

# Works in progress at the UCSC Farm

By PAUL BEILEY

AS STEVE GLIESSMAN likes to point out, our present gardening and farming technology, which depends on lavish use of energy in the form of chemicals and fuel, has been around a mere matter of decades. And the verdict isn't in.

There are some ominous signs, he says: Fossil fuels are being expended at a fast clip; we still don't know the long-term effects of pesticides on health; and the pests continue to fight back by developing resistance to poisons sometimes so fast that it is we who are struggling to keep up.

Gliessman is an assistant professor of environmental studies at UC-Santa Cruz, where research on other approaches is going on. Some of the techniques are refinements of long-established methods. Others stem from discoveries in the natural sciences.

Here is a sample:

## Companion planting

In an experiment at the UCSC Farm last fall, Gliessman and his students planted three crop types and studied the response of weeds—broad beans alone, collards alone, and beans and collards together—in a total of 36 plots, weeded in various ways.

The results, which will appear in detail in the journal *California Agriculture*, showed "much less weed biomass in the polyculture (companion plantings) than in either monoculture," Gliessman said. The reason, he said, is that the different plants in the companion planting live and grow in complementary ways, together providing more cover and using up more of the root area than either monocul-

ture, and leaving less space for the weeds.

Somewhat surprisingly (to the uninitiated), the weeds in the two-crop plots were more diverse—that is, of more different species—even though they were fewer in number than in the single-crop plots.

That's because the companion planting "creates a much more diverse habitat," Gliessman said, enabling more different kinds of plants to survive, while at the same time "the use of the environment is more efficient," leaving less sunlight, water and nutrients for weeds to survive on.

Beans and collards were chosen because of their complementing growth curves. "Beans grow fast, mature quickly and begin to lose dominance," Gliessman said. "Collards are slower-growing and don't establish dominance until after four weeks. So by combining them we hoped to get the optimum in reducing weeding."

Four weeding treatments were used. One plot of each crop type was weeded throughout the experiment, another for only the first four weeks after planting, another for only the first two weeks, and another not

at all. The entire setup was repeated twice, for a total of 36 plots.

The best results came from the four-weeks-and-stop system; results of the two-week weeding regime were also "pretty good," Gliessman said.

In this experiment, the "companions" were planted alternately—bean-collard-bean-collard. But in another experiment (for which the results were not in), peas and cabbage were planted in alternate rows, which could be done by machine. "We're not just talking about hand cultivation," Gliessman said. "We're talking

about application on a broader scale."

## Allelopathy

... which means chemical warfare among plants.

Gliessman and his students soaked leaves of a common weedy grass, ripgut brome, in water for three hours, and used that water in planting various crop seeds. Lettuce seeds didn't germinate at all, and seeds of some other crops were inhibited to lesser degrees. "But in the field, with so many other factors, maybe the inhibition doesn't work," Gliessman cautioned. "This is just a first step, to see whether these things have the potential for inhibiting crops."

Wild oats, fescues and black mustard were also found to inhibit certain crops (the flowers of mustards, on the other hand, benefit crop plants by hosting predacious insects "so the obvious recommendation is to plant them around the border of the field, not right in the middle").

The other side of the coin is that some crop and forage plants can suppress weeds, by releasing toxic substances from their roots. Among them are certain kinds of oats, wheats, ryes, barleys, bromes, mustards and tobaccos. Researchers recently found strains of cucumber that also do this. They commercial strains lack the weed-fighting ability, but it should be possible for plant breeders to incorporate it into commercial cucumbers, just as they've bred disease-resistance and other characters into crop plants.

## Cultivation practices

Not all weeds are bad actors. Gliessman taught agro-ecology in Tabasco, tropical Mexico, for four years and notes that the

