

**FIELD CONDITIONS AT THE MARICOPA AGRICULTURAL CENTER,
PINAL COUNTY, ARIZONA, JUNE 16, 1989**

By Sandra J. Owen-Joyce

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CONVERSION FACTORS

For readers who prefer to use inch-pound units rather than metric (International System) units, the conversion factors for the terms used in this report are listed below:

<u>Multiply inch-pound unit</u>	<u>By</u>	<u>To obtain metric unit</u>
millimeter (mm)	0.03937	inch (in.)
meter (m)	3.2818	foot (ft)
kilometer (km)	0.6214	mile (mi)

Sea level: In this report "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)—A geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called "Sea Level Datum of 1929."

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ABSTRACT

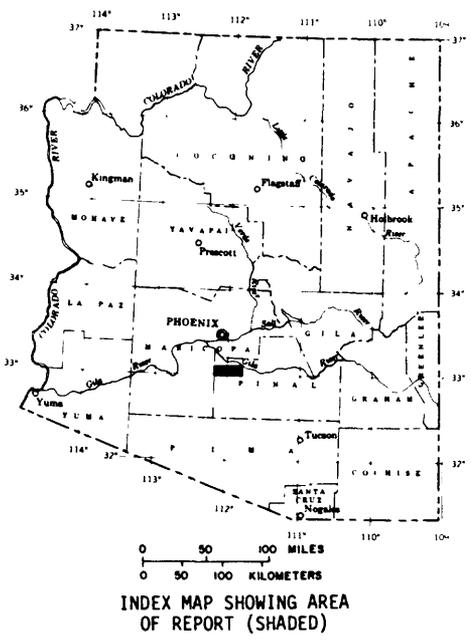
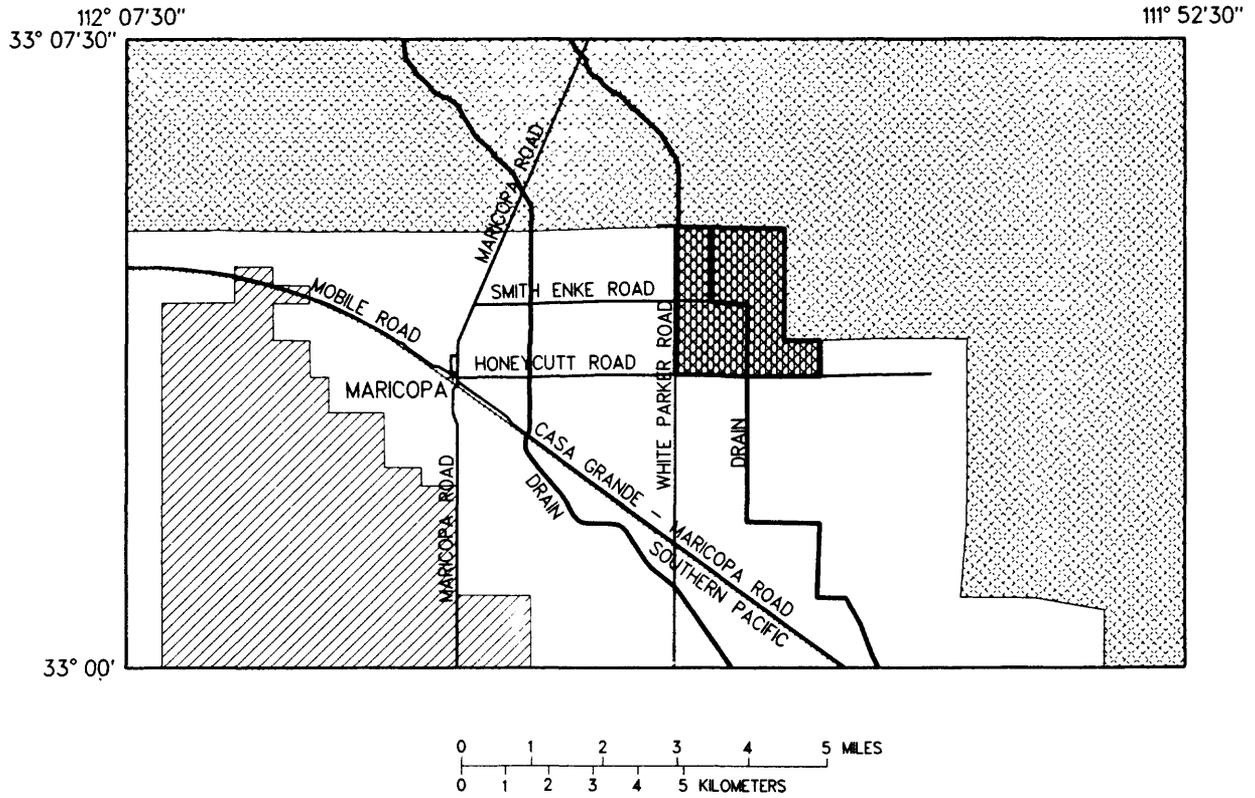
Field conditions were documented during the Landsat and SPOT satellite overpasses of the Maricopa Agricultural Center, Pinal County, Arizona, on June 16, 1989. Crop types were mapped and photographed for each demonstration farm field, and irrigation, cultivation, and orientation of rows are described. Field and photographic descriptions are presented in tabular and graphic form.

