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COMITE INTERAFRICAIN D'ETUDES HYDRAULIQUES

OUAGADOUGOU
HAUTE VOLTA

L'UTILISATION DES RESSOURCES EN EAU ET DES TERRES DES REGIONS DE SAVANE

VOLUME 6
UTILISATION ACTUELLE DES TERRES

COMITE INTERAFRICAIN D'ETUDES HYDRAULIQUES

CIEH-USAID
Accords de Subvention
625-11-120-712
698-0415
et 629-0026

Preparé par
EARTH SATELLITE CORPORATION
Washington D.C.
au titre d'un contrat de sous-traitance

TAMS ADG
345 Park Ave.
New York 10022

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INTRODUCTION

Les trois premiers volumes du rapport intitulé "L'utilisation des ressources en eau et des terres des régions de savane" donnent une vue d'ensemble de la disponibilité des eaux superficielles et des eaux souterraines tant en Afrique Occidentale qu'en Afrique Centrale. Cet aperçu général vise à servir de base aux travaux de planification que le Comité Interafricain d'Etudes hydrauliques (CIEH) ainsi que d'autres organismes régionaux sont appelés à entreprendre à l'avenir dans le domaine de la mise en valeur des ressources hydrauliques.

Ce Volume 6 ainsi que la carte au 1:5 millionièmes ci-jointe fournissent une évaluation générale de l'utilisation actuelle des terres et de la production agricole dans les régions de savane. Une édition à plus grande échelle de cette carte a été établie au 1:2,5 millionièmes pour servir de document de travail au CIEH. Le CIEH dispose, aux fins de reproduction, de deux originaux transparents positifs de la carte susvisée.

Le présent rapport doit être utilisé conjointement avec le Volume 5, qui lui-même traite de l'utilisation faite actuellement des eaux dans les régions de savane. L'évaluation combinée de l'emploi fait en ce moment des ressources en eau et en terre dans la savane représente une phase essentielle des opérations de planification du CIEH qui visent à formuler des recommandations pour de nouveaux projets à entreprendre dans le cadre de la conservation et de la mise en oeuvre efficaces des ressources en question.

Par ailleurs, ce Volume 6 renseigne au sujet de la production agricole actuelle des régions à l'étude et permet d'identifier les secteurs où cette production pourrait être aisément augmentée.

Il est évident qu'à l'occasion de la détermination de la mesure

dans laquelle les cultures vivrières devraient être entreprises sous irrigation, et partant, à l'occasion de la définition des besoins de ces cultures en eau, il importe que soient prises en compte les estimations de la future production alimentaire en sec (voir également TP 05 dans le Volume 4, Recommandations pour des études, de la série de rapports du projet) ainsi que du reste les prévisions de la future demande pour cette production. S'agissant des futurs besoins en eau dans les régions de savane, ils font l'objet du Volume 7.

On notera que la présente carte de l'utilisation et de la couverture végétale des terres constitue la première tentative jamais faite pour établir une carte de l'Afrique Occidentale et de l'Afrique Centrale à partir de renseignements obtenus par télédétection. En conséquence de ce travail cartographique, on a pu définir un cadre écologique qui se rapporte directement à la situation réelle à terre, au niveau régional.

C'est à la Société Earth Satellite Corporation, Washington, D.C., que TAMS, au titre d'un contrat de sous-traitance, avait confié le soin de préparer la carte susvisée en partant de données obtenues par satellite. On trouvera dans la Planche 1 ci-après la liste des experts qui ont apporté leur collaboration à la préparation du présent document.

Planche 1

Experts ayant collaboré à l'établissement du Volume 6

M. M.G. Gagara	: Secrétaire Général du CIEH
Dr. John Buursink	: Directeur du projet, TAMS
M. Donald Garofalo	: Directeur du projet, EarthSat
M. Fred P. Weber	: Classification des unités cartographiques, TAMS
M. Kodjo Ativon	: Classification des unités cartographiques, CIEH
M. Charles J. Dorigan	: Classification des unités cartographiques, EarthSat
M. David Nichols	: Classification des unités cartographiques, EarthSat
M. Edmund A. Schantz	: Compilation cartographique, EarthSat
M. Michael M. Douglas	: Etude de légendes, EarthSat
M. J. William Stohlman	: Recueil des données complémentaires, EarthSat
Dr. F. Ahn	: Utilisation des terres, TAMS
Mlle. Emily T. Candelmo	: Documentation

CHAPITRE 1

METHODOLOGIE

1.1 Méthodes d'exécution des travaux cartographiques

EarthSat a utilisé la méthodologie décrite ci-après pour établir la carte à l'échelle 1:5 millionièmes (Carte 1) de l'utilisation et de la couverture végétale des terres dans les régions de savane.

Dans le cadre de ces travaux, trois cent quarante-deux (342) images Landsat ont été achetées du U.S. Agricultural Stabilization and Conservation Service, images qui fournissent une couverture complète par satellite de la zone du projet. Seules les images avec moins de 20% de couverture nuageuse ont été retenues. De toutes ces images, environ 70% étaient entièrement sans nuage, tandis que 92% comportaient moins de 10% de couverture nuageuse. Sur l'ensemble des images Landsat ainsi acquises, à peu près 4% avaient été prises en 1972, approximativement 4% également en 1973, environ 15% en 1974, et le reste, soit 77%, en 1975 et 1976. Dans les 80% de la couverture photographique portent sur les mois de décembre et de janvier, le solde des images ayant été pris par satellite au cours des mois de novembre, février et mars. Des diapositives de 70mm des bandes 4, 5, 6 et 7 du balayeur multi-spectres (MSS) ont été obtenues pour chaque image Landsat. Ces diapositives se trouvent actuellement disponibles pour utilisation au Centre de Documentation du CIEH à Ouagadougou.

Sur la base de la qualité, on a effectué la sélection des 230 meilleures images qui ont alors servi à préparer une photocomposition Landsat (assemblages de photographies non-redressées) au 1:2,5 millionièmes de la zone du projet. La bande 5 du balayeur multi-spectres (MSS) a été choisie comme la bande Landsat convenant le mieux à la préparation de ce document. D'ailleurs, cette bande 5 est excellente pour indiquer les zones d'activité agricole ainsi que les

variations de la végétation naturelle.

Puis, une copie de la carte de base au 1:2,5 millionièmes des régions de savane, détenue au CIEH, a été préparée sous forme d'une carte superposable en plastique transparent. Cette carte a pu être superposée sur la composition Landsat, tout en s'harmonisant avec cette dernière. La zone du projet a été alors subdivisée sur la carte superposable en 154 unités cartographiques, cela en fonction des différences évidentes de teintes et de textures telles qu'interprétées sur la composition de la bande 5 Landsat sous-jacente.

Un imprimé intitulé "Fiche de renseignements de l'unité cartographique" (Planche 2) a été ensuite établi pour identifier chacune des 154 unités cartographiques par numéro, superficie, situation, et couverture de l'image Landsat. Cet imprimé comprend quatre parties. Les trois premières décrivent la végétation agricole et la végétation naturelle de l'unité cartographique sur la base:

1. Des données complémentaires
2. Des éléments fournis par le consultant
3. De l'analyse Landsat

Quant à la quatrième partie de l'imprimé, elle précise la classification définitive de l'unité cartographique en fonction de l'ensemble des renseignements intégrés.

On trouvera à la fin du présent rapport et sous le titre "Références" la nomenclature des renseignements complémentaires qui peuvent être consultés au Centre de Documentation du CIEH. Les informations cartographiées portant sur la végétation naturelle, l'agriculture et les parcs nationaux ont été reportées sur une carte de base au 1:2,5 millionièmes de la zone du projet:

1. Par transfert visuel, en utilisant les détails de la carte, comme par exemple, les villes, les frontières, les éléments physiques, etc. afin d'assurer un transfert

Planche 2

FICHE DE RENSEIGNEMENTS DE L'UNITE CARTOGRAPHIQUE

UNITE (POLYGONE) NUMERO_____ SUPERFICIE_____ KM^2_____

SITUATION_____

IDENTIFICATION DE L'IMAGE_____

Description de l'unité (données complémentaires)

_____

_____

_____

_____

_____

Description de l'unité (consultant)

_____

_____

_____

_____

_____

Description de l'unité (analyse landsat)

_____

_____

_____

_____

_____

Classification définitive

_____

_____

_____

_____

_____

précis des informations de la carte complémentaire à la carte de base, ou bien,

2. En mettant en oeuvre un matériel de projection capable de ramener la carte complémentaire à la même échelle et à la même projection que la carte de base, permettant ainsi le transfert direct des renseignements. A cet effet, on s'est servi d' "overhead and 35mm slide projectors" et un "Zoom Transfer Scope".

