include maize and long season sorghum and millet. As growing seasons grow shorter progressively northwards, so do crops and the crop varieties change. In the northernmost cropping zones maize is not planted, and very short season sorghum and millet (able to grow in as little as 55 days) are the dominant grains.

3.2 Cultivation Intensity

Each map unit was delineated using the Landsat MSS band 5 laydown as the principal data source. The black-and-white band 5 prints show variations in gray tones and texture that are related to density and composition of natural vegetation cover, landform differences, and land use activity. For example, in an area of dense vegetation cover, the Landsat tonal signature is a medium to dark gray. Any efforts to clear the area of its natural vegetation cover in order to, for example, cultivate the area for crops would be noticeable on the Landsat image, especially during those times of year when the agricultural land is fallow and bare soil is exposed. Bare, fallow soil would image as a much lighter gray tone than the adjacent, undisturbed natural vegetation cover. Variations in image tone and texture alone cannot be used as the sole guide for identifying agriculture versus natural vegetation cover. Geographic location of a given land use activity is an important

consideration when arriving at a decision during Landsat analysis.
For example, areas around major towns are frequently subjected to
intensive cultivation and associating town location with a surrounding
light gray tonal signature would be an important analytical criterion
for identifying and mapping the area's land use activity. An
analysis of the distribution of image tone and texture for a Landsat
scene is useful for studying patterns of land use and land cover.
In an area with a high population density, but with the population
distributed among a large number of towns and villages within the
area, a characteristic regional pattern would be displayed on the
Landsat image. In this case, the pattern would include bright or
light gray tonal dots in a darker gray matrix with the dots representing
towns or villages with associated intensive subsistence culti-
vation, and the darker gray matrix being the hinterland with less
intensive agriculture and a denser natural vegetation cover.

Because map units delineated during this study were based on
Landsat image pattern recognition as well as gray level of tones
and textures, it was possible to assign a quantitative value
relating to the percentage of the map unit cleared for cultivation
at the time of satellite overpass. Three arbitrary ranges were
selected:

1. 0% to 30% of the area was cleared for cultivation at the
    time of satellite overpass.

2. 31% to 60% of the area was cleared for cultivation at the
    time of satellite overpass.

3. More than 60% of the area was cleared for cultivation.

The degree of accuracy of assigning a map unit to one of these
three categories, and by which agricultural lands per se were

classified as such using Landsat analysis, is estimated by EarthSat to be high, i.e., 90% to 100% in the following vegetation zones where a good contrast between agricultural land and natural vegetation is shown on the Landsat imagery:

Zone 2 - Tree Steppe

Zone 3 - Shrub Savanna

Zone 4 - Wooded Savanna

Zone 5 - Woodland

Zone 6 - Mosaic

In the Grass Steppe (Zone 1) where rainfall is minimal, it was difficult to distinguish between fallow cropland and areas devoid of natural vegetation cover due to lack of sufficient precipitation. Also, in the Tropical Rainforest (Zone 7) where a dense forest canopy is present, many of the crops grown are tree crops. Rainfall is heavy in this zone and it was difficult to distinguish, using Landsat imagery alone, between agricultural areas and natural vegetation cover. In the Grass Steppe and Rainforest zones, map accuracy with respect to cultivation intensity depended more heavily on the knowledge and experience of the project consultant.

The three categories that indicate the intensity of cultivation relate the total area cleared for cultivation to the total map unit area. In a region where most cultivation is of the land rotation (shifting agriculture) type, a variable percentage of the land area is under fallow each year. Areas of fallow are, in West Africa, areas of regrowth vegetation, i.e., of the vegetation which springs up naturally when farm land is abandoned and no longer weeded.

Under present conditions of West African farming, extensive culture with little or no use of fertilizers, a relatively long fallow is needed to maintain soil productivity. The longer the fallows, the greater the percentage of the total area which is resting and the smaller the percentage under current cultivation. As population pressures increased during the last half century, and with increasing interest in the production of cash crops, both fallow periods and the percentage of land not currently cultivated tended to fall. For this study, it was not feasible to separate the land cleared for cultivation into areas that are farmed in a particular year, and the recently abandoned farm areas. However, data on areas farmed in 1976 were derived from the FAO Production Yearbook (FAO, '78). The total areas cleared for cultivation, arranged per vegetation zone, are shown in Table 3.

Table 3: Areas Cleared for Cultivation per Vegetation Zone
(In 1000ha)

Map Symbol	Vegetation	From 0 to 30 Percent of Area Cleared For Cultivation	From 31 to 60 Percent of Area Cleared For Cultivation	More Than 60 Percent of Area Cleared for Cultivation	Total Area Cleared For Cultivation
1	Grass Steppe	10,687	Nil	Nil	1,603
2	Tree Steppe	41,959	6,974	121	3,853
3	Shrub Savanna	43,836	21,574	18,798	29,443
4	Wooded Savanna	25,487	24,632	38,005	41,511
5	Woodland	17,160	105,838	21,443	65,211
6	Mosaic	6,119	31,026	19,922	28,825
7	Tropical Rain-forest	5,145	Nil	1,780	2,018
8	Mangroves	885	174	Nil	211
TOTAL	SAVANNA	151,278	190,218	100,070	172,674

Calculations based on average values of cultivation intensity (15, 45, and 70 percent respectively for categories 1, 2, and 3 of cleared land) give an estimated extent of the areas cleared for cultivation per vegetation zone (see Table 3). The total area cleared for cultivation in the Savanna Region covers 173 million hectares or 38 percent of the total land area.

According to land capability data developed in Chapter 6 of Volume 1 of this report series, about 80 million hectares are considered generally unsuited to cultivation. They include loose, shifting dune sands, shallow lithosols, and saline soils. Approximately 375 million hectares are arable.

With National Parks covering 13 million hectares, and assuming that most parks are in arable land, the total arable area is approximately 362 million ha. The area which is now cleared for cultivation constitutes almost half (48 percent) of this arable land, the remainder (189 million hectares) is forest or rangeland.

It is assumed that, in general (except in areas of river blindness), the farmers have selected the best lands of the Savanna for cultivation. The three best categories of land (Capability Class 1, 2, and 3) cover 227 million hectares. Poor land (Class 4) occurs in 149 million hectares. Generally, these lands with light textured soils dominate in the more northern, drier areas of the Savanna. It is considered likely that most of the arable land that is not cleared for cultivation yet is Class 4 land, of poor quality.

A relatively small area is actually cultivated each year for the production of cereals, root and tuber crops, and pulses. The extent of the area harvested each year in all of the Savanna countries is given in

Table 4: Estimated Percentage of Total Area Harvested
Per Country Located in Savanna Region

Country	Percentage of Country in Savanna Region	Percentage of Harvested Area in Savanna
Benin	94.5	94.5
Cameroun	53.6	53.6
Centr. Afr. Emp.	97.7	97.7
Chad	43.6	95.0
Gambia	100.0	100.0
Ghana	71.5	71.5
Guinea	95.0	95.0
Guinea Bissau	100.0	100.0
Ivory Coast	54.3	54.3
Mali	43.7	95.0
Mauritania	17.3	95.0
Niger	27.6	95.0
Nigeria	84.4	84.4
Senegal	100.0	100.0
Sierra Leone	38.4	38.4
Togo	100.0	100.0
Upper Volta	100.0	100.0

the FAO Production Yearbook (FAO, 1978). Many of these countries are only partially located in the Savanna Region (see Table 4).

In order to estimate the area harvested in the part of each country that is located in the Savanna Region, the harvested area was in most cases assumed to be divided in the same ratio as the total land area of each country. For example, 53.6 percent of Cameroun is in the Savanna Region; it is assumed also that 53.6 percent of Cameroun's harvested area is in the Savanna. For the Sahelian countries, Mauritania to Chad, it was assumed that 95% of their respective harvested areas are in the Savanna Region (see Table 4). On this basis, the areas that in 1976 were in cereals, roots and tubers, pulses, sesame seed and cotton seed were computed (see Table 5). The total area in the Savanna Region utilized to produce these crops, both irrigated and rainfed, is approximately 35 million hectares. About a 200,000 ha area is now under irrigation (see Table 6 of Volume 5 of this report series) . Thus, the area harvested each year represents 8 percent of the total Savanna area, some 10 percent of the total arable land of the Savanna area, and 20 percent of the area cleared for cultivation. This indicates that fallows last an average of four years per year of cultivation. For details on areas cultivated in Upper Volta, one is referred to a study by Remy (1970) based on aerial photography of the period 1950-56.

Of particular interest is the situation in Nigeria. This country constitutes 17.1 percent of the total Savanna area, yet half of the total harvested area of the Savanna (17.5 million hectares) is in Nigeria. As a result, the bulk of the agricultural production of the Savanna Region comes from Nigeria.

Table 5: Areas of Different Crops in 1976 Per Country
In The Savanna Region
(in 1000 ha)
(derived from FAO, 1978)

Country	Cereals	Roots & Tubers	Pulses	Sesame Seed	Cotton Seed	Total
BENIN	445	123	49		51	668
CAMEROUN	423	299	79		32	833
C. AFR. EMPIRE	173	308	11	46	132	670
CHAD	1,076	34	134	27	303	1,574
GAMBIA	72	2	12			86
GHANA	583	458	90		4	1,135
GUINEA	979	78	48	2		1,107
GUINEA BISSAU	90	7	3			100
IVORY COAST	400	358	7	2	35	802
MALI	1,460	9	29		107	1,605
MAURITANIA	179	5	34			218
NIGER	3,035	31	837		12	3,915
NIGERIA	11,037	2,387	3,511	194	444	17,573
SENEGAL	1,084	24	50		44	1,202
SERRIA LEONE	165	13	19	1		198
TOGO	334	110	75	7	8	534
UPPER VOLTA	2,234	28	560	40	68	2,930
TOTAL	23,769	4,274	5,548	319	1,240	35,150

3.3 Crop Production

An estimate of the prouduction of major crops is calculated from data provided by FAO (FAO, 1978). On the basis of areas of different crops as given in Table 5, the total production of these crops was computed for each portion of the countries concerned that is located in the Savanna Region, using 1976 yield data (in kg/ha) given by FAO.

Table 6 lists the total production in 1000 metric tons of cereal crops, roots and tubers, and pulses.

The main cereals in the area are millet, sorghum, maize and rice, taking up about 48, 32, 16, and 4 percent of the total area in cereals each year.

The most important tuber is cassava which takes up by far the largest portion of the roots and tubers area.

Of the pulses, groundnuts and beans are the most important.

Table 6 shows that in the Nigerian part of the Savanna Region about half of the total cereals and pulses are produced, and about 70 percent of the roots and tubers.

In addition, some 90,000 metric tons of sesame seed are produced in the Savanna Region, two-thirds of it in Nigeria, and lesser amounts in the Central African Empire, Chad and Upper Volta. Also, some 700 to 800,000 metric tons of cotton seed are produced in the region, primarily in Nigeria, Chad, Mali and Benin.

For data on the production of vegetables, fruits, fiber crops and rubber, one is referred to the statistics given by FAO for each country concerned (FAO, 1978).

Table 6: Production of Major Crops in the Savanna Region in 1976

Country	Cereals		Roots & Tubers		Pulses	
	Yield Kg/Ha	Production 1000 MT	Yield Kg/Ha	Production 1000 MT	Yield Kg/Ha	Production 1000 MT
BENIN	658	293	7,201	886	373	18
CAMEROUN	968	410	3,607	1,078	599	47
C. AFR. EMPIRE	531	92	2,891	890	505	6
CHAD	502	540	2,915	99	402	54
GAMBIA	936	67	4,000	8	233	3
GHANA	560	327	6,911	3,165	95	8
GUINEA	747	732	8,049	628	540	26
GUINEA BISSAU	1,184	106	4,615	30	600	2
IVORY COAST	838	335	4,495	1,609	625	4
MALI	748	1,092	9,228	83	1,123	33
MAURITANIA	367	66	1,087	5	278	9
NIGER	482	1,463	7,636	237	284	238
NIGERIA	649	7,164	9,982	23,827	224	787
SENEGAL	659	714	5,010	120	326	16
SIERRA LEONE	1,427	236	3,287	43	537	10
TOGO	850	284	8,096	891	300	23
UPPER VOLTA	495	1,106	4,464	125	321	180
TOTAL SAVANNA		15,027		33,724		1,464
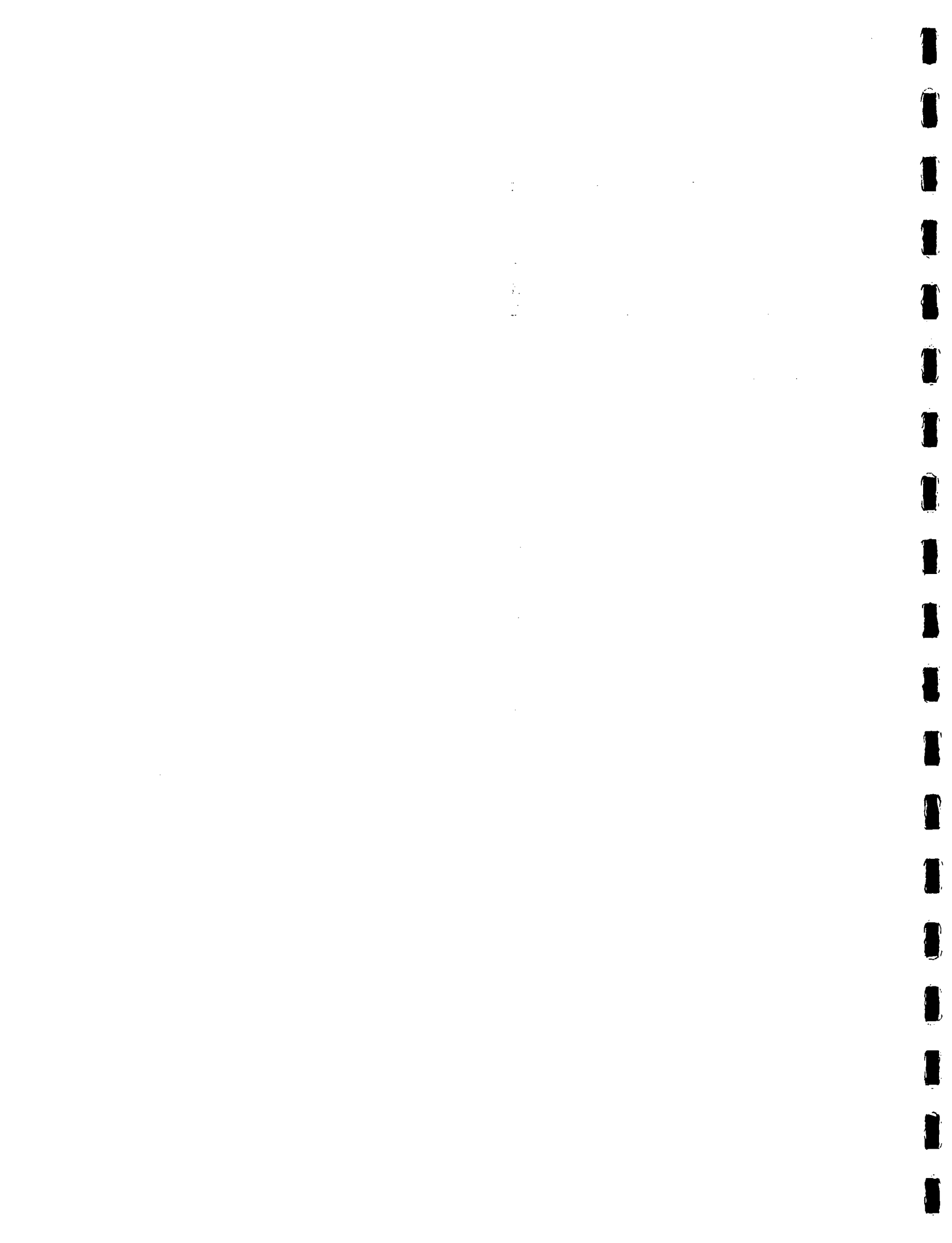
SUMMARY

A summary of the land cover, land use and agricultural production of the Savanna Region is given in tabular form (Table 7).

Table 7: Savanna Land Cover, Land Use and Crop Production

Land Use/Land Cover	10^6 hectares	10^6 metric tons
Total Land Area	455	
Natural Vegetation (Forest and Range)	269	
National Parks	13	
Arable Land	375	
Non-Arable Land	80	
Area Cleared for Cultivation	173	
Arable Land not Cleared for Cultivation	189	
Area Harvested 1976	35	
Area Harvested and Production of Cereals 1976	24	15
Area Harvested and Production of Roots and Tubers 1976	4	33
Area Harvested and Production of Pulses 1976	6	1

The accompanying map shows areas where there are obvious agricultural pressures on the land. The map thus sub-divides the region into areas where potential problems exist, and identifies areas requiring more detailed analyses. More detailed studies of smaller areas can be accomplished, using field checking and larger scale (e.g., 1:250,000) Landsat images which have been enhanced to show maximum information on land cover and land use.

Should a Landsat data ground receiving station be built in Ouagadougou in the near future, the usefulness of Landsat data as a regional planning tool would increase dramatically. A seasonal monitoring capability would then exist. This has important implications for identifying and managing water resources throughout West Africa. Seasonal changes in surface water bodies could be monitored as well as the process of

desertification. Using Landsat, maps showing areas undergoing severe stress due to, for example, agricultural pressures, could be prepared and used as management tools.

REFERENCES

Area handbook for Sierra Leone (1976) Washington, D.C., Government
    Printing Office.

Atlas International de l'Ouest Africain/International Atlas of West
    Africa (1968) Organization of African Unity.

Atlas National du Sénégal (1977) Paris, Institut Géographique National.

Aubreville, A. (1958) Carte de la vegetation de l'Afrique au sud du
    Tropique du Cancer. Vegetation map of Africa south of the Tropic
    of Cancer. London, Oxford University Press.

Bahry, G. (1954) Carte agricole de l'Afrique Occidentale Française.
    Scale: 1:500.000, Carte no. 63. Paris, Institut Géographique
    National.

Bale, J.B. (1974) Remote sensing applications to resource management
    problems in the Sahel. Washington, D.C., Earth Satellite Corporation.

British Government Overseas Development Administration (DOS) (1972) Map
    of Sierra Leone - 1:250.000 scale, 4 sheets.

Central Intelligence Agency (1970) Map of Cameroon - 1:2.525.000 scale.
    Washington, D.C.

Central Intelligence Agency (1969) Map of Chad - 1:3.890.000 scale.
    Washington.

Central Intelligence Agency (1970) Map of Dahomey - 1:1.5 million scale.
    Washington, D.C.

Central Intelligence Agency (1971) Map of Ghana - 1:1.5 million scale.
    Washington, D.C.

Central Intelligence Agency (1973) Map of Guinea - 1:1.716.000 scale.
    Washington, D.C.

Central Intelligence Agency (1972) Map of Ivory Coast - 1:1.900.000
    scale. Washington, D.C.

Central Intelligence Agency (1970) Map of Mali - 1:4 million scale.
    Washington, D.C.

Central Intelligence Agency (1967) Map of Mauritania - 1:3.5 million
    scale. Washington, D.C.

Central Intelligence Agency (1962) Map of Niger - 1" = 135 miles.
    Washington, D.C.

Central Intelligence Agency (1972) Map of Nigeria - 1:2.950.000 scale.
    Washington, D.C.

Central Intelligence Agency (1972) Map of Senegal and Gambia - 1:1.5 million scale. Washington, D.C.

Central Intelligence Agency (1969) Map of Sierra Leone - 1:920.000 scale. Washington, D.C.

Central Intelligence Agency (1968) Map of Upper Volta - 1:3 million scale. Washington, D.C.

Curran, Brian Dean and Joann Schrock (1972) Area handbook for Mauritania. Washington, D.C., Government Printing Office.

Deshler, W. (1974) An example of the extent of fire in grassland and savanna, along the southern site of the Sahara. In: Proceedings of the Ninth International Symposium on Remote Sensing of the Environment, Volume I, p. 23-30.

Editions Jeune Afrique (1973) Grand atlas du continent African. Paris.

FAO (1976) Etude prospective pour le développement agricole des pays de la zone Sahélienne (1975-1990). Rome.

FAO Production Yearbook/Annuaire FAO de la production, 1977, vol. 31 (1978) Rome.

Ghana. Survey of Ghana (1969) Map of Ghana, agricultural productivity, 1:2 million scale. Accra.

Ghana. Survey of Ghana (1969) Map of Ghana, vegetation zones, 1:2 million scale. Accra.

Harrison-Church, R.J. (1974) West Africa. London, Longman.

Institut Fondamental d'Afrique Noire (1964) Sénégal-Gambia. Carte d'utilisation des sols. Scale 1:1.000.000. Paris, Institut Géographique National.

Institut Géographique National (1975) Map of Cameroon - 1:1.5 million scale. Paris.

Institut Géographique National (1969) Map of Central African Empire - 1:1.5 million scale. Paris.

Institut Géographique National (1970) Map of Ivory Coast - 1:1 million scale. Paris.

Institut Géographique National (1971) Map of Mali - 1:2.5 million scale. Paris.

Institut Géographique National (1971) Map of Niger - 1:2.5 million scale. Paris.

Institut Géographique National. Map of Sénégal - 1:5 million scale, 1 of 4 sheets. Paris.

Institut Géographique National (1968) République du Tchad - 1:1.5
     million scale. Paris.

Institut Géographique National (1968) Map of Upper Volta - 1:1 million
     scale. Paris.

Institut National Tchadien pour les Sciences Humaines (1972) Atlas
     Pratique du Tchad. Paris, Institut Géographique National.

International Bank for Reconstruction and Development (1976) Map of
     Ivory Coast, Vegetation and Rainfall - 1" = 40 km. Washington,
     D.C.

Irvine, F.R. (1969) West African crops. London, Oxford University
     Press.

Instituto Geografico De Agostini (1976) World atlas of agriculture,
     volume 4 - Africa. Novara, Italy.

Kaplan, Irving et al (1971) Area handbook for Ghana. 2nd ed. Washington,
     D.C., Government Printing Office.

Kowal, J.M. and A.H. Kassam. The agricultural ecology of savanna; a
     study of the savanna of West Africa. (Book not yet published by
     Oxford University Press.)

Map of Ivory Coast - roads - 1:800.000 scale (1973) Michelin.

Morel, R. et P. Quantin (1964) "Les jachères et la régéneration du sol
     en climat soudano-guineen d'Afrique Centrale," Agronomie Tropicale,
     no 2, fév. p. 105-136.

Nelson, Harold D. et al. (1972) Area handbook for Chad. Washington,
     D.C., Government Printing Office.

Nelson, Harold D. et al. (1975) Area handbook for Guinea. 2nd ed.
     Washington, D.C., Government Printing Office.

Nelson, Harold D. et al. (1972) Area handbook for Nigeria. Washington,
     D.C., Government Printing Office.

Nelson, Harold D. et al. (1974) Area handbook for Senegal. Washington,
     D.C., Government Printing Office.

Nelson, Harold D. (1974) Area handbook for the United Republic of
     Cameroon. Washington, D.C. Government Printing Office.

Rattray, J.M. (1960) The grass cover of Africa. Rome, FAO.

Remy, G. (1970) "Une carte de l'occupation du sol en Haute-Volta. Note
     methodologique et descriptive," Cahiers ORSTOM, sér. Sciences
     Humaines, vol. VII, no. 2, p. 3-14.

Roberts, T.D. et al. (1973) Area handbook for Ivory Coast. 2nd ed.
     Washington, D.C., Government Printing Office.

S.A.E.P. (1963) Map of Ivory Coast - 1" = 40 km. Abidjan.

Togo. Service Topographique (1974) Map of central Togo, région centrales - 1:200.000 scale.

Togo. Service Topographique (1974) Map of northern Togo, région de la Kara - 1:200.000 scale.

Togo. Service Topographique (1974) Map of Togo, région des plateaux - 1:200.000 scale.

Togo. Service Topographique (1974) Map of Togo, région du savanes - 1:200.000 scale.

UNESCO (1975) The Sahel; ecological approaches to land use. Paris.