INTRODUCTION

The Remote Sensing Technology Transfer Experiment is being run at the University of Arizona Maricopa Agricultural Center (MAC) (fig. 1) by the University of Arizona to demonstrate the feasibility of remote-sensing techniques as an agricultural management tool. The purpose of the experiment is to investigate and implement potential commercial applications of this technology to agriculture with a long-term goal of providing the farmer with a "real time" management tool for (1) detection and early warning indicators of pest, water, and nutrient stress problems; (2) yield forecasting; and (3) efficient application of water, nutrients, and biologic pest-control substances.

The U.S. Geological Survey, in cooperation with the U.S. Bureau of Reclamation, is conducting research to evaluate the spatial and temporal variability of point data collected at weather stations for use with satellite-image data in estimating local evapotranspiration. The data collection at the weather stations is being done under contract with the University of Arizona. This work is being done at MAC during the Remote Sensing Technology Transfer Experiment under an umbrella agreement whereby scientists that work independently can cooperatively share the data collected. This report documents the field conditions at the time of the Landsat and SPOT overpasses on June 16, 1989.

Field conditions have been documented previously at MAC to correspond with the acquisition of satellite imagery. Data on crop types are available for June 1988 (Owen-Joyce, 1988) and April 1989 (Owen-Joyce, 1989).



EXPLANATION

-  MARICOPA AGRICULTURAL CENTER, UNIVERSITY OF ARIZONA
-  GILA RIVER INDIAN RESERVATION
-  AK-CHIN INDIAN RESERVATION
-  PRIVATE OWNERSHIP

Figure 1.--Location of the Maricopa Agricultural Center, Pinal County, Arizona.

FIELD CONDITIONS

Ground-truth data were collected to coincide with the Landsat and SPOT satellite overpasses on June 16, 1989. The data include crop type for each field on the demonstration farm, a description of the crop and field conditions, and photographs (35-millimeter slides) of the fields. Photographs were taken on June 16 to document field conditions and to provide ground truth for interpretation of the satellite data. Photographs were taken also of participating scientists and their equipment during data collection.

Crop types and descriptions of the fields are presented in table 1. Field boundaries and the crop type in each demonstration farm field are shown in figure 2. The generalized location from which each photograph was taken, the direction of view, and a brief description of conditions that the photograph documents are listed in table 2. The location from which photographs documenting field conditions were taken are shown in figure 3; where possible, these photographs were taken viewing 180° away from the sun. Selected slides were duplicated and are available at the U.S. Water Conservation Laboratory, Phoenix, Arizona; these slides are footnoted in table 2.

