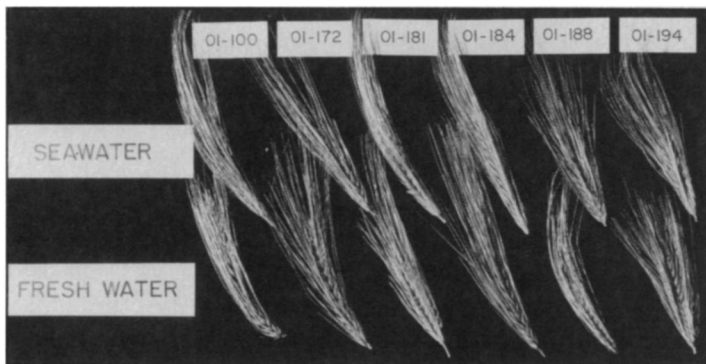


committee on HUD and Independent Agencies, headed by Edward P. Boland (D-Mass.). The "Boland amendment" to delete the approximately \$20 million in "new start" funding for JOP was sustained by the full appropriations committee but was forced into conference when the Senate committee voted to keep the mission in the budget bill. In conference, both sides firmly stood their ground, leading to this week's (July 19) surprising House vote, in which the House chose to defeat the amendment before

passing the rest of the conference bill, 326 to 85.

The intensive lobbying that preceded the House action was motivated by concern for the continuity of planetary research as well as for the JOP itself. Past experience with such programs as Landsat C, the Space Telescope and Pioneer Venus (which was nearly cut out in its second year, with six times as much money at stake) suggests, however, that NASA should be wary of assuming an automatically rosy future. □

## Salty irrigation: Bringing in the sheaves



*Barley irrigated with seawater and fresh water: Biochemical contents are similar.*

Two scientists have achieved dramatic success by harvesting significant yields of barley grown in soil irrigated with seawater. This is a breakthrough in the general attempt to utilize the oceans' resources in agriculture.

A number of experiments during the past 15 years have investigated the tantalizing prospect of growing plants using seawater (SN: 6/22/74, p. 406). Unlike this one, however, they have generally dealt with plant species not commercially cultivated and used saline solutions about one-tenth as concentrated. This experiment illustrates that varieties of a "cash crop" can be selected, albeit painstakingly, to grow in highly salinized soil.

With a few exceptions like sugar beets and barley, commercial crops cannot tolerate even slightly salinized soils. Emanuel Epstein and J.D. Norlyn, of the University of California at Davis, reasoned, however, that it might be possible to ferret from the medley of barley varieties a few exceptionally salt-tolerant ones. This was like guessing that from the world's population of humans, there likely would be some candidates suited for an unusual task.

The researchers began their search by subjecting an assemblage of experimental barley (collectively known as Composite Cross XXI) to something resembling a two-round, single elimination tournament.

Initially there were 7,200 contestant-seeds. During the first round, 4,320 were allowed to germinate, mature and set seed in an increasingly saline (pure sodium chloride) environment. Only 5.9 percent actually did so. The other group of 2,880 seeds participated in a similar contest that involved, instead of table

salt, a synthetic sea-salt mix. Only 9.2 percent of this group survived the ordeal.

First-round survivors advanced to the finals. These seeds were allowed to germinate in special loam treated with a solution that was 85 percent seawater. Following a few more procedures, the lone survivors emerged: Only 22 plants successfully withstood the rigors of a severe selection process.

Seeds from seven of these "spartan" varieties (genotypes), together with seeds from three kinds of commercial barley (Arivat, California Mariout and U.C. Signal) and one other experimental barley from Arizona (S-68-1-11-22) were planted in eight plots. Each contained rows of the 11 test seeds arranged in random order.

The various plots were irrigated with different dilutions of seawater: from fresh water to full-strength (3.5 grams of salts per 100 grams of water). Until a month before harvest, this was done weekly and after each rainfall in order to minimize dilution effects of precipitation on the controlled salinities.

Because of California's much-publicized drought, there was very little rain (180 millimeters) to disrupt the experimental conditions during the crop's growth between January and June 1976, when it was harvested. At least one similar study, in Norway, was adversely affected by persistent winter rains that leached the salt from the soil.

The harvest from seeds treated with undiluted seawater ranged from 92 to 1,243 kilograms for each hectare (about 2.5 acres). The three commercial varieties (called cultivars), remarkably, produced a mean of 833 kg/ha. By comparison, the estimated yield of barley in

the United States was 2,370 kg/ha in 1975.

The biochemical content of grain harvested from the seawater trials was similar to that of freshwater specimens. This included comparable assay values of protein, ash, fat, fiber and sodium. Actual feed tests will require larger harvests, which still are several years away, said Epstein.

These results are a "breakthrough," according to University of Delaware biologist G. Fred Somers, himself a noted researcher in the field. The study represents a different point-of-view, one that he hopes will start a trend. Previous experiments, he says, have concentrated on ways to modify the soil to suit the plants.

The authors, reporting in the July 15 SCIENCE, claim that their experiment underscores the remarkable adaptive capabilities of a species. The three cultivars, normally accustomed to an un-salinized environment, nonetheless were sufficiently versatile to burgeon in disparate conditions.

In addition to experimenting with barley, Epstein says he has obtained preliminary success with wheat, "the premier grain crop." He has grown seedlings in salinized conditions, but hasn't yet grown wheat through maturity. He is also working with tomatoes.

A major general limitation of seawater-irrigated farming is that land be sandy enough to provide adequate drainage of the salty residue. If not, Epstein said, the salts will eventually accumulate and cause effective concentrations far exceeding that of seawater. The ideal locations, therefore, are sandy coastal areas, like the one of this experiment. □

## Japan joins weather satellite network

The Geostationary Meteorological Satellite (GMS), built and launched in the United States for Japan's National Space Development Agency, is the newest member of a planned worldwide network of weather-watching satellites. Launched on July 16, GMS was aimed at a fixed (geosynchronous) position over the equator south of Japan, providing photographs and other data 24 hours a day.

It is part of a network known as the Geostationary Operational Environmental Satellite system, which will include five similar eyes in the sky: two from the United States, one from Japan, one from the multinational European Space Agency and one from the Soviet Union. Both U.S. probes are now aloft; the latest, GOES-2, was launched on June 16. Europe's contribution, known as Meteosat, is scheduled to be launched for ESA by NASA on Sept. 15. The Soviet entry presumably will follow at a later date, with the completed network providing overlapping, global coverage. □