Volunteers in Technical Assistance (1977) Reforestation in arid lands. Mt. Rainier, Maryland.
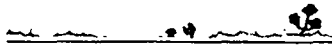
ASSOCIATIONS DE VEGETATION PAR ZONE [1]
VEGETATION ASSOCIATIONS BY ZONE

PHYTOSOCIOLOGIE [2] *PHYTOSOCIOLOGY*		BUISSONS ET ARBRES *BUSHES AND TREES*	HERBES *GRASSES*
Steppe herbacée *Grass Steppe*		*Acacia raddiana* Savi. *Balanites aegyptiaca* *Leptadenia spartium* Wright	*Aristida pungens* Desf. & *plumosa* L.. *Panicum turgidum* Forsk. , *Eragrostis tremula* Hochst.
Steppe arborée *Tree Steppe*		*Acacia raddiana* Savi. *Acacia senegal* (L.) Willd. *Acacia seyal* Del. *Boscia senegalensis* Lam. *Commiphora africana* (Rich.) Engl. *Euphorbia balsamifera* Ait. *Salvadora persica* L.	*Aristida mutabilis* Trin. & Rupr. *Schoenefeldia gracilis* Kunth *Cenchrus biflorus* Roxb. *Eragrostis tremula* Hochst.
Savane arbustive *Shrub Savanna*		*Combretum micranthum* G. Don. *Combretum nigricans* Leprieur *Combretum glutinosum* Perr. *C. glutinosum* var. *passargei* Aubr. *Guiera senegalensis* Pers. *Cassia sieberiana* D.C. *Annona senegalensis* Pers. *Bauhinia rufescens* Lam. *Ziziphus sieberiana* *Ziziphus mauritiaca* Lam. *Sclerocarya birrea* (A.Rich.) Hochst. *Prosopis africana* Taub.	*Cenchrus ciliaris* L. *Andropogon gayanus* Kunth , *Brachiaria* spp. Griseb. *Loudetia hordeiformis* (Stapf) C.E.Hubbard
Savane arborée *Wooded Savanna*		*Acacia scorpioides* (L.) var. *nilotica* (L.) A.Chev. *Acacia ataxacantha* D.C. *Acacia caffra* Willd. var. *campylacantha* Aubr. *Anogeissus leiocarpus* Guill. & Perr. *Bauhinia reticulata* D.C. *Hyphaene thebaica* (L.) Mart. *Mitragyna inermis* O.Kuntze *Acacia caffra* Willd. var. *campylacantha* Aubr. *Acacia macrostachya* Reichenb. *Acacia scorpioides* (L.) var. *nilotica* (L.) A.Chev. *Adansonia digitata* L. *Anogeissus leiocarpus* Guill. & Perr. *Bombax costatum* Pellegr. & Vuillet. *Borassus aethiopum* Mart. , *Butyrospermum parkii* Kotschy *Detarium senegalense* Gmel. *Ficus* spp. L. *Isoberlinia dalzielii* Craib & Stapf *Isoberlinia doka* Craib & Stapf *Terminalia avicennioides* Guill. & Perr. *Lannea acida* A.Rich. *Parkia biglobosa* Benth. *Pterocarpus erinaceus* Poir. *Tamarindus indica* L.	[5] *Andropogon* spp., e.g., *gayanus* Kunth, *chevalieri* Reznik, *tectorum* Schumach. *Loudetia togoensis* (Pilger) C.E.Hubbard *Pennisetum pedicellatum* Trin. *Hyparrhenia* spp. Anderss. ex Fourn. , *Schizachyrium* spp. Nees
Savane boisée *Woodland*		*Daniellia oliverii* (Rolfe) Hutch. & Dalz. *Detarium senegalense* Gmel. *Khaya senegalensis* Juss. *Parinari macrophylla* Sabine *Pterocarpus erinaceus* Poir. *Sterculia setigera* Del. *Ceiba pentandra* (L.) Gaertn.	*Hyparrhenia* spp. Anderss. ex Fourn., e.g., *chrysargyrea* (Stapf), *subplumosa* Stapf *Chasmopodium caudatum* (Hack.) Stapf *Andropogon pseudapricus* Stapf *Echinochloa pyramidalis* (Lam.) Hitchcock & Chase *Pennisetum purpureum* Schumach. ,
Mosaïque *Mosaic*		*Dichrostachys glomerata* (Forsk.) Hutch. & Dalz. *Afzelia africana* Smith *Lophira alata* Banks *Entandrophragma* spp. C.DC. *Elaeis* spp. Jacq.	*Chasmopodium* spp. Stapf *Panicum maximum* Jacq. *Centotheca lappacea* (L.) Desv. *Pennisetum* spp. L. Rich, e.g., *purpureum* Schumach., *subangustum* (Schumach) Stapf & C.E.Hubbard, *hordeoides* (Lam.) Steud.
Forêt dense humide *Tropical Rainforest*		Une large diversité et un grand nombre d'arbres, de buissons et de plantes rampantes (avec un abondant sous-étage qui forment une couverture végétale très dense de plusieurs étages) se rencontrent dans les zones de forêt tropicale humide. *A large variety and number of trees, bushes, and vines (with a profuse understory forming a very dense vegetation cover of several layers) occur in tropical rainforest areas.*	Dans les zones de forêt tropicale humide, les arbres constituent essentiellement la voûte de verdure, tandis que la couverture du sol par des plantes herbacées ne se rencontre que là où le défrichement a été effectué. Cette situation est caractéristique de la zone en mosaïque. *In dense rainforest areas the tree canopy is dominant, thus the grass groundcover occurs only where clearings exist. This is characteristic of the mosaic area.*
Mangliers *Mangroves*		*Rhizophora* spp. L.	

[1] Les catégories de végétation naturelle se conforment à celles établies à la conférence de Yangambi tenue en juillet-août 1956. *The natural vegetation categories conform to those established at the Yangambi Conference held in July-August, 1956.*

[2] Les croquis phytosociologiques représentés se rapportent à l'habitat de la végétation, tel qu'observé sur le terrain. *The phytosociological sketches shown relate to the vegetation habitat as seen in the field.*

[3] Dans des cours d'eau non permanents. *In dry washes.*

[4] Cette espèce avait été abondante dans le passé mais elle a disparu par suite des pressions exercées par l'élevage. *This was formerly abundant but has disappeared due to grazing pressures.*

[5] Sols plus lourds et lieux plus humides. *Heavier soils and more moist locales.*

[6] Aux endroits favorables. *At favorable locations.*

[7] Dans les plaines d'inondation. *In floodplains.*

[8] Dans les lieux humides. *In wet locations.*

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____1_____ SIZE __28,119__ Sq. km.
Northwestern part of project area in Mauritania. North of Aioun-
LOCATION _el-Atbuss and Nema_

IMAGE I. D. __Path 220, 221, 222 Row 48__

Area description (collateral data)

Desert vegetation area (CIA Map of Mauritania,1967). Wooded Steppe with
abundant Acacia and Commiphora (Keay & Aubreville, 1958). Sahelian zone
predominantly livestock, Basic food crop - millet and sorghum (Atlas of
Africa, 1973). Scattered date palm (oasis) (CIA Map of Mauritania,1967).
Non-agricultural rough grazing land (World Atlas of Agriculture, 1976)

Area description (consultant)

Desert; sand

Area description (Landsat analysis)

Light gray signature indicative of sandy minimal vegetation area. This is
judged to be the southern limit of the desert region and the polygon is
principally desert and desert vegetation.

Final classification
Grass steppe & Barren land
No crops
0 - 30% of area cleared for cultivation at the time of Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____2_____ SIZE __7,210__ Sq. km.

LOCATION _Northeast of Kiffa; West and Northwest of Aioun-el-Atrouss_

IMAGE I. D. __Path 221 Row 48-49__

Area description (collateral data)

Acacia savanna (CIA Map of Mauritania, 1967); Sahelian zone-predominantly
livestock (Atlas of Africa, 1973). Wooded Steppe with abundant Acacia
and Commiphora (Keay & Aubreville, 1958). Basic food crops-millet and
sorghum (Atlas of Africa, 1973); Afolle' plateau area and raw mineral
soils of non-climatic origin (International Atlas of West Africa, 1971).
Scrub grasses and acacia dominate, occasional baobob-trees (Area Handbook
for Mauritania, 1972).

Area description (consultant)

May be rock outcrop; parent material; lateritic-capped plateau
with steep escarpments

Area description (Landsat analysis)

Landsat shows polygon to be plateaus with associated escarpments and
some erosional outliers. Vegetation, probable Acacia and scrub types
occur here.

Final classification
Grass steppe and Barren Land
No crops
0 - 30% of area cleared for cultivation at the time of Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____3_____ SIZE __2,523__ Sq. km.

LOCATION _Southeast of Tombouctou_____

IMAGE I. D. _Path 215 and 216, Row 48 and 49_____

Area description (collateral data)

   Acacia savanna and desert vegetation (CIA Maps of Mauritania and Mali,
   1967 and 1970 respectively); Wooded steppe with abundant Acacia and Commi-
   phora (Keay and Aubreville, 1958); Non-intensive subsistence agriculture
   (Millet)- predominantly pastoral. Isohumic soils-reddish brown subarid
   soils over aeolian sands (International Atlas of West Africa, 1971).

Area description (consultant)

   Grass steppe; grazing activity; submarginal farming; livestock grazing;
   nomadic herding.

Area description (Landsat analysis)

   Vegetation is sparse in this area which is a transitional area from Steppe
   to Desert, agricultural activity is minimal; Grazing is problbly the dominant
   agricultural activity.

Final classification
   Grass steppe
   No crops
   0 - 30% of area has been cleared for cultivation at the time of Landsat
   overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____4_____ SIZE _69,019_ Sq. km.

LOCATION _Along northern border of project area in Niger_____

IMAGE I. D. _Path 205-211; Row 49-50_____

Area description (collateral data)

   Woodlands, savannas and steppes with abundant Acacia and Commiphora
   (Keay & Aubreville); Desert vegetation (CIA Map of Niger, 1962); Above the
   northern limit of cultivation (CIA Map of Niger, 1962); Non-agricultural
   rough grazing land (World Atlas of Agriculture, 1976).

Area description (consultant)

   Grass steppe area; practically no trees; drought - resistant bushes.
   Annual pasture dependent on rainfall; undeveloped soils - sandy - wind
   erosion & over grazing; no cropping; all water for animal & people is
   ground water for short periods. No intermittent streams. Extensively
   travelled by nomads and their herds. Turegs - desert nomads.

Area description (Landsat analysis)

   The light tonal signature of Landsat band 5 indicates an area of minimal
   natural vegetation and low soil moisture.

Final classification
   Grass steppe
   No crops
   0 - 30% of area has been cleared for cultivation at the time of Landsat
   overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____5_____ SIZE __10,291__ Sq. km.

LOCATION _Northwesternmost part of area north of Rosso & Senegal River_

IMAGE I. D. _Path 225 & 224 Row 48_

Area description (collateral data)

Acacia savanna (CIA Map, 1972); Sahelian zone - predominantly livestock
(Atlas of Africa, 1973); Wooded Steppe with abundant Acacia & Commiphora
(Keay and Aubreville, 1958). Reddish brown subarid soils over aeolian
sands (International Atlas of Africa, 1971). Scattered gum arabic (CIA
Map, 1971).

Area description (consultant)

Blotches are towns; Dark areas Acacia Senegal (gum); Typical tree steppe.
Millet raising between the dunes; some grazing.

Area description (Landsat analysis)

Landsat band 5 has mottled signature - white splotches in a dark-toned
matrix. This area is transitional to desert. Northeast to southwest
trending dunes exist over area. Steppe vegetation - Acacia & Commiphora
probably dominate and the area is principally non-agricultural grazing
land. Gum arabic is the dominant commercial crop (Area Handbook for
Senegal, 1974.

Final classification

Tree steppe
Millet
0 - 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____6_____ SIZE __15,075__ Sq. km.

LOCATION _Northeast of Boghe in Mountania_

IMAGE I. D. _Paths 223 & 224 Row 49_

Area description (collateral data)

Acacia savanna (CIA Map of Mountania,1967) Sahelian zone - predominantly
livestock (Atlas of Africa, 1973). Non-agricultural - rough grazing land
(World Atlas of Agriculture, 1976), Raw mineral soils of non-climatic ori-
gin, raw-mineral erosion soils over various rocks and immature hydromor-
phic deposit soils overy clay-sandy to sandy clay materials; (International
Atlas of West Africa, 1971).

Area description (consultant)

Some topographic relief; small escarpments, rolling hills; some pronounced
water sheds; occasional flooding & alluvial Some date palms - oasis type
agriculture; minor millet & sorghum. Localized grazing around intermit-
tent water sources - sheep, goats, cover.

Area description (Landsat analysis)

Band 5 shows northeast/southwest trending dunes with sharp linear inter-
face between lowland and plateau. Clouds obscur part of area. Area is
drained by intermittent channels at scarp base. Agricultural activity not
observed. Probably a livestock area.

Final classification

Tree Steppe
Millet and sorghum, and oases at selected relatively limited locations
only.
0 - 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___7___ SIZE __37,646__ Sq. km.

LOCATION __Northwest part of project area. Area surrounds Bakel, Senegal;__
__Kiffa, Aioun-el Atrouss and Nema, Mauritania.__

IMAGE I. D. __Path 222,223,221 Row 48 & 49__

Area description (collateral data)

Acacia savanna area (CIA Map of Mountania, 1967). This is a gum producing
(Acacia) area (Area Handbook for Mauritania 1972). Wooded Steppe with a-
bundant Acacia & Commiphora (Keay & Aubreville, 1958). Sahelian zone
predominantly livestock (Atlas of Africa 1973). Scattered date palm (CIA
Map of Mountania, 1967). Non-agricultural, rough grazing land (World Atlas
of Agriculture, 1976). West of Kiffa; Isohumic reddish-brown subarid soils.
East of Kiffa – raw mineral erosion soils over various rocks;also desert
soils (International Atlas of West Africa, 1971).

Area description (consultant)

Tree steppe; annuals; Acacia; grazing; little farming except
near the river in the south

Area description (Landsat analysis)

Light gray-white tonal signature indicates area of minimal vegetation.
O'Ghorfa and Karakors Rivers drain the area. Plateaus and associated
escarpments occur here.

Final classification
Tree steppe

Millet and sorghum

0 – 30% of area cleared for cultivation at the time of Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___8___ SIZE __40,867__ Sq. km.

LOCATION __Northwestern part of project area in Mauritania. Surrounding__
__Kiffa Aroun-el-Atrouss.__

IMAGE I. D. __Path 220, 221, 222 Row 49 & 50__

Area description (collateral data)

Sahelian zone-predominantly livestock; non-intensive subsistence (mil-
let) – (Atlas of Africa, 1973). Acacia savanna with scattered gum
arabic production (CIA Map of Mauritania, 1967); Wooded Steppe with
abundant Acacia and Commiphora (Keay & Aubreville, 1958). Non-agricul-
tural rough grazing land (World Atlas of Agriculture, 1976). Raw min-
eral soils of non-climatic origin over various rocks or isohumic reddish
brown subarid soils over aeolian sands (International Atlas of West
Africa, 1971).

Area description (consultant)

Not familiar with area; tree steppe ; Hilly or mountain area. Peanuts &
susbistence (Millet and sorghum).

Area description (Landsat analysis)

Landsat band 5 shows light gray tones indicative of an area of sparse
natural vegetation cover. Northeast-southwest trending longitudinal
dunes cross the area. Permanent streams are non-existent over most of
the area. Area is transitional to desert.

Final classification
Tree Steppe

Millet, Sorghum, Peanuts

0 – 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____9_____ SIZE __39,884__ Sq. km.

LOCATION West of Niafounke; northern limit of project area

IMAGE I. D. Path 217 & 218, Row 49

Area description (collateral data)

Acacia savanna and desert vegetation (CIA Maps of Nauritania & Mali, 1967
and 1970 respectively); Wooded steppe with abundant Acacai and Commiphora
(Keay & Aubreville, 1958); Non-intensive subsistence (Millet)-predominantly
pastoral. Desert soils over aeolian sands(International Atlas of W. Africa,
1971).

Area description (consultant)

Unknown area (Fred Weber, August 21, 1978).

Area description (Landsat analysis)

Vegetation is sparse in this area which is a transitional area from Steppe
to desert. Agricultural activity is minimal, Grazing is probably the dom-
inant agricultural activity.

Final classification

Tree steppe

No crops

0 - 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____10_____ SIZE __40,736__ Sq. km.

LOCATION North of Hombori; South of Niger River

IMAGE I. D. Path 214, 215, 216; Row 49

Area description (collateral data)

Predominantly pastoral; non-intensive subsistence (millet) (Atlas of
Africa, 1973); Wooded steppe with abundant Acacia and Commiphora (Keay &
Aubreville, 1958); Reddish-brown subarid soils over aeolian sands (International
Atlas of W. Africa (1971).

Area description (consultant)

Tree steppe; Submarginal farming (Fred Weber, August 21, 1978); Livestock
grazing area; nomadic herding.

Area description (Landsat analysis)

Light gray Landsat band 5 tones indicative of minimal natural vegetation
and grading into a desert environment. Agriculture is minimal with grazing
being the principal agricultural activity. Longitudinal sand dunes occur
within the area.

Final classification

Tree steppe

No crops

0 - 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___11___ SIZE _15,862_ Sq. km.

LOCATION _South of Tomboutou along Niger River at Niafounke_

IMAGE I. D. _Paths 216 and 217 Row 49 and 50_

Area description (collateral data)
Marsh grass & crops (CIA Map of Mali, 1968); Acacia savanna (CIA Map of
Mali, 1968); Wood Steppe with Abundant Acacia and Commiphora (Keay & Au-
breville, 1958). Rice and cotton (CIA Map, 1968);soils with pseudo-gley
(International Atlas of West Africa, 1970).

Area description (consultant)
Tree steppe area (Fred Weber; August 21, 1978).

Area description (Landsat analysis)
The inland delta of the Niger River is flooded at the time of this Landsat
scene. Longitudinal east-west trending dunes have their swales flooded.
Marsh grasses, rice and cotton are the principal crops here.

Final classification
Tree steppe
Rice and cotton at selected relatively limited locations only.
0 - 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___12___ SIZE _67,773_ Sq. km.

LOCATION _Northern part of project area around Gao and Menaka_

IMAGE I. D. _Paths 212-213; Row 50-51_

Area description (collateral data)
Wooded steppe with abundant Acacia and Commiphora (Keay & Aubreville,
1958); Acacia savanna and desert vegetation (CIA Map of Mali, 1970).
Rice (Atlas of Afric, 1973); Rice and cotton; nomadic herding (CIA Map of
Mali, 1970); Reddish - brown subarid soils over aeolian sands (International
Atlas of W. Africa, 1971).

Area description (consultant)
Tree steppe - good pasture - and annarals; Acacia Naddiana; Balonytes;
some subsistence millet in southern portion, but mainly is rangeland.
In north alurral system - serious wind erosion.

Area description (Landsat analysis)
Landsat band 5 shows this to be an area of sparse natural vegetation
cover. It is difficult, using band 5 alone, to distinguish between areas
under intensive agricultural activity such as the rice/cotton area adjacent
to the Niger River and the nomadic hearding area south of Menaka.

Final classification
Tree steppe
Millet
31 - 60% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____13_____ SIZE ___1,213___ Sq. km.

LOCATION _Adjacent to and north of Filingue_____

IMAGE I. D. _Path 211; Row 50_____

Area description (collateral data)

   Wooded steppe with abundant Acacia and Commiphora (Keay & Aubreville, 1958);
Millet and sorghum (CIA Map of Niger, 1962); Multicrop subsistence farming
with sedentary livestock breeding (Atlas of Africa, 1973). Isohumic
brown subarid vertic soils over clay alluv ium (International Atlas of W.
Africa, 1971).

Area description (consultant)

   Valley bottom of ancient river system; favorable hydrology – deeper, richer
soils; shallow water table – intermittently. Good millet, cow peas
(rich in protein) niebe areas – high yield. Natural vegetation – shrub
savanna and tree steppe but species found in Wooded savanna are here –
Baurinia reticulta; Baobob; Acacia nilotica. Dense population; large
livestock population.

Area description (Landsat analysis)

   A strip of medium gray tones adjacent to the north-south flowing stream
is shown on Landsat band 5. This could be an indicator of higher soil
moisture and cropping practices associated with such soils – eg rice or
cotton.

Final classification
   Tree steppe
   Millet
   Greater than 60% of area has been cleared for cultivation at the time of
Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____14_____ SIZE 9,996 _____ Sq. km.

LOCATION _North central section of study area; Niger & Nigeria_____

IMAGE I. D. _Path 205, 206; Row 50, 51_____

Area description (collateral data)

Veg. Wooded Steppe with abundant Acacia & Commiphora (Keay & Aubreville, 1958).
   Short grass savanna; sudan savanna (CIA Map).
Ag. Multi-crop subsistence & sedentary livestock; peanuts (Atlas of Africa,
   1973); Non-agriculture & Rough Grazing Land (World Atlas of Agriculture,
   1976); Millet & sorghum (CIA Map).
Soils Mineral hydromorphic soils with deep gley.

Area description (consultant)

   Tree steppe with gum arabic; livestock; submarginal millet subsistence mainly
nomadic; Agriculture assoc. with Mares is date palm, onion, tomatoes, some
wheat. Traditional garden crops.

Area description (Landsat analysis)

   Many scattered small circular dark tonal signatures indicative of lakes
(about 1 sq. km. ea. – from ONC chart); over entire map unit. These lakes
are often surrounded by an area of light gray tonal signature indicative of
sparce vegetation (grass) or possible farming.

Final classification
   Tree steppe
   Gum arabic, millet
   0 – 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 15 _____ SIZE ___1,966___ Sq. km.

LOCATION _Northern east central section of study area; N.E. Nigeria, Koma-_
     dugu; :Gambi Rivers
IMAGE I. D. _Path 205, 206; Row 51, 52_____

Area description (collateral data)
Veg. Wooded Savannas & Steppes (Keay & Aubreville, 1958); Sudan savanna (CIA
   Maps).
Ag. Subsistence crops with commercial (Atlas of Africa, 1973); Non agriculture
  & Rough Grazing Land with Trees (World Atlas of Agriculture, 1976).
Soils Little leached gray ferruginous soils - hydromorphic facies over sandy
  material (International Atlas of W. Africa, 1971).

Area description (consultant)
  Tributary of the channel in 145. Probably same remnant tree appears &
  agricultural activity. No peanuts.

Area description (Landsat analysis)
  Minor interior drainage system (incomplete). Dark tonal signature indicative
  of trees and/or Standing water; medium gray tonal signature indicative of
  grass. No evidence of sand dunes.

Final classification
  Tree steppe
  Millet, , cottons, fruit trees
  31 - 60% of area has been cleared for cultivation at the time of Landsat
  overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 16 _____ SIZE __128,757*___ Sq. km.

LOCATION _North Central section of study area; N. central Nigeria_____

IMAGE I. D. _Path 199-209; Row 50, 51_____

Area description (collateral data)
Veg. Wooded steppe with abundant Acicia & Commiphora; Woodland savanna & Steppe -
  undifferentiated relatively dry types (Keay & Aubreville, 1976).
Ag. Non-agriculture & Rough Grazing Land (World Atlas of Agriculture, 1976); Non-a;
  riculture & Rough Grazing Land with trees; Traditional subsistence; Multi-
  crop subsistence & sedentary livestock; irrigated rice; gum arabic (Atlas
  of Africa, 1973). Grazing to some subsistence; Millet & Sorghum; peanuts
  (CIA Maps)
Soils Brown & reddish-brown isohumic subarid soils with sesquioxydes (Inter-
Area description (consultant) national Atlas of W. Africa, 1971). No data east of
                       Lake Chad.

  Tree steppe; nothing but grazing; Minor wheat in Lake Chad area with polders-
  dunes pumped with water. Too small for Landsat resolution detecting.

Area description (Landsat analysis)
  Only drainage present is interior, and not well defined. Over most of the
  area are light gray tonal signatures with north west - southwest dunes
  indicative of sand & desert environment. There are some light gray tonal
  signatures indicative of farming. East of Lake Chad is a wadi of south-
  west - northeast direction (Bahr el Ghazal). (Darker gray tonal signature)

Final classification
  Tree steppe
  No crops
  0 - 30% of area has been cleared for cultivation at the time of Landsat
  overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 17 _____ SIZE __ 5,080 __ Sq. km.

LOCATION __ North eastern section of study area; Ati, Central Chad __

IMAGE I. D. __ Path 201; Row 51 __

Area description (collateral data)

Veg. Woodland, Savanna & Steppe - undifferentiated relatively dry types (Keay
& Aubreville, 1958).

Ag. Traditional subsistence (Atlas of Africa, 1973); Non-agriculture & Rough
Grazing Land; Rough Grazing Land (World Atlas of Africa, 1976); Grazing to
some subsistence; Mixed subsistence/Grazing (CIA Map).

Soils No data

Area description (consultant)

Tree steppe (Atlas of Chad, 1972)
Miller/sorghum - minor amount.
Heavy grazing area

Area description (Landsat analysis)

Low density drainage; some medium gray tonal signatures indicative of grass;
Mostly lighter gray tonal signatures indicative very sparce vegetation or
possible farming.

Final classification
Tree steppe
Millet, sorghum
0 - 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 18 _____ SIZE __ 41,359 __ Sq. km.

LOCATION __ Northeastern section of study area; West of Sudan, contains city of
Abeche __

IMAGE I. D. __ Path 199, 198; Row 50, 51 __

Area description (collateral data)

Veg. North section - Wooded steppe with abundant Acacia & Commiphora. South
section Woodlands, Savannas & Steppes, undifferentiated relatively dry types
(Keay & Aubreville, 1958).

Ag. North Section - Non-ag. & Rough Grazing Land; South Section Non Ag. &
RGL with trees (World Atlas of Agriculture, 1976). Traditional - subsistence
Millet, sorghum, peanuts (Atlas of Africa, 1973). Grazing to same subsistence
(CIA)

Soils No data

Area description (consultant)

Tree steppe. Some basic millet (Subsistence); gum arabic area. North of
farming; Much gum arabic; tree steppe; camels & cattle & sheep & goats.

Area description (Landsat analysis)

Sahel region in north - smooth light gray tonal signatures indicative of
scattered & sparse scrub vegetation: transition between vegetative south
& vegetation free areas north. Part of Azoum River drainage area in south
(dendritic pattern) is in an area of scattered medium gray tonal signatures
(grass) and a few light tonal signatures (farming) and a few dark regular
shaped tonal signatures (burns). A few dark gray tonal signatures in
extreme south indicate forest vegetation.

Final classification
Tree steppe
Millet, gum arabic
0 - 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___19___ SIZE ___5,145___ Sq. km.

LOCATION __West of Kiffa. Between O'Chorfa and Karakoro Rivers__

IMAGE I. D. __Paths 221 & 222 Rows 50 & 49__

Area description (collateral data)

Wooded Steppe with abundant Acacia and Commiphora (Keay & Aubreville, 1958).
Acacia savanna (CIA Map of Mauritania, 1967). Sahelian zone-predominantly
livestock; basic food crops-millet and sorghum (Atlas of Africa, 1973).
The El Assaba Plateau with raw mineral soils of non-climatic origin (Inter-
national Atlas of West Africa, 1971). Some millet, maize and sorghum
(Area Handbook for Mauritania, 1972).

Area description (consultant)

May be rock outcrop; parent material

Area description (Landsat analysis)

This is a plateau and associated escarpment region. Vegetation is sparse
and any cropping is probably scattered millet and sorghum. Acacia is probab-
ly dominant natural vegetation.

Final classification

Tree steppe and Barren land
No crops
0 - 30% of area cleared for cultivation at the time of Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___20___ SIZE ___12,673___ Sq. km.

LOCATION __South of Nema__

IMAGE I. D. __Path 219 Row 49 & 50__

Area description (collateral data)

Wooded Steppe with abundant Acacia and Commiphora (Keay & Aubreville,
1958); Acacia savanna (CIA Map of Mauritania, 1967); Some date palm
(CIA Map of Mauritania, 1967); Principally non-agricultural rough grazing
land (World Atlas of Agriculture, 1976); Basic food crops - millet and
sorghum (Atlas of Africa, 1973); Raw mineral soils of non-climatic origin
over various rocks and Isohumic reddish-brown subarid soils (International
Atlas of West Africa, 1971); Low-yield dates (Area Handbook for Mauritania,
1972).

Area description (consultant)

Rock outcrop; no agriculture; grass steppe - Acacia, Balonytes

Area description (Landsat analysis)

Area consists principally of erosional outliers and dunes trending north-
east/southwest. Area is dissected by several large intermittent streams.
Area is bounded on the east by a steep escarpment; livestock migration
area probable. Vegetation (natural) unknown. Dark to black tones could
be exposed rock.

Final classification

Tree steppe and Barren land
No crops
0 - 30% of area cleared for cultivation at the time of Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____21_____ SIZE __14,125__ Sq. km.