Conditions were also noted in the fields outside the farm but immediately adjacent to boundary roads of the demonstration farm. Wheat stubble is in fields east of field 19 and north of field 23. North of fields 19-22 is natural desert vegetation. Cotton is planted in east-west rows east of field 11, north of field 39, and west of fields 37-39. North of fields 25 and 26, cotton is planted in north-south rows. West of fields 27 to 3201, the land is planted with mature pecan trees. West of fields 33-36, the fallow land grades from plowed with clods west of fields 36 and the north half of field 35 to plowed with some clods and some weeds west of fields 33, 34, and the south half of field 35.

REFERENCES CITED

- Owen-Joyce, S.J., 1988, Field conditions at the Maricopa Agricultural Center, Maricopa County, Arizona, June 13, 1988: U.S. Geological Survey Open-File Report 88-708, 5 p.
- Owen-Joyce, S.J., 1989, Field conditions at the Maricopa Agricultural Center, Pinal County, Arizona, April 9, 1989: U.S. Geological Survey Open-File Report 89-377, 14 p.

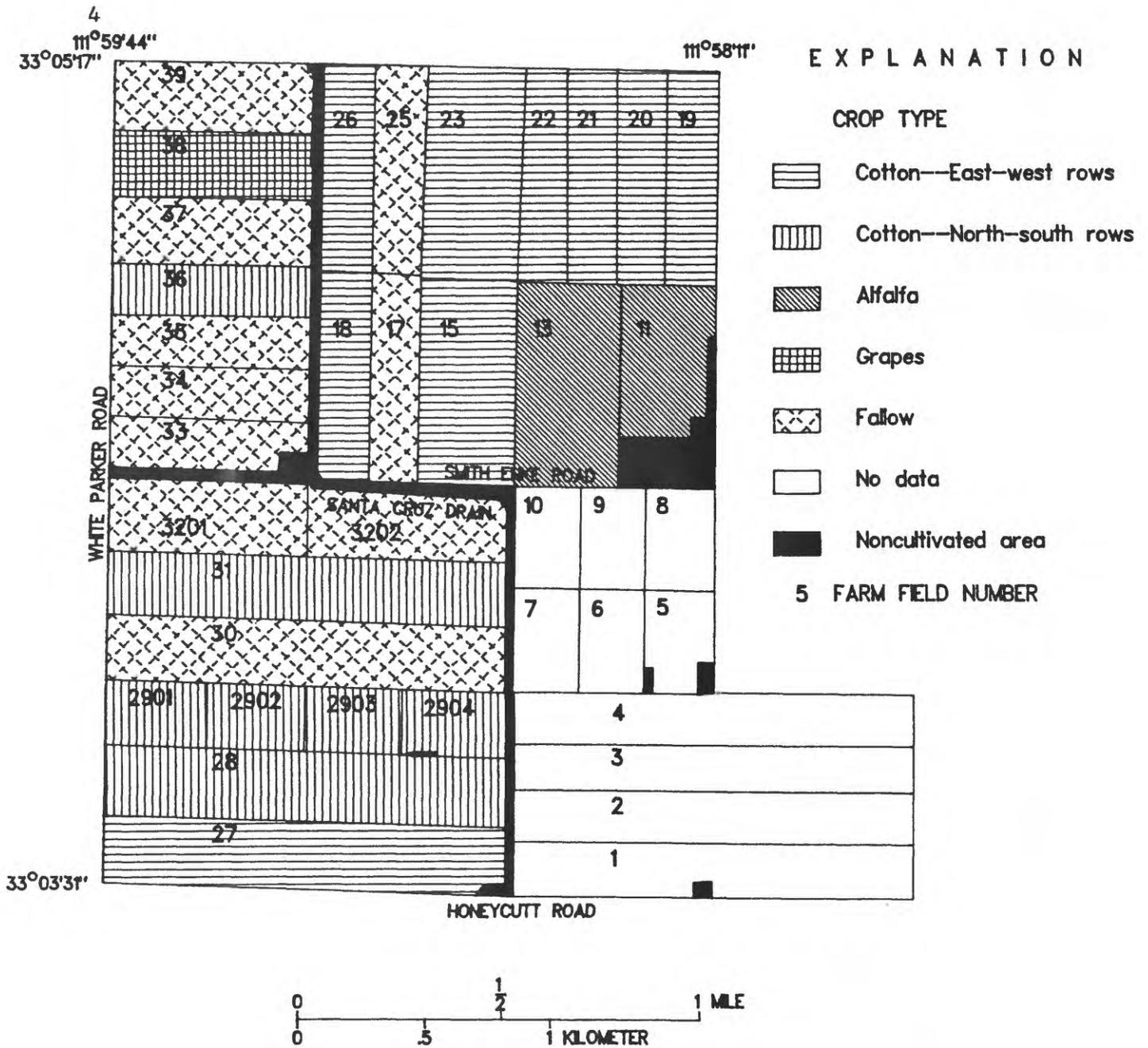


Figure 2.--Field boundaries for the Maricopa Agricultural Center and crop types on June 16, 1989.

EXPLANATION

5 FARM FIELD NUMBER

△ LOCATION AND VIEW
 1-26 ANGLE OF PHOTOGRAPH--
 Number, 1-26, is number
 of photograph listed in
 table 2.

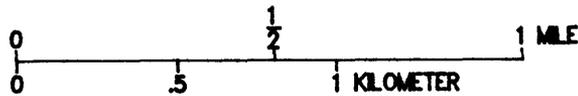
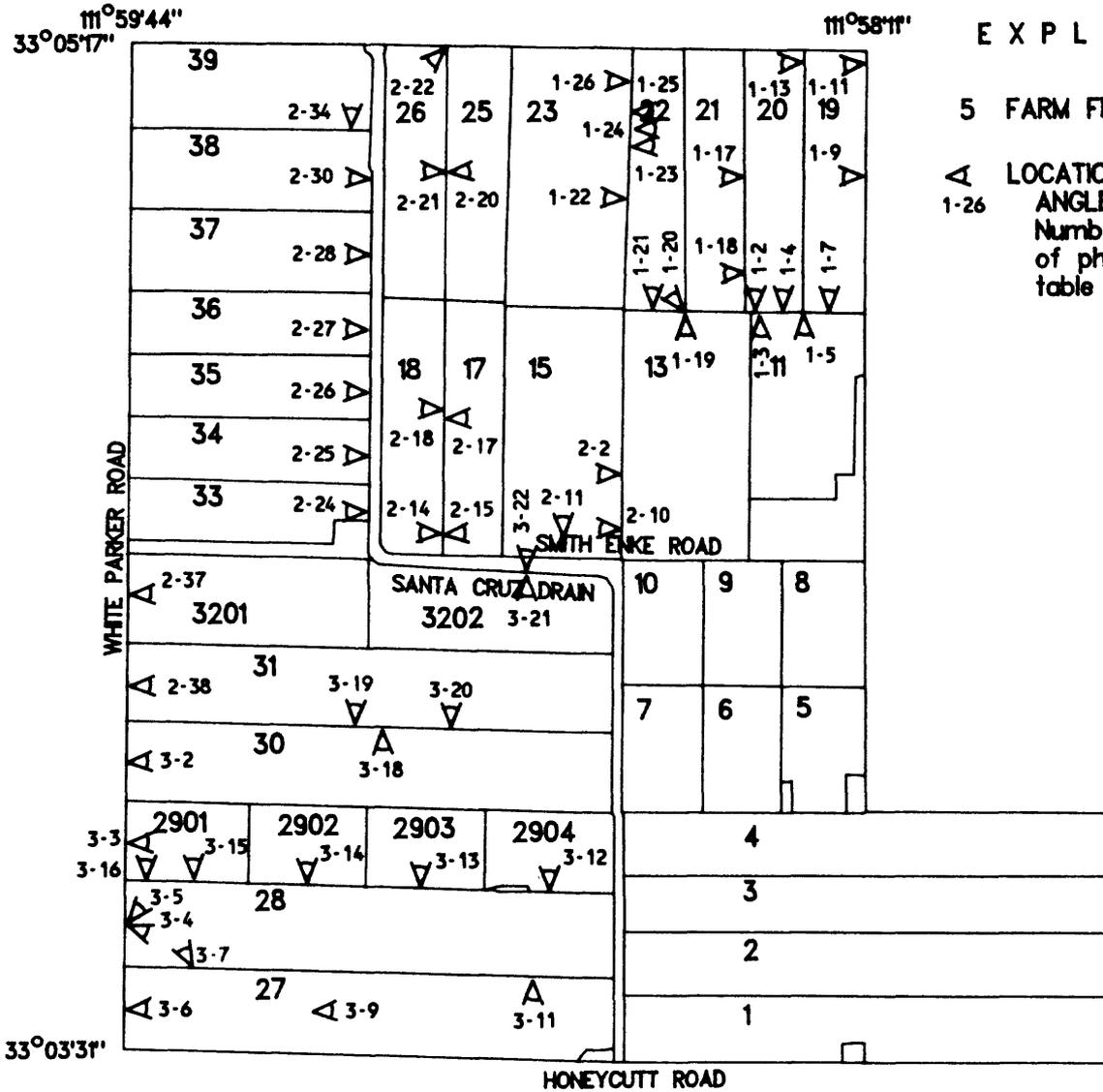


