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Quarterly Progress Report
HCMM Contract
with the
U. S. Water Conservation Laboratory

1. Order No.: S-40255B

2. Principal Investigator: Ray D. Jackson
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4331 E. Broadway
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3. Period of Report: 1 FEB 78 to 30 APRIL 78

4. Description:

a. General.--The weather during this reporting period was characterized by above normal rainfall and temperature. Because of these conditions, the barley has, for the most part, made good growth. Ground-based measurements have been relatively routine, except for a few days when rain prevented measurements, and several aircraft flights had to be cancelled because of weather.

The grower applied 40 pounds per acre of nitrogen fertilizer by aircraft on 01 Feb 78, as much of his original fertilizer had been leached from the soil by the heavy rains. During the following 2 weeks, the barley turned a much darker green, meaning that the fertilizer was being taken up. Even in the low areas that had become waterlogged, the plants responded to the nitrogen. On 20 Feb 78 the grower had the field sprayed with an herbicide to kill broadleaf weeds.

In early March heavy rains and high winds caused some of the barley to lodge. Although the plants, mainly on the hills, were laying flat on the ground, the stems were not broken, and growth continued. The heads in these areas have now started to grow upward.

Early April brought an infestation of aphids which congregated about the base of the plants. The populations of several predators increased, and the natural biological control process eliminated plant damage by aphids.

Differences in soil moisture between sites (adequate to excess) caused differences in plant growth. Those sites that were well

drained made good growth, while those that were waterlogged (poor root aeration) made very poor growth. A site with a south-facing 20° slope, which had adequate moisture, was headed by 27 March 78, while a level, waterlogged site had not yet headed by 13 Apr 78. Additionally, those poorly drained areas had more weeds, fewer barley plants, and smaller heads on the plants, than those areas whose soils were well drained. Poor root aeration (lack of adequate oxygen) may have caused the poor barley growth.

Rainfall in February was 118.1 mm; in March 86.4 mm; and in April 57.2 mm, for a quarterly total of 261.6 mm (10.30 inches). Since October a total of 675 mm (26.56 inches) of rain has fallen--average rainfall is about 400 mm for that 7-month period. Most of the storms have come from the south, accompanied by rather strong winds. Rainfall on the 20° slope, south-facing site was 565 mm, whereas the 24° slope, north-facing site had 791 mm rain (October 77 through April 78). A probable explanation for this difference is that the strong south winds cause the rain to fall, and, because of turbulence on the backside of the hills (north-facing slopes), more rain falls. The two specific sites mentioned above are the extremes in measured rainfall; all the other sites lie somewhere in between. These differences in rainfall may result in differences in available soil moisture later in the growing season, which, in turn, may cause differences in plant stress.

The aluminum access tubes for soil moisture measurements with the neutron probe were installed at each site to a depth of 180 cm. When a water table formed in the low areas due to the heavy rains, water rose in the tubes, so the depth to the free water surface below ground level was measured. These measurements corresponded quite well with observations of reduced plant growth.

Recent warm dry weather has caused maturation of the barley to accelerate. If these conditions hold, harvest will probably be in late May.

b. Problems.--No major problems other than inclement weather were encountered during this period.

c. Accomplishments.--Plant growth parameters, biomass, leaf area index, number of tillers etc. have been documented throughout the growing season. Surface temperatures with hand-held IR

thermometers and some airborne scanner data have been obtained. These data form a basis from which the spacecraft data will be interpreted.

d. Significant results.--None as yet.

e. Publications.--None as yet.

f. Recommendations.--None.

g. Funds expended.--$15,514

h. Data utility.--No spacecraft data available.

Submitted by

Ray D. Jackson

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Principal Investigator