

LOW LEVEL TRANSECT AERIAL PHOTOGRAPHY OVER THE FIFTH
REGION OF MALI FOR VALIDATION OF SATELLITE IMAGERY

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1 INTRODUCTION.

The passage of the River Niger and the seasonal inundation of an extensive Inland Delta profoundly effect the way of life in the Fifth Region of Mali, which covers a land area of some 95,000 square kilometers. Although the Region lies within the Sahel and receives less than 600 mm rainfall per annum, the complexity and intensity of land use are not typical of the zone as a whole. A wide variety of agricultural production systems are represented.

In the southern part of the Region, rainfed millet is extensively farmed. With good rainfall and floods large areas of the Inland Delta are planted with paddy and local varieties of wild rice. Along the banks of rivers and lake shores flood retreat cultivation is widely practiced at the early dry season. Fishing is another major activity. But above all else the Fifth Region is recognised as being one of Mali's most important livestock producing areas. Oxen, horses and donkeys are commonly employed as work animals.

Low level aerial survey and complimentary ground surveys of livestock resources and production systems carried out in 1987 found substantially fewer cattle and many more small ruminants within the Region than before the 1983-85 drought (RIM, 1987). It was also concluded that, after many years of low rainfall, reduced river flow and less extensive flooding, all forms of production had been severely disrupted and that there was intense and increased pressure on declining resources. In response to this producers had intended to diversify their activities into a variety of different modes of production.

It is within this context of post-drought recovery, increasing competition for limited resources, socio-economic transition and environmental change, that two of the major Government agencies working in the Region: L'Operation de Developpement d'Elevage dans la Region de Mopti (ODEM) and L'Operation Riz Mopti (ORM) have initiated a two year Rural Production System Study - Etude System Production Rurale (ESPR). The objectives of the study are to review the present status of agricultural production in the Region and address the complex issue of future development policy by exploring the implications of alternative development strategies.

To achieve these goals it is obviously essential to know what resources are currently available, and in particular how much land is under

cultivation. The most cost-effective and reliable means of rapidly obtaining such information over an area as large as the Fifth Region is to employ a combination of satellite imagery and validatory low level aerial photography.

Project Inventoire Ressources Terrestres (PIRT), a Mali Government Agency with considerable experience of interpretation of LANDSAT imagery, is collaborating with ESPR to provide a regional assessment of land use and vegetation patterns, based on 1988 LANDSAT imagery. Resource Inventory and Management Limited (RIM) was commissioned to provide new strip sample aerial photography along three East-West transects across the region (Figure 1), and obtain up-to-date satellite imagery of the Fifth Region:

I - Southern Transect: Diaforabe - Bankas - Koro.

From the western Regional boundary, over Diaforabe, across the southern floodplains of the Inland Delta, over the Bandiagara (Dogon) Plateau, to Bankas and Koro and the extensively cultivated southern part of the Seno Mango, to the frontier with Burkina Fasso.

II - Central Transect: Seri - Douentza - South of Hombori.

From the western Regional boundary, over Seri, across the central floodplains of the Inland Delta to Kona, across the northern escarpment of the Bandiagara Plateau to Douentza, and eastward just south of the Dyounde mountain range, across the northern grasslands of the Seno Mango, south of Hombori to the frontier with Burkina Fasso.

III - Northern Transect: Lere - Bambara-Maounde.

From the western Regional boundary, south-east of the Mauritanian frontier, over Lere, and across the northern lake zone of the Inland Delta to Bambara-Maounde.

2 AERIAL PHOTOGRAPHY.

2.1 Aircraft and Crew.

The three transects selected by ESPR were flown using a light aircraft specially equipped for low level aerial survey work - a twin engined Partenavia with a crew of four: pilot, navigator, photographer and an observer from PIRT. The aircraft was fitted with a Crouzet Omega Navigation System and a radar altimeter for accurate flight control, and a centrally mounted inboard camera platform and hatch for vertical photography.

2.2 Camera Equipment, Film and Prints.

Photographic equipment consisted of a Nikon F3 camera with a 24 mm wide angle lens and a 250 frame motor driven bulk film data- back, triggered by an intervalometer.

The intervalometer was set to take one exposure every five seconds. At a cruising speed of 220 kilometers per hour (110 knots) and at 2,000 feet (610 meters) above ground this frequency provided photographic coverage of one frame every 300 meters and an overlap between adjacent prints of some 50%.

Fujicolour Professional 160 ASA colour negative film was used throughout. The negatives obtained were at a scale of 1:25,000, which were enlarged and printed on Konica Lustre paper at a scale of 1:5,000. A total of 3518 130 x 180 mm (5" x 7") were produced: 909 for Transect I; 1570 for Transect II; and 1039 for Transect III. Each print represented an area of some 600 x 900 meters on the ground, and is uniquely identified by a data window to the left of each frame, indicating: Date, Time, Film and Transect. (See Figure 2.)