Figure 3.--Location and view direction of photographs taken to document field conditions on the demonstration farm, Maricopa Agricultural Center, June 16, 1989.

Table 1.--Ground-truth data for fields on the demonstration farm, Maricopa Agricultural Center, on June 16, 1989

Maricopa Agricultural Center Field Number ¹	Crop	Description
11	Alfalfa	Soil wet. Northwest corner bare. Buildings in south half.
13	Alfalfa	Standing water in north half. Dry in south half.
15	Cotton	East-west rows. Cultivated. Dry except for about 45 m at south end wet. Middle of field contains open areas.
17	Fallow	North half plowed, clods, yellow stubble, dry. South half, smooth, dry, and being laser leveled.
18	Cotton	East-west rows. Cultivated. Dry.
19	Cotton	East-west rows. Not cultivated. Dry except limited irrigation in north 15 rows. Some rows wet, standing water between rows 7 and 8 from north end. Canal lower at north end and overflowed.
20	Cotton	East-west rows. Not cultivated. Dry. North end of field has about 45 m of sparse weeds.
21	Cotton	East-west rows. Soil wet except about 90 m at south end dry. Scattered weeds.
22	Cotton	East-west rows. Cultivated. Dry in about 210 m at north end. Standing water in about 120 m north central part of field and dry in south 490 m.
23	Cotton	East-west rows. Cultivated. Dry.
25	Fallow	Plowed, clods, yellow stubble. Dry.
26	Cotton	East-west rows. Cultivated south half. Not cultivated north half. Dry. North 45 m fallow, clods, lumpy, and smooth where water evaporated.
27	Cotton	East-west rows. Cultivated. Dry at surface. Drip irrigated field. Sparse at south end in west half. East end has carbon dioxide rings set up.
28	Cotton	North-south rows. Tractor cultivating from east to west. Dry.
2901	Cotton	North-south rows. Soil wet east end. Standing water with active irrigation west end.
2902	Cotton	North-south rows. Soil wet.
2903	Cotton	North-south rows. Soil wet.
2904	Cotton	North-south rows. Not cultivated. Dry at surface.
30	Fallow	Plowed with yellow stubble. Dry.
31	Cotton	North-south rows. West 910 m cultivated and dry. East 335 m not cultivated and dry at surface. Middle 210 m standing water and active irrigation. Water across field at east side of irrigation and a quarter to half way across field on west side of irrigation.
3201	Fallow	Plowed, clods, yellow stubble. Dry.
3202	Fallow	Same as field 3201.
33	Fallow	Plowed, some yellow stubble, some clods, some weeds. Dry.
34	Fallow	Plowed, some clods, some yellow stubble. Dry.
35	Fallow	Plowed, clods, some yellow stubble. Dry.
36	Cotton	North-south rows. Not cultivated. Dry. Sparse at east end.
37	Fallow	Plowed, clods, some yellow stubble, some weeds. Dry.
38	Grapes	North-south rows. Not cultivated. Dry. In east center rows, plants are smaller than rest of field.
39	Fallow	Plowed, clods, yellow stubble. Dry.

