

New Technique Makes Practical Use of Infra-Red Scanning in Pinpointing Problems in Crops

INFRA-RED scanning has great potential as a technique for detecting problems in growing crops. Temperature differences in areas of a field are detected by infra-red and since higher temperatures in a growing crop are caused by stress, problems such as insects, disease or moisture stress can be accurately located.

Infra-red scanning as opposed to infra-red photography is a relatively inexpensive and rapid means of gathering crop information. Infra-red scanning also does a better job of detecting stress in crops than does infra-red photography. With the scanning technique thousands of acres per hour can be covered and an infra-red image of individual fields recorded electronically.

NASA and USDA have used infra-red remote sensing techniques for some years to detect crop problems. A major draw-back has been the time-lag between the infra-red scanning and the time the image is available for analysis. By the time the information is available it is too late to cure the problem and save the crop.

Organizers of a new company in Oklahoma City, Remote Sensing Services, say they have developed a technique that solves the time-lag problem. In tests, they have scanned crops from the air and bad images on a television screen and photo print within nine hours. This could give the grower ample time to thoroughly analyze problem areas in his fields and make decisions to solve them.

Steve Paley, president of RSS, said his company uses the same proven infra-red

scanning techniques which have been used by NASA and USDA for many years. A technique for rapidly transferring the imagery from the scanner to TV screen and photo print is the company's major contribution, he says.

In demonstrations RSS has flown and scanned at the rate of 66,000 connected acres per hour. The way acreage is scattered a reasonable commercial capability is about 100,00 acres per night.

The scanner mounted in the nose of a Piper Aztec covers a strip 2/3 mile wide. Flying is done from about 2 a.m. until sunrise. Within nine hours of a scanning trip a grower can view his fields on a screen or have a photo print in his hands. Night flying is the rule because daylight can distort the image picked up by the infra-red scanner, Paley said.

Precision navigation is a major consideration in night flying but it has been worked out with Archie Huff who is in charge of aircraft operations for RSS. RSS does its scanning at an altitude of 3,000 ft. This produces an image that permits analyses of areas as small as three ft. in diameter. "This means we can gather information that a grower can use," Paley said. Paley pointed out that much of the remote sensing done by NASA and USDA is from satellites in high orbit. Smallest area identifiable from that distance is about the size of a football field. "If you want information on an individual farm we can supply it," he said. "If you want information on an entire country the satellite is best."

Describing the service to be offered farmers by his company Paley said the

economic situation farmers are in has been a factor in development of his company. "Current high costs of labor, herbicides, fertilizer and irrigation water make our service attractive," he said. "We supply information at low cost that will let the farmers pinpoint his herbicide, insecticide or fertilizer needs or save on irrigation."

Here's how the cost-savings come about, according to Paley: On a regular once-a-week schedule a farmer's land is scanned. The farmer examines the image and finds a stress spot in a field. He walks directly to the area, finds the problem is a crop disease. A fungicide can be applied to the area affected rather than the entire field, with substantial savings of chemical and labor.

Paley said remote scanning does not eliminate the need for the grower, scout or crop consultant going into the field and making judgments about crop problems. "We provide the tool for finding quickly and accurately where crop problems are" he said. He added that the remote scanning technique is a more accurate method of locating crop stress than currently used scouting methods. "Scouting is a random sampling method," Paley said. "When evidence of a problem is found in a field it is then assumed the problem applies to the entire field." With remote scanning the problem areas can be precisely located, whether it's less than an acre or an entire field.

Paley said the infra-red scanning technique that's possible with his company's instruments produce a high degree of accuracy. The scanner is sensitive to temperature differences of .2 degree. In addition the image can be enhanced electronically to give a very clear picture of the temperature contrasts that indicate crop stress. Irrigators

will find the scanning service valuable, Paley believes. "We can presently show moisture patterns and tell when it is time to irrigate," Paley said. The RSS service to a farmer begins with establishment of "ground truth" of the fields to be scanned. This involves identifying conditions and features of the land so that infra-red images of the area can be read accurately.