LOCATION __Northern most part of project area east and west of Menaka, Mali__

IMAGE I. D. ___Path 212, 213; Row 49___

Area description (collateral data)

 Wooded Steppe with abundant Acacia and Commiphora (Keay & Aubreville, 1958);
 Desert vegetation or Acacia savanna (CIA Map of Mali, 1970); Predominantly
 pastoral non-intensive subsistence (millet) and nomadic herding (Atlas of
 Africa, 1973 and CIA Map of Mali, 1970). Reddish - brown subarid soil
 over aeolian sands (International Atlas of W. Africa, 1971). Ancient
 basement rock outcrops between Ansongo and Tillabere (Church, 1974).

Area description (consultant)

 Rock outcrop area - granites; Vegetation is tree steppe; Trees and bushes
 influence by shallow soils and constant overgrazing. No agriculture -
 area of nomadic grazing.

Area description (Landsat analysis)

 Landsat band 5 shows the area with alternating northeast-southwest trending
 black and white bands indicating hills or parallel dune ridges and swales.
 The dark gray to black tonal signature is most probably related to the
 low reflectance of soil, or rock outcrops on the area.

Final classification
 Tree steppe and Barren land
 No crops
 0 - 30% of area has been cleared for cultivation at the time of Landsat
 overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____22_____ SIZE _2,097_____ Sq. km.

LOCATION __Along northernmost boundary of project area northwest of Kiffa__

IMAGE I. D. ___Path 222 & 223; Row 48 & 49___

Area description (collateral data)

 Wooded Steppe with abundant Acacia and Commiphora (Keay & Aubreville, 1958)
 Acacia Savanna (CIA Map of (Mauritania, 1967); Isohumic reddish-brown
 subarid soils over aeolian sands (International Atlas of West Africa, 1971).
 Tagant plateau area drained by intermittent streams (International Atlas of
 West Africa, 1971). Springs and wells provide good pasturage and permit
 raising of some crops. Large date palm plantations present (Area Handbook
 for Mauritania, 1972).

Area description (consultant)

 Not familiar with this area

Area description (Landsat analysis)

 The distinctive interface between the desert and the plateau show up well
 on the Landsat band 5. The plateau escarpment stands out well on the
 imagery. Erosional outliers of the plateau also are striking. Vegetation
 on the plateau appears to be sparse.

Final classification
 Barren land
 No crops
 0 - 30% of area has been cleared for cultivation at the time of Landsat
 overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 23 _____ SIZE __ 48,241 ____ Sq. km.

LOCATION __Northeast of Dakar; south of Senegal River. Southernmost limit__
             approximately at Bakel.

IMAGE I. D. __Paths 223, 224, 225 Rows 50 & 51__

Area description (collateral data)

   Wooded Steppe with abundant Acacia and Commiphora. Southern part of area
within Woodlands, Savanna, Steppe – Undifferentiated dry types; (Keay &
Aubreville, 1958). Acacia savanna (CIA Map of Senegal & Gambia, 1972).
Peanut/Millet association and non-intensive grazing (Atlas of Africa, 1973).
Isohumic soils – reddish-brown subarid types over aeolian sands and other
sandy material; some raw mineral soils over various rocks (desert ablatrin
soils (International Atlas of West Africa, 1971). Gray ferruginous soils
in western portion.

Area description (consultant)

   Open rangeland – tree steppe – good grass growth. Acacia sial A. Senegal,
Balanites egyptiaca
No peanuts! Only little millet. Too dry

Area description (Landsat analysis)

   Cloud cover in western portion prevents good delineation of area differen-
tiation. In eastern portion of polygon agricultural activity appears to be
minimal. While the western cloud – obscured portion may be dominated by
peanut/millet cropping, the eastern portion appears to be a grazing area.
A few major trails (migration-transhumance) cross the area toward the Senegal
River.

Final classification

   Shrub savanna
   Millet
   0 – 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 24 _____ SIZE __ 1,934 ____ Sq. km.

LOCATION __East of Matam outside of Senegal River Valley__

IMAGE I. D. __Path 223, Row 50__

Area description (collateral data)

   Wooded Steppe – abundant Acacia & Commiphora (Keay & Aubreville, 1958).
Acacia savanna (CIA Map of Senegal & Gambia, 1972). Date palm area (CIA
Maize (Atlas of Africa, 1973). Isohumic soils; brown sub-arid vertic
soils over clay material insuing from marls (International Atlas of West
Africa, 1971).

Area description (consultant)

   Not familiar with this area

Area description (Landsat analysis)

   Landsat band 5 shows medium gray tonal signature surrounded by lighter
area. Tonal difference may be a soil difference rather than a land cover/
use difference

Final classification

   Shrub savanna
   Millet, maize
   0 – 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 25 _____ SIZE _22,908_ Sq. km.

LOCATION _West of Diema; East of Kayes; North of Bafoulable_

IMAGE I. D. _Paths 220,221 Row 50 & 51_

Area description (collateral data)

____Polygon bisects Wooded Steppe with Abundant Acacia and Commiphora and
____ Woodlands, Savannas and Steppes (undifferentiated relatively dry types)
____(Keay & Aubreville, 1958); Subsistence agriculture (millet and sorghum)
____with peanuts and cotton (Atlas of Africa, 1973); Acacia savanna (CIA
____Map of Mali, 1970; Raw mineral soils of non-climatic origin over fer-
____ruginious crusts and concretionary leached gray ferrugirious soils
____(International Atlas of West Africa, 1971). Non agricultural and
____rough grazing land with trees (World Atlas of agriculture, 1976).

Area description (consultant)

___Not familiar with area; Shrub savanna subsistence are millet/sorghum.

Area description (Landsat analysis)

____Landsat shows a plateau area with steep westward facing escarpment
____and gradually sloping toward the east. Agricultural activity appears
____to be concentrated around villages. Area not as intensively farmed
____as areas to the east and west.

Final classification

___Shrub savanna

___Millet sorghum, cotton

___31 - 60% of area cleared for cultivation at the time of Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 26 _____ SIZE _3,376_ Sq. km.

LOCATION _Surrounding Nioro du Sahel_

IMAGE I. D. _Path 220, Row 50_

Area description (collateral data)

____Intensive cotton growing area (Atlas of Africa, 1973). Wooded Steppe
____with abundant Acacia & Commiphora (Keay & Aubreville, 1958); Acacia
____savanna (CIA Map of Mali, 1970); Scattered gum arabic (CIA Map of
____Mali, 1970).

Area description (consultant)

___Not familiar with area. Shrub savanna;subsistence is millet/sorghum.

Area description (Landsat analysis)

____Intensively cleared area around Nioro du Sahel/White tonal signature.
____Correlates with collateral data;cotton area.

Final classification

___Shrub savanna

___Millet, sorghum, cotton

___31 - 60% of area cleared for cultivation at the time of Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____27_____ SIZE ___77,113___ Sq. km.

LOCATION _From Kayes northeast to Nioro du Sahel and eastward to Sokolo_

IMAGE I. D. _Paths 218,219, 220, 221 Rows 50 & 51_

Area description (collateral data)

Subsistence agriculture (millet & sorghum) with peanuts and cotton (Atlas of Africa, 1973); (CIA Maps of Mauritania and Mali, 1967 and 1970 respectively). Polygon - principally in Wooded Steppe with Abundant Acacia and Commiphora area (Keay & Aubreville, 1958); Acacia savanna (CIA Map of Mali, 1970). Scattered gum arabic (CIA Map of Mali, 1970).

Area description (consultant)

Not familiar with area; getting into shrub savanna; Subsistence agriculture - millet and sorghum

Area description (Landsat analysis)

Village and trails characterize this area. Much of the natural vegetation is gone in the western portion of the area. Most probably due to intensive subsistence agriculture. In the eastern portion of the area, villages and trails dot the landscape with subsistence agriculture concentrated around the villages. Natural vegetation is a medium gray tone characteristic of wooded steppe with Acacia and Commiphora.

Final classification

Shrub savanna

Millet, sorghum

0 - 30% of area cleared for cultivation at the time of Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____28_____ SIZE ___2,294___ Sq. km.

LOCATION _In the Sokola and Niono area of Mali_

IMAGE I. D. _Path 218, Row 50_

Area description (collateral data)

Rice and cotton (CIA Map of Mali, 1970); Wooded Steppe with abundant Acacia and Commiphora (northern part); Woodlands, savannas and steppes-undifferentiated relatively dry types (Keays & Aubreville, 1958);(southern part). Acacia savanna (CIA Map of Mali, 1970); Vertisols with no external drainage;non-grumasolic topographic vertisols over clay alluvium (International Atlas of W. Africa, 1971).

Area description (consultant)

Not familiar with the area.

Area description (Landsat analysis)

Area receives internal drainage. Large regularly shaped agricultural area - probably rice paddies (Intensively cropped area).

Final classification

Shrub savanna

Irrigated rice

Greater than 60% of area has been cleared for cultivation at the time of Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___29___ SIZE _8,849___ Sq. km.

LOCATION __In the Sokalo and Niono areas of Mali_____

IMAGE I. D. Path 218, Row 50 _____

Area description (collateral data)

Rice and Cotton (CIA Map of Mali, 1970); Irrigated Cotton (Atlas of Africa,
1973). Wooded Steppe with abundant Acacia & Commiphora (northern part);
Woodlands Savannas and Steppes - undifferentiated relatively dry types
(Keay & Aubreville, 1958); Acacia savanna (CIA Map of Mali, 1970). Vertisol
soils with no external drainage; non-grumosolic topomorphic vertisols over
clay alluvium (International Atlas of W. Africa, 1971).

Area description (consultant)

Not familiar with the area _____

Area description (Landsat analysis)

Distinctive white to light gray tonal signature. This correlates well with
the soil type and the cropping practices (e.g.) irrigated cotton in this area.

Final classification

Shrub savanna
Irrigated cotton, rice at selected relatively limited locations only
Greater than 60% of area has been cleared for cultivation at the time of
Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___30___ SIZE _6,128___ Sq. km.

LOCATION _Around and east of Segou, Mali_____

IMAGE I. D. _Path 217-218; Row 50-51_____

Area description (collateral data)

Woodlands, savannas, and steppes - undifferentiated relatively dry types
(Keay & Aubreville, 1958); Tallgrass savanna, brush and cultivated vege-
tation (CIA Map of Mali, 1970); Rice, cotton are dominant (Atlas of Africa,
1973; CIA Map of Mali; 1970). Mineral hydromorphic soils with pseudo-
gley and leached gray ferruginous soils (International Atlas of W. Africa,
1971). Marsh grass and crops (CIA Map of Mali, 1970).

Area description (consultant)

Not familiar with area

Area description (Landsat analysis)

White tonal Landsat signature with mottled medium gray tones. This indi-
cates an intensively cultivated area. Along the Niger highly reflective
tonal signatures are indicative of possible rice cultivation.

Final classification

Shrub savanna
Rice and cotton at selected relatively limited locations only; peanuts
Greater than 60% of area has been cleared for cultivation at the time of
Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____31_____ SIZE __17,500__ Sq. km.

LOCATION _Around and west of Mopti_____

IMAGE I. D. _Path 216-217; Row 49-50_____

Area description (collateral data)

  Woodlands, savannas and steppes - undifferentiated relatively dry types;
Wooded steppe with abundant Acacia and Commiphora (Keay & Aubreville, 1958);
Marsh grass and crops (CIA Map of Mali, 1970); Mineral hydromorphic soils
with pseudo gley (International Atlas of W. Africa, 1971); Rice and cotton
(Atlas of Africa, 1973; CIA Map of Mali, 1970).

Area description (consultant)

  Sand marsh, scrub brush observed from airplane. Marsh areas. Good re-
clamation potential. Collateral data may not be accurate.

Area description (Landsat analysis)

  The dark gray to black tonal Landsat signature indicates extensive flooding
within the Niger Inland Delta. Marsh grasses characterize the area and rice
and cotton are the dominant crops.

Final classification

  Shrub savanna

  Rice, cotton, millet, sorghum

  31 - 60% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____32_____ SIZE __14,649__ Sq. km.

LOCATION _North of Douentza; East of Mopti_____

IMAGE I. D. _Path 216, Row 49_____

Area description (collateral data)

  Wooded steppe with abundant Acacia & Commiphora (Keay and Aubreville, 1958);
Acacia savanna (CIA Map of Upper Volta, 1968); Predominatly pastoral (north-
ern part). Non-intensive subsistence - Millet; Bandiagara plateau and out-
liers - non agricultural on the plateaus (R. J. Harrison Church, 1974).
Raw mineral soils of non-climatic origin over various rocks (International
Atlas of W. Africa, 1971).

Area description (consultant)

  Shrub savanna; Use above description

Area description (Landsat analysis)

  The Bandiagara Plateau and its steep escarpments show up well on the Land-
sat band 5. Agricultural activity on the plateaus is minimal due to the
poor soils and water supply.

Final classification

  Shrub savanna

  Millet

  0 - 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____33_____ SIZE __81,800__ Sq. km.

LOCATION In Upper Volta and Mali at Djibo, Dori, Hombori and Douentya area

IMAGE I. D. Path 213, 215, Row 49, 50

Area description (collateral data)

Wooded Steppe with abundant Acacia and Commiphora (Keay & Aubreville, 1958). Millet, sorghum, fundi; peanuts, beans and sesame; Indian butter trees around Djibo and Ouahigouiga (Atlas of Africa, 1973). Reddish-brown sub-arid soils, leached gray ferrugenious soils; brown sub-arid modal soils (International Atlas of West Africa, 1971).

Area description (consultant)

Grass steppe; No farming; Rangeland; A little millet & sorghum.

Area description (Landsat analysis)

The light gray tonal signature on Landsat band 5 indicates a sparse natural vegetative cover. Clearing for agriculture appears difficult to determine since the white tones coalesce with the sparsely vegetated bare areas.

Final classification

Shrub savanna

Millet and sorghum; Rice at selected relatively limited locations only. Some irrigated land at selected relatively limited locations only.

31 - 60% of area cleared for cultivation at the time of Landsat overpass.

AREA (POLYGON) NUMBER _____34_____ SIZE __3,671__ Sq. km.

LOCATION Along Niger River Floodplain northwest and southeast of Tallalfry and Niamey.

IMAGE I. D. Path 212, 213,; Row 51,52

Area description (collateral data)

Wooded steppe with abundant Acacia and Commiphora (Keay & Aubreville, 1958); north of Niamey; Woodlands, savannas and steppes with undifferentiated dry types - south of Niamey (Keay and Aubreville, 1958); Acacia savanna (CIA Map of Niger, 1962); Irrigated rice and peanuts (Atlas of Africa, 1973, and CIA Map of Niger, 1962); Non or little leached gray ferruginous soils (International Atlas of W. Africa, 1971).

Area description (consultant)

Floodplain; recent large scale rice development; typical riparian vegetation, large trees - Tamarindus, stands of Doum palm; Acacia milotica; large dense stands of Acacia Albida. Deep sandy soils productive for millet, some peanuts, fruit or chard - mango, guava, papaya, citrus. Feeding and watering area. So important ecologically that remnants of original population are there.

Area description (Landsat analysis)

Intensive agricultural activity along the Niger River flood plain. White tonal signatures. Probably rice signature and intensive peanut production.

Final classification

Shrub savanna

Rice at selected relatively limited locations only; millet; peanuts, fruit trees

Greater than 60% of area has been cleared for cultivation at the time of Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 35 _____ SIZE _- 55,058 _____ Sq. km.

LOCATION _East of Tillaberry, Niger_____

IMAGE I. D. _Path 211-212; Row 50-51_____

Area description (collateral data)
   Wooded steppe with abundant Acacia and Commiphora (Keay & Aubreville,
   1958); Acacia savanna (CIA Map of Niger, 1962); Peanuts, millet and sorghum
   (CIA Map of Niger, 1962); Multicrop subsistence and sedentary livestock
   (Atlas of Africa, 1973). Non or little leached gray ferruginous soils
   over aeolian sands (International Atlas of W. Africa, 1971). Level plains
   of soft sandstones and clays with same laterite crossed by wide relic river
   valleys known as dallols. Acacia and borassus palms line banks. Myrrh
   (Church, 1974).

Area description (consultant)
   Wooded savanna; fair amount of shallow soils over thick laterite; hard to
   get water; millet and locally owned livestock. Escape area for herds in
   north during dry time. Cash crop - peanuts. Some manioc, mango, and
   fruit trees (citrus). Moderate cultivation except for low lying farm areas.
   50% of area under cultivation.

Area description (Landsat analysis)
   Agricultural activity appears spotty in this area. Toward the north the
   wide relic river channels appear to be filled with sandy soils unsuitable
   for large scale agricultural production.

Final classification
   Shrub savanna
   Millet, sorghum, peanuts
   31 - 60% of area has been cleared for cultivation at the time of Landsat
   overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 36 _____ SIZE _8,062_____ Sq. km.

LOCATION _Along Niger and Sokoto Rivers_____

IMAGE I. D. _Path 208 Row 51; Path 209 Row51; Path 210 Row 52_

Area description (collateral data)
   Wooded steppe with abundant Acacia and Commiphora and Woodlands,
   Savannas and Steppes with undifferentiated dry types (Keay and
   Aubreville, 1958), Irrigated rice, peanuts and cotton (Atlas of
   Africa, 1973; CIA maps of Niger and Nigeria, 1962, 1972).
   Little leached gray ferruginous soils over aeolian sands or
   mineral hydromorphic soils with deep gley (International Atlas
   of West Africa, 1971).

Area description (consultant)
   Rice irrigation schemes and sugar cane in southern part; good
   irrigation potential; grass- thick perennials; good Borassus
   area.

Area description (Landsat analysis)
   A band of light gray to white tones adjacent to the Niger and
   Sokoto Rivers indicates intensive cultivation. The white, highly
   reflective tones are believed to be rice while the bright or
   light gray tones are probably peanuts and cotton cultivation.

Final classification
   Shrub savanna
   Millet, sorghum, peanuts
   Greater than 60% of the area was under cultivation at the time
   of Landsat overpass

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ____ 37 ____ SIZE __9,635__ Sq. km.

LOCATION ____ North central section of study area; S.W. Niger ____

IMAGE I. D. __Path 210/211 Row 49__

Area description (collateral data)

Veg. __Wooded Steppe with abundant Acacia & Commiphora (Keay & Aubreville, 1958).__
   __Sudan Savanna (CIA)__

Ag. __Semi-desert (Atlas of Africa 1973) Non-agricultural Rough Grazing Land__
   __(World Atlas of Agriculture 1976) Grazing (CIA)__

Soils __Reddish brown subarid isohumic soils-modal facies over eolian sands__
   __(International Atlas of West Africa 1971)__

Area description (consultant)

__Shrub savanna; has grazing pressure throughout 67 & 71 , non-agricultural;__
__good grazing area.__

Area description (Landsat analysis)

__Little to no drainage. Mostly medium gray tonal signatures indicative__
__of grass. Some evidence of dunes. Only one small area of light tonal__
__signature indicative of farming detected.__

Final classification
   __Shrub savanna__
   __No crops__
   __0 - 30% of area has been cleared for cultivation at the time of Landsat__
   __overpass.__

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ____ 38 ____ SIZE __14,649__ Sq. km.

LOCATION ____ North central section of study area; S.W. Niger ____

IMAGE I. D. __Path 209/210 Row 50/51__

Area description (collateral data)

Veg. __Wooded steppe with abundant Acacia & Commiphora (Keay & Aubreville, 1958).__
   __Sudan Savanna (CIA)__

Ag. __Semi-desert; cotton; Rice-irrigated (Atlas of Africa 1973) Non-agriculture__
   __& Rough Grazing Land; Non-ag. & RGL with trees (World Atlas of Agriculture__
   __1976) Cotton; Grazing (CIA)__

Soils __Reddish-brown sub arid isohumic soils-modal facies, over eolian sands;__
   __little leached gray ferruginous soils-modal facies over sandy materials__
   __(International Atlas of West Africa 1971)__

Area description (consultant)

__Mountains - dark areas on Landsat are ridges; light areas agriculture -__
__good alluvial soil; basic staple crop - millet, much peanuts, little cotton,__
__manioc, cassava. Very intersected valley agriculture systems; Relatively__
__agricultural area; livestock - domestic & nomadic. The Majya*; Shrub savanna.__

Area description (Landsat analysis)

__Evidence of moderate density dendritic interior drainage, indicative of__
__some relief. In many instances, medium gray tonal signatures indicative__
__of grass appear in conjunction with the drainage network, surrounded by a__
__narrow band of dark tonal signatures indicative of forest vegetation. Some__
__light striations indicative of blowing sand. Not many light tonal signa-__
__tures indicative of farming.__

Final classification
   __Shrub savanna__
   __Millet, peanut, cotton, cassava__
   __31 - 60% of area has been cleared for cultivation at the time of Landsat__
   __overpass.__

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____39_____ SIZE __102,348__ Sq. km.

LOCATION __North Central section of study area; N. central Nigeria__

IMAGE I. D. __Path 199-209; Row 50, 51__

Area description (collateral data)

Veg. __Wooded steppe with abundant Acicia & Commiphora; Woodland savanna & Steppe__
__undifferentiated relatively dry types (Keay & Aubreville, 1976).__

Ag. __Non-agriculture & Rough Grazing Land (World Atlas of Agriculture, 1976);__
__Non-Agriculture & Rough Grazing Land with trees; Traditional subsistence;__
__Multicrop subsistence & sedentary livestock; irrigated rice; gum arabic (Atlas__
__of Africa, 1973). Grazing to some subsistence; Millet & Sorghum; Peanuts__
__(CIA Maps).__

Soils - Brown & reddish-brown isohumic subarid soils with sesquioxydes (Inter-
Area description (consultant) national Atlas of W. Africa, 1971). No data east of
Lake Chad.

__Tree steppe; nothing but grazing; Minor wheat in Lake Chad area with polders-__
__dunes pumped with water. Too small for Landsat resolution detecting.__

Area description (Landsat analysis)

__Only drainage present is interior, and not well defined. Over most of the__
__area are light gray tonal signatures sith north west - southwest dunes__
indicative of sand & desert environment. There are some light gray tonal
__signatures indicative of farming. East of Lake Chad is a wadi of south-__
__west - northeast direction (Bahr el Ghazal), (Darker gray tonal signature)__

Final classification
__Shrub savanna__
__Millet, peanuts, irrigated rice__
__Greater than 60% of area has been cleared for cultivation at the time of__
__Landsat overpass.__

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____40_____ SIZE __5,866__ Sq. km.

LOCATION __North central section of study area, N. Central Nigeria__

IMAGE I. D. __Paths 206, 207; Row 51__

Area description (collateral data)

Veg. __Woodland, Savanna & Steppe undifferentiated relatively dry types (Keay &__
__Aubreville, 1958); Sudan Savanna (CIA Maps)__

Ag. __Subsistence crops with commercial (Atlas of Africa, 1973); Non-agricul-__
__ture & Rough Grazing Land; Non Ag. & RGL (World Atlas of Agriculture, 1976).__
__Ground nuts (CIA Maps)__

Soils __Little leached gray ferruginous soils - modal facies over eolian sands__
__(International Atlas of W. Africa, 1971).__

Area description (consultant)

__Not familiar with area.__
__Shrub savanna__

Area description (Landsat analysis)

__Light gray tonal signature indicative of farming. A few striations in south__
__indicative of sand dunes. Scattered circular shaped dunes through area.__
__Evidence of braided stream channels, perhaps now dry.__

Final classification
__Shrub savanna__
__peanuts, cotton, millet, sorghum__
__30 - 60% of area has been cleared for cultivation at the time of Landsat__
__overpass.__

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___41___ SIZE _56,631_ Sq. km.

LOCATION _Eastern central section of the study area; N.E. Nigeria; S.W. of Lake Chad_

IMAGE I. D. _Path 204, 205, 206, 207; Row 50, 51, 52, 53_

Area description (collateral data)

Veg. Wooded Steppe with abundant Acacia & Commiphora; Woodland Savanna & Steppe-undifferentiated relatively dry types (Keay & Aubreville, 1958); Short grass savanna; Sudan savanna; Tallgrass savanna (CIA Maps).

Ag. Subsistence crop with commercial; cotton; rice (Atlas of Africa, 1973); Non-agriculture & rough grazing land; Non-Ag. & RGL with trees; Arable land – 10,000 hectors. (World Atlas of Agriculture, 1976).

Soils – Little leached gray ferruginous soils; topomorphic vertisols (International Atlas of W. Africa, 1971).

Area description (consultant)

Wooded savanna; Peanuts, sandy soils

Area description (Landsat analysis)

No defined drainage network detected in northeastern section adjacent to Lake Chad. Here, light to medium gray tonal signatures with some N.E. – S.W. direction striations indicative of sand dunes and some areas of farming or grass vegetation. In the southern sections are predominantly light tonal signatures indicative of rather intensive farming, such as rice & ground nuts.

Final classification

Shrub savanna

Millet, peanuts

Greater than 60% of area has been cleared for cultivation at the time of Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___42___ SIZE _1,478_ Sq. km.

LOCATION _East central section of study area; N.E. Nigeria; S.W. of Lake Chad_

IMAGE I. D. _Path 204; Row 52_

Area description (collateral data)

Veg. Woodland Savanna & Steppe undifferentiated relatively dry types (Keay & Aubreville, 1958). Sudan savanna (CIA Map).

Ag. Non-agriculture & Rough Grazing Land & Trees (World Atlas of Agriculture, 1976); Subsistence crops & Commercial (Atlas of Africa, 1973).

Soils Modal facies – mineral hydromorphic soils with pseudo-gley & with spots and concretions; little leached gray ferruginous soils with sesquioxydes modal facies over eolian sands (International Atlas of W. Africa, 1971).

Area description (consultant)

Not familiar with area

Area description (Landsat analysis)

No drainage network detected. Predominately medium gray tonal signature indicative of grass vegetation. Small amounts of light tonal signatures indicative of farming.

Final classification

Shrub savanna

Millet, sorghum, peanuts, irrigated cotton

31 – 60% of area has been cleared for cultivation at the time of Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ____43____ SIZE __22,285__ Sq. km.

LOCATION __East central section of study area; Cameroun & Nigeria; Babakoum,__
__& Kelo__

IMAGE I. D. __Path 204, 205; Row 52, 53, 54, 55__

Area description (collateral data)

Veg. From south to north: Woodland Savannas & Steppe - undifferentiated rela-
tively moist types; Northern area - with abundant Isoberlinia doka & I.
dalzeilii; Woodland, Savanna & Steppe - undifferentiated relatively dry types;
Wooded Steppe with abundant acacia & Commiphora (Keay & Aubreville, 1958).
Mixed Savanna & Scrub, grassland, & crops; some swamp or marsh; savanna; tall-
grass savanna (CIA Maps).

