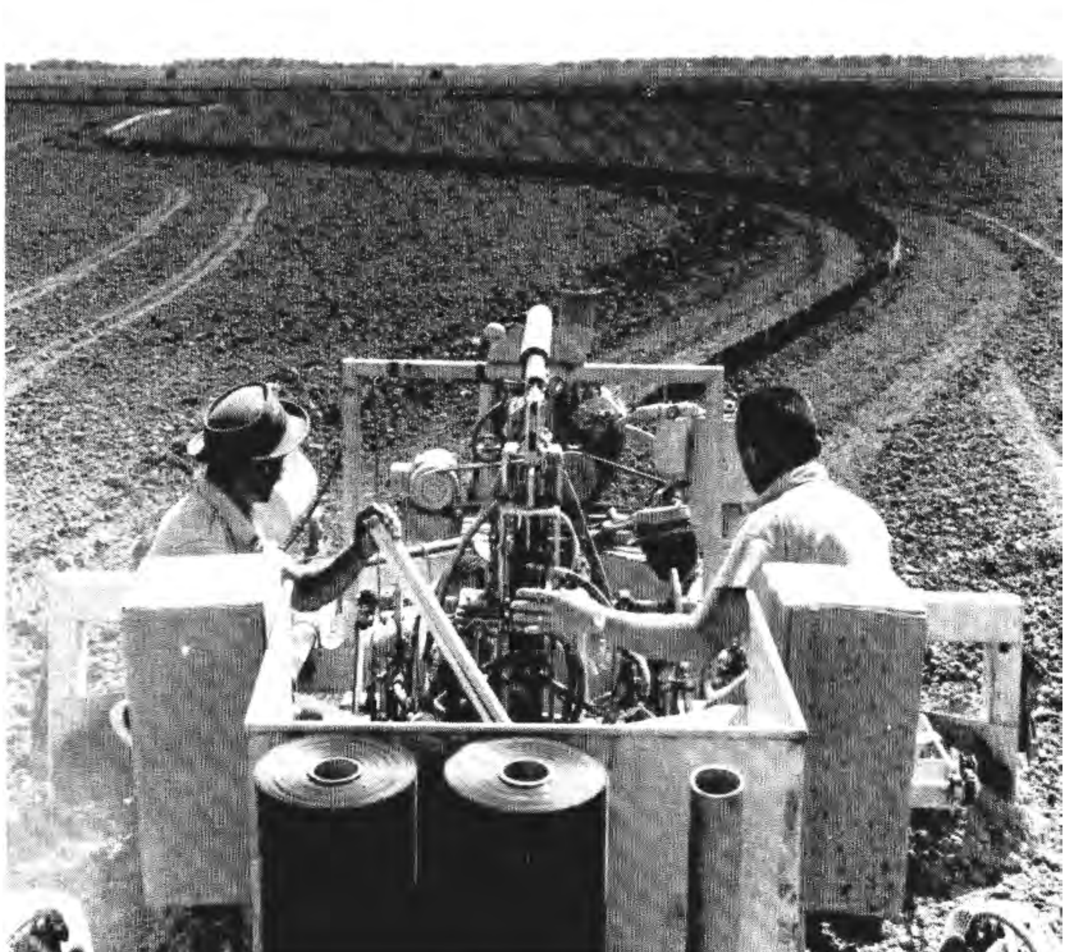
Plastic levees are being used to control irrigation water on an estimated 2,500 acres of California rice land this year.

As with several other agricultural industries, rice growers and processors are to be congratulated for their early and continuous support of research. The Rice Experiment Station is owned and maintained out of grower and industry contributions by voluntary assessments on every bag of rice milled in the State. University scientists operate the station and research projects, with the cooperation of USDA specialists, either as resident staff members or as field workers from other campuses. During 1962, an additional $100,000 in cash and machinery contributions were received to update the facilities at Biggs. Growers and industry people from 19 rice growing counties in the State contributed to the fund—under the leadership of a three man statewide committee consisting of Leland O. Drew and Vincent Vanderford of Yuba City, and Lorris Lauppe of Pleasant Grove. The beneficial impact of this accomplishment will be felt for many years in the future.

The rice industry has kept step with changing events through research and is thus better prepared to face the problems of the future. The "cold water" problem in rice, to be discussed in the next issue by Dr. Frank Raney of the Department of Irrigation, is based on the pioneering research of Dr. Robert Hagan of the same department. As more high dams are built above the rice-growing areas, these research findings will pay even greater dividends. Plant breeders are also working on cold water tolerance as well as general improvements in palatability, nutritional value and marketing quality of California rice. Older varieties are being improved by breeding-in stiffer straw and removing the pubescence, or hairiness, from plant parts. New early-maturing, long-grain rice varieties for California will be available soon, if needed by the industry.

Continuing support of research, consistent with changing economic conditions, is needed to maintain California's position as one of the most efficient rice producing areas in the world. To get rice research findings to growers more efficiently, farm advisor help to rice growers was reorganized in 1961–62 to include area farm advisors who can give greater technical assistance in work with rice and other field crops.

New tractor-drawn machine seen below is one of the recently developed machines capable of completely installing plastic levees in rice fields in one operation. This "Polydike" machine was developed by Robert Ziegenmeyer, Sutter City, and Tobias Grether, Camarillo, California—following University research proving the feasibility and economy of the plastic levee concept.



K. L. VISTE

WATERGRASS

CALIFORNIA

Chemicals now available will apparently control watergrass and some broadleaved weeds, if properly used. Another group of chemicals including MCPA and 2,4-D are extremely effective against the broadleaved weeds. Good crop rotation systems, use of weed-free seed, water management and many other well known riceland management practices are also still available to rice farmers fighting weeds. With proper use of these new chemical tools for weed control, growers could be at the threshold of a new era of rice culture.

