AGRICULTURAL APPLICATIONS (PARALLEL SESSION)

A APPLICATION OF REMOTE SENSING TECHNIQUES FOR IDENTIFICATION OF IRRIGATED CROP LANDS IN ARIZONA

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Introduction

The Arizona Department of Water Resources contacted NASA officials in April 1980 to request information on the possibility of using satellite imagery in its effort to identify irrigated acreage for the 1980 Arizona Water Resource Inventory Report. DWR staff and representatives from NASA Ames, formulated a project to demonstrate remote sensing methods of determining irrigated acreage. The Maricopa Water District, lying just west of the Phoenix metropolitan area containing about 30,000 acres of irrigable land, was chosen as a test area. The district was selected because of the availability of reliable historic data and its willingness to provide the necessary ground-truth. In a typical year, about 23,000 acres of cotton, grain, vegetables, citrus and some specialty crops such as roses and nursery trees are irrigated in the district. In most years, cotton has accounted for between 50 and 60% of the acreage under cultivation.

Since all crops except fall lettuce and some miscellaneous crops are under irrigation in April and July, imagery for April and July were obtained in order that a multi-date analysis could be performed.

DWRs input to the demo-project was to establish project goals and to provide appropriate maps, resource information, assemble cropping patterns for the test site. DWR coordinated the program with the irrigation district managers.

Two types of analysis, band ratioing and unsupervised categorization, were chosen to perform the irrigated lands inventory. For both techniques, the irrigation district boundaries and section lines were digitized and calculated and displayed section by section.

Band Ratio

Since vigorous vegetation reflects near infrared light strongly and absorbs red light, a high ratio value is a good indicator of vegetative

cover. A threshold value was chosen by testing several values. The value which yielded results which best correspond with known crop patterns in the test area was utilized to represent an irrigated field. Natural vegetation acreage was excluded by identifying these areas on false color composites on the Landsat scene and confirmed by ground-truth.

Unsupervised Categorization

An unsupervised categorization was done for the April and July 1979 scenes separately and then for the two dates together. The clustered data was categorized and were identified as irrigated or idle and verified by using both ground-truth and false color composites.

The estimates from both techniques were quite close for July irrigated acreage and indicated that about half of the irrigation district was irrigated at that time. The district reported that 21,560 acres were irrigated in 1979. The estimates of April irrigated acreage by unsupervised categorization labeled some of the areas of natural vegetation within the district boundaries which were green in April as irrigated.

The following table shows that both estimation techniques were quite accurate in estimating irrigated acreage in the 1979 growing season.

Maricopa Water District Land Usage

Gross Acreage	34,700	
1979 Reported Crop Acreage	23,700	
1979 Irrigated Acreage	23,700 - 2,140* = 21,560	

Maricopa Water District Land Use Estimates (Band Ratio Analysis)

Gross Acreage	35,969	
April 1979 Irrigated Acreage	7,614	
July 1979 Irrigated Acreage	15,939	
1979 Irrigated Acreage	21,330	

Maricopa Water District Land Use Estimates (Unsupervised Categorization Analysis)

Gross Acreage	35,969	
April 1979 Irrigated Acreage	10,412	(Single-Date Analysis)
	8,862	(Multi-Date Analysis)
July 1979 Irrigated Acreage	16,325	(Single-Date Analysis)
	21,399	(Multi-Date Analysis)

NOTE * District roads, ditches, buildings, right-of way