An index of photographic coverage for each transect is given in Section 4. Actual flight paths, based on visual ground fixes during flight, together with photo reference points are shown on a single set of 1:200,000 IGN Topographical Maps of the region which accompany the aerial photographs presented together with this report.

Map sheets for the central and southern transects (I and II) are: NIONO, MOPTI, BANDIAGARA, DOUENTZA, and DJIBO.

Map sheets for northern transect (III) are: NAMPALA, SA, NIAFOUNKE, and BAMBARA-MAOUNDE.

3 AIR PHOTO INDEX 1:200,000 REFERENCE MAPS.

3.1 Southern Transect - I.

TABLE 1: AIR PHOTO INDEX FOR SOUTHERN TRANSECT - I.

DATE	TIME	PRINT	COMMENTS
6-1-89	11-39-17	86	Diaforabe
6-1-89	11-52-43	237	River
6-1-89	12-03-05	280	River confluence
6-1-89	12-11-35	384	Village and river
6-1-89	12-13-04	402	River Bani
6-1-89	12-16-03	438	Main road
6-1-89	12-20-08	488	Small river
6-1-89	12-36-08	575	Outcrop of rock
6-1-89	12-38-21	590	Outcrop of rock
6-1-89	12-44-26	644	Bankass
6-1-89	12-56-24	758	Ville
6-1-89	12-58-53	788	Large village
6-1-89	13-02-40	834	Koro
6-1-89	13-06-11	878	Striated bush

3.2 Central Transect - II.

TABLE 2: AIR PHOTO INDEX FOR SOUTHERN TRANSECT - II.

DATE	TIME	PRINT	COMMENTS
7-1-89	11-09-00	55	Segouba
7-1-89	11-15-55	126	L. Kanou
7-1-89	11-21-25	192	TiambaueI
7-1-89	11-24-05	227	Seri
7-1-89	11-39-10	340	Ouro Altaka
7-1-89	11-44-35	406	Mayo Dembe/Saba
7-1-89	11-58-15	496	River Niger
7-1-89	12-02-50	553	Outcrop of rocks
7-1-89	12-10-40	646	Drainage ditch
7-1-89	12-14-35	693	Escarpment
7-1-89	12-25-15	757	Temba
7-1-89	12-32-37	846	Douentza
7-1-89	12-38-10	913	Tebi Toumbo
7-1-89	12-45-27	942	Start of film #9
7-1-89	12-52-45	1030	Vegetation
7-1-89	12-55-15	1072	Vegetation
7-1-89	13-00-20	1123	Sparse vegetation
7-1-89	13-10-20	1180	Start of film #10
7-1-89	13-15-02	1238	Vegetation
7-1-89	13-20-10	1300	Road N - S
7-1-89	12-25-35	1364	Road N - SE
7-1-89	13-32-06	1412	Start of film #11
7-1-89	12-38-15	1486	Vegetation
7-1-89	13-41-34	1526	Vegetation

3.3 Northern Transect - III.

TABLE 3: AIR PHOTO INDEX FOR SOUTHERN TRANSECT - III.

DATE	TIME	PRINT	COMMENTS
8-1-89	11-12-25	50	Cultivation
8-1-89	11-17-18	119	Lere
8-1-89	11-22-44	190	Dianke (north)
8-1-89	11-30-36	238	Start of film #13
8-1-89	11-32-13	268	Village
8-1-89	11-37-23	309	Vegetation
8-1-89	11-39-06	340	Small lake and canal
8-1-89	11-44-33	394	River Niger
8-1-89	11-46-46	421	Sparse vegetation
8-1-89	11-49-25	483	River confluence
8-1-89	11-56-58	528	Bank of the river
8-1-89	12-01-03	580	Vegetation
8-1-89	12-02-53	602	Edge of a dry lake
8-1-89	12-09-32	682	Village
8-1-89	12-12-26	717	Vegetation
8-1-89	12-19-21	775	Red ground
8-1-89	12-24-00	843	Bare ground
8-1-89	12-38-23	1018	Red ground
8-1-89	12-39-03	1038	Bambara-Maounde

4 REFERENCES.

RIM, 1987. Un Refuge dans le Sahel. Rapport par Resource Inventory and Management Limited a l'Operation de Developpement de l'Elevage dans la Region de Mopti et le Banque Mondiale.

5 ACKNOWLEDGEMENTS.

RIM would like to thank the following organisations and individuals for their support and assistance in carrying out this study: the Director Generals and staff of ODEM and ORM; the Team leader and staff of ESPR; the Director and Deputy Director of PIRT; the International Livestock Centre for Africa for the hire of their aircraft and facilities provided in Bamako. In particular RIM would like to thank the individuals who took part in the survey: the pilot Captain Tassew Medhin; the coordinator and navigator: Dr. David Bourn, the photographer: Felicity Wint; and the observer from PIRT, Oumar Doumbia.