Les informations obtenues des rapports ont été rattachées par code à chaque unité en employant des repères géographiques spécifiques tels que l'emplacement de l'activité agricole dans le voisinage d'un centre urbain déterminé, ou encore la végétation naturelle au sein d'une région montagneuse donnée.

Chaque unité cartographique est alors décrite dans la première partie de la "Fiche de renseignements", en fonction de l'activité agricole et de la végétation naturelle qui la caractérisent.

Monsieur Fred Weber, consultant au projet, et Monsieur Kodjo Ativon, cadre supérieur du CIEH, ainsi que les experts de EarthSat participant au "Projet Landsat d'inventaire par télédétection des ressources des zones libérées de l'onchocercose" (ROAP) en Haute-Volta, au Ghana et au Bénin, tous connaissant bien les conditions existant réellement au sol dans la zone du projet, ont fourni de précieux renseignements à propos de l'agriculture et de la couverture de végétation naturelle de chaque unité cartographique. Ces données sont consignées dans la troisième partie de la "Fiche de renseignements".

Les images Landsat de la bande 5 ont été visuellement analysées.

Des composites en couleurs ont été préparés et analysés pour certaines images contenant une série de signatures de teinte et de texture indiquant des caractéristiques différentes de sol dans toute la zone du projet. Ces composites en couleurs ont utilement servi à bonifier les informations obtenues des images, permettant ainsi d'améliorer l'exactitude de l'interprétation. Un système Addcol de visée a été utilisé pour réaliser les vues composites en couleurs. Les informations concernant la couverture végétale ainsi que l'intensité de culture ont été inscrites dans la troisième partie de la "Fiche de renseignements".

En se basant sur l'intégration des données contenues dans la première, la deuxième et la troisième partie de ladite fiche, chaque unité cartographique Landsat a été classée dans la quatrième partie de la fiche, selon le type de culture, l'intensité de cette dernière et les caractéristiques de couverture végétale naturelle. La totalité des 154 fiches de renseignements ainsi établies se trouvent au Centre de Documentation du CIEH où elles peuvent être consultées aux fins de référence. Quant à la légende définitive de la carte, elle comporte les trois catégories principales suivantes: (1) couverture de végétation naturelle, (2) intensité de culture, et (3) types de cultures.

Dans chaque unité cartographique, ces trois catégories sont identifiées au moyen de symboles cartographiques alphanumériques. C'est ainsi que le symbole 76.4MiMsM Ct 3 indique qu'il s'agit de l'unité cartographique no. 76, située dans la zone de végétation 4 (savane arborée), où le mil, le maïs et l'arachide constituent les principales spéculations agricoles, tandis que le coton n'est entrepris que sur certains emplacements, de superficie relativement limitée, cette zone de végétation 4 se caractérisant de plus par une forte intensité de culture (plus de 60% de l'ensemble des terres sont défrichés à des fins agricoles). Pour faciliter les consultations, les catégories de végétation naturelle ont été codées en couleurs, alors que l'intensité de culture est indiquée par des teintes différentes au "zip-a-tone".

1.2 Exactitude des cartes

Afin de garantir aux cartes établies la plus haute exactitude compatible avec l'échelle des cartes préparées et les données utilisées, on a eu recours à deux procédés de contrôle de la qualité, soit:

1. Contrôle portant sur le mécanisme du transfert des données et la délinéation; et

2. Contrôle concernant l'exactitude de l'analyse des données Landsat.

1.2.1 Exactitude des méthodes mécaniques

Le mécanisme du transfert des données aux cartes de base avec échelles aux 1:2,5 millionièmes et 1:5 millionièmes implique le transfert, à partir des cartes existantes ou des images Landsat, des renseignements couvrant tant des points que des secteurs dans tous les compartiments des informations cartographiées. Bien entendu, la précision du transfert et du repérage dépend de l'exactitude des cartes existantes, ainsi que de la méthode mise en oeuvre pour reporter les informations de cartes et d'images à échelles différentes sur une carte à échelle compatible.

On a présumé que, sauf indication contraire fournie par l'interprétation Landsat, les cartes existantes utilisées comme source de données dans la présente étude étaient exactes quant aux informations qu'elles contenaient ainsi qu'au sujet de l'emplacement de celles-ci.

Sur l'ensemble des techniques et du matériel utilisés figure notamment une lunette Bausch et Lomb de transfert à longueur focale variable ("Bausch and Lomb Zoom Transfer Scope - ZTS") qui permet de regarder une image et une carte en superposition. L'image peut être agrandie de 1x à 4x au moyen d'un système continu d'objectif à longueur focale variable. L'appareil est également muni d'un

allongement optique permettant de compenser les décalages d'images. L'appareil ZTS susmentionné est un instrument de précision permettant de se conformer aux normes de précision du Service Cartographique des Etats-Unis en ce qui a trait aux opérations de transfert des données cartographiques. En outre, on s'est servi d'autres appareils de projection optique qui ont permis de transférer à la carte de base les données des cartes supplémentaires.

Dans le cadre de la méthode du contrôle de la qualité, on a veillé à ce que:

- Les sources (données existantes, Landsat, etc.) pour la cartographie soient appuyées par des documents.
- Les légendes et les renseignements cartographiques complémentaires soient correctement présentés.
- Les données pertinentes soient transférées des cartes existantes ou des images Landsat aux cartes de base au 1:2,5 millionièmes et au 1:5 millionièmes.
- Les zones délimitées soient classées avec le symbole d'identification approprié, et que ces zones soient fermées.
- Les données disponibles au sujet de points spécifiques soient convenablement identifiées.
- Les symboles identifiant l'unité et les points spécifiques soient lisibles.

1.2.2 Exactitude de l'analyse Landsat

L'analyse Landsat est une méthode complexe, faisant intervenir plusieurs variables, qui vise à élargir, à mettre à jour et/ou à vérifier les données que comportent des cartes existantes. À cet égard, Landsat a fourni parfois des informations permettant d'améliorer l'exactitude des

cartes existantes. Par contre, il y a eu des cas où il a fallu recourir aux cartes existantes de l'utilisation et de la couverture végétale des terres pour renforcer l'exactitude de l'analyse des images Landsat. Le degré d'extraction des données par interprétation des images a été fonction de la catégorie d'utilisation et de couverture des terres qui faisait l'objet d'une interprétation, du caractère satisfaisant ou non des données complémentaires existantes (puisqu'aucune enquête n'a été faite sur le terrain), de l'époque de l'année à laquelle l'image a été obtenue, de la qualité générale de l'image et de la méthode d'interprétation.

On s'est servi de méthodes d'interprétation manuelles pour interpréter les images Landsat noir et blanc au 1:2,5 millionièmes et en couleurs au 1:1 millionième reproduites en masse. La réduction ultérieure au 1:5 millionièmes des données interprétées a diminué encore davantage les possibilités d'inexactitude.

L'exactitude de l'interprétation concerne la classification ou l'identification des éléments au sol d'après leur représentation sur l'image. L'exactitude d'interprétation comporte deux parties: l'interprétation proprement dite de l'élément, et la classification de celui-ci. Les images Landsat ont fait apparaître de nouveaux éléments d'utilisation et de couverture des terres qui n'avaient pas été représentés jusqu'ici, ou l'avaient été de façon incorrecte en raison de l'absence de vérification au sol.

Les travaux n'ont pas permis de vérifier sur le terrain la carte définitive. Il faut donc considérer que la carte définitive est aussi exacte que les données portées sur les documents disponibles lui ayant servi de sources.

Afin de vérifier l'exactitude, on a comparé les tracés des unités

cartographiques de la carte jointe au présent rapport et les tracés des images composites Landsat en couleurs rehaussées par ordinateur (au 1:200,000) pour le "Projet Landsat d'inventaire par télédétection des ressources des zones libérées de l'onchocercose".