Ag. Mostly millet & subsistence farming; some cotton & cotton seed, peanuts
(Atlas of Africa, 1973); Rough grazing land & Rough Grazing Land with Trees

Area description (consultant) (World Atlas of Agriculture, 1976); Cotton (CIA Maps).

Soils - Mineral hydromorphic soils with pseudo - gley modal
facies along Benue River; Topomorphic & Lithomorphic
medium desaturated ferallitic soils & Halomorphic soils.

Shrub savanna; little agriculture - subsistence millet; some Niebe beans
some peanuts. Good grazing potential grazing land now.

Area description (Landsat analysis)

Low density drainage; Mostly medium gray tonal signatures indicative of
grass; scattered light tonal signatures (farming) & a few dark tonal signa-
tures (burns). Very few significant forest signatures (Dark gray). Small
relatively evenly distributed light area on darker background indicative of
sand dunes.

Final classification
Shrub savanna
Millet, sorghum, irrigated rice, peanuts
31 - 60% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ____44____ SIZE __7,013__ Sq. km.

LOCATION __East central section of study area; N. Cameroun; South of Lake Chad__

IMAGE I. D. __Path 203; Row 52__

Area description (collateral data)

Veg. Wooded Steppe with abundant Acacia & Commiphora; Woodlands, Savanna, &
Steppe - undifferentiated relatively dry types (Keay & Aubreville, 1958);
Marsh or swamp; savanna (CIA Map).

Ag. Rough Grazing Land; Non-agriculture & Rough Grazing Land with Trees (World
Atlas of Agriculture, 1976); Association of traditional and Commercial
crops (Atlas of Africa, 1973); Mixed subsistence/grazing (CIA Map).

Soils No data

Area description (consultant)

Dense riparian vegetation along rivers; Flood plain grassland with marsh
vegetation & other grasses. Rice cultivation.

Area description (Landsat analysis)

Area of major braided stream drainage into Lake Chad. Mostly dark tonal
signatures indicative of flooded land, wet soils, as indicated on ONC
charts. Some medium to dark tonal signatures some distance from major
channels could indicate grass.

Final classification
Shrub savanna
Rice, sorghum
31 - 60% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___45___ SIZE __6,718__ Sq. km.

LOCATION _East central section of study area; Chari River_

IMAGE I. D. _Path 201, 202, 203; Row 52_

Area description (collateral data)

Veg. Woodland, Savanna, & Steppe - undifferentiated relatively dry types
(Keay & Aubreville, 1958).

Ag. Non-agriculture & Rough Grazing Land with Trees; Rough Grazing Land
(World Atlas of Agriculture, 1976); Fraditional & Commercial (Atlas of
Africa, 1973); Grazing (CIA Maps).

Soils No data

Area description (consultant)

Rice or open grass along riparian systems.

Area description (Landsat analysis)

Portion of Chari River system. Scattered light tonal signatures along river
indicative of intensive farming. Medium gray tonal signatures indicative
of grass mixed with some darker gray. Tonal signatures indicative of
forest vegetation or moist soil, as indicated on ONC charts.

Final classification
Shrub savanna
Rice, millet sorghum
31 - 60% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___46___ SIZE __12,617__ Sq. km.

LOCATION _East central section of study area; S.E. of Lake Chad_

IMAGE I. D. _Path 201, 202; Row 52_

Area description (collateral data)

Veg. Woodland, Savanna, & Steppe - undifferentiated relatively dry types;
Wooded Steppe with abundant Acacia & Commiphora (Keay & Aubreville, 1958).

Ag. Non-agriculture & Rough Grazing Land with Trees; Rough Grazing Land
(World Atlas of Agriculture, 1976); Traditional subsistance & commercial
(Atlas of Africa, 1973); Mixed subsistence & grazing (CIA Maps).

Soils No data

Area description (consultant)

Dense shrub savanna; Rice along river. Minimal subsistence - millet and
sorghum. Local goats and sheep.

Area description (Landsat analysis)

Low density drainage. Some scattered light tonal signatures indicative of
farming, especially along river. Medium gray tonal signatures indicative
of grass and dark gray tonal signatures indicative of forest vegetation,
or possible wet soils, as indicated on the ONC charts.

Final classification
Shrub savanna
Millet, sorghum, irrigated rice
0 - 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____47_____ SIZE _36,017_____ Sq. km.

LOCATION _East central section of study area; S.E. of Lake Chad_____

IMAGE I. D. _Path 201, 202, 203; Row 51, 52, 53_____

Area description (collateral data)

Veg. Woodland Savanna & Steppe – undifferentiated relatively dry types; Wooded
Steppe with abundant Acacia & Commiphora (Keay & Aubreville, 1958).

Ag. Rough grazing land (World Atlas of Agriculture, 1976); Traditional subsis-
tence & some commercial (Atlas of Africa, 1973); Mixed subsistence & graz-
ing (CIA Maps)

Soils No data

Area description (consultant)

Shrub savanna; marginal millet; mainly livestock. Recession agriculture –
some sorghum. Heavy brush – similar to 127A except a little drier.

Area description (Landsat analysis)

Moderate density drainage – undefined pattern – internal drainage into Lake
Chad. Mostly light tonal signatures indicative of farming and medium gray
tonal signatures indicative of grass; these two signatures are very com-
plexly intermingled, especially along the Bahr Erguig. In the northern
section of the map unit; these signatures have more generally defined do-
mains; however, cloud cover obscures it somewhat. Flooding indicated on
IGN map in area adjacent to Bahr Erguig.

Final classification

Shrub savanna

Millet, sorghum

0 – 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____48_____ SIZE ___107,264___ Sq. km.

LOCATION _North eastern section of study area; S. Chad_____

IMAGE I. D. _Path 198, 199, 200, 201, 202; Row 51, 52, 53_____

Area description (collateral data)

Veg. Woodland, Savanna & Steppe – undifferentiated relatively dry types (Keay
& Aubreville, 1958).

Ag. Non-agriculture & Rough Grazing Land with Trees; Rough Grazing Land (World
Atlas of Agriculture, 1976). Traditional Subsistence; Traditional & Com-
mercial (Atlas of Africa, 1973); Grazing with some subsistence; Mixed
Grazing & Subsistence; Subsistence (CIA Maps).

Area description (consultant)

Not familiar with area. Southern part wooded savanna aided by
high water. Shrub savanna in north. Burns. Marginal millet.
Nomadic grazing area. Millet and sorghum do exist as far north
as Lake Chad (Atlas Pratique du Tchad, 1972).

Area description (Landsat analysis)

Medium density drainage of dendritic variety. Mostly medium gray tonal
signatures, indicative of grass; some darker gray tonal signatures indica-
tive of forest or moist soils, as indicated by swamp symbols on ONC charts;
occupy some areas; some mountain features in northeast.

Final classification

Shrub savanna

Millet and sorghum

0 – 30% of area under cultivation at the time of Landsat
overpass

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___49___ SIZE _81,603_ Sq. km.

LOCATION __North eastern section of study area; S.W. of Sudan; contains Am-Timan__

IMAGE I. D. _Path 200, 199, 198; Row 52, 53_

Area description (collateral data)

Veg. __Woodlands, Savannas, Steppes - undifferentiated relatively dry types__
     __(Keay & Aubreville, 1958).__

Ag. __Traditional subsistence (peanuts, sorghum, & manioc) & commercial (cotton,__
    __rice) (Atlas of Africa, 1973). North section Non Ag. & Rough grazing land__
    __& trees. Most of map unit; Rough grazing land (World Atlas of Agriculture,__
    __1976). Grazing & some subsistence in north & subsistence in south (CIA)__
Soils No data   Some area of cotton (Area Handbook for Chad, AU, 1972). Much
    of area is marsh according to International Atlas & ONC charts.

Area description (consultant)

__Flooded during rainy season; black areas are burns; burned for grazing.__
__Might be brush. Shrub savanna, maybe tree steppe in north, much livestock__
__nomadic movement.__

Area description (Landsat analysis)

__Pattern of medium gray tonal signatures indicative of grass, along some__
__tributaries of Bahr Azoum. Much scattered light tonal area (Cleared__
__land for farming) and dark area (burns). Lack of well defined drainage__
__network other than few major streams. Lac Iro is white tonal signature-__
__possible salt. Medium gray tonal signature may indicate some forest vege-__
__tation.__

Final classification
__Shrub savanna__

__No crops__
0 - 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___50___ SIZE _10,094_ Sq. km.

LOCATION __Eastern section of study area; west of Sudan__

IMAGE I. D. _Path 197; Row 52_

Area description (collateral data)

Veg. __Woodlands, Savannas, & Steppes - undifferentiated relatively dry types__
     __(Keay & Aubreville, 1958).__

Ag. __Non-Agriculture & Rough Grazing Land with Trees (World Atlas of Agriculture,__
    __1976). Traditional - peanuts, sorghum, manioc/commercial - cotton, rice__
    __(Atlas of Africa, 1973) Mixed subsistance/Grazing (CIA)__
Soils No data

Area description (consultant)

__Not familiar with area__
__Shrub savanna, basic millet, not much livestock; marginal cotton.__

Area description (Landsat analysis)

__Light tonal signatures along Azam River indicative of cleared land for farm-__
__ing, also scattered dark areas here indicative of burns. Medium gray tonal__
__signatures indicative of grass present from river to higher elevations to__
__south & east, where dark gray tonal signatures indicate forest vegetation.__

Final classification
__Shrub savanna__

__Millet, cassava; cotton at selected relatively limited locations only__
0 - 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 51 _____ SIZE _16,288_ Sq. km.

LOCATION Eastern section of study area; S.W. of Sudan; surrounds Birao

IMAGE I. D. Path 198, 197; Row 53

Area description (collateral data)

Veg. Woodland Savanna & Steppe – undifferentiated relatively dry types (Keay
& Aubreville, 1958);
Ag. Millet (Atlas of Africa, 1973).
Soils No data

Area description (consultant)

Not familiar with area

Area description (Landsat analysis)

Other than the Yata River flowing S.E. to N.W. thru map unit, there are
very few drainage patterns. Some foothills evident in south, with dark
tonal signatures indicative of forest vegetation. Some along river. Rest
of map unit mostly light gray tonal signature indicative of grass. Two
areas adjacent to river have black tonal signatures that may indicate
recent burns. One area is not even dark on Landsat image to east.
Little to no light tonal signatures indicative of cleared land for farming.

Final classification

Shrub savanna
Millet
0 – 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 52 _____ SIZE _426_ Sq. km.

LOCATION Senegal – east of Dakar

IMAGE I. D. Path 225 Row 51

Area description (collateral data)

Forest Area (Republique du Senegal – IGN, 1:500,000)

Peanuts/Millet Assoc. (CIA Map, Senegal & Gambia, 1972)
Plateau with surronding escarpments (International Atlas of West Africa 1971)

Raw mineral erosion soils over feruginous crusts (International Atlas of
West Africa, 1971)

Area description (consultant)

Upland, rocky outcrop, brush – lateritic outcrop Acacia sial baobob.
Not used much for agriculture – drainage too porous. Good baobob habitat –
leaves for sauce; fruit eaten (Fred Weber, personal communication, August
2, 1978)

Area description (Landsat analysis)

Band 5 – dark tonal signature – smooth texture – indicative of forested
areas. Minimal land cleared.

Final classification

Wooded Savanna
Millet, Sorghum, Peanuts
0 – 30% of area has been cleared for cultivation at the time of Landsat
overpass

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ____53____ SIZE __2,851__ Sq. km.

LOCATION __Along coast 100 km. southeast of Dakar__

IMAGE I. D. __Path 225 Row 51__

Area description (collateral data)

Marsh or swamp (CIA Veg. Map of Senegal & Gambia, 1972)

Halomorphic soils - acidified salt soils and with incrustrations (In-
ternational Atlas of West Africa, 1971)

Area description (consultant)

Salt flats, much tidal brackish intrusion; freshwater only during heavy
precip. Sparse vegetation, tameric of salt tolerant plant - alkalai
flats - salt even in water table;too salty for rice, northern limit for
mangrove.

Area description (Landsat analysis)

Band 5 image signature - coastal (tidal) drainage system; meandering
channels with adjacent marsh vegetation. Characteristic estuarine area·

Final classification
Wooded Savanna

No Crops

0 - 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ____54____ SIZE __18,189__ Sq. km.

LOCATION __Area bounded on north by Linguere, on west by Banjul and on east__
__approximately by Tambacounda__

IMAGE I. D. __Path224 and 225; Row 51__

Area description (collateral data)
Polygon transects several mapped vegetation zones - deciduous forest; brush

and cultivated vegetation; Acacia savanna (CIA Maps of Senegal and Gambia,1972).
Wooded steppe with abundant Acacia and Commiphora in northern part; Woodland,
savanna and steppes - undifferentiated, relatively dry types in central portion
and woodlands, savannas and steppes in southern portion (Keay and Aubreville, 1958).
Agriculture is dominated by peanut farming(CIA Maps of Senegal and Gambia, 1972;
Atlas of Africa, 1973). Gray ferrugenous soils over aeolian sands - little leach-
ing (International Atlas of West Africa, 1971).

Area description (consultant)
Very difficult area - possible forest reserve within large polygon. See revised
line -- green for peanut basin -- remainder of polygon #9 bush steppe principally
with millet. Sandy soils of low pH. Dry land farming. Erratic rainfall.

Area description (Landsat analysis)
Medium gray tonal signature (Band 5). Forest is minimal. Acacia savanna is
probable. This dominates with tall grasses and brush. Uncleared land (forest)
occurs along interfluves in eastern part of area. Area overall is poorly dissected
by drainage. Broad areas appear to have been cleared for agriculture -- probably
peanuts associated with millet.

Final classification
Wooded savanna

Peanuts

Greater than 60% of area has been cleared for cultivation at the time of
Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ____55____ SIZE ___31,330___ Sq. km.

LOCATION __Area bounded on north by Linguere, on west by Banjul and on east__
approximately by Tambacounda

IMAGE I. D. __Path224 and 225; Row 51__

Area description (collateral data)

Polygon transects several mapped vegetation zones - deciduous forest; brush
and cultivated vegetation; Acacia savanna (CIA Maps of Senegal and Gambia,1972).
Wooded steppe with abundant Acacia and Commiphora in northern part; Woodland,
savanna and steppes - undifferentiated, relatively dry types in central portion
and woodlands, savannas and steppes in southern portion (Keay and Aubreville, 1958).
Agriculture is dominated by peanut farming (CIA Maps of Senegal and Gambia, 1972;
Atlas of Africa, 1973). Gray ferrugenous soils over aeolian sands - little leach-
ing (International Atlas of West Africa, 1971).

Area description (consultant)

Very difficult area - possible forest reserve within large polygon. See revised
line -- green for peanut basin -- remainder of polygon #9 bush steppe principally
with millet. Sandy soils of low pH. Dry land farming. Erratic rainfall.

Area description (Landsat analysis)

Medium gray tonal signature (Band 5). Forest is minimal. Acacia savanna is
probable. This dominates with tall grasses and brush. Uncleared land (forest)
occurs along interfluves in eastern part of area. Area overall is poorly dissected
by drainage. Broad areas appear to have been cleared for agriculture -- probably
peanuts associated with millet.

Final classification

Wooded Savanna

Millet, sorghum, peanuts

31-60% of area has been cleared for cultivation at the time of Landsat overpass.

AREA (POLYGON) NUMBER _____56_____ SIZE __11,929__ Sq. km.

LOCATION __Adjacent to Bintanz and Casamance Rivers; 25-250 Km inland from__
Atlantic Coast. SE of Banjal, Ziguinchor and Kolda are within the area

IMAGE I. D. __Paths 224-225 Row 52__

Area description (collateral data)

Landsat polygon transects area identified as marsh or swamp broadleaf ever-
green forest Decidious forest brush and cultivated vegetation (CIA Map of
Gambia & Sengal, 1972) Also within broader Woodlands, Savanas Steppes with
abundant Isoberlinia doka and I. dalziellii (Keay and Aubreville, 1958)
within peanut, millet, rice area(CIA 1972; atlas of Africa, 1973)

Area description (consultant)

Looks like rice along river, not familiar with area. Fairly heavy agricul-
ture - rice, sweet potatoes, oil palm, peanuts, much manioc heavy clay soils.

Area description (Landsat analysis)

Band 5 show area to be one of intensive agriculture along the valleys and
tributaries of the Gambie, Casamance and Bintang Rivers. Highly reflective
white - toned areas nearest to stream banks believed to be rice cultivation
areas. Further back from channels intensive peanut and millet cultivation
likely. 95% of area under cultivation.

Final classification

Wooded Savanna

Rice, other root crops, oil palms, peanuts, cassava

31% - 60% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___57___ SIZE __10,520__ Sq. km.

LOCATION __Valley of the Senegal River__

IMAGE I. D. __Path 223, 224, 225; Row 48 & 49__

Area description (collateral data)

Marsh or Swamp (CIA Map of Senegal & Gambia, 1972); Wooded Steppe, Abundant
Acacia & Commiphora (Keay & Aubreville, 1958); Rice, cotton area and sub-
sistence - millets and maize cultivated with rainfall and river ebb; also
millet and sorghum (Sahelian zone) (Atlas of Africa, 1973) Halomorphic
soils with incrustations along Senegal River near coast & mineral hydro-
morphic soils with pseudo-gley up river (International Atlas of W. Africa, 1971).

Area description (consultant)

Riparian - natural veg. - dense Acacia Nilotica - dominant; extensive
flood plain, heavy land use; some large rice schemes. See revisions;

Flood recession agriculture-sorghum & a little millet and corn in
parallel bands as water recedes.

Area description (Landsat analysis)

Dark tonal signature separates Senegal River Valley, which is under inten-
sive cultivation, from adjacent minimally cultivated higher elevations.
Highly reflective light   toned signature adjacent to stream channel as well
as darker toned saturated areas probably support rice cultivation. Cannot
separate out subsistence millet and sorghum and maize from cotton.

Final classification

Wooded savanna
Rice, sorghum, millet, maize
Greater than 60% of area has been cleared for cultivation at the time of
Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___58___ SIZE __29,135__ Sq. km.

LOCATION __Region of Koussanar, Sandougou and Nicrike rivers; near Tambacounda__

IMAGE I. D. __Path 223, Row 51__

Area description (collateral data)

Woodlands, Savanna and Steppe - undifferentiated relatively dry types
(Keay & Aubreville, 1958); Acacia Savanna (CIA Map of Gambia and Senegal,
1972). Peanut/Millet assoc. west of Tambacounda; Non-intensive grazing east
of Tambacounda. Some cotton within Tambacounda area. (CIA Map, 1972);
(Atlas of Africa, 1973). Immature soils of non-climatic origin (over gravel-
ly material) and indurated leached gray ferrunginous soils (International
Atlas of West Africa, 1971).

Area description (consultant)

Bush savanna; Combretum; not much grass; brush; some millet, subsistence
agriculture.

Area description (Landsat analysis)

Band 5 shows area to be criss crossed with trails connecting villages.
Cleared agricultural areas are associated with villages, but intensive
agricultural seems to be minimal! Appears to be more of a grazing - cattle
movement area with associated subsistence agriculture.

Final classification

Wooded savanna
Millet, sorghum, maize
0 - 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____59_____ SIZE ____89,141____ Sq. km.
             From approximately Diema in the west, southeastward to Bobo-Dioulasso
LOCATION and eastward to Dedougou.

IMAGE I. D. ___Path 218 to 224; Rows 51 to 53___

Area description (collateral data)
    Woodlands, savannas and steppes - undifferentiated relatively dry types
    in the north. With abundant Isoberlinia doka and I. Dalzielli (Keay and
    Aubreville, 1958). Tallgrass savanna in the southern part and Acacia
    savanna in the northern portions(CIA Maps of Mali and Upper Volta, 1968).
    Subsistence agriculture (millet and sorghum) with peanuts and cotton
    (Atlas of Africa, 1973). Peanuts (CIA Maps listed above). Principal soils
    are immature soils of non-climatic origin over gravelly material and
    leached gray ferrugenous soils (concretionary). (International Atlas of West
    Africa, 1971).
Area description (consultant)
    Wooded Savanna - Shea butter; Parkia;Borassus; Agriculture -- solid
    subsistence agriculture - millet and sorghum with occasional root crops
    -manioc. Relatively intense agriculture. More than 50% of available land
    under cultivation.

Area description (Landsat analysis)
    A medium gray tonal signature is characteristic of the Landsat imagery
    of this area. Indicative of relatively dry vegetation types. Area is
    under moderate agricultural activity. Drainage density is also moderate
    with major rivers characteristic of low slope flow, i.e. meandering for
    the most part with minimal structural control. Occasional dark splotches
    may indicate sites of burns. Most intensive cropping occurs around villages.
    Cropping is of the subsistence variety.

Final classification
    Wooded Savanna
    Millet, sorghum, cassava
    31 - 60% of area has been cleared for cultivation at the time of Landsat
       overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____60_____ SIZE ____1,606____ Sq. km.
LOCATION Surrounding Kita

IMAGE I. D. _Path 220; Row 51_

Area description (collateral data)
    Tallgrass savanna, brush and cultivated vegetation (southern part);
    Woodlands, savannas and steppes - relatively undifferentiated dry types
    (Keay & Aubreville, 1958). Peanuts (Atlas of Africa, 1973; CIA Map of
    Mali, 1970); Subsistence agriculture with peanuts and cotton (Atlas of
    Africa, 1973); Immature erosion soils of non-climatic origin over gravelly
    material (International Atlas of W. Africa, 1971).

Area description (consultant)
    Not familiar with the area

Area description (Landsat analysis)
    Landsat band 5 shows this area to be intensively cultivated. Peanuts
    probably dominate as the commercial crop with millet and sorghum
    being the subsistence types.

Final classification
    Wooded savanna
    Millet, sorghum, peanuts
    Greater than 60% of area has been cleared for cultivation at the time of
    Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___61___ SIZE ___2,720___ Sq. km.

LOCATION __Area adjacent to and southeast of Bamako, Adjacent to Niger River__

IMAGE I. D. __Path 219, Row 51-52__

Area description (collateral data)

Woodlands, savannas and steppes - northern areas with abundant Isoberlinia doka and I. dalzielii (Keay & Aubreville, 1958). Tallgrass savannas, brush and cultivated vegetation (CIA Map of Mali, 1970); Subsistnece agriculture - millet and sorghum with peanuts and cotton (Atlas of Africa, 1973); some fruit trees (World Atlas of Agriculture, 1976); arable land (millet,sorghum,manioc, sorn and sweet potatoes (CIA Map of Mali, 1970). Leached gray ferruginous soils (conditionary) (International Atlas of W. Africa,1971).

Area description (consultant)

River terrace: much like 40 & 41 except heavier use. Wooded savanna: millet, sorghum, maize, peanuts.

Area description (Landsat analysis)

Landsat band 5 shows this area to be cleared of natural vegetation along the Niger River and in the nearby river valleys. Somewhat regularly shaped cleared area suggest intensive agricultural activity with natural vegetation growing along the interfluves. Natural vegetation images a medium to dark gray tonal signature suggestive of savanna mixed with wooded steppe.

Final classification
Wooded savanna
Millet, sorghum, maize, peanuts
Greater than 60% of area has been cleared for cultivation at the time of Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___62___ SIZE ___3,048___ Sq. km.

LOCATION __Around Banamba, Mali__

IMAGE I. D. __Path 219 Row 50-51__

Area description (collateral data)

Tallgrass savannas and steppes (Undifferentiated dry types)(Atlas of Africa, 1973); Subsistence agriculture (millet and sorghum) both peanuts and cotton (Atlas of Africa, 1973). Raw mineral erosion soils over various rocks (International Atlas of W. Africa, 1971).

Area description (consultant)

Intensive agriculture

Area description (Landsat analysis)

Landsat Band 5 shows this to be an area with intensive cultivation in the stream valleys. More than 80% of the area under cultivation.

Final classification
Wooded Savanna
Millet, sorghum, peanuts, cotton
Greater than 60% of area has been cleared for cultivation at the time of Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 63 _____ SIZE _____ 13,011 _____ Sq. km.

LOCATION _North of Dedougou, Upper Volta_____

IMAGE I. D. _Path 216, Row 51_____

Area description (collateral data)

Millet, sorghum, fundi, peanuts, beans, sesame (Atlas of Africa, 1973);
Intensive peanut growing area (Atlas of Africa, 1973); Woodlands, savannas,
and steppes; indifferentiated relatively dry types (Keay & Aubreville, 1958);
Acacia savanna (CIA Map 1968). Mineral hydromorphic soils with pseudo-
gley and vertisols with no external drainage; non-grumosolic topomorphic
vertisols (International Atlas of W. Africa, 1978).

Area description (consultant)

_Intensive agriculture - Wooded savanna_____

Area description (Landsat analysis)

Intensively cultivated intermittent drainage channels. Sourou River flows
through the area. Area likely an intensively cultivated commercial peanut
region. More than 80% of the area under cultivation.

Final classification
_Wooded savanna_____
_Millet, sorghum, peanuts, sesame seed_____
Greater than 60% of area has been cleared for cultivation at the time of
Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 64 _____ SIZE _ 13,207 _ Sq. km.

LOCATION _South of Boromo and 100 east of Bobo Dioulasso_____

IMAGE I. D. _Path 215; Row 52 & 53_____

Area description (collateral data)

Woodlands, savanna and steppes - northern area with abundant Isoberlinia
doka and I. Dalzielii (southern portion); Woodlands, savannas and steppes-
undifferentiated relatively dry types (Keay & Aubreville, 1958). Millet,
manioc, peanuts, and rice - subsistence (Atlas of Africa, 1973). Mineral
hydromorphic (International Atlas of W. Africa, 1971).

Area description (consultant)

Wooded savanna; sorghum, millet, maize, upland rice, peanuts; some veg-
etable crops. Heavy cultivation and population pressure. Cut and burned.
Sedentary livestock ownership.

Area description (Landsat analysis)

This area is drained by and centered on the Black Volta. A medium density
dendritic drainage pattern characterizes the area. Light gray tonal
signatures indicate an area under intensive agriculture. Highly reflectance
white tonal signatures are most probably related to rice production and
intensively cultivated peanuts and millet. Area is 70 - 90% cultivated.

Final classification
_Wooded savanna_____
_Sorghum, millet, maize, rice, peanuts_____
Greater than 60% of area has been cleared for cultivation at the time of
Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 65 _____ SIZE _ 21,630 ___ Sq. km.