¹Fields plotted on figure 2.

Table 2.--Photographs (35-millimeter slides) taken of fields on the demonstration farm, Maricopa Agricultural Center, and of scientists and equipment on June 16, 1989

[Location and View direction: SE, Southeast; SW, Southwest; NE, Northeast; NW, Northwest. Description: MAC, Maricopa Agricultural Center; IRT, Infrared Thermometer; TM, Thematic Mapper; MMR, Modular Multispectral Radiometer; SPOT, Systeme Probatoire d'Observation de la Terre]

Date	Time	Slide	Field number	Location	View direction	Description
6/16/89	--	1-1	20	South side	North	Same as 1-2 but from inside truck.
"	--	¹ 1-2	20	SW corner	North	Cotton, not cultivated, bare strips running north-south in southernmost bench ² , sparse in SW corner. Dry.
"	--	¹ 1-3	11	NW corner	South	Alfalfa. NW corner of field sparse growth. Soil wet at surface.
"	--	¹ 1-4	20	South side	North	Same as 1-2. Sparse patches along south side.
"	--	¹ 1-5	11	North side	South	Alfalfa, full cover, soil wet at surface.
"	--	1-6	11	" "	South	Same as 1-5.
"	--	¹ 1-7	19	South side	North	Cotton, not cultivated. Dry.
"	--	1-8	19	" "	North	Same as 1-7.
"	--	1-9	19	East side	West	Cotton, not cultivated. Dry.
"	--	¹ 1-10	19	" "	West	Same as 1-9 only closer.
"	--	¹ 1-11	19	" "	West	Limited irrigation within 15 rows at north end of field. One furrow with standing water between rows 7 and 8 from north end. Leakage from canal.
"	0945	¹ 1-12	20	NE corner	West	About 45 m of weeds at north end of field. Border between cotton and weeds.
"	0945	¹ 1-13	20	East side	West	Cotton, not cultivated. Dry.
"	0952	¹ 1-14	20	Middle	West	Weather station. Bruce Russell and Richard Wilson.
"	0952	1-15	20	"	West	Same as 1-14.
"	0955	1-16	20	"	NW	Helicopter coming in to land on road north of field 21.
"	0958	¹ 1-17	21	East side	West	Cotton with weeds, soil wet at surface.
"	1004	¹ 1-18	21	" "	West	Cotton with weeds, soil dry at surface in about 90 m at south end of field.
"	1007	¹ 1-19	13	North side	South	Alfalfa, full cover, standing water at north end of field.

See footnotes at end of table.

Table 2.--Photographs (35-millimeter slides) taken of fields on the demonstration farm, Maricopa Agricultural Center, and of scientists and equipment on June 16, 1989--Continued