CHAPITRE 2

COUVERTURE DE VEGETATION NATURELLE

Les régions de savane sont subdivisées en huit zones de végétation naturelle. Chaque zone de végétation est définie en fonction d'une classification des types de végétation africaine établie en 1956 par le Conseil scientifique de la Commission de coopération technique en Afrique au Sud du Sahara. Cet organe international de spécialistes de la phytogéographie avait tenu une réunion à Yangambi. La méthode de classification est fondée sur l'ouvrage de Keay et Aubréville "Végétation Map of Africa"; plusieurs organes des Nations Unies et la FAO utilisent désormais la classification de Yangambi (Weber, 1977).

La composition Landsat MSS de la bande 6 au 1:2,5 millionièmes, qui fut la principale source de données permettant de tracer les zones de végétation dans la région du projet, fait apparaître en couleurs grises vives et douces les zones de végétation naturelle rencontrées lorsque l'on se déplace du nord au sud dans la région. L'emplacement des limites entre zones de végétation adjacentes représente les conditions véritables au sol et, partant, les changements réels de végétation tels qu'ils apparaisent à 920 km au-dessus de la surface de la terre. Les détails du sol vus par le satellite ont permis à l'analyste Landsat de préciser et d'améliorer considérablement le détail des limites de végétation et l'exactitude des emplacements que d'autres cartes régionales à petite échelle de la végétation n'indiquent souvent que de façon générale. Comme le CIEH veut améliorer l'utilisation des ressources en eau pour mettre en valeur l'ensemble de la région, on ne saurait trop souligner la valeur que présentent des informations de caractère régional géographiquement exactes.

La légende de la carte contient également un tableau qui, pour chaque catégorie de végétation, donne la liste des arbres, buissons et

graminées caractérisant le mieux cette catégorie (VITA, 1977). Les graminées indiquées sont tirées d'une carte et d'une publication de J. M. Rattray (1960), intitulée "The Grass Cover of Africa". Le tableau contient également une série de croquis phytosociologiques représentant la perspective au sol de l'habitat de la végétation.

On a identifié six grandes zones ou ceintures de végétation est-ouest dans les régions de savane de l'Afrique Occidentale. En outre, on a constaté la présence de zones de forêts denses humides au nord de la limite méridionale des régions de savane. En fait, il s'agit là d'une précision nouvelle qui est apportée à cette limite. De plus, on a indiqué séparément les zones de mangliers. Le Tableau 1 indique l'étendue de chacune des huits zones de végétation telle qu'on peut la mesurer sur la carte au 1:2,5 millionièmes.

Il semble que, dans toutes les zones, la végétation naturelle est remplacée à des degrés divers par l'agriculture. La carte fournit des renseignements sur la superficie qui est actuellement défrichée aux fins de culture. Des calculs fondés sur les valeurs moyennes de l'intensité de culture (respectivement, 15, 45 et 70% des catégories 1, 2 et 3 des terres défrichées) permettent d'estimer la surface exploitée à des fins agricoles. Le Tableau 2 indique la superficie de chaque zone de végétation qui possède encore sa couverture naturelle de forêts et de terrains de parcours.

Bien qu'il semble qu'environ 62% des régions de savane ne soient pas défrichés aux fins de culture, il convient de noter que, dans les zones de végétation 3, 4, 5 et 6 qui représentent 80% de la région de savane, les forêts et les terrains de parcours n'occupent qu'un peu plus de la moitié des terres.

Tableau 1

Etendue des zones de végétation naturelle dans les régions de savane

Symbole de la carte	Description de la végétation	Superficie (milliers d'hectares)	Pourcentage de la savane
1	Steppe herbacée	10.607	2,3
2	Steppe arborée	49.055	10,8
3	Savane arbustive	84.209	18,5
4	Savane arborée	88.124	19,4
5	Savane boisée	144.441	31,8
6	Mosaïque	57.067	12,6
7	Forêt dense humide	6.925	1,5
8	Mangliers	1.059	0,2
PN	Parcs nationaux	12.984	2,9
TOTAL	Régions de savane	454.549	100,0

Note: Le total de la superficie est légèrement inférieur au chiffre qui apparaît dans les Volumes 1 à 3 (4.562.547 km^2), vu qu'ici les principaux plans d'eau n'ont pas été pris en compte.

Tableau 2

Couverture naturelle de forêts et de terrains de parcours existant actuellement

Symbole de la carte	Description de la végétation	Estimation de la superficie non défrichée pour la culture (milliers d'hectares)	Pourcentage de la zone de végétation non défrichée pour la culture
1	Steppe herbacée	9.084	85
2	Steppe arborée	45.202	92
3	Savane arbustive	54.766	65
4	Savane arborée	46.613	53
5	Savane boisée	79.230	55
6	Mosaïque	28.242	49
7	Forêt dense humide	4.907	71
8	Mangliers	848	80
PN	Parcs nationaux	12.984	100
TOTAL	Régions de savane	281.875	62

CHAPITRE 3

UTILISATION AGRICOLE DES TERRES

3.1 Identification des types de cultures

Comme les images Landsat de la zone du projet ont été surtout prises durant les mois de décembre, janvier et février, la plupart des terres agricoles étaient alors en jachère. L'identification des types de cultures a donc été faite entièrement en fonction de données complémentaires, renforcées par les connaissances de personnes bien au fait des conditions véritables au sol.

Le lecteur ne doit pas croire, cependant, que si l'on avait disposé d'images Landsat de haute qualité prises au fort du cycle végétatif, il aurait été possible d'identifier les catégories de récolte avec ces seules images. Si l'on voulait identifier les catégories de cultures avec les images Landsat, il faudrait sans aucun doute, à titre de minimum, posséder des données portant sur une série de dates (c'est-à-dire des images Landsat correspondant à toute la saison végétative) et des images rehaussées en couleurs de haute qualité, et procéder à des vérifications au sol pour établir et vérifier les signatures.

Certaines images composites en couleurs Landsat de la zone du projet ont été interprétées pour vérifier l'interprétation en blanc et noir et résoudre les questions qui s'étaient posées durant l'analyse de l'image MSS de la bande 5. Les images composites en couleurs ont fourni plus d'informations détaillées sur les conditions au sol que les vues en blanc et noir. En raison du nombre plus grand de couleurs et de la subtilité des teintes, les images composites en couleurs ont donc amélioré l'exactitude générale de l'analyse Landsat.

Chaque unité cartographique contient un ou plusieurs codes alphabétiques, dont chacun est lié à une culture particulière. On peut porter sur une unité cartographique donnée les indications d'un à sept types de cultures. L'ordre dans lequel deux codes de types de cultures ou davantage sont indiqués sur une unité cartographique n'a aucun rapport avec la dominance ou l'importance économique de ces cultures dans l'unité en question.

En règle générale, le genre d'utilisation des terres, c'est-à-dire les cultures entreprises et, dans une certaine mesure, les méthodes employées, est adapté et correspond à la longueur et à la latitude de la saison agricole. Dans les zones humides de la savane méridionale, la gamme de cultures est plus grande et, vu le cycle végétatif relativement plus long, on y cultive des variétés à rendement plus élevé. C'est ainsi que la culture du maïs y est pratiquée, ainsi que celle du sorgho et du mil à long cycle végétatif. Au fur et à mesure que la saison agricole diminue, en se déplaçant vers le nord, les cultures durent moins longtemps et les variétés changent. Dans les zones les plus septentrionales, on ne cultive pas de maïs; le sorgho et le mil à cycle végétatif très court (capables de pousser en 55 jours) sont les céréales dominantes.