LOCATION _Upper Volta-area of Koudougou and Ouagadougo_____

IMAGE I. D. _Path 214 - 215 Row 51_____

Area description (collateral data)

Woodlands, savannas and steppes - undifferentiated relatively dry types
(Keay and Aubreville, 1958); Peanuts, cotton, market gardening (Atlas of
Africa, 1973; Millet, sorghum, fundi, peanuts, beans and sesame (Atlas of
Africa, 1973); Fruit trees near Bororulo (World Atlas of Agriculture,
1976); Peanuts (Church, 1974); hydromorphic leached=d gray ferruguious
soils, concretionary leached gray ferrugious soils and immature erosion
soils of non-climatic origin (International Atlas of W. Africa, 1971).

Area description (consultant)

Massi plateau southern portion; Wooded savanna, park type, Shea butter,
sorghum, peanut, cotton, irrigated rice in lowland, farmers and live-
stock owners. Koudougou area;lack of water is nothern part - less extensive
use.

Area description (Landsat analysis)

Landsat indicates that 80 - 90% of the area is cleared or cultivated.
Spotty natural vegetation occurs throughout the area especially along
drainages and in area of forest reserves.

Final classification
Wooded savanna
Sorghum, peanuts, cotton; rice at selected relatively limited locations
only.
Greater than 60% of area has been cleared for cultivation at the time of
Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 66 _____ SIZE _ 50,469 _ Sq. km.

LOCATION _East of Ouagadougou centered on Kaya and east to the Niger River

IMAGE I. D. _____ _____ __ .

Area description (collateral data)

Woodlands, savannas and steppe - undifferentiated relatively dry types
Keays & Aubreville, 1958); Indian butter trees around Kaya (Atlas of Africa,
1973)` Millet sorghum funds, peanuts, beans and sesame (Atlas of Africa,
1973). Immature soils of non-climatic origin and concretionary leached
gray ferruginous soils; some mineral hydromorphic soils with pseudo-gley
(International Atlas of West Africa, 1975).

Area description (consultant)

Rel. intensive agriculture/park farming landscape. Shea butter trees,
Parkia;Dry land sorghum and millet; in depressions substantial flooding -
some rice. Essentially a sedentary ag. area. Some animals - every
farmer a livestock owner. Darker spots-tree savanna. Lateritic outcrops.
Higher rainfall eastward.

Area description (Landsat analysis)

Alternating dark and light tonal signatures indicate woodland and savanna
areas with intensive agriculture indicated by geometrically-shaped lighter
tones in a dark natural vegetation matrix.

Final classification
Wooded savanna
Sorghum; Rice at selected relatively limited locations only.
Greater than 60% of area cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___67___* ___ SIZE __1875__ Sq. km.

LOCATION __Adjacent to and east of the Pendjari River in Upper Volta just__
west of Atacora Mountains.

IMAGE I. D. _Path 212, Row 53_

Area description (collateral data)

Woodlands, savannas and steppes - undifferentiated relatively dry types
(Keay & Aubreville, 1958); Deciduous forest brush and cultivated vegeta-
tion (CIA Map of Benin, 1970); Millet, sorghum, fundi; peanuts, beans and
sesame. Indian butter trees (Atlas of Africa, 1973); Mineral hydromor-
phic soils with psuedo-gley and leached gray ferruginous soils (Inter-
national Atlas of W. Africa, 1971).

Area description (consultant)

This is probably a burn area. Difference between 60 is that this is in the
mountains. Millet fields and sorghum are the dominant crops in the area.
Wooded savanna (Fred Weber, August 23, 1978).

Area description (Landsat analysis)

Dark gray to black tonal signature indicates wide stream channels with
dense forest canopy and adjacent upland areas also with a dense forest
canopy. Geometrically shaped clearing within the area suggest intensive
agricultural activity-perhaps large commercial operations.

* This map unit has been incorporated into a National Park/Reserve.

Final classification

Wooded savanna
Millet, sorghum
31 - 60% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___68 ·___ SIZE __2,425__ Sq. km.

LOCATION ___Southeast of Fada N'Gourma___

IMAGE I. D. ___Path 213   Row 53___

Area description (collateral data)

Woodlands, Savannas and Steppes (Keay and Aubreville, 1958)
Deciduous forest, brush and cultivated vegetation (CIA map
of UpperVolta, 1968). Peanuts, millet, maize, beans.

Area description (consultant)

Wooded savanna. Cereal crops like maize and sorghum.

Area description (Landsat analysis)

Dark tonal Landsat signature indicative of a fairly dense
natural vegetation cover with scattered agricultural
activity. Most intensive agricultural activity is surrounding
towns and villages

Final classification

Wooded savanna
Maize and Sorghum
31-60% of area has been cleared for cultivation at the
time of Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____69_____ SIZE ___59,416___ Sq. km.

LOCATION __Area adjacent to, east and north of the Kainji Reservoir; Also north of Fada N'Gourma.__

IMAGE I. D. __Path 215; Rows 54 and 55__

Area description (collateral data)

Northern part – Woodland, Savannas and Steppes – areas with abundant Isober-
linia doka and I. Dalzielli; Tallgrass Savanna; Deciduous Forest, Brush and
cultivated vegetation in the southern protion (CIA Maps of Upper Volta, and
Nigeria, 1968 and 1972 respectively). Crops – peanuts, millet, maize, beans;
predominantly subsistence – millet, manioc, maize and rice (Atlas of Africa,
1973). East of Kainji Reservoir -- tobacco, and large peanut and cotton area
(Atlas of Africa, 1973).

Area description (consultant)

Wooded Savanna with shea butter, Parkia, sorghum, millet, maize, peanuts.
50% of area under cultivation.

Area description (Landsat analysis)

Dark tonal Landsat signature indicative of a fairly dense natural vegetation
cover with scattered agricultural activity. Most intensive agriculture is
surrounding towns and villages.

Final classification

Wooded Savanna
Millet, sorghum, peanuts
31-60% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____70_____ SIZE __18,582__ Sq. km.

LOCATION __East of Tillaberry, Niger__

IMAGE I. D. __Path 211-212; Row 50-51__

Area description (collateral data)

Wooded steppe with abundant Acacia and Commiphora (Keay & Aubreville,
1958); Acacia savanna (CIA Map of Niger, 1962); Peanuts, millet and sorghum
(CIA Map of Niger, 1962); Culticrop subsistence and sedentary livestock
(ATlas of Africa, 1973). Non or little leached gray ferruginous soils
over aeolian sands (International Atlas of W. Africa, 1971). Level plains
of soft sandstones and clays with same laterite crossed by wide relic river
valleys known as dallols. Acacia and borassus palms line banks. Myrrh
(Church, 1974).

Area description (consultant)

Shrub savanna – Combretum brush or shrub. Subsistence niebebeans, millet
farming. People are farmers & livestock raisers. Some peanuts. Consider-
able land pressure due to extensive need for shifting cultivation; some
lowland intensified farming. Little manioc. Bisected peneplain with
laterite outcrops. Shallow, poor soils; millet. Ancient rivers.

Area description (Landsat analysis)

Agricultural activity appears spotty in this area. Toward the north the
wide relic river channels appear to be filled with sandy soils unsuitable
for large scale agricultural production.

Final classification

Wooded savanna
Millet, cassava, fruit trees, peanuts
0 - 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___71___*___ SIZE _1250_____ Sq. km.

LOCATION _150 Km south of Dosso on Mekrou and Alibori Rivers____

IMAGE I. D. _Path 211; Row 52-53_____

Area description (collateral data)

  Woodlands, savannas and steppes - undifferentiated relatively dry types

  (Keay & Aubreville, 1958); Peanuts (CIA Map of Benin, 1970); Isohumic

  brown subarid vertic soils over clay alluvium (International Atlas of W.

  Africa, 1971).

Area description (consultant)

  Park area - no agriculture; Wooded savanna, densely covered. Maybe

  heavy grazingduring extreme drought years.

Area description (Landsat analysis)

  Dark black tonal signature indicative of highly absorbent materials in

  Landsat band 5. These are likely forested areas. No evidnece of agricul-

  ture exists within these areas.

Final classification

  Wooded savanna

  No crops

  0 - 30% of area has been cleared for cultivation at the time of Landsat

  overpass.

  * This map unit has been incorporated into a National Park/Reserve

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___72___*___ SIZE _1250_____ Sq. km.

LOCATION _Adjacent to Niger River 125 Km south of Dosso_____

IMAGE I. D. _Path 211;Row 52-53_____

Area description (collateral data)

  Woodlands, savannas and steppes - undifferentiated relatively dry types

  (Keay & Aubreville, 1958); Peanuts (Atlas of Africa, 1973); Peanuts (CIA

  Map of Benin, 1970); Concretionary leached gray ferruginous soils (Inter-

  national Atlas of W. Africa, 1971).

Area description (consultant)

  Could be wide-open grassland - marshy area during rainy season within the

  national park. Check to see if it is within the boundary.

Area description (Landsat analysis)

  Landsat band 5 shows this to be a heavily cleared and probably cultivated

  area with a well developed drendritic drainage pattern. This is likely

  a peanut growing area.

Final classification

  Wooded savanna

  No crops

  0 - 30% of area has been cleared for cultivation at the time of Landsat

  overpass.

  * This map unit has been incorporated into a National Park/Reserve

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____73_____ SIZE ___9,275___ Sq. km.

LOCATION _Along Niger and Sokoto Rivers_____

IMAGE I. D. _Path 208; Row 51; Path 209; Row 51; Path 210; Row 52; Path 211;_
             Row 52-53; Path 212; Row 51-52; Path 213; Row 50-51

Area description (collateral data)

Wooded steppe with abundant Acacia and Commiphora and Woodlands, savannas
and steppes with undifferentiated dry types (Keay & Aubreville, 1958);
Irrigated rice, peanuts, and cotton (Atlas of Africa, 1973; CIA Maps of
Niger and Nigeria, 1962, 1972); Little leached gray ferrug n ous soils
over aeolian sands or mineral hydromorphic soils with deep gley (International
Atlas of W. Africa, 1971).

Area description (consultant)

Rice irrigation schemes and sugar cane in southern part. Good irrigation
potential. Grass - thick peranial, good Borassis area. 83A - northern
portion - like 75

Area description (Landsat analysis)

A band of light gray to white tones adjacent to the Niger and Sokoto
Rivers indicates intensive sultivation. The white highly reflective tones
are believed to be rice white. The bright or gray tones are probable peanuts
and cotton.

Final classification
Wooded savanna
Rice, millet, sorghum, peanuts, sugar cane, fruite trees.
Greater than 60% of area has been cleared for cultivation at the time of
Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____74_____ SIZE __3,638__ Sq. km.

LOCATION _Adjacent to and north and south of Dogondoutchi_____

IMAGE I. D. _Path 211; Row 51-52_____

Area description (collateral data)

Wooded, steppe with abundant Acacia and Commiphora (Keay & Aubreville, 1958);
Peanuts (CIA Map of Niger, 1962 and Nigeria, 1972); Non or little leached
gray ferruginous soils over aeolian sand (International Atlas of W. Africa,
_1971)._

Area description (consultant)

Ancient river valley extensively cultivated millet, sorghum, peanuts, cotton,
development schemes, rice, sugar cane; natural vegetation - low lying
grass area; Borassus ethiopum palm. Extensive vegetable gardening -
tomatoes and onions in waterhole area (MARS) or ponds - small permanent
lakes.

Area description (Landsat analysis)

Light gray to white tonal signature indicative of intensive cultivation.
Likely an intensively cultivated peanut area.

Final classification
Wooded savanna
Millet, sorghum, peanuts; cotton, rice and sugar cane at selected relatively
limited locations only
Greater than 60% of area has been cleared for cultivation at the time of
Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____75_____ SIZE __23,137__ Sq. km.

LOCATION _North Central section of study area; N.W. Nigeria_____

IMAGE I.D. __Path 208, 209; Row 51_____

Area description (collateral data)

Veg. Woodland, Savanna & Steppe - undifferentiated relatively dry types
     (Keay & Aubreville, 1958). Sudan Savanna (CIA)
Ag. Non-agriculture & Rough Grazing Land with trees (World Atlas of Agriculture,
     1976); Peanuts; Cotton (Atlas of Africa, 1973); Peanuts; Cotton (CIA)
Soils - Little leached gray ferruginous soils - modal facies over eolain sands.
     (International Atlas of W. Africa, 1971).

Area description (consultant)
     Area not as heavily utilized as 133. Reasons not certain. Hilly region.
     Shallow soils. Access to water difficult. Wooded savanna; millet sorghum,
     maize, a little yams in favorable area; small livestock. Manioc.

Area description (Landsat analysis)
     Moderate density drainage of the dendritic variety. Mostly medium gray
     tonal signatures indicative of grass, vegetation. Not much light tonal
     signatures indicative of farming. Evidence of a fair amount of relief.

Final classification
     Wooded savanna
     Millet, sorghum, cassava, maize, other root crops.
     0 - 30% of area has been cleared for cultivation at the time of Landsat
     overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____76_____ SIZE ·89,632· Sq. km.

LOCATION _Central section of study area; N. Nigeria; Kano, Sokoto_____

IMAGE I.D. _Paths 206 - 210; Row 51, 52_____

Area description (collateral data)

Veg. Woodlands, savannas & Steppe - undifferentiated relatively dry types;
     Woodlands, savannas & Steppe - northern areas with abundant Isoberlinia
     doka & I. dalzielii (Keay & Aubreville, 1958); Sudan savanna; tallgrass
     savanna (CIA Maps).
Ag. Arable land and 10,000 ha.;Non-ag. & Rough Grazing Land with trees (World
     Atlas of Ag., 1976). Subsistence crops with commercial; cotton (Atlas of
     Africa, 1973). Ground nuts (CIA Maps).
Soils - Soils with scsquioxydes: gray & leached gray ferruginous; immature ero-
Area description (consultant) sion (lithosols) soils of non-climatic origin (Interna-
                              tional Atlas of W. Africa, 1971).

     Very important area: Wooded savanna (Sudan savanna); heavy agriculture -
     more than 75% of land in pernament use - millet & maize are staples; pea-
     nuts - heavy; some cotton. Peanuts are the major crop. Much locally - owned
     livestock.

Area description (Landsat analysis)
     Only drainage patterns seem to be interior. Almost intire area is dominated
     by light tonal signatures indicative of intensive farming. Some medium
     gray tonal signatures indicative of grass or less intensive farming. Small
     area in N.E. - light gray tonal signature has striations indicative of
     sand dunes.

Final classification
     Wooded savanna
     Millet, maize, peanuts, irritated cotton
     Greater than 60% of area has been cleared for cultivation at the time of
     Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____77_____ SIZE ___16,878___ Sq. km.

LOCATION Central section of study area; central Nigeria

IMAGE I. D. Paths 206, 207; Row 52, 53

Area description (collateral data)

Veg. Woodland, Savanna & Steppes - undifferentiated relatively dry types;
Woodland, Savanna & Steppes - northern area, with abundant Isoberlinia
doka & I. dalzielii (Keay & Aubreville, 1958); Sudan Savanna; Tallgrass
Savanna (CIA Maps).

Ag. Non-agriculture & Rough Grazing Land with Trees (World Atlas of Agriculture,
1976); Subsistence crops with commercial (Atlas of Africa, 1973).

Soils Raw mineral erosion soils (lithosols) of Non-climatic origin over various
rocks; hydromorphic, leached gray ferrugionous soils (international Atlas
Area description (consultant) of W. Africa, 1971).

Not familiar with area
Wooded savanna

Area description (Landsat analysis)

Mixed presence of light gray tonal signatures indicative of farming and
medium gray tonal signatures indicative of grass. A few small regularyly
shaped dark tonal signatures indicative of burns

Final classification
Wooded savanna
No crops
0 - 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____78_____ SIZE __8,160__ Sq. km.

LOCATION central section of study area; Jos, Nigeria

IMAGE I. D. Path 206, 207 Row 53 -54

Area description (collateral data)

Veg. Woodland, Savanna & Steppe - northern areas with abundant Isoberlinia
doka & I. dalziellii (Keay & Aubreville 1958) Woodland, Savanna & Steppe-
undifferentiated relatively moist types. Tallgrass Savanna (CIA)

Ag. Predominantly subsistence; subsistence crop with commercial (Atlas of
Africa 1973) Arable land 710,000 ha. (World Atlas of Agriculture 1976)

Area description (consultant)

Mountain area. Woodland altered by mining and cultivation. Little maize
& manioc; sparsley settled; grazing good. JOS plateau. Due to tin mining
& cultivation pressure. The original woodland has practically disappeared.
The plateau is open and woodless. Hyparrhenia rufa.

Area description (Landsat analysis)

Little to no drainage evident. Series of plateau peaks, as indicated by
rough tonal texture. Light tonal signatures indicative of farming in
center portion of map unit; mostly medium gray tonal signatures indicative
of grass.

Final classification
Woodland
Maize, cassava, cotton
31 - 60% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ____79____ SIZE __45,980__ Sq. km.

LOCATION Eastern central section of the study area; N.E. Nigeria; S.W. of
Lake Chad

IMAGE I. D. Path 204, 205, 206, 207; Row 50, 51, 52, 53

Area description (collateral data)

Veg. Wooded Steppe with abundant Acacia & Commiphora; Woodland Savanna & Steppe-
undifferentiated relatively dry types (Keay & Aubreville, 1958); Short
grass savanna; Sudan savanna; Tallgrass savanna (CIA Maps)

Ag. Subsistence crop with commercial; cotton; rice (Atlas of Africa, 1973); Non-ag-
riculture & rough grazing Land; Non-Ag. & RGL with trees; Arable land -
10,000 hec   (World Atlas of Agriculture, 1976).

Soils Little leached gray ferruginous soils; topomorphic vertisols (International
Atlas of W. Africa, 1971).

Area description (consultant)

Wooded savanna; Peanuts, sandy soils

Area description (Landsat analysis)

No defined drainage network detected in northeatern section adjacent to
Lake Chad. Here, light to medium gray tonal signatures with some N.E. -
S.W. direction striations indicative of sand dunes and some areas of farming
or grass vegetation. In the southern sections are predominantly light
tonal signatures indicative of rather intensive farming, such as rice &
ground nuts.

Final classification

Wooded savanna

Peanuts

Greater than 60% of area has been cleared for cultivation at the time of
Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ____80____ SIZE __13,076__ Sq. km.

LOCATION Central section of study area; central Nigeria, West of Gambi.

IMAGE I. D. Path 205, 206; Row 53

Area description (collateral data)

Veg. Woodland, Savanna, & Steppe - undifferentiated relatively dry types (Keay
& Aubreville, 1958); Sudan Savanna (CIA Maps).

Ag. Subsistence crop with commercial; cotton (Atlas of Africa, 1973); Non-ag-
riculture & Rough Grazing Land with Trees (World Atlas of Agriculture, 1976).

Soils impoverished medium desaturated ferallitic soils (International Atlas of
W. Africa, 1971).

Area description (consultant)

Not familiar with area

Wooded savanna

Area description (Landsat analysis)

Portion of a minor drainage system. Mostly medium gray tonal signature
indicative of grass. Scattered small light tonal signatures indicative of
cleared land for farming. A few dark tonal signatures indicative of burns.
A sizable area of farming at south is indicated by lighter tonal signature
and perhaps because the stream diminishes dramatically even though this area
is not arid or subarid.

Final classification

Wooded savanna

No crops

0 - 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ____81____ SIZE ____5,145____ Sq. km.

LOCATION __East central section of study area; Nigeria__

IMAGE I. D. __Path 205, 206; Row 51, 52__

Area description (collateral data)

Veg. Woodland Savanna & Steppe (Keay & Aubreville, 1958); Sudan Savanna (CIA Maps).

Ag. Subsistence crops with commercial (Atlas of Africa, 1973); Non agriculture & Rough Grazing Land with Trees (World Atlas of Agriculture, 1976).

Soils Immature erosion soils of non-climatic origin over gravelly material; ferralitic soils (International Atlas of W. Africa, 1971).

Area description (consultant)

Not familiar with area

Wooded savanna

Area description (Landsat analysis)

Medium gray tonal signatures indicative of grass; some dark gray tonal signatures indicative of trees. Location of this map unit in relation to neighboring drainage & sand dunes (no dunes in this map unit) suggests this is higher elevation.

Final classification

Wooded savanna

Millet, sorghum, maize, cotton, peanuts

31 - 60% of area has been cleared for cultivation at the time of Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ____82____ SIZE __13,404__ Sq. km.

LOCATION __East central section of study area; E. Nigeria & W. Cameroua__

IMAGE I. D. __Path 204, 205; Row 54, 55__

Area description (collateral data)

Veg. S. section - Montaine communities undifferentiated; central section - Woodland, Savanna, & Steppe; Northern areas: with abundant Isoberlinia doka & I. dalzielii; N. section - Woodland, Savanna, Steppe - undifferentiated relatively dry types (Keay & Aubreville, 1958); Savanna; scrub, grasslands & crops; montaine vegetation; tallgrass savanna; Sudan savanna

Ag. (CIA maps); subsistence agriculture (Atlas of Africa, 1973); Non-agriculture & Rough Grazing land with trees (World Atlas of Agriculture, 1976).

Soils Mineral hydromorphic (modal); over clay alluvium - non-grumosolic modal topomorphic vertisols; concretionary, leached gray

Area description (consultant) ferruginous (leached); desert ablation soils (International Atlas of W. Africa, 1971).

Not familiar with area

Area description (Landsat analysis)

Low density drainage network other than major tributaries. Mostly medium gray tonal signature indicative of grass. A fair amount of light tonal signatures indicative of cleared land for farming and a few dark tonal signatures indicative of burns. Little dark gray tonal signatures indicative of forest vegetation.

Final classification

Wooded savanna

Millet, cassava, maize, irrigated rice

Greater than 60% of area has been cleared for cultivation at the time of Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___83*___ SIZE __750__ Sq. km.

LOCATION __East central section of study area; N. Cameroun__

IMAGE I. D. __Path 204; Row 54__

Area description (collateral data)

Veg. W. Section - montain communities - undifferentiated; E. Section - Woodland,
   Savanna & Steppe - northern areas - with abundant Isoberlinia doka & I.
   dalzielii (Keay & Aubreville, 1958); Tallgrass Savanna (CIA Maps)

Ag. Non - agriculture Rough Grazing Land with Trees (World Atlas of Agriculture,
   1976); subsistence agriculture; Millet (Atlas of Africa, 1973).

Soils Mineral hydromorphic with pseudo - gley (modal facies); impoverished and
   leached gray ferruninous soils (International Atlas of West Africa, 1971).

Area description (consultant)

   Could be burns. Not familiar with area

Area description (Landsat analysis)

   Coarse texture tonal signature indicative of mountain features; dark gray
   tonal signature indicative of forest vegetation. Little to no drainage
   network observable.

Final classification

   Wooded savanna

   Millet

   0 - 30% of area has been cleared for cultivation at the time of Landsat
   overpass.

   * This map unit has been incorporated into a National Park/Reserve

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___84___ SIZE __4,424__ Sq. km.

LOCATION __East central section of study area; W. Cameroun__

IMAGE I. D. __Paths 203, 204; Row 54, 55__

Area description (collateral data)

Veg. Woodland Savanna, & Steppe, northern areas 0 with abundant Isoberlinia
   doka & I. dalzielii (Keay & Aubreville, 1958); Savanna & Scrub, grassland
   crops (CIA Maps)

Ag. Millet, some peanuts (Atlas of Africa, 1973); Non - agriculture, rough
   grazing land with Trees (World Atlas of Agriculture, 1976); Cotton (CIA).

Soils impoverished & medium desaturated ferralitic soil & concretionary, leached
   gray ferrunginous soils (International Atlas of West Africa, 1971).

Area description (consultant)

   Not familiar with area

Area description (Landsat analysis)

   Moderate density drainage of dendritic variety. Medium gray toanl signatures
   indicative of grass; some dark gray tonal signatures indicative of forest
   vegetation; a few light tonal signatures indicative of farming.

Final classification

   Wooded savanna

   Millet, peanuts

   31 - 60% of area has been cleared for cultivation at the time of Landsat
   overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____85_____ SIZE __103,462__ Sq. km.

LOCATION _East central section of study area; Cameroun & Nigeria; Babakoum,_
& Kelo

IMAGE I. D. Path 204, 205; Row 52,53, 54, 55

Area description (collateral data)

Veg. From south to north: Woodland Savannas & Steppe – undifferentiated rela-
tively moist types; Northern areas – with abundant Isoberlinia doka & I.
dalzeilii; Woodland, Savanna & Steppe – undifferentiated relatively dry types;
Wooded Steppe with abundant acacia & Commiphora (Keay & Aubreville, 1958). Mix-
ed Savanna & Scrub, grassland, & crops; some swamp or marsh; savanna; tall-
grass savanna (CIA Maps).

Ag. Mostly millet & subsistence farming; some cotton & cotton seed, peanuts
(Atlas of Africa, 1973); Rough grazing land & Rough Grazing Land with Trees

Area description (consultant) (World Atlas of Agriculture, 1976); Cotton (CIA Maps).
            Soils: Mineral hydromorphic soils with pseudo – gley
                    (modal facias) along Benue River; Topomorphic &
                    Lithomorphic medium desaturated ferallitic soils
                    & Halomorphic soils.

More cultivation – millet, niebe beans, peanuts (some); sorghum toward south;
Wooded savanna, some cotton

Area description (Landsat analysis)

Low density drainage; Mostly medium gray tonal signatures indicative of
grass; scattered light tonal signatures (farming) & a few dark tonal sig-
natures (burns). Very few significant forest signatures (Dark gray).
Small relatively evenly distributed light area on darker background in-
dicative of sand dunes.

Final classification
Wooded savanna
Millet, peanuts, sorghum, cotton
0 – 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____86_____ SIZE __1,049__ Sq. km.

LOCATION _East central section of study area; contains N. Gaoundere, Camerouna_

IMAGE I. D. __Path 203; Row 55__

Area description (collateral data)

Veg. Woodland, Savanna, Steppe – undifferentiated relatively moist types (Keay
& Aubreville, 1958). Savanna (CIA Map)

Ag. Rough Grazing Land (World Atlas of Agriculture, 1976). Millet (Atlas of
Africa, 1973).

Area description (consultant)
     More intensive agriculture around town.

Area description (Landsat analysis)
Moderate density drainage of the dendritic variety. Much light tonal signature
indicative of cleared land for farming; medium gray tonal signatures indicative
of grass.

Final classification
     Wooded savanna
     Millet
     31 – 60% of area has been cleared for cultivation at the time of Landsat
     overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 87 _____ SIZE __ 27,103 __ Sq. km.