Date	Time	Slide	Field number	Location	View direction	Description
6/16/89	1007	¹ 1-20	22	SE corner	NW	Cotton, sparse at south end, soil wet at surface.
"	1009	¹ 1-21	22	South side	North	Same as 1-20.
"	--	¹ 1-22	23	East side	West	Cotton, cultivated. Dry.
"	--	1-23	22	West side	East	Cotton, soil wet with some standing water in furrows.
"	--	¹ 1-24	22	" "	East	Cotton, border between irrigated area and dry, cultivated area at north end of field.
"	--	¹ 1-25	22	" "	Close up	Cotton with flower.
"	--	¹ 1-26	23	East side	West	Cotton, cultivated. Dry. Some stunted plants in patches on east side of field in north half.
"	1031	¹ 1-27	13	West side	--	Sky conditions, thin cirrus clouds, hot.
"	1033	1-28	13	" "	South	Cessna ³ (Dave Ammon) in air, cirrus clouds.
"	--	¹ 1-29	13	" "	East	Bowen Ratio equipment--2 set ups (Lloyd Gay).
"	1042	1-30	13	" "	East	Cessna (John Goodwin) in air.
"	--	¹ 1-31	13	" "	West	Cessna (Dave Ammon) in air.
"	--	1-32	13	" "	SE	Exotech with TM bands and IRT--Tom Clarke and Stephanie Johnson; Bowen Ratio equipment.
"	1046	¹ 1-33	15	East side	NW	Cessna (John Goodwin) in air.
"	--	1-34	13	West side	SE	Helicopter in air.
"	--	¹ 1-35	13	" "	SE	Same as 1-34.
"	--	¹ 1-36	13	" "	West	Helicopter in air.
"	1052	¹ 1-37	13	" "	SE	Jim Blandford, Richard Wilson, and Lloyd Gay.
"	--	¹ 2-2	15	East side	West	Cotton, cultivated, stakes. Dry.
"	1109	¹ 2-3	13	West side	NE	Exotech with SPOT bands and IRT--Tom Clarke and Stephanie Johnson.
"	1110	2-4	13	" "	West	Cessna (Dave Ammon) in air, cirrus clouds.

See footnotes at end of table.

Table 2.--Photographs (35-millimeter slides) taken of fields on the demonstration farm, Maricopa Agricultural Center, and of scientists and equipment on June 16, 1989--Continued

Date	Time	Slide	Field number	Location	View direction	Description
6/16/89	1112	2-5	13	West side	NE	Same as 2-3 over calibration plate.
"	1113	¹ 2-6	13	" "	East	Same as 2-3 with Cessna (Dave Ammon) in air.
"	1116	¹ 2-7	13	" "	Close up	Soil sensor set up.
"	1117	¹ 2-8	13	" "	--	Sky condition, thin cirrus clouds, hot.
"	1117	¹ 2-9	13	" "	--	Same as 2-8.
"	--	¹ 2-10	15	East side	West	Cotton, soil wet at surface at south end of field.
"	--	¹ 2-11	15	South side	North	Cotton, bare strips running north-south in southern part of field.
"	--	¹ 2-12	17	West side	NE	Exotech--Ron Seay and Susan Moran; MMR--Phil Slater and Dan Levitt.
"	--	¹ 2-13	17	" "	NE	MMR--Phil Slater and Dan Levitt.
"	--	¹ 2-14	18	East side	West	Cotton, cultivated. Dry.
"	--	¹ 2-15	17	West side	East	South half of field fallow, smooth. Dry.
"	--	2-16	17	" "	East	Cessna (Dave Ammon) landing.
"	--	¹ 2-17	17	" "	East	North half of field fallow, plowed, clods, yellow stubble. Dry.
"	--	¹ 2-18	18	East side	West	Weather station in cotton field, cultivated. Dry.
"	--	2-19	17	West side	East	Cessna (John Goodwin) landing.
"	--	¹ 2-20	25	" "	East	Fallow, plowed, clods, yellow stubble. Dry.
"	--	¹ 2-21	26	East side	West	Cotton, cultivated. Dry.
"	--	¹ 2-22	26	" "	SW	Northern about 45 m fallow, clods, lumpy and smooth where water evaporated.
"	--	2-23	--	" "	Close up	Video cameras in Cessna (Dave Ammon).
"	--	¹ 2-24	33	" "	West	Fallow, plowed, some clods, some yellow stubble, some weeds. Dry.
"	--	¹ 2-25	34	" "	West	Fallow, plowed, some clods, some yellow stubble. Dry.
"	--	¹ 2-26	35	" "	"	Fallow, plowed, clods, yellow stubble. Dry.

See footnotes at end of table.