3.2 Intensité de culture

Chaque unité cartographique a été tracée en prenant comme source principale la composition Landsat MSS de la bande 5. Les impressions noir et blanc de la bande 5 font apparaître des variations de gris et de texture qui sont liées à la densité et à la composition de la couverture de végétation naturelle, aux différences de relief et à l'utilisation des terres. Par exemple, dans une zone à couverture végétale dense, la signature tonale Landsat va de gris ordinaire à gris sombre. Tout effort pour débarasser la région de sa couverture végétale naturelle afin, par exemple, de la cultiver, aurait été perceptible sur l'image Landsat, notamment à l'époque de l'année où les

champs sont en jachère et où le sol est à nu. Un sol en jachère à nu est représenté par une couleur grise beaucoup plus légère que la couverture adjacente de végétation naturelle laissée intacte. Les variations de nuances et de texture de l'image ne peuvent servir à elles seules pour identifier l'agriculture en fonction de la couverture de végétation naturelle. L'emplacement géographique de telle ou telle utilisation des terres est une considération importante quand il faut prendre une décision durant l'analyse Landsat. Par exemple, les environs des grandes villes font souvent l'objet d'une culture intensive: associer un emplacement de ville à une signature gris pâle serait donc un critère analytique important pour identifier et cartographier les utilisations des terres de la zone. Une analyse de la répartition des nuances et des textures des images d'une vue Landsat est utile pour étudier les caractéristiques d'utilisation et de couverture des terres. Dans une région à forte densité démographique, mais où la population est répartie en un grand nombre de villes et de villages, une configuration régionale caractéristique apparaîtrait sur l'image Landsat. En pareil cas, la configuration comporterait des points gris vif ou pâle dans une matrice d'un gris plus sombre où les points représenteraient les villes et les villages avec lesquels sont associées des cultures intensives de subsistance, tandis que la matrice d'un gris plus sombre correspondrait à l'intérieur du pays où l'agriculture est moins intensive et où la couverture végétale naturelle est plus dense.

Comme les unités cartographiques qui ont été définies durant l'étude sont fondées sur la reconnaissance des schémas d'images Landsat ainsi que sur la qualité des nuances de gris et des textures, il a été possible de chiffrer le pourcentage qui était défriché aux fins de culture au moment du passage du satellite. On a arbitrairement retenu trois catégories:

1. 0% à 30% de la surface étaient défrichés aux fins de

culture au moment du passage du satellite;

2. 31% à 60% de la surface étaient défrichés aux fins de culture au moment du passage du satellite;

3. plus de 60% de la surface étaient défrichés aux fins de culture.

Selon EarthSat, l'affectation d'une unité cartographique à l'une de ces catégories, grâce à quoi les terres agricoles proprement dites ont été classées comme telles par l'analyse Landsat, se fait avec une grande exactitude qui atteint de 90 à 100% dans les zones de végétation suivantes où les images Landsat font apparaître un bon contraste entre les terres agricoles et la végétation naturelle:

Zone 2 - Steppe arborée

Zone 3 - Savane arbustive

Zone 4 - Savane arborée

Zone 5 - Savane boisée

Zone 6 - Mosaïque

Dans la steppe herbacée (Zone 1), où les précipitations sont minimes, il a été difficile de distinguer entre les terres agricoles en jachère et les zones dépourvues de végétation naturelle en raison des précipitations insuffisantes. De plus, dans la forêt dense humide (Zone 7), où l'on trouve une voûte de forêt dense, un grand nombre de cultures sont des espèces arboricoles. Les précipitations sont abondantes dans cette zone et il a été difficile de distinguer, avec les seules images Landsat, les zones agricoles des zones à couverture de végétation naturelle. Dans les zones de steppe herbacée et de forêt dense humide, l'exactitude des cartes sur le plan de l'intensité de culture est davantage fonction des connaissances et de l'expérience du

consultant du projet.

Les trois catégories indiquant l'intensité des cultures établissent un rapport entre le total de la superficie défrichée pour l'agriculture et le total de l'unité cartographique. Dans une région où la plupart des cultures se font par assolement (agriculture itinérante), un pourcentage variable de terres sont en jachère chaque année. Les superficies en jachère sont, en Afrique Occidentale, des zones de repousse, c'est-à-dire de végétation qui pousse naturellement quand on abandonne les cultures et qu'on ne pratique plus le désherbage.

Dans les conditions actuelles de l'agriculture en Afrique Occidentale, où l'on pratique une agriculture extensive avec peu ou pas d'engrais, il faut une longue jachère pour maintenir la productivité. Plus la jachère est longue, plus le pourcentage de terre au repos est élevé et moins le pourcentage de terres cultivées est grand. Au fur et à mesure que la pression démographique s'est accentuée durant le dernier demi-siècle, et compte tenu de l'intérêt grandissant porté aux cultures de rapport, les périodes de jachère et le pourcentage de terres non cultivées ont eu tendance à diminuer. Pour la présente étude, il n'a pas été possible de subdiviser la terre défrichée aux fins de culture en zones exploitées telle ou telle année, et en zones agricoles abandonnées récemment. Cependant, on a établi, d'après l'Annuaire Agricole de la FAO (FAO, 1978), des données concernant les superficies cultivées en 1976. Le Tableau 3 indique le total des superficies défrichées aux fins de culture, par zone de végétation.

Les calculs fondés sur les valeurs moyennes de l'intensité de culture (15, 45 et 70 pour cent, respectivement, pour les Catégories 1, 2 et 3 de terres défrichées) donnent une estimation de la superficie de terres défrichées pour la culture par zone de végétation (voir Tableau 3). L'ensemble de la superficie défrichée aux fins de culture dans les régions de savane

Tableau 3

Superficies défrichées pour la culture, par zone de végétation

(en milliers d'hectares)

Symbole cartographique	Végétation	De 0 à 30% de la superficie défrichés pour la culture	De 31 à 60% de la superficie défrichés pour la culture	Plus de 60% de la superficie défrichés pour la culture	Superficie totale défrichée pour la culture
1	Steppe herbacée	10.687	néant	néant	1.603
2	Steppe arborée	41.959	6.974	121	3.853
3	Savane arbustive	43.836	21.574	18.798	29.443
4	Savane arborée	25.487	24.632	38.005	41.511
5	Savane boisée	17.160	105.838	21.443	65.211
6	Mosaïque	6.119	31.026	19.922	28.825
7	Forêt dense humide	5.145	néant	1.780	2.018
8	Mangliers	885	174	néant	211
Total des régions de savane		151.278	190.218	100.070	172.674

s'élève à 178 millions d'hectares, soit 38 pour cent de la superficie totale.

Selon les données concernant les potentialités des sols présentées au Chapitre 6 du Volume 1 de la série de rapports pour le projet, environ 80 millions d'hectares sont considérés en règle générale comme ne se prêtant pas à la mise en valeur agricole. Cette superficie englobe des dunes de sable mouvants, les lithosols peu profonds, et les sols salins. Il existe à peu près 875 millions d'hectares de terres arables.

Comme les parcs nationaux occupent 13 millions d'hectares, et dans l'hypothèse où la plupart des parcs sont des terres arables, le total de la superficie arable se chiffre à quelque 362 millions d'hectares. La superficie qui est actuellement défrichée aux fins de culture représente près de la moitié (48 pour cent) de ces terres arables, le reste (189 millions d'hectares) comprend des forêts ou des terrains de parcours.

On suppose qu'en règle générale (sauf dans les zones à onchocercose), les agriculteurs ont choisi les meilleures terres de la savane pour y pratiquer l'agriculture. Les trois meilleures catégories de terres (Classes de potentialité 1, 2 et 3) occupent 227 millions d'hectares. Les terres de mauvaise qualité (Classe 4) totalisent 149 millions d'hectares: en règle générale, ce sont des terres légères qui dominent dans les zones septentrionales plus sèches de la savane. Il est probable, pense-t-on, que la plus grande partie des terres arables qui ne sont pas encore défrichées pour la culture se trouvent dans la Classe 4 et donc de mauvaise qualité.

En fait, une proportion relativement réduite de la superficie est cultivée chaque année pour la production de céréales, de plantes à racines et à tubercules, ainsi que pour celle de légumineuses. L'Annuaire Agricole de la FAO (FAO, 1978) indique la superficie mise en culture chaque année dans l'ensemble des pays de la savane. Un grand nombre de ces pays ne

se trouvent qu'en partie dans la région de la savane (voir Tableau 4).