LOCATION _East central section of study area; North central Cameroun, Maroula_

IMAGE I. D. _Path 202, 203; Row 52, 53, 54_

Area description (collateral data)

Veg. _Woodland, Savanna & Steppe - undifferentiated relatively dry types;_
Wooded Steppe with abundant Acacia & Commiphora (Keay & Aubreville, 1958).
Sudan Steppe & Scrub, grasslands & crops (CIA Map)

Ag. _Non-agriculture & Rough Grazing Land with Trees (World Atlas of Agricul-_
ture, 1976). Traditional & Commercial; Cotton (Atlas of Africa, 1973).

Soils _Salt soils with incrustations (non-degraded); solonetz with a columnar_
B horizon (degraded); concretionary, leached gray ferruginous soils.
(International Atlas of W. Africa, 1971).

Area description (consultant)

Very important area; Wooded savanna (Sudan savanna), heavy agriculture -
more than 75% of land in permanent use - millet and maize are staples;
peanuts - heavy; some cotton. Peanuts are the major crop; much locally
owned livestock.

Area description (Landsat analysis)

Very low density drainage. Scattered coarse signature features indicative
of mountains in north; considerable light tonal signatures indicative of
cleared land for farming, as well as some dark tonal signatures indicative
of burns; moderate amount of medium gray tonal signatures indicative of
grass. Very few dark gray tonal signatures indicative of forests.

Final classification

Wooded savanna
Millet, sorghum and   irrigated rice
Greater than 60% of area has been cleared for cultivation at the time of
Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 88 _____ SIZE _ 16,222 __ Sq. km.

LOCATION _East central section of study area; Cameroun & Nigeria; Babakoum,_
& Kelo

IMAGE I. D. _Path 204, 205; Row 52, 53, 54, 55_

Area description (collateral data)

Veg. _From south to north: Woodland Savannas & Steppe - undifferentiated rela-_
tively moist types; Northern area - with abundant Isoberlinia doka & I.
dalzeilii; Woodland, Savanna & Steppe - undifferentiated relatively dry types;
Wooded Steppe with abundant acacia & Commiphora (Keay & Aubreville, 1958).
Mixed Savanna & Scrub, grassland, & crops; some swamp or marsh; savanna; tall-
grass savanna (CIA Maps).

Ag. _Mostly millet & subsistence farming; some cotton & cotton seed, peanuts_
(Atlas of Africa, 1973); Rough grazing land & Rough Grazing Land with Trees
(World Atlas of Agriculture, 1976); Cotton (CIA Maps).

Area description (consultant)

Soils - Mineral hydromorphic soils with pseudo - gley
modal facies along Benue River; Ropomorphic &
Lithomorphic medium desaturated ferallitic soils
& Halomorphic soils.
Wooded savanna relatively rich soils, cotton & animal traction, sorghum,
millet, manioc, rice along water. Rich farm area.

Area description (Landsat analysis)

Low density drainage; Mostly medium gray tonal signatures indicative of
grass; scattered light tonal signatures (farming) & a few dark tonal signa-
tures (burns). Very few significant forest signatures (Cark gray). Small
relatively evenly distributed light area on darker background indicative of
sand dunes.

Final classification

Wooded savanna
Sorghum, maize, cassava, cotton, irrigated rice, fruit trees
Greater than 60% of area has been cleared for cultivation at the time of
Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___89___ SIZE ___5,244___ Sq. km.

LOCATION _Eastern section of study area;S. Chad; Logone River_

IMAGE I. D. _Path 201, 202; Row 53, 54_

Area description (collateral data)

Veg. Woodland Savanna & Steppe - undifferentiated relatively dry types (Keay
& Aubreville, 1958).

Ag. Rough Grazing Land; Non-agriculture & Rough Grazing Land with Trees (World
Atlas of Agriculture, 1976). Traditional & Commercial; Cotton seed (Atlas
of Africa, 1973); Mix subsistence & Grazing; Cotton (CIA Maps).

Soils No data

Area description (consultant)

Dark signature - dense growth of small trees & bushes; periodic flooding;
extensive rice along rivers; some cotton; area is a floodplain; subsistence
farming with peanut, cotton, rice as cash crop; newly habitated area.
Wooded savanna.

Area description (Landsat analysis)

Portion of Logone River Valley system (major river). Narrow band of light
tonal signatures along river indicative of intensive farming. Narrow bands
of medium gray tonal signatures indicative of grass. Most of remainder
very dark gray tonal signatures, indicative of high moisture content in
soil or even marsh. Some areas of green water, etc. Marsh & Flooding
symbols on ONC charts.

Final classification
Wooded savanna
Rice, cotton, peanuts
Greater than 60% of area has been cleared for cultivation at the time of
Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___90___ SIZE _28,076_ Sq. km.

LOCATION _East section of study area; S. Chad; Doumra, Sahr, & Moissala_

IMAGE I. D. _Path 200, 201; Row 59_

Area description (collateral data)

Veg. Woodland, Savanna & Steppe: Northern areas with abundant Isoberlinia doka
& I. dalzielii; WSS undifferentiated relatively dry types (Keay & Aubre-
ville, 1958)

Ag. Traditional & commercial; cotton seed (Atlas of Africa, 1973); Non-agri-
culture & Rough Grazing Land with Trees (World Atlas of Agriculture (1976).

Soils No data

Area description (consultant) (Fred Weber personal communication, August, 1978)

Heavy agriculture - cotton, tobacco, sorghum, monioc, lowland rice; wooded
savanna. Area under periodic flooding.

Area description (Landsat analysis)

Moderate to high drainage density of dendritic variety. Scattered area of
light tonal signature indicative of intensive farming. Some medium gray
tonal signatures indicative of grass. A few dark signatures indicative of
burns. Some smooth dark gray tonal signatures indicative of moist soils;
swamp symbols indicated on ONC charts.

Final classification
Wooded savanna
Cotton, tobacco, sorghum, cassava, irrigated rice
Greater than 60% of area has been cleared for cultivation at the time of
Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____91_____ SIZE __5,244__ Sq. km.

LOCATION __Eastern section of study area;Chad,Centrafricain__

IMAGE I. D. Path 200, 199; Row 53, 54

Area description (collateral data)
Veg. Woodland, Savannas & Steppe - undifferentiated relatively dry types;
    north; abundant Isoberlinia doka & I. dalzielii in south. (Keay & Aubre-
    ville, 1958).
Ag. Traditional subsistance & commercial crops (Atlas of Africa, 1975); Non-
    Ag. Rough Grazing land with trees (World Atlas of Agriculture (1978);
    Possible cotton (CIA).
Soils No data   Some river flooding indicated by ONC charts

Area description (consultant)
    Getting into peanut, cotton growing area; See Atlas of Chad.

Area description (Landsat analysis)
    Mostly medium gray tonal signature indicative of grass vegetation scattered
    dark tonal signatures indicative of burns & a few light tonal signatures
    indicative of cleared land for farming.

Final classification
    Wooded savanna
    Peanuts, cotton
    31 - 60% of area has been cleared for cultivation at the time of Landsat
    overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____92_____ SIZE __29,004__ Sq. km.

LOCATION __Eastern section of study area; North Central Africa__

IMAGE I. D. Path 198, 197; Row 53, 54

Area description (collateral data)
Veg. Woodland, Savanna & Steppe (Northern Areas: with abundant Isoberlinia
    doka & I. dalzielii (Keay & Aubreville, 1958).
Ag. Millet in north, millet & manioc in south, some cotton around
    in south (Atlas of Africa, 1973). Non-agriculture & Rough grazing & trees
    (World Atlas of Agriculture, 1976).
Soils No data

Area description (consultant)
    Not familiar with area.
    Wooded savanna

Area description (Landsat analysis)
    Moderate density dendritic drainage network (some major streams)-medium
    gray tonal signatures along streams may indicate marsh vegetation. Light
    gray signature (cleared land for farming) & dark tonal signature

Final classification
    Wooded savanna
    Millet, cassava
    0 - 30% of area has been cleared for cultivation at the time of Landsat
    overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 93 _____ SIZE _12,027_ Sq. km.

LOCATION _Eastern section of study area; southwest of Sudan_

IMAGE I. D. _Path 197; Row 54_

Area description (collateral data)

Veg._ Northern areas of Woodlands, Savanna & Steppe with abundant Isoberlinia
    doka & I. dalzielii (Keay & Aubreville, 1958).
Ag._ Millet (Atlas of Africa, 1973).
Soils _No data_

Area description (consultant)
    Maybe burns

Area description (Landsat analysis)
    Sparce to moderate density drainage of dendritic variety. Gray to light
    Gray tonal signatures indicative of grass; very few light tonal signatures
    indicative of cleared land for farming.

Final classification
    Wooded savanna
    Millet
    0 - 30% of area has been cleared for cultivation at the time of Landsat
    overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 94 _____ SIZE _6,292_ Sq. km.

LOCATION _Eastern section of study area; south of Sudan_

IMAGE I. D. _Path 196, 195   Row 54, 55_

Area description (collateral data)
    _Veg. - northern areas of Woodland, savannas and steppes with
    abundant Isoberlinia doka and I. dalziellii; southern section-
    Woodlands, savannas and steppes- undifferentiated relatively moist
    types (Keay and Aubreville, 1958);
    Ag. - Millet and manioc (World Atlas of Agriculture, 1976)._

Area description (consultant)

    May be burns

Area description (Landsat analysis)
    Very dark gray tonal signature of regular shape (virtually no
    infrared reflectance) suggests either rock outcrops   or burns.
    Medium density drainage of dendritic variety

Final classification

    Wooded savanna
    Millet and cassava are found at selected, relatively limited
        locations only
    0 - 30% of area had been cleared fro cultivation at the time
        of Landsat overpass

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____95_____ SIZE __7,079__ Sq. km.

LOCATION _Eastern portion of Gambie River south of Tambacounda and north-_
_____east of Kolda_____

IMAGE I. D. _Path 223 Row 52_____

Area description (collateral data)
    Woodlands savannas and steppes; northern area with abundant Isober-
____linia doka and I. Palzielli (Keay & Aubreville, 1958). Tall grass
____savanna brush and cultivated vegetation; some marsh/swamp and deciduous
____forest and scrub (CIA Map of Gambia and Senegal, 1972). Peanut and rice
____area with some cotton (Atlas of Africa, 1971 and CIA Map of Gambia and
____Senegal, 1972). Mineral hydromorphic soils with pseudo gley along
____river; slightly desaturated ferralitic soils; immature soils non-clima-
____tic origin; and concretionary leached gray ferruganious soils (Inter-
Area description (consultant) West Africa, 1971).

_____Wooded savanna; diversified farming - corn, manioc, fruit trees, some
____rice area; Terminalia, Parkia;_____

Area description (Landsat analysis)
    Landsat shows this to be an intensively cropped area. Bright highly-
____reflective signatures adjacent to stream _____ probably cultivated rice.
____Farther away from the channel cropped areas probably intensive peanut
____and cotton farming. More than 90% of the polygon is cropped.

Final classification
   Wooded savanna
   Maize, cassawa, rice
   Greater than 60% of area has been cleared for cultivation at the time of Land-
   sat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____96_____ SIZE __1500__ Sq. km.

LOCATION _Along Gambie River east of Gambul_____

IMAGE I. D. __Path 225 Row 52_____

Area description (collateral data)
    Marsh or swamp (CIA Map of Gambia & Senegal 1972)
    only near coast, Halomorphic soils - acidified salt soils and with incrusta-
    tions (International Atlas of West Africa, 1971)

Area description (consultant)
    More rainfall here. Almost tropical rainforest; Oil palm grows in tropical
    clay soils. Oil palm in the Gambie River Valley. High population pressures.
    Remnant of tropical vegetation. Label - Nat. veg. - rigarian trop. forest
    belts along water courses; land use - heavily farmed for root crops - not
    much rice.

Area description (Landsat analysis)
    Band 5 - dark (black) tonal signature adjacent to Gambie River and trib-
    utaries. Characteristic marsh signature.

Final classification
   Woodland
   Manioc, Maize, Sorghum, Penauts, Oil Palm
   Greater than 60% of the area has been cleared for cultivation at the time of
   Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____97_____ SIZE __623__ Sq. km.

LOCATION __25-50 km. southeast of Banjul__

IMAGE I. D. __Path 225 Row 52__

Area description (collateral data)

Deciduous forest brush and cultivated vegetation area
(CIA Map of Gambia/Senegal, 1972)

Uncultivated area (Atlas of Africa, 1973)
Reworked ferallitic soils (Int. Atlas of West Africa, 1971)

Area description (consultant)

Not familiar with this area. Maybe secondary tropical forest

Area description (Landsat analysis)

Landsat band 5 - smooth gray tonal area-no indication of agricultural activity.
Likely a forested/brush area.

Final classification
Woodland
No Crops
0 - 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____98_____ SIZE __25,562__ Sq. km.

LOCATION __Several of these occur in Senegal, Gambia and Guine Bissau__

IMAGE I. D. __Paths 224 & 225 Row 52 & 53__

Area description (collateral data)

These Landsat-delineated polygons transect a Forest-Savana Mosaic and
Woodlands, Savannas and Steppes Region(Keay and Aubreville, 1958); Peanuts
and millets are the dominant crops in the region where the polygons are
located (Atlas of Africa, 1973). Soils are leached gray, ferruginous-
modal concretionary or indurated (International Atlas of West Africa, 1971).

Area description (consultant)

Less land pressure More natural vegetation - tropical forest - heavy timber-
large trees - slash & burn shifting ag.--- upland rice - monkey country;
Oil palm

Area description (Landsat analysis)

Landsat band 5 shows dark gray areas with smooth texture. Minimal indica-
tion of agricultural activity. Areas appear to be dominantly forest with
less than 10% of the areas in agriculture.

Final classification
Woodland
Rice, Oil Palm
0 - 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____99_____ SIZE __43,325__ Sq. km.

LOCATION _Large area in Guinea Bissau and Guinea north and east of Boke_

IMAGE I. D. _Path 222, 223 Row 53_

Area description (collateral data)

   Deciduous forest, brush and cultivated vegetation; lowland evergreen forests
(CIA Map of Guinea, 1973); Forest-savanna mosaic; Woodlands, savannas and
steppes-undifferentiated relatively moist types (Keay and Aubreville, 1958);
Pineapples, Kola nuts, oil palm, peanuts (Atlas of Africa, 1973); Fruit
trees (World Atlas of Agriculture, 1976); Oil palm, coffee, banana (CIA
Map of Guinea, 1973); Raw-mineral erosion soils over various rocks (Inter-
national Atlas of W. Africa, 1971).

Area description (consultant)

   Not familiar with area (Fred Weber, 1978)

Area description (Landsat analysis)

   Medium gray tonal signature on band 5. Dense dendritic drainage network
with forest above stream channels; No outstanding evidence of agricultural
activity.

Final classification

   Woodland
   Coffee, oil palm, peanuts, fruit trees
   31 - 60% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____100_____ SIZE __183,558__ Sq. km.

LOCATION ___From approximately Kolda in the west, northeastward to Kayes,
and· eastward to Banamba.

IMAGE I. D. _Path 218 to 224; Rows 51 to 53._

Area description (collateral data)

   Woodlands, savannas and steppes - undifferentiated relatively dry types
in the north -- with abundant Isoberlinia doka and I. Dalzielli (Keay and
Aubreville, 1958). Tallgrass savanna in southern part and Acacia savanna
in northern portions (CIA Maps of Senegal and Gambia, 1970). Subsistence
agriculure (millet and sorghum) with peanuts and cotton (Atlas of Africa, 1973).
Peanuts (CIA Maps listed above). Principal soils are immature soils of non-
climatic origin over gravelly material and leached gray ferrugenous soil
(concretionary) (International Atlas of West Africa, 1971).

Area description (consultant)

   Woodland - Isoberlinia doka; Kapok; Silk cotton tree; Some slash and burn
agriculture; Staples - maize, root crops, cotton, tobacco, rice in lowlands,
fruit trees, mangos, papaya.

Area description (Landsat analysis)

   A medium gray tonal signature is characteristic of the Landsat imagery of
this area. Indicative of relatively dry vegetation types. Area is under
moderate agricultural activity. Drainage density is also moderate with major
rivers characteristic of low slope flow, i.e. meandering for the most part
with minimal structural control. Occasional dark splotches may indicate
sites of burns. Most intensive cropping occurs around villages and is of
the subsistence variety.

Final classification

   Woodland
   Maize, cotton, tobacco, rice and other root crops
   31 - 60% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 101 _____ SIZE __5,244__ Sq. km.

LOCATION Around Friguiagoe, Guinea

IMAGE I. D. Path 222 Row 53-54

Area description (collateral data)

Wooded, open savanna woodland bush (Area Handbook for Guinea, 1973);Savanna & lowland
evergreen forest (CIA Map of Guinea, 1973); Forest savanna mosaic (Keay &
Aubreville, 1958); Savanna, oil palm, pineapple, citrus fruits (CIA Map of
Guinea, 1973; Atlas of Africa, 1973). Yellow strongly desaturated ferra-
litic soils (International Atlas of W. Africa, 1971).

Area description (consultant)

Not familiar with area (Fred Weber, 1978).

Area description (Landsat analysis)

Smooth dark gray tonal signature on Landsat band 5; The Foutadjalon slopes
to the coastal plain. Fruit cultivation occurs at the higher coastal
elevations. No evidence of cultivation is seen on the image.

Final classification
Woodland

Oil palm, fruit trees

30 - 60% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 102 _____ SIZE __4,162__ Sq. km.

LOCATION Northeast and southeast of Frea, Guinea

IMAGE I. D. Path 222; Row 53-54

Area description (collateral data)

Lowland evergreen forest; deciduous forest, brush and culitvated vegetation
(CIA Map of Guinea, 1973); Forest-Savanna mosaic (southern part); Woodlands,
savannas and steppes - undifferentiated relatively moist types (Keay &
Aubreville, 1958); Bananas, coffee, pineapples, citrus fruits, oil palm
(CIA Map of Guinea, 1973); Raw mineral soils of non-climatic origin over
various rocks and ferruginous crusts (International Atlas of W. Africa,
1971).

Area description (consultant)

Woodland (Fred Weber, August 21, 1978).

Area description (Landsat analysis)

The dark gray to black signature on Landsat band 5 indicates a forested
area. Agricultural activity is not detectable, yet collateral data indi-
cates this to be a fruit producing area. Dense fruit and coffee trees
would image as a natural forest area.

Final classification
Woodland

Oil palm, fruit trees, plantains, coffee

31 - 60% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____103_____ SIZE __13,240__ Sq. km.

LOCATION _South of Kedougou; Centered on Lake Guinea_____

IMAGE I. D. _Path 221 & 222 Row 54 & 53_____

Area description (collateral data)

Woodlands savannas and steppes - undifferentiated relatively moist types
(Keay & Aubreville, 1958); Montane communities - undifferentated (Keay
& Aubreville, 1958); Decidious forest, brush and cultivated vegetation;
(CIA Map of Giunea, 1973); Coffee (Atlas of Africa, 1973); Peanuts (CIA
Map of Guinea, 1973); Subsistence agriculture (Millet and sorghum with
peanuts and cotton) (Atlas of Africa, 1973). Raw mineral erosion soils over
Various rocks or ferruginous crusts (International Atlas of W. Africa, 1971).
The Fouta Djllon highland mass - complex of elevated relatively level
plateaus; agriculture is difficult; coffee cultivation near Lobe (Area
Area description (consultant) Handbook for Guinea, 1975).

Not familiar with area (Fred Weber, August 21, 1978).

Area description (Landsat analysis)

Landsat band 5 shows an area of rugged terrain in the vicinity of Labe.
This is an area of hills and plateaus. Agriculture on the hills and pla-
teaus is sparse as indicated by a medium-gray tonal signature. Lighter
gray tones in the valleys indicate more intensive agricultural production
in these areas.

Final classification
Woodland
Peanuts, coffee at selected relatively limited locations only, Millet, sor-
ghum.
31 - 60% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____104_____ SIZE __8,193__ Sq. km.

LOCATION _Area surrounding Labe, Guinea_____.

IMAGE I. D. _Path 221-222; Row 52-53_____

Area description (collateral data)

Upland evergreen forest, grassland, and cultivated vegetation (CIA Map of
Guinea, 1973); Montane communities undifferentiated and woodlands, savannas
and steppes - undifferentiated relatively moist types (Keay & Aubreville,
1958); Coffee and peanuts (CIA Map of Guinea, 1973); Subsistence agricul-
ture (Atlas of Africa, 1973); Raw mineral soils of non-climatic origin
over various rocks and ferruginous crust, (International Atlas of W. Africa,
1971). The Fouta Djallon Plateau and adjacent Plains (Area Handbook for
Guinea, 1975).

Area description (consultant)

Not familiar with area. Relatively heavy agricultural use.

Area description (Landsat analysis)

Landsat band 5 indicates that much of the area has been cleared for
agriculture. Area around Labe appears to be a hilly region, probably
suitable for coffee cultivation.

Final classification
Woodland
coffee, peanuts, maize, sorghum
Greater than 60% of area has been cleared for cultivation at the time of
Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 105 _____ SIZE _ 59,908 _____ Sq. km.

LOCATION Near headwaters of Gambie River;east past Dinguiraye and Siguiri
         then north to Bamako
IMAGE I. D. Path 219, 220, 221, 222; Row 51, 52, 53

Area description (collateral data)
  Upland evergreen forest, grassland and cultivated vegetation in the eastern
  portion; (CIA Map of Guinèa, 1973); Woodlands savannas and Steppes - north-
  ern areas with abundant Isoberlinia Doka and I. Dalzielii (Keay & Aubreville,
  1971); tallgrass savanna brush and cultivated vegetation (CIA Map of
  Guinia 1973). Subsistence agriculture (millet and sorghum) with peanuts
  and cotton (Atlas of Africa, 1973); Peanuts (CIA Map of Guinia 1973).
  Rice along Milo and Niger Rivers (CIA Map of Guinea, 1973); Lowland ever-
  green forest also along these rivers (CIA Map of Guinea, 1973). Raw mineral
Area description (consultant) erosion soils over various rocks or ferruginous crusts
                              (International Atlas of W. Africa, 1971). Swamp rice,

                  dryland rice, other dryland food grains, stockraising,
                  cotton (Area Handbook for Guinea, 1975).

  Not familiar with area (Fred Weber, August 21, 1978).

Area description (Landsat analysis)
  Medium gray tonal signature on Landsat band 5. Area does not appear to be
  intensively cultivated except along stream valleys. Smooth signature sug-
  gests more of a grassland type situation. In western portion of polygon
  dark mottled tone in western part are hills with trees.

Final classification
  Woodland
  Millet, sorghum, peanuts, cotton, rice
  0 - 30% of area has been cleared for cultivation at the time of Landsat
  overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 106 _____ SIZE _ 1,868 _____ Sq. km.

LOCATION South of Siguiri along Milo and Niandan Rivers

IMAGE I. D. Path 219-220; Row 52-53

Area description (collateral data)
  Lowland, evergreen forest (CIA Map of Guinea, 1-73); Woodlands, savanna
  and steppes - northern areas with abundant Isoberlinia doka and I. Dalzielii
  (Keay & Aubreville, 1958); Rice (Atlas of Africa, 1973); Mineral hydro-
  morphic soils with pseudo-gley (International Atlas of W. Africa, 1971).

Area description (consultant)
  Not familiar with area

Area description (Landsat analysis)
  A bright gray to white tonal signature show the Milo and Niandan Rivers
  is indicative of rice cultivation.

Final classification
  Woodland
  Rice
  31 - 60% of area has been cleared for cultivation at the time of Landsat
  overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____107_____ SIZE __25,005__ Sq. km.

LOCATION _In Bamako area and south toward Bougounis_

IMAGE I. D. _Path 219, Row 51, 52, 53_

Area description (collateral data)

Woodlands, savannas and steppes (Northern area with abundant Isoberlinia
Doka and A. Dalziellii(Keay & Aubreville, 1958); Tallgrass savanna, brush
and cultivated vegetation (CIA Maps of Guinea and Mali, 1973 and 1970
respectively). Subsistence agriculture (Millet and Sorghum) with peanuts
and cotton (Atlas of Africa, 1973); Peanuts near Bamako (Atlas of Africa,
1973; CIA Map of Mali, 1970); Arable land (millet, sorghum, manioc, corn,
and sweet potatoes)(CIA Map of Mali, 1970). Leached gray ferrugenous
soils (Concretionary) International Map of Mali; 1971).

Area description (consultant)

Not familiar with area (Fred Weber, August 21, 1978). Latertic plateaus
around Bamako. Relatively high unproductive with wooded savanna. Heavy
agriculture in river valley. Sorghum, corn, peanuts, monioc, canova.

Area description (Landsat analysis)

Dark to black tonal signature suggests a wooded area and lighter toned
signature intermixed with darker tones indicates clearing and cultivation.
Tree canopies line the stream banks in this area.

Final classification
Woodland
Rice at selected relatively limited locations only.
Millet, sorghum, maize, peanuts, cassava
31 - 60% of area has been cleared for cultivation at the time of Landsat
overpass.

AREA (POLYGON) NUMBER _____108_____ SIZE __214,495__ Sq. km.

LOCATION _Southwestern part of project area from Kindia Guinea in the west_
                 to Ferkessedougoa, Ivory Coast
IMAGE I. D. _Path 219 to 222, Row 54-55_

Area description (collateral data)

Forest-savanna mosaic (southern part); Woodlands, savannas and steppes-
undifferentiated relatively moist types; Woodland, savannas and steppes
(Atlas of Africa, 1973); Savanna Upland evergreen forest; grassland and
cultivated vegetation; Deciduous forest (CIA Maps of Guinea, Ivory Coast,
Sierra Leone (1973, 1972 1969 respectively); Western portion bananas, oil
palm; Middle portion - subsistence agriculture and rough grazing land;cof-
fee, and oil palm; Eastern portion - cotton, tobacco, peanuts, millet and
maize (Atlas of Africa, 1973). Coffee and oil palm near Beyl. (CIA Map of
Guinea, 1973); Raw mineral soils of non-climatic
origin; impoverished and leached
strongly desaturated feralitic soils

                 (International Atlas of W. Africa, 1971).

Area description (consultant)

Woodland - savanna mosaic; oil palm; coffee; cotton; slash-burn agriculture;
inland rice; natural vegetation becomes a nuisance (Fred Weber, August 21,
1978).

Area description (Landsat analysis)

Dark gray to black tonal signature indicative of dense vegetation within
a humid zone. Outliers of the southern forest are indicated with black
spotty signatures extending into the more moist savanna areas.