10 Table 2.--Photographs (35-millimeter slides) taken of fields on the demonstration farm, Maricopa Agricultural Center, and of scientists and equipment on June 16, 1989--Continued

Date	Time	Slide	Field number	Location	View direction	Description
6/16/89	--	¹ 2-27	36	East side	West	Cotton, not cultivated, sparse at east end. Dry.
"	--	¹ 2-28	37	" "	West	Fallow, plowed, clods, some yellow stubble, some weeds. Dry.
"	--	2-29	38	" "	West	Grapes--Richard Wilson.
"	--	¹ 2-30	38	" "	West	Grapes, not cultivated. Dry.
"	--	2-31	38	" "	NW	Well by field 38.
"	--	2-32	38	NE corner	Close up	Grapes.
"	--	¹ 2-33	38	" "	Close up	Same as 2-32.
"	--	¹ 2-34	39	South side	North	Fallow, plowed, clods, yellow stubble. Dry.
"	--	2-35	--	--	Close up	Pistachio seed pods.
"	--	2-36	--	--	NW	Pistachio trees--2.0 km west of MAC on Smith Enke Road.
"	--	¹ 2-37	3201	West side	East	Fallow, plowed, clods, yellow stubble. Dry.
"	--	¹ 2-38	31	" "	East	Cotton, cultivated. Dry.
"	--	¹ 3-2	30	" "	East	Fallow, plowed, yellow stubble. Dry.
"	1508	¹ 3-3	2901	" "	East	Cotton, irrigating west end of field.
"	1509	¹ 3-4	28	" "	East	Cotton, being cultivated east to west. Dry.
"	1509	3-5	28	" "	NE	Tractor cultivating field.
"	--	¹ 3-6	27	" "	East	Cotton, cultivated, drip irrigated field, sparse at south end of west half, soil dry at surface.
"	--	3-7	28	South side	NW	Cotton, color change by groups of rows.
"	--	¹ 3-8	28	" "	NW	Same as 3-7.
"	--	¹ 3-9	27	Middle	East	Weather station in bench 5 in middle of field.
"	--	3-10	27	Middle	East	Same as 3-9.
"	--	¹ 3-11	27	North side	South	Cotton, carbon dioxide rings in bench 2 at east end of field.
"	--	¹ 3-12	2904	South side	North	Cotton, not cultivated, soil dry at surface.

See footnotes at end of table.

Table 2.--Photographs (35-millimeter slides) taken of fields on the demonstration farm, Maricopa Agricultural Center, and of scientists and equipment on June 16, 1989--Continued

Date	Time	Slide	Field number	Location	View direction	Description
6/16/89	--	¹ 3-13	2903	" "	North	Cotton, soil wet at surface.
"	--	¹ 3-14	2902	" "	North	Cotton, soil wet at surface.
"	--	¹ 3-15	2901	" "	North	Cotton, soil wet at surface.
"	1540	¹ 3-16	2901	" "	North	Cotton, west half of field being irrigated.
"	1540	3-17	2901	" "	North	Same as 3-16.
"	--	¹ 3-18	30	North side	South	Weather station in center of fallow field.
"	1545	¹ 3-19	31	South side	North	Weather station in center of cotton field.
"	--	¹ 3-20	31	" "	North	Irrigating in cotton east half of bench 2, water not half way across field.
"	--	¹ 3-21	3202	North side	South	Fallow, plowed, clods, yellow stubble. Dry.
"	--	¹ 3-22	15	South side	North	Cotton, plane parking, south of drain.
"	--	3-23	3202	North side	South	Camera test--80 mm (millimeter) with polarizer.
"	--	3-24	3202	" "	South	Camera test--80 mm without polarizer.
"	--	3-25	3202	" "	South	Camera test--35 mm without polarizer.
"	--	3-26	3202	" "	South	Camera test--35 mm with polarizer.
"	--	3-27	--	NE corner	SW	Melons--2.8 km east of MAC on Smith Enke Road.

¹Duplicate slides at the U.S. Water Conservation Laboratory, Phoenix, AZ.

²One-mile wide fields are divided into 8 parts called benches. Benches differ in altitude and are numbered from east to west.

³Use of brand names in this report is for identification purposes only and does not constitute endorsement by the U.S. Geological Survey.