THE MAJOR WEED PROBLEMS in California rice requiring further investigations include watergrass control, general weed control (especially in districts where the use of herbicides is seasonally restricted) and control of certain aquatic weeds.

Watergrass remains the most important

RICE VARIETAL IMPROVEMENT IN CALIFORNIA

IN THE CALIFORNIA varietal improvement program, the main objectives are the development of non-lodging, short-, medium- and long-grain varieties, which emerge well through the cold water of the sowing season, which have a high yield and meet the required milling and cooking characteristics. Joseph R. Thysell, Research Agronomist, CRD, ARS, heads the USDA rice-breeding project at the Rice Experiment Station, Biggs, as re-

CONTROL IN RICE FIELDS

single weed in California rice production, however, and it will be in the foreseeable future because of its adaptation to a wide range of crops, and in non-crop areas. Chemical means of eradication, as they become available, may not be used by everyone because of the desirability of watergrass as a feed for game birds. Watergrass is a major weed in most irrigated summer crops, and seeds remain viable for several years in non-irrigated soils. This means rotations offer no easy solution to watergrass problems, and it is necessary to consider control of watergrass during the crop season.

One efficient and economical means of watergrass control available at the present time is the proper management of water depth during the rice growing season. A minimum of 6 inches and a maximum of 9 inches of water should be maintained for a period of at least three weeks after planting. These depths are the extremes of fluctuation between which good weed control and rice production are possible. They are not the averages of fluctuating levels. This management demands level fields, accurate contours, well constructed levees, adequate water supply, adequate drainage capacity, and an alert, capable irrigator.

The herbicide 3,4-dichloropropionanilide (propanil)—(trade names: Stam F-34 and Rogue)—provides selective control of watergrass in rice from postemergence applications. The results have been good in many situations:

RICE YIELDS, CWT/ACRE, TREATED WITH PROPANIL IN 1962 AT THE RICE EXPERIMENT STATION, BIGGS

Days after planting	Control	Rate DPA 4 lbs/A	Rate DPA 6 lbs/A	Rate DPA 8 lbs/A
36	8.0	30.0	34.3	..
49	40.0	42.7	..	47.4

Propanil is recommended for application in grassy fields between three to five weeks after planting. Well-timed applications of propanil have also been helpful in controlling a number of the broadleaved weeds if they are in the seedling stage. One disadvantage of propanil is that some grass plants may be under water at the time of application and thus only partial control is obtained. Another disadvantage is that propanil has no preemergence activity so that if water is removed from the field at application, and held off for a period of time, additional seeds will germinate and a new growth of watergrass will develop. To overcome this disadvantage, it is best not to completely drain the field.

Propanil's advantage is that it can be used as a postemergence herbicide after the weed infestation is apparent. This approach supposes that the procedures of rice production currently in use are satisfactory, and the use of propanil is justified economically—after the control by water fails. To fully exploit chemical weed control, however, it will be necessary to investigate ways of increasing yields or decreasing production costs and risks.

An experiment in 1962, conducted by Colusa County Farm Advisor Karl Ingebretsen and Agronomy Department researcher Dr. D. S. Mikkelsen, showed that plots with water 2 to 3 inches deep that were also sprayed with propanil provided higher yields than the deep water control plots. These results indicated low water culture may provide sufficient advantages to justify expenditure for herbicides.

Experimental work in 1962 showed that a new herbicide, methyl 3-4-dichlorocarbanilate (swep), provided a combination of pre- and postemergence control in rice tests and may be useful where fields are to be drained. Still another new herbicide, Ethyl-1-hexamethylene-iminesarbothiolate (R4572) showed promise as a preplanting application to the soil. Some of the newer herbicides may also be effective when applied to the water instead of directly to the plants. However, the use of these new compounds is still experimental and they are not recommended by the University at this time.

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ported separately in this issue. The breeding program was intensified and expanded in 1961 with the appointment of a rice breeder by the California Rice Research Foundation. This is a report on phases of the rice breeding project for which the Foundation has principal responsibility.

To obtain new sources of hybrid material of all grain types, 20 foreign long-grain varieties with good straw and cooking characteristics were crossed to the early maturing short-grain variety Colusa and two early maturing long-grain varieties in 1961. The F_1 seed of 45 cross-combinations were grown in the greenhouse during the winter of 1961 so that the second generation could be sown in the field in 1962. The greenhouse capacity had been increased at the same time to three times the original space, and in January, 1963, 10 third-generation populations of these crosses were planted. This makes it possible, in the summer of 1963, to grow the fourth generation in which the selection of desirable types can be started.

With the cooperation of USDA's Agricultural Research Service, Rice Section, Beltsville, Md., a number of varieties of all grain types were obtained from several countries with a latitude more or less comparable to that of the California rice-growing areas. This material was grown in isolation at the University of California Imperial Valley Field Station for increasing the gene pool of the breeding program. Several hybrid populations were also imported. Also, a large number of selections were made in 1961 from populations received as F_2 and F_4 generations from Beaumont, Texas. From this group some 50 lines were retained in 1962 and many reselections were made. Most selections have stiff straw and good grain type; their 1000-grain weight ranges from 28 to 32 grams, which is comparable to the weight of good Caloro seed.

In 1962, 24 varieties, developed at the Biggs station in earlier years, or obtained from the South or abroad, were tested for the first time in large replicated yield trials under water-sown conditions. Four short-grain varieties produced better than Caloro and lodged less. One long-grain variety yielded almost as much as Caloro, has good kernel characteristics and a maturity period varying from 110 to 120 days, depending on the date of seeding. —*Johan J. Mastenbroek, Rice Breeder, California Rice Research Foundation, Rice Experiment Station, Biggs.*