Final classification
Woodland
Oil palm, rice, coffee, cotton
31 - 60% of area has been cleared for cultivation as the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 109 _____ SIZE __ 2,458 __ Sq. km.

LOCATION Around and south of Kerouane along Milo, River

IMAGE I. D. Path 219; Row 53-54

Area description (collateral data)

Upland evergreen forest, grassland and cultivated vegetation (CIA Map of
Guinea, 1973); Woodlands, savannas and steppes - undifferentiated relatively
moist types (Keay & Aubreville, 1958); Oil palm, coffee, peanuts (Atlas of
Africa, 1973 and CIA Map of Guinea, 1973); Raw mineral soils of non-climatic
origin over various rocks (International Atlas of W. Africa, 1971).

Area description (consultant)

Not familiar with area

Area description (Landsat analysis)

The medium to dark gray tonal signature indicates the Simandou Mountains.
This is a lightly forested area with dominant crops being oil palm and
coffee.

Final classification
Woodland
Oil palm, coffee
31 - 60% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 110 _____ SIZE __ 2,523 __ Sq. km.

LOCATION Around Korhogo, Ivory Coast

IMAGE I. D. Path 217 Row 53

Area description (collateral data)

Woodlands, Savannas and Steppes - northern areas with abundant Isoberlinia
doka and I. dalzielii; Cotton area (Atlas of Africa, 1973); Cotton with pea-
nuts - millet and maize. Reworked slightly desaturated ferralitic soils
and impoverished yellow medium desaturated ferallitic soils (International
Atlas of W. Africa, 1971).

Area description (consultant)

Heavy agriculture. Corn, cotton, coffee, rice in lowland. Heavy cotton
and rice area. Woodland-natural vegetation. Great variety of tree species -
some commercial. Heavy grass cover with limited palatibility.

Area description (Landsat analysis)

Landsat band 5 shows the area around Korhogo to be cleared of natural
vegetation cover and under cultivation. Principal crops are most likely
cotton.

Final classification
Woodland
Maize, cotton, coffee, rice
Greater than 60% of area has been cleared for cultivation at the time of
Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___111___ SIZE _10,389_ Sq. km.

LOCATION _Surrounding and southwest of Bobo Dioulasso_

IMAGE I. D. _Path 216 Row 52 and 53_

Area description (collateral data)

Woodlands, savannas and steppes - northern areas with abundant Isoberlinia doka and I. dalzielii (Keay and Aubreville, 1958); Tallgrass savanna and brush (CIA Map of Mali, 1970); Cotton, Market gardening; peanuts (Atlas of Africa, 1973); Impoverished medium desaturated ferallitic soils (International Atlas of W. Africa, 1971);

Area description (consultant)

Heavy land use; rice, sugar cane, cotton, tobacco, cashew, citrus. Staple-tubers - manioc, cassava, maize, sorghum. Limited grazing. Commercial plantational - service wood (teak, eucalyptus), firewood.

Area description (Landsat analysis)

The light tonal Landsat band 5 signature indicates an area under intensive cultivation in the Bobo Dijoulasso region. Principal drainage is outward from the area along the Kou, Volta Noire; Bougouriba and Komoe Rivers. 80 - 90% of the area is under cultivation.

Final classification
Woodland
Rice; sugar cane at selected relatively limited locations only; fruit trees, tobacco, coffee.
Greater than 60% of area has been cleared for cultivation at the time of Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___112___ SIZE _403,133_ Sq. km.

LOCATION _Southern part of project area from Korhogo, Ivory Coast in the west to just east of Lafia, Nigeria_

IMAGE I. D. _Path 208 to 217; Rows 53 to 56._

Area description (collateral data)

Woodlands, Savannas and Steppes - undifferentiated, relatively moist types (Keay and Aubreville, 1958); Deciduous forest, brush and cultivated vege-tation (CIA Maps of Ivory Coast, Upper Volta, Benin, Togo and Nigeria, 1972, 1968, 1970, 1970, 1972 respectively). Crops - peanuts, millet, maize, beans, and predominantly subsistence millet, manioc, maize and rice (Atlas of Africa, 1973). Sesame seed occurs around Lafia (CIA Map of Nigeria, 1972).

Area description (consultant)
Woodland Savanna. Staple crops - more cereal crops like maize than root crops. A little more than 50% of area is under cultivation. Some livestock grazing occurs during the drought season.

Area description (Landsat analysis)
Dark tonal Landsat signature indicative of a fairly dense natural vegetation cover with scattered agricutural activity. Most intensive agriculture is surrounding towns and villages.

Final classification
Woodland
Maize, sorghum
31-60% of area has been cleared for cultivation at the time of Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____113_____ SIZE ___9,930___ Sq. km.

LOCATION __In Togo and Benin from about Anie Mano in the south to about__
Sanjanna Mango in the north, Atacora Mountain region
IMAGE I. D. _Path 212, Row 52, 53, 54_____

Area description (collateral data)

__Woodlands, savannas and steppes (northern areas with abundant Isoberlinia__
__doka and I. Dalzielii (Keay & Aubreville, 1958). Tallgrass savanna, brush__
__and cultivated vegetation (CIA Map of Benin, 1970); Low yield subsistence__
__crops (millet, manioc, yams, with peanuts and cotton; Coffee, manioc,__
__maize and yams in southern part (Atlas of Africa, 1973); Cocoa and cotton__
__southern part (CIA Map of Benin, 1970). Raw mineral erosion soils over__
__various rocks and leached gray ferrugenous soils (International Atlas of__
W. Africa, 1971).

Area description (consultant)

Woodland originally; heavy land pressure, peanuts, sorghum, maize, some
fruit trees; some rice. No livestock; Heavy pacellated land use; No
coffee here!

Area description (Landsat analysis)

The light to medium gray Landsat band 5 and forested areas tonal signature
suggests clearing of wooded savannas for agricultural purposes. The area
is relatively intensively cultivated - 60-70% of the area.

Final classification
Woodland
Peanuts, sorghum, maize, fruit trees, rice
Greater than 60% of area has been cleared for cultivation at the time
of Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____114_____ SIZE __13,928__ Sq. km.

LOCATION __Central section of sutdy area; S.W. Nigeria_____

IMAGE I. D. _Path 209,210 Row 53-54_____

Area description (collateral data)

Veg. _Woodland, Savanna & Steppes northern areas with abundant Isoberlinia doka_
__& I. dalzielii; WSS - undifferentiated relatively dry types (Keay & Aubreville__
__1958) Tall grass Savanna (CIA)__
Ag. _predominantly subsistence (Atlas of Agriculture 1973) Non-agriculture_
__& Rough Grazing Land with trees (World Atlas of Agriculture, 1975)__
Soils _humiferous strongly desaturated ferallitic soils; impoverished slightly_
__desaturated ferallitic soils (International Atlas of West Africa, 1971)__

Area description (consultant)

May be like 50A only denser vegetation.
Maybe slash & burn - sorghum, maize, cassava, etc.
Woodland

Area description (Landsat analysis)

Moderate density drainage of the dendritic variety. Mostly medium dark
tonal signature indicative of natural vegetation that is more dense than
the surrounding area. Some lighter tonal signatures near some of the
drainage network could indicate farming.

Final classification
Woodland
Sorghum, maize, cassava
0 - 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___115___ SIZE __7,702__ Sq. km.

LOCATION _South central section of study area; southern Nigeria, Bida_

IMAGE I. D. _Path 208, 209; Row 53, 54_

Area description (collateral data)

Veg. Woodland Savanna & Steppe - undifferentiated relatively moist types
(Keay & Aubreville, 1958); Tallgrass savanna (CIA)

Ag. Predominantly subsistence; Rice; Forest (Atlas of Africa, 1973); Non-
agriculture & Rought Grazing Land with Trees (World Atlas of Agriculture.
1976).

Soils Impoverished medium desaturated ferallitic soils; mineral hydromorphic
soils with pseudo-gley - modal facies (International Atlas of W. Africa, 1971).

Area description (consultant)

Not familiar with area

Woodland

Area description (Landsat analysis)

Moderate density drainage network of dendritic variety indicative of
slight relief. Mixed areas of light gray tonal signature indicative of
farming and medium gray tonal signature indicative of grass. Narrow band
of very light tonal signature along Kaduna River indicative of intensive
farming and/or sand dunes.

Final classification

Woodland

Millet, cassava, maize, rice

31 - 60% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___116___ SIZE __15,239__ Sq. km.

LOCATION __South central section of study area; portion of Niger-Benue River_

IMAGE I. D. __Path 206,207,208,209 Row 54-55__

Area description (collateral data)

Veg. Woodland, Savanna & Steppe - Undifferentiated relatively moist types;
Forest - Savanna Mosaic (Keay & Aubreville 1958) Tallgrass savanna (CIA)

Ag. Rice; Forest (Atlas of Africa 1973) Non-agriculture & Rough Grazing Land
with trees (World Atlas of Africa 1976) Sesame Seed (CIA)

Soils mineral hydromorphic soils with gley over the whole (International Atlas
of West Africa 1971)

Area description (consultant)

Not familiar with area

Area description (Landsat analysis)

Portion of Niger-Benue system. Narrow band of very light tonal signatures
indicative of intensive farming along river. Along the river are medium
gray tonal signature indicative of either grass or possible rice and dark
gray tonal signatures indicative of forest

Final classification

Woodland

Rice

31 - 60% of area has been cleared for cultivation at the time of Landsat
overpass..

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____117_____ SIZE __1,770__ Sq. km.

LOCATION Center of study area; central Nigeria _____

IMAGE I. D. __Path 208; Row 53_____

Area description (collateral data)
Veg. Woodland, Savanna & Steppe; northern areas with abundant Isoberlinia
   doka and I. dalzielii; Woodland, Savanna, & Steppe - undifferentiated
   relatively moist types (Keay & Aubreville, 1958); Tallgrass savanna (CIA)
Ag. Tobacco; Predominantly subsistence (Atlas of Africa, 1973); Non-agricul-
   ture & Rough Grazing Land with trees (World Atlas of Agriculture, 1976).
Soils- Raw mineral erosion soils of non-climatic origin over various rocks
   (International Atlas of W. Africa, 1971).

Area description (consultant)
   Same as 159; Hilly area _____

_____
_____
_____
_____
_____

Area description (Landsat analysis)
   Moderate density drainage of dendritic variety. Area of considerable
   relief. Mostly dark gray tonal signatures indicative of forest vegetation.
   Some medium gray tonal signatures indicative of grass vegetation.

_____
_____
_____

Final classification
   Woodland _____
   Millet, cassava, maize, irrigated rice _____
   0 - 30% of area has been cleared for cultivation at the time of Landsat
   overpass. _____

_____
_____
_____

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____118_____ SIZE __18,090__ Sq. km.

LOCATION Center of study area; central Nigeria _____

IMAGE I. D. __Path 207, 208; Row 53_____

Area description (collateral data)
Veg. Woodland, Savanna & Steppe - northern areas - with abundant Isoberlinia
   doka & I. dalzielii; Woodland, Savanna & Steppe - undifferentiated relatively
   moist types (Keay & Aubreville, 1958); Tallgrass savanna (CIA.)
Ag. Predominantly subsistence; Tobacco; Forest; Cotton (Atlas of Africa, 1973);
   Non-agriculture & Rough Grazing Land with Trees (World Atlas of Agricul-
   ture, 1976); Cotton (CIA).
Soil impoverished slightly desaturated ferralitic soils; concretionary leached
   gray ferruginous soils (International Atlas of W. Africa, 1971).
Area description (consultant)
   Woodland; Slash and burn; Little agriculture _____

_____
_____
_____
_____
_____

Area description (Landsat analysis)
   Low density drainage. Some relief features. Mostly medium gray tonal
   signatures indicative of grass and dark gray tonal signatures indicative of
   forest vegetation. Some areas of light gray tonal signatures indicative
   of farming.

_____
_____
_____

Final classification
   Woodland _____
   Millet, cassava, maize, irrigated rice _____
   0 - 30% of area has been cleared for cultivation at the time of Landsat
   overpass. _____

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_____

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 119 _____ SIZE _ 11,765 _____ Sq. km.

LOCATION __Central section of study area; S.E. Nigeria_____

IMAGE I. D. _Paths 205, 206; Row 53, 54_____

Area description (collateral data)

Veg._ Woodland, Savanna & Steppes - undifferentiated relatively dry types;_
  Woodland, Savanna & Steppes - with abundant Isoberlinia doka & I. dal-
  zielii; Woodland, Savanna & Steppes - undifferentiated relatively moist
  types (Keay & Aubreville, 1958) sudan savanna; tallgrass savanna (CIA
  Maps).
Ag._ subsistence crops with commercial .; predominantly subsistence; cotton_
  (Atlas of Africa, 1973). Non-agriculture & Rough Grazing Land with trees
  (World Atlas of Agriculture, 1976).

Area description (consultant)

Soils_ Raw mineral erosion soils (lithosols) of non climatic origin over various_
  rocks; lithomorphic vertisals over clay alluvium; little leached gray
  ferruginous soils - modal facies over eolian sands; hydromorphic leached
  gray ferruginous soils (International Atlas of W. Africa, 1971).

  Not familiar with area
  Woodlands

Area description (Landsat analysis)

  Little drainage detected. Some scattered relief features in north. Much
  medium gray tonal signatures indicative of grass. Some light gray tonal
  signatures indicative of farming. A number of dark tonal signatures in
  south indicative of burns.

Final classification
  Woodland
  Cotton, millet, cassava, maize, rice
  31 - 60% of area has been cleared for cultivation at the time of Landsat
  overpass.

AREA (POLYGON) NUMBER _____ 120 _____ SIZE ___ 3,474 ____ Sq. km.

LOCATION __Eastern central section of study area; upper Benine River in Nigeria_

IMAGE I. D. _Path 203, 204, 205; Row 53, 54_____

Area description (collateral data)

Veg._ Woodland, Savanna & Steppe - undifferentiated relatively dry types (Keay_
  & Aubreville, 1958). Sudan Steppe (CIA Map)
Ag._ Forest (Atlas of Africa, 1973); Non-agriculture & Rough Grazing Land with_
  Trees (World Atlas of Agriculture, 1976).
Soils_ Mineral hydromorphic soils pseudo-gley & with spots and concretions (modal_
  facies); (International Atlas of W. Africa, 1971).

Area description (consultant)

  Not familiar with area.

Area description (Landsat analysis)

  Portion of Benue River Valley system (major River). Narrow band of light
  tonal signatures along river indicative of intensive farming. Some dark
  tonal signatures adjacent indicative of burns. Rest of unit is medium gray
  tonal signatures indicative of grass; & dark gray tonal signatures indica-
  tive of forest or moist soils, as indicated on ONC charts.

Final classification
  Woodland
  Rice, millet
  31 to 60% of area cleared for cultivation at the time of Landsat
  overpass

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 121 _____ SIZE _ 9,832 _____ Sq. km.

LOCATION Northern east central section of study area; N.E. Nigeria, Komaduguo
        River.
IMAGE I.D. Path 204,205, 206; Row 50, 51, 52

Area description (collateral data)
Veg. Woodland, Savannas, & Steppe - undifferentiated relatively dry types;

   Woodland, Savannas, & Steppe with abundant acacia & Commiphora (Keay &
   Aubreville, 1958). Sudan savanna (CIA Map)
Ag. Non-agriculture & Rough Grazing Land; Non ag. & RGL with trees (World Atlas
   of Agriculture, 1976). Multicrop subsistence & sedentary livestock also
   peanuts (Atlas of Africa, 1973); Rice (CIA Map)
Soils Little leached gray ferruginous soils - hydromorphic facies over sandy
   materials; mineral hydromorphic soils with pseudo gley-modal facies (Inter-
Area description (consultant) national Atlas of W. Africa, 1971).

   Remnant natural vegetation cover - dense - numerous large tree species
   which are found much farther southeast. Influence of central Africa species.
   Much local irrigation - tomatoe, onion, rice and wheat; local vegetable areas.
   Lower half of the river system only (toward Lake Chad). No peanuts.

Area description (Landsat analysis)
   Major interior drainage system - dark tonal signature indicative of possible
   trees & wet soil and or standing water. In southern portion some light gray
   tonal signatures of linear shape indicative of sand dunes. Some medium
   gray tonal signatures indicative of grass.

Final classification
   Woodland
   Sorghum,   rice, fruit trees, irrigated wheat
   31 - 60% of area has been cleared for cultivation at the time of Landsat
   overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 122 _____ SIZE __ 42,670 _____ Sq. km.

LOCATION S. Central section of study area; S. Nigeria, Abaka Kaliki
IMAGE I.D. Path 205, 206, 207; Row 54, 55

Area description (collateral data)
Veg. Woodland, Savanna & Steppe - undifferentiated, relatively moist types;

   Forest - savanna mosaic; (Keay & Aubreville, 1958); Tallgrass savanna
   (CIA)
Ag. Forest; Rough Grazing Land; Non-agriculture & Rough Grazing Land with
   trees (World Atlas of Agriculture, 1976); Bananas, Millet & fruit trees
   (World Atlas of Agriculture, 1976); Manioc; Oil Palm; Forest (Atlas of
   Africa, 1973).
Soils. Humiferous strongly desaturated ferallitic soils leached & unleached
Area description (consultant) types; penevolved medium desaturated ferralitic soils
                        (International Atlas of W. Africa, 1971).

   Woodlands and forest mosiac
   Der ived savanna - or Mosaic
   Woodland - trees and grasses

Area description (Landsat analysis)
   Adjacent to Benue River, no relief features detected. Mostly light
   gray tonal signatures indicative of farming. Cloud cover in southern
   section of map unit.

Final classification
   Woodland
   Rice, oil palm, sesame seed
   31 - 60% of area has been cleared for cultivation at the time of Landsat
   overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 123 _____ SIZE __6,260__ Sq. km.

LOCATION _S. Central Section of study area; S.E. Nigeria_____

IMAGE I. D. _Path 205; Row 55_____

Area description (collateral data)

Veg. Woodland, Savanna & Steppe - undifferentiated relatively moist types
　　Woodland, Savanna & Steppe - with abundant Isoberlinia doka & I. dalzielii
　　(Keay & Aubreville, 1958). Tall grass savanna (CIA Maps)
Ag. Forest; Rice (Atlas of Africa, 1973); Non-agriculture & Rough Grazing
　　Land with Trees (World Atlas of Agriculture, 1976); Rice (CIA Maps).
Soils Mineral hydromorphic soils with pseudo-gley - modal facies (International
　　Atlas of W. Africa, 1971).

Area description (consultant)
　　Cameroun Mountains
　　Woodlands

Area description (Landsat analysis)
　　Major river system (Benue, the major tributary of the Niger). Band of
　　light tonal signature along river indicative of intensive farming or
　　riverine sand bars. Rest of map unit is medium to dark gray tonal sig-
　　natures indicative of grass and trees and/or forest.

Final classification
　　Woodland
　　Coffee at selected relatively limited locations only; root crops
　　0 - 30% of area has been cleared for cultivation at the time of Landsat
　　overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ___124___ SIZE __16,484__ Sq. km.

LOCATION _South central section of study area; S.E. Nigeria_____

IMAGE I. D. _Path 205; Row 54_____

Area description (collateral data)

Veg. Woodland, Savanna & Steppe - undifferentiated relatively moist types
　　Woodland, Savanna & Steppe - with abundant Isoberlinia doka & I. dalzielii
　　(Keay & Aubreville, 1958). Tallgrass savanna (CIA Maps)
Ag. Predominantly subsistence (Atlas of Africa, 1973) Non-agriculture & Rough
　　Grazing Land with Trees (World Atlas of Agriculture, 1976)
Soils Concretionary, leached gray ferruginous soils; mineral hydromorphic soils
　　pseudo-glei - modal facies (International Atlas of W. Africa, 1971).

Area description (consultant)
　　Not familiar with area
　　Woodlands

Area description (Landsat analysis)
　　Narrow band of light tonal signatures along major tributary indicative
　　of intensive farming. Mostly medium gray tonal signatures indicative of
　　grass. Few light tonal signatures indicative of farming. A few small
　　dark tonal signatures indicative of burns. Medium to darker gray tonal
　　signatures indicative of trees in south. South of map unit are mountains.

Final classification
　　Woodland
　　Millet, cassava, maize, rice
　　0 - 30% of area has been cleared for cultivation at the time of Landsat
　　overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 125 _____ SIZE _ 28,971 _ Sq. km.

LOCATION _East central section of sudy area; Nigeria & Cameroun_

IMAGE I. D. _Path 205, 204, 203; Row 54, 55_

Area description (collateral data)

Veg. N. & E. - Woodland Savanna & Steppe - undifferentiated relatively moist type;

W. - Forest savanna mosaic; rest is montaine communities undifferentiated
(Keay & Aubreville, 1958). Savanna & Tall Grass Savanna; some scrub,
grassland, & crops and Montane vegetation (CIA Map).

Ag. Subsistance & commercial (Atlas of Africa, 1973). Non agriculture & Rough
Grazing with Trees in north; South - Rough Grazing Land (World Atlas of

Soils ~~Agriculture, 1976).~~ ~~Strongly desaturated ferallitic soils, some leached also; raw mineral~~
soils (International Atlas of West Africa, 1971).

Area description (consultant)

Mountainous grassland area. All grazing.

Area description (Landsat analysis)

Little drainage network other than Taraba River; Most of this map unit is
occupied by the Adamoua Plateau (1000 - 2000 Feet), minor mountain ranges
within this area. Mostly medium gray tonal signatures indicate grass;
a few dark tonal signatures indicate forest vegetation.

Final classification
Woodland
No crops
0 - 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 126 _____ SIZE _ 172,415 _ Sq. km.

LOCATION _ Southern portion of east central portion of study area; north of
Congo; Contains cities of Lai, Moundou, Doba, Bossangoa, Mbaikai, & Bangui_
IMAGE I. D. _Path 204, 203, 202, 200, 199; Row 54, 55, 56, 57_

Area description (collateral data)

Veg. North to south; Woodlands, Savannas, & Steppe, undifferentiated relatively
dry types; Northern area of W.S.S. - with abundant Isoberlinia doka & I.
dalzielii; WSS undifferentiated relatively moist types; Forest Savanna
mosaic (Keay & Aubreville, 1958); East - non agriculture & Rough Grazing
Land with Trees; some forest in south; rough grazing land & scattered forest
in west (World Atlas of Agriculture, 1976). Mostly millet & manioc with
peanuts along N'Gui & M'Poko Rivers, scattered cotton area in east, & some
coffee & fruit trees near Bangui (Atlas of Africa, 1973). Savanna North
Cameroun, Mised broadleaf deciduous & Evergreen forest-South Cameroun, small
Area description (consultant) marsh or swamp in central Cameroun under vegetation
(CIA Maps).

Soils Strongly desaturated ferallitic soils - yellow & reworked strongly desatu-
rated ferallitic soils - modal & yellow; some raw mineral erosion soils
(International Atlas of W. Africa, 1971).......
Staple crops - millet & sorghum & grass savanna; Cameroon portion;

Collateral data is poor. Mr. Guigonis with the French Tropical Forest Re-
search Service (CTFT) knows the area well. He is in Paris. Plateau high-
land in Cameroon - good volcanic soils by highland grazing. Natural veg.-
tall grassland, scattered short trees. Some subsistence millet & sorghum.
Area description (Landsat analysis)

Medium density drainage of dendritic variety. Mostly medium gray tonal
signatures indicative of grass; scattered small areas of darker gray tonal
signatures indicative of forest vegetation. No coverage for Banjui frame;
Cloud cover over 199-55 in center of map unit.

Final classification
Woodland
Millet, sorghum, irrigated rice, cotton, tobacco, root crops
Greater than 60% of area has been cleared for cultivation at the time of
Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 127 _____ SIZE __ 32,543 __ Sq. km.

LOCATION _Eastern section of study area; southwest of Sudan; S.E. of Chad_

IMAGE I. D. _Path 198, 197; Row 54,55_

Area description (collateral data)

Veg._South Section Woodlands, Savanna & Steppe - undifferentiated relatively_
   moist types North section - Northern area of above, with abundant Isoberlinia
   doka & I. dalzeilii (Keay & Abreville, 1958)._

Ag._Millet & Manioc; (Atlas of Africa, 1973). Non-agriculture & Rough Grazing_
   Land with trees (World Atlas of Agriculture, 1976)._

Soils _No data (Small area of cotton in west_

Area description (consultant)

   Not familiar with area

Area description (Landsat analysis)

   Dark tonal signatures indicative of forest vegetation, mostly on inter-
   fluves of dendritic drainage which has wide alluvial plains, as indicated
   by light tonal signatures. Medium gray tonal signatures indicative of grass
   vegetation. Drainage density is moderate. Geomorphically influenced (Bon-
   go Massi).

Final classification
   Woodland
   Millet, cassava
   31 -60% of area has been cleared for cultivation at the time of Landsat
   overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 128 _____ SIZE _5,735_ Sq. km.

LOCATION _Eastern section of study area; southwest of Sudan, Southeast of Chad_

IMAGE I. D. _Path 198, 197; Row 54, 55_

Area description (collateral data)

Veg._ Northern area of Woodland, Savanna, Steppe, with abundant Isoberlinia_
   doka & I. dalzielii (Keay & Abreville, 1958)._

Ag._ Millet & Manioc (Atlas of Africa, 1973). Non agriculture & Rough Grazing_
   Land with trees (World Atlas of Agriculture, 1976)._

Soils _No data_

Area description (consultant)

   Not familiar with area

Area description (Landsat analysis)

   Medium gray tonal signatures indicative of grass. Very few darker gray
   tonal signatures (forest) or light tonal signatures (cleared land for farm-
   ing). Medium density drainage of dendritic variety.

Final classification
   Woodland
   Millet, cassava
   Greater than 60% of area has been cleared for cultivation at the time of
   Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____129_____ SIZE __5,244__ Sq. km.

LOCATION __Eastern section of study area; southwest of Sudan; S.E. of Chad__

IMAGE I. D. __Path 197; Row 55__

Area description (collateral data)

Veg. South section – Woodlands, Savanna, Steppe undifferentiated relatively
moist type Northern section – Northern area of above with abundant Isoberlinia
doka & I. dalzeilii (Keay & Aubreville, 1958).

Ag. Millet & Manioc (Atlas of Africa, 1973). Non agriculture & Rough Grazing
land with trees (World Atlas of Agriculture, 1976).

Soils No data

Area description (consultant)

Not familiar with area

Area description (Landsat analysis)

Medium gray tonal signatures indicative of grass vegetation; few scattered
dark tonal signatures indicative of forest vegetation; Sparce density
drainage of the dendritic variety.

Final classification
Woodland
Millet, cassava
Greater than 60% of area has been cleared for cultivation at the time of
Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____130_____ SIZE __30,511__ Sq. km.