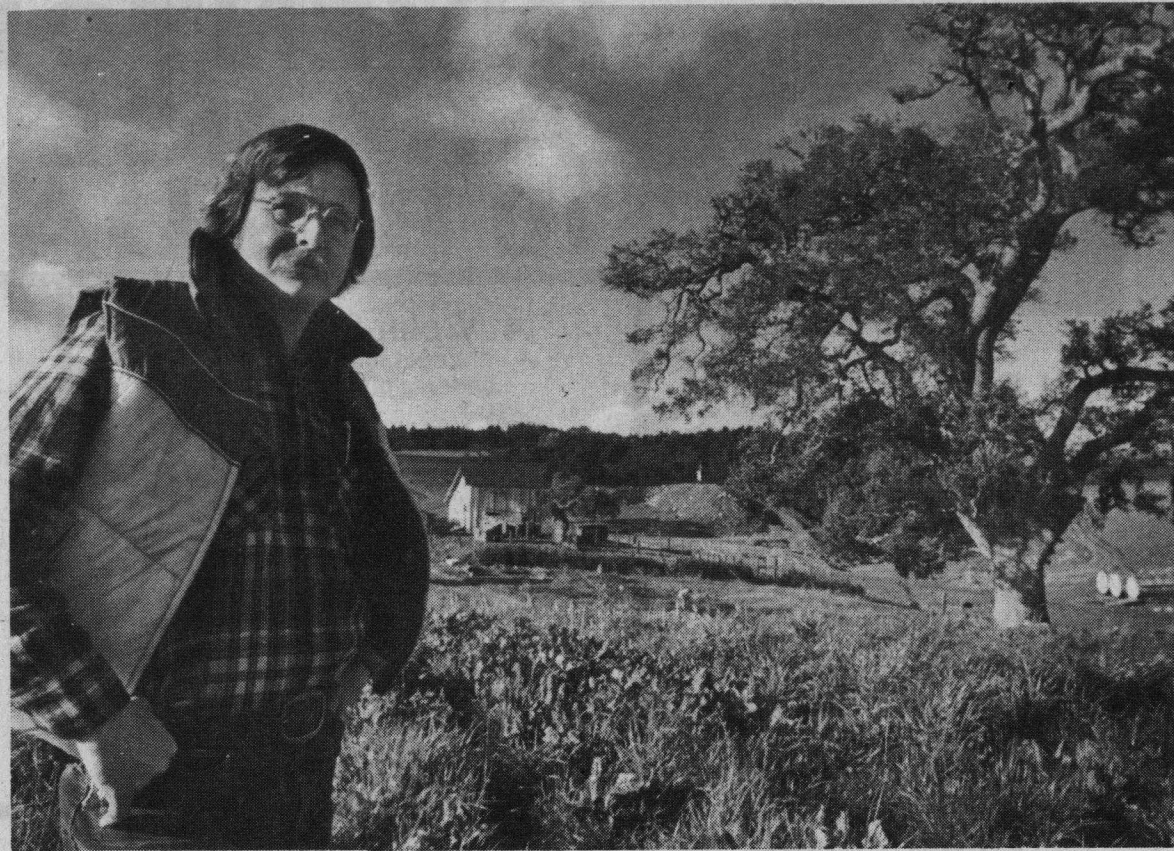
people there don't even have an overall word for "weed."

"To them, a 'good plant' is a non-crop beneficial plant. A 'bad plant' is a non-crop harmful plant. They've developed a whole vocabulary (for their cultivation practices). Some they cut at the surface, some at 10 centimeters, some they pull up, some they don't touch."

And many of the volunteer plants around here do more good than harm, if only by adding organic matter to the soil when they die. Pigweed and goosefoot are usually tall and slender, and don't crowd the crop plants. Portulaca, a low plant, grows under the crops (and is good to eat). Spurry provides a nectar source for insects like parasitic wasps that attack harmful larvae. So do the mustard weeds, black mustard and field mustard, "but they can be aggressive, so grow them in hedgerows or strips around or through the crop area." Bur clover is a low-growing legume, fixing nitrogen for other plants to use.

In Mexican gardens, Gliessman said, "a lot of the plants are there for what they add to the system, not what they produce that can be taken out of the system." A particularly valuable plant, for instance, may be one that adds a lot of leaf and twig litter to the soil. And this approach, he thinks, "will become more important (here) as fossil fuels become more expensive."

Gliessman emphasizes that he doesn't yet have specific advice for the home gardener. "We're trying to establish that these things work on an experimental basis," he says. "It's basic research now"—a search for the "why," with the "how-to" to follow in due course.



Steve Gliessman at the UCSC Farm, now idle

Photo by Kurt Ellison

U.C.S.C. to 1980

REFERENCE

WATSONVILLE  
REGISTER-PAJARONIAN  
March 4, 1982