is $2.00 per acre. At a rate of $22.82 for 
one combine and operator plus a bankout 
wagon, tractor and man, the benefit for 
reduced harvest time is $4.79 per acre. 
A benefit-less-cost figure is given below 
for the two comparisons:

1. Plastic Levees vs. Three-year-old Soil Levees
   Total cost of plastic levees...$11.11 per acre
   Total annual cost of 3-year-old 
   soil levees .................. 1.88
   Added increment of cost due 
   to plastic levees .......... $9.23 per acre
   Benefits resulting from use of plastic levees:
   .28 hr. per acre saving in tillage 
   operations .................. $2.00
   .21 hr. per acre saving in harvest 
   operations .................. 4.79
   2.20 sack per acre increase in rice 
   yield ......................... 9.90
   Total savings per acre........ $16.69
   Net additional earnings 
   per acre = $16.69 - 9.23 = $7.46

2. Plastic Levees vs. New Soil Levees
   Total cost of plastic levees...$11.11 per acre
   Total cost of new soil levees... 3.80
   Added increment of cost due 
   to plastic levees .......... $7.31 per acre
   Benefits resulting from use of plastic levees:
   .21 hr. per acre saving in harvest 
   operations .................. $4.79
   1.30 sack per acre increase in 
   rice yield .................... 5.85
   Total savings per acre........ $10.64
   Net additional earnings 
   per acre = $10.64 - 7.31 = $3.33

If growers receive extra income from 
rice lands used for game hunting, the 
weed growth is a benefit in favor of old 
soil levees and should be deducted from 
the benefits of plastic levees in figuring 
additional earnings.

Since there are substantial net addi-
tional earnings per acre for the example 
given, it is economically feasible to re-
place soil levees with plastic levees. It 
must be kept in mind that the costs com-
pared depend on the length of levee per 
acre, and the benefits of increased yield 
are dependent on both length of levee per 
acre and the average yield. A new calcu-
lation of costs and benefits must be made 
from the tables and graphs for every field 
where a change in levee construction practice is being considered. The only 
foreseeable change in plastic levee eco-
nomics is that the costs may decrease as 
far as further mechanization is accomplished— 
and this is theoretically justified in plastic levees.

Davis C. Lewis is Junior Research Irrigation Engineer, University of California, 
Davis; Verne H. Scott is Associate Professor of Irrigation and Associate Irrigation 
Engineer, U.C., Davis; Kenneth E. 
Mueller is Superintendent of the California 
Cooperative Rice Research Foundation's Experiment Station at Biggs in 
Butte County; Kenneth L. Viste is Research Agronomist, Crops Research Division, 
Agricultural Research Service, United States Department of Agriculture, 
Agronomy Department, U.C., Davis; 
Alan F. Babb is Assistant Engineer in 
Irrigation, U.C., Davis; Donald R. Fox 
is Farm Advisor, Yuba County, University of California.

IMPROVING YIELDS IN SELF-POLLINATED CROPS

Some mixtures of pure-line varieties of self-pollinated crops show promise of 
 improving yields and stabilizing productivity, as compared to the pure lines.

In the past half-century much of the 
 improvement in yielding ability of crops 
such as barley, wheat and beans has 
 resulted from selecting pure-line varieties— 
 consisting of a single genetic type.

These pure-line varieties are highly 
 uniform for such features as size, 
maturity, disease resistance, and quality 
 factors that improve their marketability. 
 Valuable as these pure-line varieties have 
 been, there are theoretical reasons for 
 believing that certain types of mixed 
 populations may be still more useful in 
 agriculture.

Investigations have been conducted to 
test the theory that mixtures which pro-
 vide a controlled measure of genetic 
diversity may not only yield more than a 
single pure line but also perform more 
 steadily year after year. Under test is the 
 idea that individual plants may encounter 
different environments not only within 
 fields but also in different locations and 
 years, and that different plant types may 
 be able to exploit particular sites to their 
 own particular advantage and to the ad-
 vantage of the entire population.

One experiment with lima beans con-
ducted at four locations over four years 
 indicated that mixtures of pure lines were 
 less likely to produce as high-yields—or 
as low yields—in any one year as the best 
 pure line included in the mixtures. The 
 important point is that certain of the mix-
tures yielded more, when averaged over 
 several years, than the best constituent 
 pure line included in the mixture.—R. W. 
 Allard, Professor of Agronomy and 
 Agronomist, Department of Agronomy, 
 University of California, Davis.

UREA FORM

Urea formaldehyde was the first major 
synthetic nitrogen source developed 
 for controlled availability. It has been 
 commercially available for about a decade 
 and primary uses have been with turf-
 grass and ornamentals. To obtain satisf-
actory responses, several aspects of its 
 properties must be understood.

In the manufacture of urea formalde-
hyde these two components react to form 
 polymers of various complexity. The ratio 
of urea to formaldehyde, and other factors 
affecting the reactions, influence the sus-
cceptibility of the product to mineralization— 
 namely, conversion of the nitrogen 
 to ammonium or nitrate forms. Commercial 
 materials vary, particularly in the 
 fraction of the total material that is 
 readily available.

In commercial materials a substantial 
 portion of the total nitrogen (25 per cent 
or more) is cold-water soluble. This frac-
 tion is of low molecular weight and is 
nitrified readily. The bulk of this fraction 
nitrifies, when conditions are favorable, 
within a four-week period. The remain-
 ing fraction which is relatively resistant 
 to nitrification is mineralized at a much 
 slower rate.

Under typical greenhouse soil condi-
 tions, about 6 to 7 per cent of the fraction 
 relatively resistant to mineralization is 
 converted to nitrate or ammonium each 
 month. There is also some evidence that 
 this rate tends to increase as the resistant 
 fraction ages. From a given initial supply 
of this type of nitrogen the yield of 
 mineral nitrogen tends to remain more 
 nearly uniform than would be expected.

The 6 to 7 per cent rate of mineraliza-
tion per month is some 50 times as fast 
as natural soil humus is mineralized. 
 Thus, nitrogen from “residual” urea-
 formaldehyde is much more available 
 than nitrogen from soil humus.

T. G. BYRNE · O. R. LUNT

CALIFORNIA AGRICULTURE, MARCH, 1962