LOCATION Eastern section of study area; south of Sudan

IMAGE I. D. __Path 196, 195; Row 55__

Area description (collateral data)

Veg. North section – Northern area of Woodlands, Savannas, & Steppes with abun-
dant Isoberlinia doka & I. Dalzielii; South section – Savannas & Steppes-
undifferentiated relatively moist types (Keay & Abreville, 1958).

Ag. Non-agricultural Rough Grazing Land with Trees (World Atlas of Agricul-
ture, 1976); North section – Millet, South Section – Millet, Manioc (Atlas
of Africa, 1973).

Soils No data

Area description (consultant)

Not familiar with area. More into savanna.

Area description (Landsat analysis)

Gray & limited light gray tonal signature indicative of grasses and limited
cleared land for farming; medium density drainage of dendritic variety.

Final classification
Woodland
Millet at selected relatively limited locations only; Cassava at selected
relatively limitted locations.
31 – 60% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____131_____ SIZE __69,477__ Sq. km.

LOCATION __Southern part of project area from Korhogo, Ivory Coast in the__
__West to just west of Lafia, Nigeria__

IMAGE I. D. Path 208 - 217; Row 53 - 56

Area description (collateral data)

Northern part - Woodlands Savannas and Steppes - northern areas with abun-
dant Isoberlinia doka and I. Dalzielii. Southern portion - Woodlands,
savannas and steppes - undifferentiated relatively moist types (Keay &
Aubreville, 1958); Tallgrass savanna - northern part; Deciduous forest,
brush and cultivated vegetation - southern part (CIA Maps of Ivory Coast,
Upper Volta, Venin, Togo, and Nigeria, 1972, 1968, 1970 - 1972, crops
peanuts, millet, maize, beans; predominantly subsistence - millet,
manioc, maize, rice (Atlas of Africa, 1973); east of Kainji Reservoir -

Area description (consultant) tobacco, large peanut and cotton area west of Zaria,
(Atlas of Africa, 1973); Sesame seed around Lafia

(CIA Map of Nigeria, 1972).

Tropical forest influenced greatly by slash and burn agriculture; coffee
and cocoa. Staple crops - root crops, yams and some maize. 6CF,Co,RC,M 3
Cs Ativon Kodgo (August 22, 1978).

Area description (Landsat analysis)

Dark tonal Landsat signature indicative of a fairly dense natural vege-
tation cover with scattered agricultural activity. Most intensive agri-
culture is surrounding towns and villages.

Final classification
Mosaic
Coffee, cocoa, maize, cassava, root crops.
Greater than 60% of area has been cleared for cultivation at the time of
Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____132_____ SIZE __87,404__ Sq. km.

LOCATION __Southern part of project area from Korhogo, Ivory Coast in the__
__west to just west of Lafia, Nigeria__

IMAGE I. D. Path 208 - 217; Row 53 - 56

Area description (collateral data)

Northern part - Woodlands Savannas and Steppes - northern area with abun-
dant Isoberlinia doka and I. Dalzielii. Southern portion - Woodlands,
savannas and steppes - undifferentiated relatively moist types (Keay &
Aubreville, 1958); Tallgreaa savanna - northern part; Deciduous forest,
brush and cultivated vegetation - southern part (CIA Maps of Ivory Coast,
Upper Volta, Benin, Togo, and Nigeria, 1972, 1968, 1970 - 1972, crops;
peanuts millet, maize, beans; predominantly subsistence - millet, maize,
rice (Atlas of Africa, 1973); East of Kainji Reservoir - large peanut and

Area description (consultant) Cotton area west of Zaria, (Atlas of Africa, 1973);
Sesame seed around Lafia (CIA Map of Nigeria, 1972).

Mosaic with maize, manioc, and bananas as main staple veg., kapok; 5 MGFT3
silk cotton; tall, dense grass. No livestock grazing.

Area description (Landsat analysis)

Dark tonal Landsat signature indicative of a fairly dense natural vegetation
cover with scattered agricultural activity. Most intensive agriculture
is surrounding towns and villages.

Final classification
Mosaic
Maize, cassava, fruit trees
Greater than 60% of area has been cleared for cultivation at the time of
Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 133 _____ SIZE __ 27,234 __ Sq. km.

LOCATION _____ south central section of study area; S.W. Nigeria _____

IMAGE I. D. _____ Path 208 ,209 ,210   Row 54- 55 _____

Area description (collateral data)

Veg. _Forest Savanna mosaic; Moist forest at low & medium altitudes (Keay &_
Aubreville, 1958).

Ag. _Rough Grazing Land with Forest; Fruit trees (World Atlas of Agriculture,_
1958).   Subsistence with commercial (Atlas of Agriculture 1973) Cocoa;
Oil Palm (CIA)   (International Atlas of West Africa 1971)

Area description (consultant)

Mosaic

Area description (Landsat analysis)

Low density drainage. Mostly medium gray tonal signatures indicative of
of grass. A few scattered light tonal signatures indicative of farming,
particularly along drainage.

Final classification

Mosaic
Oil palm, cocoa; fruit trees
31 - 60% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 134 _____ SIZE __ 14,158 __ Sq. km.

LOCATION _South central section of polygon - southern Nigeria, Makurdi & Abaka Kaliki_

IMAGE I. D. _Path 205, 206, 207; Row 54, 55_

Area description (collateral data)

Veg. Woodland, Savanna & Steppe - undifferentiated relatively moist types;
    Forest - savanna mosaic (Keay & Aubreville, 1958); Tallgrass savanna
    (CIA Maps).

Ag. _Nonagriculture & Rough Grazing Land with Trees; Rough Grazing Land with_
    forest; Forest (World Atlas of Agriculture, 1976); subsistence crops
    (manioc, yams, rice/maize) with commercial (cocoa, coffee, oil palm, rubber
    & spices); oil palm; rice (Atlas of Africa, 1973); Sesame Seed (CIA)

Soils **Medium**desaturated ferallitic soil; impoverished and strongly desaturated
Area description (consultant) ferallitic soils (International Atlas of W. Africa, 1971).

    Mosaic - forest and woodlands   .

Area description (Landsat analysis)

    Substantial cloud cover; moderate density drainage of dendritic variety
    indicative of some relief. Dark gray tonal signatures indicative of forest
    vegetation. Little to no agricultural activity detected.

Final classification

    Mosaic   .
    Oil palm, root crops, rice, fruit trees
    31 - 60% of area has been cleared for cultivation at the time of Landsat
    overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____135_____ SIZE __42,342____ Sq. km.

LOCATION __Southwestern Cameroun_____

IMAGE I. D. _Path 205, 206; Row 56_____

Area description (collateral data)

Coffee, oil plam, bananas, fruit trees (Atlas of Africa, 1973; CIA Map of
Cameroun, 1970; World Atlas of Agriculture, 1976.) Coastal forest - sav-
anna mosaic (Keay & Aubreville, 1958).

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Area description (consultant)

Unfamiliar with the area

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Area description (Landsat analysis)

Landsat cloud - free imagery was not available for this area

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Final classification

Mosaic

Coffee, oil palm, plantains, fruit trees;

Greater than 60% of area under cultivation at the time of
        Landsat overpass

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_____

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____136_____ SIZE ___38,508____ Sq. km.

LOCATION _Southern east central section of study area; contains Cameroun,_
        Bouar, & Central Africain.

IMAGE I. D. __Path 201, 202; Row 56, 57_____

Area description (collateral data)

Veg. Woodland, Savanna & Steppe - undifferentiated relatively moist types;
    Forest - Savanna mosaic (Keay & Aubreville, 1958); Savanna, Mixed Broad-
    leaf Deciduous & Evergreen forest; Broadleaf Evefgreen Forest (CIA Maps).

Ag. Millet & Manioc; Manioc & bananas; oil palm (Atlas of Africa, 1973);Non-
    agriculture & Rough Grazing Land with trees; Rough Grazing Land with Forest;
    Forest (World Atlas of Agriculture, 1976).

Soils No data

Area description (consultant)

Mosaic -

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Area description (Landsat analysis)

Extremely high density dendritic drainage of the pinnate variety, which
may indicate unusually steep slopes upon which tributaries have developed.
Much light gray tonal signatures indicative of grass & some medium gray
tonal signatures indicative of trees. Little dark gray tonal signatures
indicative of dense forest vegetation. Little evidence of agriculture.

_____

Final classification

Mosaic

Oil palm, cassava, plantain

31 - 60% of area has been cleared for cultivation at the time of Landsat

overpass.

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_____

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____137_____ SIZE ___197___ Sq. km.

LOCATION _Southern portion of east-central section of study area; S.W._
          Central African Empire
IMAGE I. D. _Path 202; Row 57_

Area description (collateral data)

Veg._Forest Savanna Mosaic (Keay & Aubreville, 1958)._

Ag._Rough Grazing Land & Forest (World Atlas of Agriculture, 1976); Manioc_
   & Bananas (Atlas of Africa, 1973).

Soils No Data.

Area description (consultant)

   Not familiar with area. Forest

Area description (Landsat analysis)

   Relatively high density drainage of dendritic variety. Mostly very dark
   tonal signature indicative of dense forest vegetation.

Final classification

   Mosaic
   Cassava, fruit trees
   0 - 30% of area has been cleared for cultivation at the time of Landsat
   overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____138_____ SIZE _23,137_ Sq. km.

LOCATION _Southern portion of east central section of study area; north of_
          Congo.
IMAGE I. D. _Path 201, 200; Row 56, 57_

Area description (collateral data)

Veg._Woodland Savanna & Steppe - undifferentiated - relatively moist types in_
    north; forest - Savanna mosaic in south (Keay & Aubreville, 1958).

Ag._Manioc & Bananas; some cotton (Atlas of Africa, 1973). Mostly non agri-_
   culture & Rough Grazing Land with Trees; Some Rough Grazing Land with
   Forrest in south (World Atlas of Agriculture, 1976)

Soils No Data.

Area description (consultant)

   Not familiar with area

Area description (Landsat analysis)

   Moderate to high density drainage of dendritic variety; Mostly dark gray
   tonal signature indicative of forest vegetation in south; Medium gray
   tonal signatures indicative of grass also.

Final classification

   Mosaic
   Cassava, fruit trees, cotton
   0 - 30% of area has been cleared for cultivation at the time of Landsat
   overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____139_____ SIZE __459__ Sq. km.

LOCATION _Southern portion of east - central section of study area; along_
_____Mambere River._____
IMAGE I. D. _Path 201; Row 57_____

Area description (collateral data)

Veg. _Forest Savanna Mosaic (Keay & Aubreville, 1958)._
Ag. _Manioc & Bananas (Atlas of Africa, 1973); Non-agriculture & Rough Grazing_
_____Land with trees (World Atlas of Agriculture, 1976)._
Soils _No Data_____
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Area description (consultant)

___Not familiar with area___ ___ _____
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Area description (Landsat analysis)

___Dark tonal signature indicative of dense forest vegetation.___
_____
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Final classification

___Mosaic_____
___Cassava, fruit trees_____
___0 - 30% of area has been cleared for cultivation at the time of Landsat_
___overpass._____
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DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____140_____ SIZE __1,639__ Sq. km.

LOCATION _Southern portion of east central section of study area; north of_
_____Congo_____
IMAGE I. D. _Path 200; Row 57_____

Area description (collateral data)

Veg. _Forest savanna mosaic in south; Woodlands, Savanna & Steppe-undifferen-_
_____tiated relatively moist types in north (Keay & Aubreville, 1958)._
Ag. _Manioc & bananas (Atlas of Africa, 1973); Nonagriculture & Rough Grazing_
_____Land with Trees in north; Rough Grazing Land & Forests in south (World_
_____Atlas of Agriculture, 1976)._
Soils _No data_____
_____
_____

Area description (consultant)

___Wooded savanna from highland grass savanna surrounds highland grass savanna_
___Not familiar with area_____
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_____
_____
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_____

Area description (Landsat analysis)

___Medium density drainage of dendritic variety; medium gray tonal signatures_
___indicative of grass & darker gray tonal signatures indicative of forests;_
___some dark tonal signatures indicative of burns.___
_____
_____
_____
_____

Final classification

___Mosaic_____
___Cassava, fruit trees_____
___31 - 60% of area has been cleared for cultivation at the time of Landsat_
___overpass._____
_____
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DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 141 _____ SIZE _____ 46,209 ___ Sq. km.

LOCATION Southern part of east central portion of study area; north
of Congo
IMAGE I. D. _____ Paths 204, 203, 202, 200; Rows 54, 55, 56, 57

Area description (collateral data)

   Refer to description shown for map unit 126

Area description (consultant)

   Refer to description shown for map unit 126

Area description (Landsat analysis)

   Refer to description shown for map unit 126

Final classification

   Mosaic
   Root crops, millet, fruit trees, oil palm, coffee
   31 - 60% of area has been cleared for cultivation at the time
   of Landsat overpass

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 142 _____ SIZE __ 120,176 ___ Sq. km.

LOCATION Eastern section of study area; North of Oubangi River, South central
centraficaine, surrounds Bambari & Sibut.
IMAGE I. D. Path 200, 199, 198, 197; Row 55, 56, 57

Area description (collateral data)

Veg. South to north (1) Forest-Savanna Mosaic, (2) Woodlands, Savannas &
Steppes - undifferentiated relatively moist types, (3) Northern areas
(of #2) with abundant Isoberlinia doka & I. dalzielii (Keay & Abreville,
1958).
Ag. Millet & Manioc, sacttered coffee, cotton, peanuts (Atlas of Africa, 1973).
Non agriculture & rough grazing land with trees; scattered fruit trees &
forest in south (World Atlas of Agriculture, 1976).
Soils No data

Area description (consultant)

   Not familiar with area

Area description (Landsat analysis)

   Relatively high density dendritic drainage (some pinnate) throughout most
of map unit. Scattered light tonal signatures indicative of cleared land for
farming; medium gray tonal signature indicative of grass; few dark tonal
signatures indicative of forest vegetation. Light cloud cover over center
of map unit.

Final classification
   Mosaic
   Millet, cassava, oil palm, coffee, peanuts; fruit trees at selected relatively
   limited locations only.
   31 - 60% of area has been cleared for cultivation at the time of Landsat
   overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____143_____ SIZE _2,294_ Sq. km.

LOCATION _Eastern section of study area; north of Oubangi River_

IMAGE I. D. _Path 197; Row 57_

Area description (collateral data)

Veg._ Forest Savanna Mosaic (Keay & Aubreville, 1958)._
 Ag._Rough grazing Land/RGL with trees (World Atlas of Agriculture, 1976)._
Soils _No_ _

Area description (consultant)

 Not familiar with area

Area description (Landsat analysis)

 Very high density dendritic drainage. Medium gray tonal signature indica-
 tive of grass. Some light tonal signatures indicative of cleared land for
 farming. Small regularly shaped dark tonal signatures may indicate burns.
 Little to no dark tonal signatures indicative of forest.

Final classification
 Mosaic
 Cotton; irrigated rice at selected relatively limited locations
 0 - 30% of area has been cleared for cultivation at the time of Landsat
 overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____144_____ SIZE _4,097_ Sq. km.

LOCATION _Eastern section of study area; North of Oubangui River_

IMAGE I. D._Paths 197, 196; Row 57_

Area description (collateral data)

Veg._ Forest - Savanna Mosaic (Keay & Aubreville, 1958)._
 Ag._ Forest/Rough Grazing Land with forest (World Atlas of Agriculture, 1976)_
 Cotton & Coffee (Atlas of Africa, 1973)._
Soils No data.

Area description (consultant)

 Not familiar with area

Area description (Landsat analysis)

 Dark gray tonal signatures adjacent to river indicative of forest vegetation;
 some small dark areas may be burns; Medium gray tonal signatures indicative
 of grass; low to moderate density drainage; very little light tonal sig-
 natures indicative of farming.

Final classification
 Mosaic
 Cotton, Coffee
 0 - 30% of area has been cleared for cultivation at the time of Landsat
 overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 145 _____ SIZE __31,822__ Sq. km.

LOCATION Eastern section of study area; north of M'bomou River

IMAGE I. D. Paths 196, 195; Row 56

Area description (collateral data)

Veg. N. section - Woodlands, Savannas (and Steppes) undifferentiated relatively
moist types; S. Section - Forest savanna Mosaic (Keay & Aubreville, 1958).
Ag. Millet and manioc; coffee plantations in south (Atlas of Africa, 1973);
Mixture of forest and rough grazing land; scattered coffee plantations and
fruit trees (World Atlas of Agriculture, 1976).
Soils no data.

Area description (consultant)

Not familiar with area

Area description (Landsat analysis)

Dark gray to black tonal signature in much of map unit indicative of forest
vegetation; gray tonal signatures indicative of grasses; relatively high
density drainage of the dendritic- pinnate variety which may indicate steep
slopes; a major river flows south thru middle of the map unit.

Final classification

Mosaic
Millet, cassava, coffee, fruit trees
31 - 60% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 146 _____ SIZE __5,506__ Sq. km.

LOCATION Eastern section of study area; north of M'bomou River

IMAGE I. D. Path 195; Row 57

Area description (collateral data)

Veg. Northern section - Woodlands, Savanna, and Steppe - undifferentiated re-
latively moist types; Southern section - forest savanna Mosaic (Keay & Aubre-
ville, 1958)
Ag. Mixture of forest and rough grazing land (World Atlas of Agriculture, 1976).
Soils No data

Area description (consultant)

Not familiar with area

Area description (Landsat analysis)

Light gray tonal signatures indicative of grasses and limited cleared land
for farming; very high density drainage of the dendritic - pinnate variety
may indicate steep slopes; characteristic of loess areas of high silt content.

Final classification

Mosaic
Oil palm, cassava, maize
0 - 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____147_____ SIZE __25,497__ Sq. km.

LOCATION __Eastern section of study area; north of M'bomou River__

IMAGE I. D. __Path 195; Row 56__

Area description (collateral data)

Veg. Woodland, Savanna, Steppe - indifferentiated moist types (Keay & Aubreville, 1958).

Ag. Non-Agricultural Rough Grazing land and trees (World Atlas of Agriculture, 1976).

Soils No data

Area description (consultant)

Not familiar with area. Mosaic type vegetation pattern

Area description (Landsat analysis)

High density drainage of the dendritic - pinnate variety may indicate steep slopes characteristic of loess areas of high silt content; dark tonal signatures along much of drainage indicative of forest vegetation; much gray tonal signature indicative of grasses; some scattered light gray tonal signature indicative of cleared land for farming.

Final classification
Mosaic
No crops
0 - 30% of area has been cleared for cultivation at the time of Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____148_____ SIZE __30,511__ Sq. km.

LOCATION __Eastern tip of study area; mouth of M'bomou River__

IMAGE I. D. __Paths 195, 194, 193; Row 56__

Area description (collateral data)

Veg. Woodlands, Savannas and Steppes, undifferentiated - relatively moist types (Keay & Aubreville, 1958);

Ag. Millets, manioc (Atlas of Africa, 1973); Rough grazing land with forest along river (World Atlas of Agriculture, 1976).

Soils no data.

Area description (consultant)

Not familiar with area
Oil palm

Area description (Landsat analysis)

Dark gray to black tonal signature indicative of forest vegetation; high density drainage of the dendritic-pinnate variety. This may indicate presence of unusually steep slopes upon which the tributaries have developed. Lighter gray tonal signature characteristic of interfluve areas. Evidence of agricultural activity minimal. Characteristic of loess areas of high silt content.

Final classification
Mosaic
Oil palm, millet, cassava
31 - 60% of area has been cleared for cultivation at the time of Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____149_____ SIZE __24,841__ Sq. km.

LOCATION __Along southern boundary of project area_____

IMAGE I. D. _Path 215-222 Row 54-55_____

Area description (collateral data)

Secondary brush; tropical forest; secondary growth; lowland evergreen
forest (CIA Maps of Sierra Leone, Guinea, Ivory Coast, Ghana, 1969, 1973
1972, and 1971); Coffee; Tobacco, Oil Palm, Rough grazing land and forest
(CIA Maps, 1969, 1973, 1972, 1971 respectively; Atlas of Africa, 1973;
World Atlas of Agriculture, 1976), Yellow, strongly desaturated ferralitic
soils; other desaturated ferralitic soils, (International Atlas of W. Africa-
1971).

Area description (consultant)

Tropical rainforest (Fred Weber, August 21, 1978).

Area description (Landsat analysis)

Black, smooth Landsat tonal signature shown in band 5. Indicates a heavily
vegetated forested area.

Final classification
Tropical rainforest
Rice and peanuts at selected relatively limited locations only.
0 - 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____150_____ SIZE __17,795__ Sq. km.

LOCATION _Area around Atakpame, Togo_____

IMAGE I. D. __Path 212; Row 56_____

Area description (collateral data)

Cotton, cocoa and coffee as cash crops with manioc, maize and rice (Atlas
of Africa, 1973); Fruit trees (World Atlas of Agriculture, 1976); Cocoa area
(CIA Maps of Togo and Benin, 1970). Woodlands, savannas, and steppes
(Keay and Aubreville, 1958).

Area description (consultant)

Mountain forest area. Tropical forest influenced by mountains (Weber,
August 21, and Ativon, August 22, 1978).

Area description (Landsat analysis)

The black tonal signature on Landsat band 5 is indicative of a densely
forested area. Band 5 and 7 shown in color composite confirm this analysis
by showing the forest as a deep dark red.

Final classification
Tropical rainforest
cotton, cocoa, coffee, fruit trees, cassava, maize, rice
Greater than 60% of area has been cleared for cultivation at the time of
Landsat overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ____151____ SIZE ___26,611___ Sq. km.

LOCATION _Along southern edge of east-central section of study area; north of_
Congo

IMAGE I. D. _____

Area description (collateral data)

Veg._Forest Savanna Mosaic (Keay & Aubreville, 1958); Broadleaf Evergreen_
forest & mixed broadleaf deciduous Evergreen Forest (CIA Maps).

Ag._Mostly Forest, some Rough Grazing Land with Forest, Coffee plantation_

Soils _No data_ _____
_____
_____
_____

Area description (consultant)

Not familiar with area _____
_____
_____
_____
_____
_____
_____

Area description (Landsat analysis)

Very dark tonal signature indicative of dense forest vegetation. ____
_____
_____
_____
_____
_____

Final classification
Tropical rainforest
Coffee, oil palm, fruit trees
0 - 30% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER ____152____ SIZE ___1,737___ Sq. km.

LOCATION _Due South of Banjul along coast in strip 125 km long and 50 km wide_
South to Cachen River

IMAGE I. D. ___Path 225   Row 52___

Area description (collateral data)

Marsh and swamp characterize the area (CIA Map of Senegal and Gambia, 1972).

Polygon also occurs in area described as Deciduous forest brush and cul-
tivated vegetation (CIA May of Senegal and Gambia, 1972). In region known as
Woodlands Savannas and Steppes with abundant Isoberlinia Doka and I. dalyi-
ellii coastal mangrove region. (Keay & Aubreville, 1958). Peanuts, millet, and
rice cultivation dominate the area (Atlas of Africa, 1973). Soils in the
area are acidified halomorphic soils and impoverished slightly disaturated
ferallitic soils (International Atlas of West Africa, 1971).

Area description (consultant)

Brackish and getting into mangroves. Probable not much farming. ____
_____
_____
_____
_____
_____

Area description (Landsat analysis)

Band 5 shows dark black signature in coastal and estuarine areas of Casa-
mance and Cachen Rivers interspersed with white toned highly reflective
return. Dark signature believed to be indicative of saturated soils and
dense network of estuarine channels as well as coastal mangrove. White
signature indicates highly reflective marsh vegetation and probable rice
cultivation areas.

Final classification
Mangrove
Rice at selected relatively limited locations only.
30% - 60% of area has been cleared for cultivation at the time of Landsat
overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 153 _____ SIZE ___ 8,849 ___ Sq. km.
       Estuarine and delta area along coast West of Bissau, Figuinchor,
LOCATION Boke, Boffa, Conakry

IMAGE I. D. Path 224, Row 52 & 53
            Path 224, Row 54; Path 223, Row 54,55

Area description (collateral data)

  Coastal mangrove region (Keay & Aubreville, 1958) Oil palm and rice cul-
  tivation area (Atlas of Africa, 1973). Acidified halomorphic soil dominate
  (International Atlas of West Africa, 1971). In Forest-Savanna Mosaic area
  (Keay and Aubreville, 1958).

Area description (consultant)

  Not familiar with area. Possible manioc and large yams. Tuber crops
  possible. Onions, Tomatoes, Oil palm.

Area description (Landsat analysis)

  Band 5 light - toned gray area shows dense network of coastal stream chan-
  nels adjacent to Corubal River estuary. High sediment load in these channels
  principally responsible for gray tone. Dark gray to black signature near
  coast indicates mangrove vegetation. Agricultural activity in this area
  difficult to detect. No striking rice signatures (a highly reflective
  white) Mangrove appears to dominate this region.

Final classification
  Mangroves
  Rice at selected relatively limited locations only.
  Oil Palm at selected relatively limited locations only.
  Other root crops at selected relatively limited locations only.
  0 - 30% of area has been cleared for cultivation at the time of Landsat
  overpass.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER _____ 154 _____ SIZE ___ 36,213 ___ Sq. km.

LOCATION North eastern section of study area; S. Chad

IMAGE I. D. Path 198, 199, 200, 201, 202; Row 51, 52, 53

Area description (collateral data)

Veg. Woodland, Savanna & Steppe - undifferentiated relatively dry types (Keay
    & Aubreville, 1958).
Ag. Non-agriculture & Rough Grazing Land with Trees; Rough Grazing Land (World
    Atlas of Agriculture, 1976). Traditional Subsistence; Traditional & Com-
    mercial (Atlas of Africa, 1973); Grazing with some subsistence. Mixed
    Grazing & Subsistence; Subsistence (CIA Maps).
Soils No data

Area description (consultant)

  Not familiar with area. Southern part - wooded savanna aided by
  high water. Shrub savanna in north. Burns. Marginal millet.
  Nomadic grazing area. Millet and sorghum do exist as far north
  as Lake Chad (Atlas Pratique du Chad, 1972).

Area description (Landsat analysis)

  Medium density drainage of dandritic variety. Mostly medium gray tonal
  signatures, indicative of grass; some darker gray tonal signatures indica-
  tive of forest or moist soils, as indicated by swamp symbols on ONC charts;
  occupy some areas; some mountain features in northeast.

Final classification
  Wooded savanna
  Millet, sorghum
  31 - 60% of area has been cleared for cultivation at the time of Landsat
  overpass.