Afin d'estimer la superficie cultivée dans la partie de chaque pays qui est située dans les régions de savane, on a supposé, dans la plupart des cas, que la superficie exploitée suivait la même proportion que le total de la superficie de chaque pays. Par exemple, dans le cas du Cameroun dont 53,6 pour cent du territoire se trouvent dans la savane, on suppose donc que 53,6 pour cent de la superficie cultivée du Cameroun font également partie de la savane. S'agissant des pays sahéliens, de la Mauritanie au Tchad, on postule que 95 pour cent de leur superficie respective cultivée sont situés dans les régions de savane (voir Tableau 4). C'est sur cette base qu'on a calculé les superficies qui étaient occupées en 1976 par des céréales, des espèces à racines et à tubercules, des légumineuses, du sésame et du coton (voir Tableau 5). La superficie totale de la savane qui sert à produire ces cultures, en sec et sous irrigation, se chiffre à environ 35 millions d'hectares. Environ 200.000 hectares sont actuellement irriguées (voir Tableau 6 du Volume 5 de la présente série de rapports). Ainsi donc, la surface exploitée chaque année représente 8 pour cent de la superficie totale de la savane, environ 10 pour cent de la terre arable de la savane et 20 pour cent de la superficie défrichée. Ces chiffres montrent que les jachères durent en moyenne quatre ans par année de culture. Pour plus de détails sur les superficies cultivées en Haute-Volta, on se reportera à l'étude de Rémy (1970) qui se fonde sur des photographies aériennes prises durant la période 1950-56.

La situation du Nigeria est particulièrement intéressante. En effet, bien qu'il n'occupe que 17,1 pour cent de l'ensemble de la savane, pourtant la moitié de la superficie cultivée de la savane se trouve dans ce pays (17,5 millions d'hectares). Par voie de conséquence, la plus grande partie de la production agricole de la savane provient donc du Nigeria.

Tableau 4

Estimation du pourcentage de la superficie totale cultivée, par pays situé dans les régions de savane

Pays	Pourcentage de pays dans la savane	Pourcentage de la superficie cultivé dans la savane
Bénin	94,5	94,5
Cameroun	53,6	53,6
Côte-d'Ivoire	54,3	54,3
Empire Centrafricain	97,7	97,7
Gambie	100,0	100,0
Ghana	71,5	71,5
Guinée	95,0	95,0
Guinée-Bissau	100,0	100,0
Haute-Volta	100,0	100,0
Mali	43,7	95,0
Mauritanie	17,3	95,0
Niger	27,6	95,0
Nigeria	84,4	84,4
Sénégal	100,0	100,0
Sierra Leone	38,4	38,4
Tchad	43,6	95,0
Togo	100,0	100,0

Tableau 5

Superficie, par pays, des différentes cultures entreprises en 1976 dans les régions de savane

(en milliers d'hectares)

Pays	Céréales	Plantes à racines et à tubercules	Légumineuses	Graines de sésame	Graines de coton	Total
Bénin	445	123	49		51	668
Cameroun	423	299	79		32	833
Côte-d'Ivoire	400	358	7	2	35	802
Empire Centrafricain	173	308	11	46	132	670
Gambie	72	2	12			86
Ghana	583	458	90		4	1.135
Guinée	979	78	48	2		1.107
Guinée-Bissau	90	7	3			100
Haute-Volta	2.234	28	560	40	68	2.930
Mali	1.460	9	29		107	1.605
Mauritanie	179	5	34			218
Niger	3.035	31	837		12	3.915
Nigeria	11.037	2.387	3.511	194	444	17.573
Sénégal	1.084	24	50		44	1.202
Sierra Leone	165	13	19	1		198
Tchad	1.076	34	134	27	303	1.574
Togo	334	110	75	7	8	534
TOTAL	23.769	4.274	5.548	319	1.240	35.150

3.3 Production agricole

L'estimation de la production des principales cultures a été faite en se basant sur les données de la FAO (FAO, 1978). C'est ainsi qu'en prenant en compte les superficies occupées par les différentes cultures (cf. Tableau 5) et en utilisant les statistiques de rendement (en Kg/ha) données par la FAO pour l'année 1976, on a calculé la production totale obtenue de ces cultures pour chaque partie du territoire des pays concernés qui se trouve dans les régions de savane.

Le Tableau 6 donne la liste de la production totale en milliers de tonnes métriques de céréales, de plantes à racines et à tubercules, et de légumineuses.

Les principales céréales entreprises dans la région sont le mil, le sorgho, le maïs et le riz, qui occupent chaque année environ 48, 32, 16 et 4 pour cent, respectivement, de la superficie totale en graminées.

Le tubercule le plus important est le manioc, qui occupe la majorité de la superficie des plantes à racines et à tubercules.

Parmi les légumineuses, les arachides et les haricots ont la place prépondérante.

Le Tableau 6 montre que la partie nigériane de la savane produit environ la moitié du total des céréales et des légumineuses, et environ 70 pour cent des plantes à racines et à tubercules.

En outre, quelque 90,000 tonnes métriques de graines de sésame sont produites dans la savane, les deux tiers au Nigeria et de plus faibles quantités dans l'Empire Centrafricain, au Tchad et en Haute-Volta. De plus

Tableau 6

Production des principales cultures entreprises en 1976 dans les régions de savane

Pays	Céréales		Plantes à racines et à tubercules		Légumineuses	
	Rendement (kg/ha)	Production totale (en milliers de tonnes métriques)	Rendement (kg/ha)	Production totale (en milliers de tonnes métriques)	Rendement (kg/ha)	Production totale (en milliers de tonnes métriques
Bénin	658	293	7.201	886	373	18
Cameroun	968	410	3.607	1.078	599	47
Côte-d'Ivoire	838	335	4.495	1.609	625	4
Empire Centrafricain	531	92	2.891	890	505	6
Gambie	936	67	4.000	8	233	3
Ghana	560	327	6.911	3.165	95	8
Guinée	747	732	8.049	628	540	26
Guinée-Bissau	1.184	106	4.615	30	600	2
Haute-Volta	495	1.106	4.464	125	321	180
Mali	748	1.092	9.228	83	1.123	33
Mauritanie	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
Sénégal	659	714	5.010	120	326	16
Sierra Leone	1.427	236	3.287	43	537	10
Tchad	502	540	2.915	99	402	54
Togo	850	284	8.096	891	300	23
TOTAL SAVANE		15.027		33.724		1.464

quelque 700 à 800.000 tonnes métriques de graines de coton sont produites dans la région, notamment au Nigeria, au Tchad, au Mali et au Bénin.

Pour les données concernant la production de légumes, de fruits, de fibres et de caoutchouc, on est prié de se référer aux statistiques de la FAO pour chaque pays (FAO, 1978).

RESUME

Le Tableau 7 ci-après résume les données concernant la couverture et l'utilisation des terres, ainsi que la production agricole dans les régions de savane.

Tableau 7

Couverture végétale, utilisation des terres et production agricole dans les régions de savane

Utilisation/couverture des terres	Hectares (10^6)	Tonnes métriques (10^6)
Superficie totale	455	
Végétation naturelle (forêt et terrains de parcours)	269	
Parcs nationaux	13	
Terres arables	375	
Terres non arables	80	
Superficie défrichée pour la culture	173	
Terres arables non défrichées pour la culture	189	
Superficie cultivée 1976	35	
Superficie cultivée et production de céréales 1976	24	15
Superficies cultivées et production de plantes à racines et à tubercules 1976	4	33
Superficie cultivée et production de légumineuses	6	1

La carte ci-jointe fait apparaître les régions où l'agriculture exerce des pressions évidentes sur les terres. La carte subdivise la région en zones où des problèmes sont susceptibles de se poser et identifie celles qui exigent des analyses plus détaillées. Il es possible d'exécuter des

études davantage affinées de zones plus petites en effectuant des vérifications au sol et en employant des images Landsat de plus grande échelle (par exemple au 1:250,000) qui ont été rehaussées afin de faire apparaître le maximum d'information concernant la couverture et l'utilisation des terres.

Dans le cas où dans le proche avenir une station de réception au sol des données Landsat était établie à Ouagadougou, il est certain que l'utilité des images Landsat à titre d'outil de planification régionale connaîtrait une augmentation spectaculaire. On disposerait alors d'un instrument permettant de procéder à une surveillance saisonnière. On pourrait ainsi identifier et gérer les ressources en eau de toute l'Afrique Occidentale. On pourrait suivre les modifications saisonnières des plans d'eau ainsi que le processus de désertification. Grâce au Landsat, on pourrait établir des cartes faisant apparaître les zones qui font l'objet de sévères pressions imputables, par exemple, à l'agriculture; ces cartes serviraient d'outils de gestion.