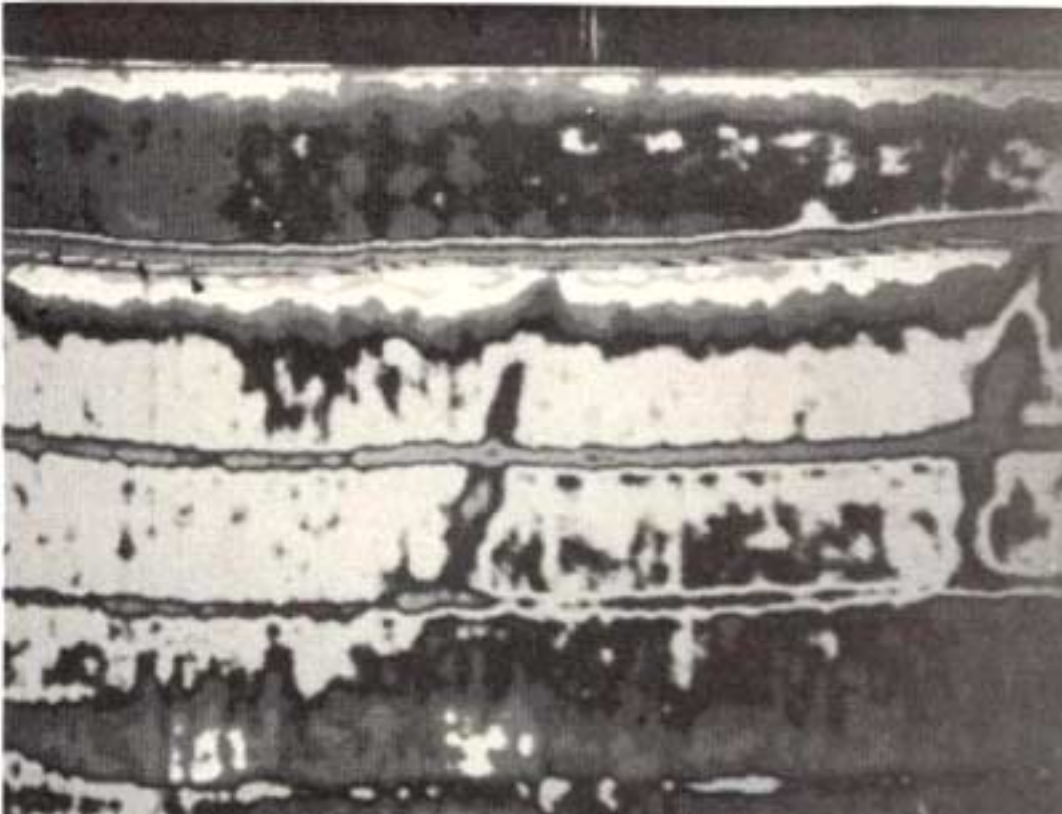
Then after the crop is established one flight weekly and one image of the land is provided the grower. Paley said the company plans to remain flexible in its operation and offer its services to a variety of potential users. Among primary users will be large acreage operators who produce crops with potentially costly problems.

"Our service will probably be most attractive to large acreage farmers who have the people available to follow through with the information we supply," Paley said. RSS also hopes to offer its service to crop consulting companies. Paley sees it as a means of expanding a consulting firm's service and increasing its efficiency. "It would save a lot of field walking by scouts and allow them to use their time more efficiently," he said. Although the scanner and other equipment used by RSS in its remote sensing work is very sensitive, at the same time it is not that delicate and can be put to practical field use. In their pilot tests they have set up operations in motel rooms where they have performed the entire process of transferring the image from tape to viewer.

"The key to offering remote sensing as a crop production tool on a commercial basis is the time element," Paley said. "We have found a method of doing in 20 seconds what it takes NASA or USDA eight hours to do."



Steve Paley, left, Archie Huff and David Chase look at an image on television screen that shows growing crop as seen by infra-red scanner.



This black & white image gives an indication of contrasts shown by infra-red. In color, blues are cool areas, yellows and reds indicate heat.