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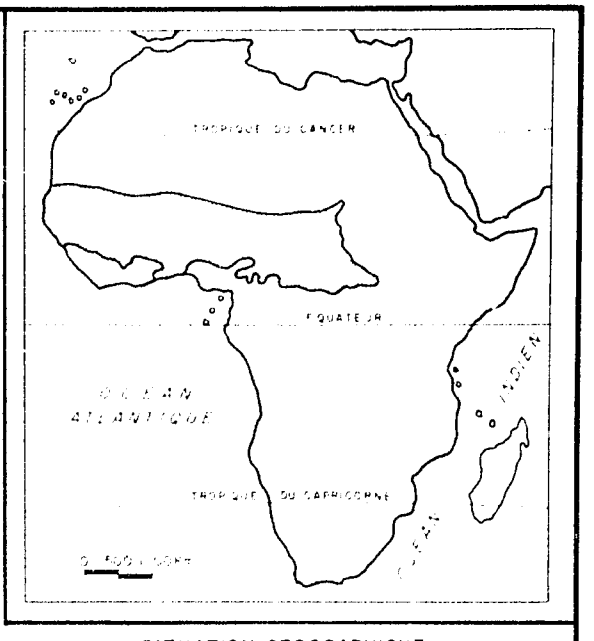
Volunteers in Technical Assistance (1977) Reforestation in arid lands. Mt. Rainier, Maryland.



SITUATION GEOGRAPHIQUE
GEOGRAPHIC LOCATION

COMITE INTERAFRICAIN D'ETUDES HYDRAULIQUES

PROJET D'UTILISATION DES RESSOURCES EN EAU ET DES TERRES DES REGIONS DE SAVANE

COMITE INTERAFRICAIN D'ETUDES HYDRAULIQUES

SAVANNA REGIONAL WATER RESOURCES AND LAND USE PROJECT

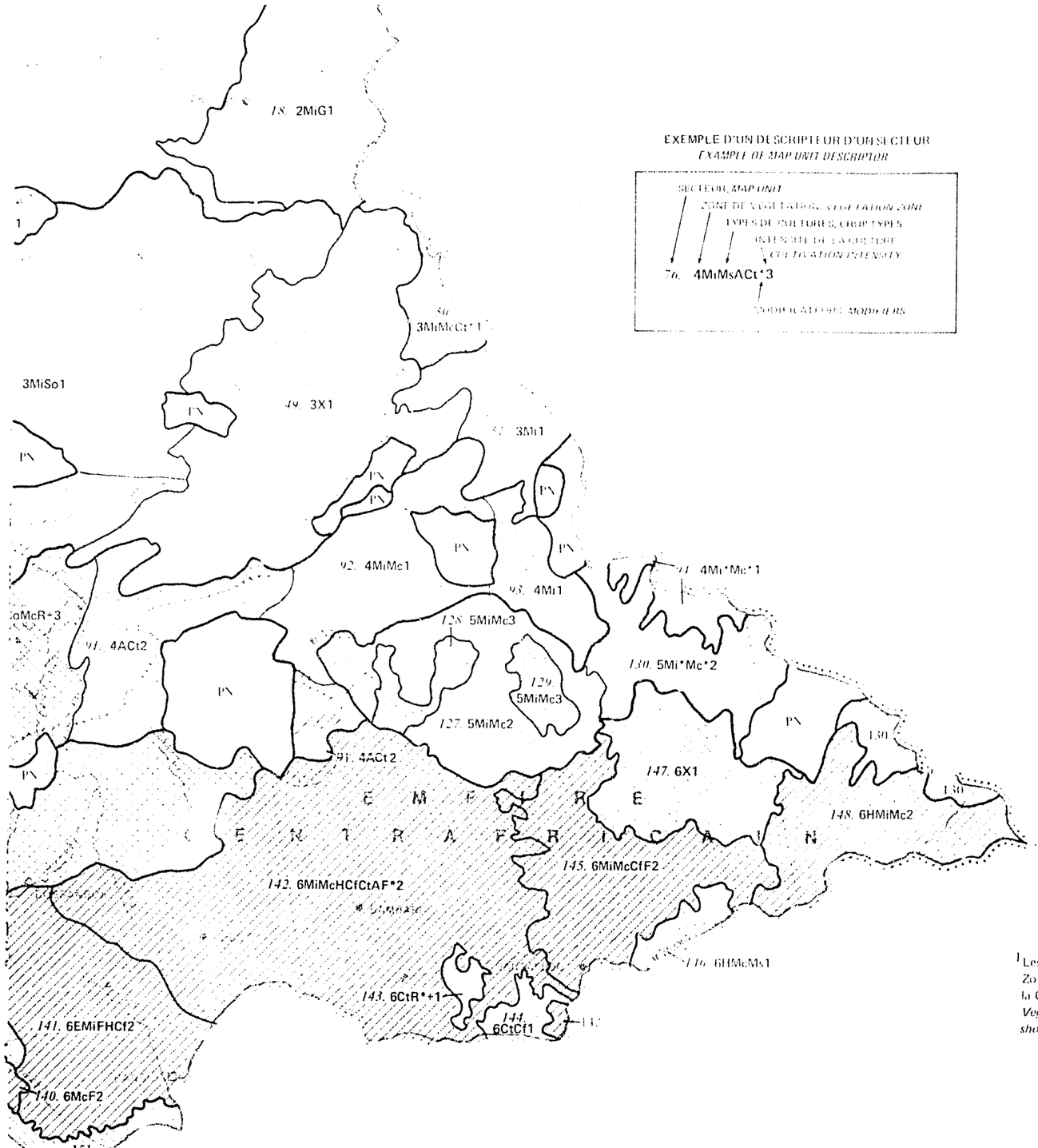
INTERAFRICAN COMMITTEE FOR HYDRAULIC STUDIES

VOLUME 6 CARTE No. / MAP No **1**	**UTILISATION ET COUVERTURES DES TERRES** **LAND USE / LAND COVER**

TIPPETTS ABBETT McCARTHY STRATTON ENGINEERS AND ARCHITECTS

4A3
4MsSoA1
4MsSoA2
4MsSoA1
4MsSoA2
4MsSoA3-C
5MsCtTE2
4MsSoACt3
4MsSoVs2
4MsSoAs3
4SoAtR3
4SoACtR3
4SoAtR3
4SoGtKsRA3
5MsSo2
5CtHAF2
5MsSoACtR1
5MsCtTE2
5RCtTEG3
5HRCtC2
5HICt2
5MsCtCtFC3
7R*A*1
6CtCaMsMcE3
7R*A*1

16 2X1
2MiS
4MiMkACt3
4MiSo2
4MiSoAR+Ct3
4RCtA3
4SoMkMcCtR+F3
4CtTS
5MiR2
4MiSoACt1
5ASoMsFR3
6HCaF2
6HERF2
4Mi2
5MiSoR+CtTE3
6MsMcF3
7CtCaCfFMcMsR3
6CfHPF3
6HMcP2
6McFCt1
6McF1
7CfHF1



EXEMPLE D'UN DESCRIPTEUR D'UN SECTEUR
EXAMPLE OF MAP UNIT DESCRIPTOR

SECTEUR, *MAP UNIT*
ZONE DE VÉGÉTATION, *VEGETATION ZONE*
TYPES DE CULTURES, *CROP TYPES*
INTENSITÉ DE LA CULTURE, *CULTIVATION INTENSITY*

76. 4MiMsACt*3

MODIFICATEURS, *MODIFIERS*

LEGENDE

VEGETATION DE FORET ET DE PARCOURS[1]
FOREST AND RANGE VEGETATION[1]

1. Steppe herbacée, *Grass Steppe*
2. Steppe arborée, *Tree Steppe*
3. Savane arbustive, *Shrub Savanna*
4. Savane arborée, *Wooded Savanna*
5. Forêt claire, *Woodland*
6. Mosaïque, *Mosaic*
7. Forêt dense humide, *Tropical Rainforest*
8. Marécages, *Mangroves*

( ) indique la présence de terre stérile;
indicates the presence of barren land

PN Parcs nationaux et réserves,
National Parks and Reserves

TYPES DE CULTURES
CROP TYPES

Mi	Millet, *Millet*
So	Sorgho, *Sorghum*
Ms	Maïs, *Maize*
B	Blé, *Wheat*
R	Riz, *Rice*
Mc	Manioc, *Cassava*
E	Autres plantes à racines, *Other Root Crops*
A	Arachides, *Ground Nuts*
P	Plantains, *Plantains*
F	Arbres fruitiers, *Fruit Trees*
Cs	Canne à sucre, *Sugar Cane*
Ca	Cacao, *Cocoa*
Cf	Café, *Coffee*
T	Tabac, *Tobacco*
Se	Sésame, *Sesame*
H	Palmier à huile, *Oil Palm*
G	Gomme arabique, *Gum Arabic*
Ct	Coton, *Cotton*
X	Aucune culture, *No Crops*
*	uniquement en des endroits sélectionnés et d'étendue relativement limitée *at selected, relatively limited locations only*
+	terre irriguée, *irrigated land*

INTENSITE DE LA CULTURE
CULTIVATION INTENSITY

1	0% - 30%	du secteur de friche à des fins agricoles à l'époque du survol Landsat *(Land used for cultivation at the time of Landsat overflight)*
2	31 - 60	
3	>60	

0 50 100 150 200 250 Km

[1] Les Associations de Végétation par Zone sont présentées en Annexe à la Carte No. 1
Vegetation Associations by Zone shown in attachment to Map No. 1.

La carte a été préparée par Earth Satellite Corporation, Washington, D.C. Les unités de la carte ont été délimitées à partir d'un levé Landsat MSS bande 5 à l'échelle 1:2,500,000 [illegible] photographies non redressées) de l'ensemble de la zone du projet. La [illegible] cartographiques a été basée sur diverses sources de renseignements [illegible] (1) les données de cartes existantes; (2) l'interprétation Landsat et (3) les consultations avec des experts familiers avec des conditions du terrain. Les images Landsat ont été utilisées [illegible] entre 1972 et 1976 au cours de la période allant de novembre à mars.

Avec l'autorisation de Michelin, les parcs nationaux et les réserves ont été reportés de la carte Michelin no. 153 publiée en 1975 à l'échelle 1:4,000,000.

The map was prepared by Earth Satellite Corporation, Washington, D.C., in October, 1978. The map units shown were delineated from a 1:2,500,000 scale Landsat MSS band-5 tiedown (uncontrolled mosaic) of the entire project area. Map unit classification was derived through the use of multiple data sources: (1) collateral map data, (2) Landsat interpretation, and (3) experts familiar with actual ground conditions. Landsat imagery was acquired by the satellite between 1972 and 1976 during the November to March time frame.

With permission from Michelin, National Parks and Reserves were transferred from Michelin Map No. 153 published in 1975 at a scale of 1:4,000,000.

ASSOCIATIONS DE VEGETATION PAR ZONE
VEGETATION ASSOCIATIONS BY ZONE

	PHYTOSOCIOLOGIE[1] *PHYTOSOCIOLOGY*	BUISSONS ET ARBRES *BUSHES AND TREES*	HERBES *GRASSES*
Steppe herbacée *Grass Steppe*		*Acacia raddiana* Savi *Balanites aegyptiaca* *Leptadenia spartium* Wight	*Aristida mutabilis* Trin. & Rupr. *Panicum turgidum* Forsk. *Eragrostis tremula* Hochst.
Steppe arborée *Tree Steppe*		*Acacia raddiana* Savi *Acacia senegal* (L.) Wille *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 nioricum* Lepoutre *Combretum glutinosum* Perr. *Terminalia avicennioides* Guill. & Perr. *Piliostigma reticulatum* (DC.) Hochst. *Cassia sieberiana* DC. *Tamarindus senegalensis* Perr. *Bauhinia reticulata* Taub. *Ziziphus mauritiana* *Zizyphus spina-christi* (L.) Desf. *Sterculia setigera* (A. Rich.) Hochst. *Prosopis africana* Taub.	*Andropogon gayanus* Kunth *Andropogon ascinodis* Chiov. *Brachiaria* spp. Griseb. *Loudetia togoensis* (Stapf) C.E. Hubbard
Savane arborée *Wooded Savanna*		*Acacia macrothyrsa* Harms *Acacia nilotica* Willd. var. *cupularis* (L.) A. Chev. *Acacia seyal* Del. *Adansonia digitata* L. *Afzelia africana* Sm. var. *pachyloba* (Harms) Adams *Anogeissus leiocarpus* (DC.) Guill. & Perr. *Bauhinia reticulata* DC. *Hymenocardia acida* Tul. *Mitragyna inermis* O. Kuntze *Pterocarpus erinaceus* Poir. *Sterculia setigera* (A. Rich.) Hochst. *Terminalia avicennioides* Guill. & Perr. *Terminalia macroptera* Guill. & Perr. *Vitex doniana* Sweet *Ziziphus mauritiana* Lam. *Ziziphus spina-christi* (L.) Desf.	*Andropogon gayanus* Kunth *Andropogon tectorum* Schumach. *Hyparrhenia* spp. Anderson *Pennisetum pedicellatum* Trin. *Panicum laetum* Kunth *Aristida* spp. Antessa ex Linné *Schizachyrium exile* (Hack.) Pilger
Savane boisée *Woodland*		*Afzelia africana* Sm. var. *pachyloba* (Harms) Adams *Anogeissus leiocarpus* (DC.) Guill. & Perr. *Bauhinia reticulata* DC. *Combretum glutinosum* Perr. *Daniellia oliveri* (Rolfe) Hutch. & Dalz. *Detarium microcarpum* Guill. & Perr. *Afzelia africana* Sm. *Pterocarpus erinaceus* Poir. *Sterculia setigera* (A. Rich.) Hochst. *Terminalia macroptera* Guill. & Perr. *Lannea acida* A. Rich. *Parkia biglobosa* (Jacq.) R. Br. *Vitex doniana* Sweet *Tamarindus indica* L.	*Andropogon gayanus* Kunth *Andropogon tectorum* Schumach. *Hyparrhenia* spp. Anderson ex Hochst. *Pennisetum pedicellatum* Trin. *Panicum laetum* Kunth *Aristida* spp. Antessa ex Linné *Schizachyrium exile* (Hack.) Stapf *Andropogon pseudapricus* Stapf *Loudetia simplex* (Nees) Hubbard & Clayton *Pennisetum ramosum* Schumach.
Mosaïque *Mosaic*		*Afzelia africana* Sm. *Anogeissus leiocarpus* (DC.) Guill. & Perr. *Bauhinia reticulata* DC. *Combretum glutinosum* Perr. *Daniellia oliveri* (Rolfe) Hutch. & Dalz. *Afzelia africana* Sm. *Detarium microcarpum* Guill. & Perr. *Pterocarpus erinaceus* Poir. *Terminalia* spp. L.	*Andropogon gayanus* Kunth *Andropogon tectorum* Schumach. *Cenchrus biflorus* Roxb. *Panicum laetum* Kunth *Pennisetum* spp. A. Rich. ex Schumach. *pedicellatum* Trin. (Schumach.) Stapf & C.E. Hubbard *ramosum* (Hamilt.) Stapf
Forêt dense humide *Tropical Rainforest*		Une large variété et de grands nombres d'espèces de buissons et de plantes rampantes [illegible] abondant. Il y a étage [illegible] une couverture végétale très dense de [illegible] dans les zones de forêts tropicales humides. *A large variety and number of bushes and vines with a profuse undergrowth forming a very dense vegetation cover (semi-evergreen in tropical rainforest areas).*	Dans les zones de forêt tropicale humide les arbres sont utilisés uniquement [illegible] tandis que le sol est couvert de végétation des plantes herbacées qui le [illegible] [illegible] Cette situation est caractéristique de la zone environnante. *In dense rainforest areas the tree canopy is dominant, thus the grass vegetation occurs only where clearings exist. This is characteristic of the surrounding 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 essence 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.*
Dans les plaines d'inondation. *In floodplains.*

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

ANNEXE A LA CARTE ATTACHMENT TO MAP VOLUME 6 CARTE No. 1 MAP No.	UTILISATION ET COUVERTURES DES TERRES LAND USE / LAND COVER

TIPPETTS ABBETT McCARTHY STRATTON ENGINEERS AND ARCHITECTS

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER 1 SIZE 28,119 Sq. km

LOCATION Northwestern part of project area in Mauritania. North of Aioun-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-predominatly 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 baobab-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 Commiphora (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 graying 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 origin, raw-mineral erosion soils over various rocks and immature hydromorphic deposit soils every 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 graying around intermittent water sources - sheep, goats, cover.

Area description (Landsat analysis)

Band 5 shows northeast/southwest trending dunes with sharp linear interface 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 abundant 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 (millet) - (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-agricultural rough grazing land (World Atlas of Agriculture, 1976). Raw mineral 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 39,834 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 dominant 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 & Aubreville, 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, Komadugu 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-agriculture & 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 (International Atlas of W. Africa, 1971). No data east of Lake Chad.

Area description (consultant)

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 southwest - 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 signatiures (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'Ghoria 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 (International 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 probably 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 northeast/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. Erorional 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 differentiation. 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 ferruginous crusts and concretionary leached gray ferruginous 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-grumusolic 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 vegetation (CIA Map of Mali, 1970); Rice, cotton are dominant (Atlas of Africa, 1973; CIA Map of Mali; 1970). Mineral hydromorphic soils with pseudogley 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 indicates 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 reclamation 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 (northern part). Non-intensive subsistence - Millet; Bandiagara plateau and outliers - non agricultural on the plateaus (R. J. Harrigon 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 Landsat 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.

DELINEATION DOCUMENTATION SHEET

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 w[illegible] 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 signatures 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 (International Atlas of W. Africa, 1971). No data east of Lake Chad.

Area description (consultant)

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-agriculture & 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 relatively 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; 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 signatures (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 subsistence & some commercial (Atlas of Africa, 1973); Mixed subsistence & grazing (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 complexly intermingled, especially along the Bahr Erguig. In the northern section of the map unit; these signatures have more generally defined domains; 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 & Commercial (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 indicative 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 vegetation.

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 farming, 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 (Kuay & 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 (International Atlas of West Africa, 1971)

Area description (consultant)

Salt flats, much tidal brackish intrusion; freshwater only during heavy precip. Sparse vegetation, tameric or 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 leaching(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 dom nates 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 leaching(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.

DELINEATION DOCUMENTATION SHEET

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 evergreen 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 agriculture - 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 subsistence - 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 hydromorphic 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 intensive 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 gravelly 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.

LOCATION From approximately Diema in the west, southeastward to Bobo-Dioulasso 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-gromosolic 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. Atea 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 vegetable 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 vegetation (CIA Map of Benin, 1970); Millet, sorghum, fundi; peanuts, beans and sesame. Indian butter trees (Atlas of Africa, 1973); Mineral hydromorphic soils with psuedo-gley and leached gray ferruginous soils (International 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 2,475 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 Isoberlinia 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 Cormiphora (Keay & Aubreville, 1958); Acacia savanna (CIA Map of Niger, 1962); Peanuts, millet and sorghum (CIA Map of Niger, 1962); Cultiorop 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. Considerable 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 agriculture 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 (International 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 aethiopum 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 sesquioxydes: gray & leached gray ferruginous; immature erosion (lithosols) soils of non-climatic origin (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 & maize are staples; peanuts - 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 of W. Africa, 1971).

Area description (consultant)

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-agriculture & 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 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

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-agriculture & 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 signaotures 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 ferruginous (leached); desert ablation soils (International Atlas of W. Africa, 1971).

Area description (consultant)

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 relatively 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). 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; 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 signatures (burns). Very few significant forest signatures (Dark gray). Small relatively evenly distributed light area on darker background indicative 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 Agriculture, 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 relatively 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; Roponorphic & Lithomorphic medium desaturated ferallitic soils & Halomorphic soils.

Wooded savanna relatively rich soils, cotton & animal traction, sorghum, millet, maniec, 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 signatures (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 & Aubreville, 1958)

Ag. Traditional & commercial; cotton seed (Atlas of Africa, 1973); Non-agriculture & 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, manioc, 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 & Aubreville, 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 sav[illegible]

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 Isoberlinia 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, 1973 and CIA Map of Gambia and Senegal, 1972). Mineral hydromorphic soils with pseudo gley along rivers; slightly desaturated ferralitic soils; immature soils non-climatic origin; and concretionary leached gray ferruganious soils (International Atlas of West Africa, 1971).

Area description (consultant)

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 Landsat 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 incrustations (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 tributaries. 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 Mostic 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 indication 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 (International 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

[illegible] - 60% of area has been cleared for cultivation at the time of Landsat [illegible]erpass.

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. Dalziellii (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 ferralitic 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 cultivated 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 indicates 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 Guinea, 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 Djallon highland mass - complex of elevated relatively level plateaus; agriculture is difficult; coffee cultivation near Lobe (Area Handbook for Guinea, 1975).

Area description (consultant)

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 plateaus 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, sorghum.

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 agriculture (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 Guinea, 1973); Woodlands savannas and Steppes - northern areas with abundant Isoberlinia Doka and I. Dalziellii (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 evergreen 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 suggests 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. Dalziellii (Keay & Aubreville, 1958); Rice (Atlas of Africa, 1973); Mineral hydromorphic 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 Bougouni

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. Dalzellii(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 ferrugen ous 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.

DELINEATION DOCUMENTATION SHEET

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; coffee 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 ferallitic 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 peanuts - millet and maize. Reworked - slightly desaturated ferralitic soils and improverished 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 vegetation (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-agriculture & 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 Agriculture, 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.

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER 119 SIZE 11,765 Sq. km.

LOCATION Dentral 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. dalzielii; 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 vertisols 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.

DELINEATION DOCUMENTATION SHEET

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 indicative 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, Komadugu 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 (international Atlas of W. Africa, 1971).

Area description (consultant)

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 types; penevolved medium desaturated ferralitic soils (International Atlas of W. Africa, 1971).

Area description (consultant)

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 riverina sand bars. Rest of map unit is medium to dark gray tonal signatures 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 shrub 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 Agriculture, 1976).

Soils ~~Strongly desaturated ferallitic soils, some leached alou; 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 - 50% 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 Camerous, Mised broadleaf deciduous & Evergreen forest-South Cameroun, small marsh or swamp in central Cameroun under vegetation (CIA Maps).

Area description (consultant)

Soils Strongly desaturated ferallitic soils - yellow & reworked strongly desaturated ferrallitic 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 Research Service (CTFT) knows the area well. He is in Paris. Plateau highland 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 interfluves 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 (Bongo Hassi).

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 farming). 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 abundant 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 Agriculture, 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 abundant 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,N 3 Cs Ativon Kodgo (August 22, 1978).

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

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 abundant 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, 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, 197[illegible]); Sesame Seed (CIA)

Soils Medium desaturated ferallitic soil; impoverished and strongly desaturated ferallitic soils (International Atlas of W. Africa, 1971).

Area description (consultant)

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 - savanna mosaic (Keay & Aubreville, 1958).

Area description (consultant)

Unfamiliar with the area

Area description (Landsat analysis)

Landsat cloud - free imagery was not available for this area

Final classification

Mosaic

Coffee, oil palm, plantains, fruit trees;

Greater than 60% of area under cultivation at the time of Landsat overpass

DELINEATION DOCUMENTATION SHEET

AREA (POLYGON) NUMBER 136 SIZE 38,509 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 Broadleaf 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 -

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 signature, 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

15 - 60% of area has been cleared for cultivation at the time of Landsat overpass.

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 agriculture & 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

Area description (consultant)

Not familiar with area

Area description (Landsat analysis)

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 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-undifferentiated 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

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.

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 indicative 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 signatures 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 31,322 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 relatively moist types; Southern section - forest savanna Mosaic (Keay & Aubreville, 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 unusally 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 cultivated vegetation (CIA May of Senegal and Gambia, 1972). In region known as Woodlands Savannas and Steppes with abundant Isoberlinia Doka and I. dalyiellii 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 Casamance 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.

LOCATION Estuarine and delta area along coast West of Bissau, Figuinchor, Boke, Bofia, 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 cultivation 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 channels adjacent to Cornbal 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 & Commercial (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 indicative 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.