Said Potter, "Cancer may be the result of reducing the intake of foods that are metabolically necessary—it may be a disease of maladaptation."

Organic Farming Goes Big Time

"Going organic" is yielding unexpected success down on the farm as some brand-name corporations have decided not to use synthetic fertilizers and pesticides on much of their crop acreage. In doing so, they're challenging the idea that organic methods only work best on a small scale, and they are seeing improvements in crop quality as well as savings in pesticide-related costs per acre—without reduced yields.

California-based Gallo Vineyards is now the largest organic farm in the United States, with 6,000 of its 10,000 acres devoted to strict organic farming methods. These include mechanical cultivation to destroy weeds instead of herbicidal dustings; intercropping vineyards with nitrogen-producing peas and oats which fertilize the soil naturally; and reliance on natural predators, including spiders and ladybugs, rather than insecticides which must be applied several times a year.

In California, the leading agricultural state in the United States, where over 50% of the nation's fruits and nuts and 47% of its vegetables are produced, 50,000 acres are now certified "organic" and 20,000 more await such certification by California Certified Organic Farmers (CCOF) in Santa Cruz.

Over the last 10 years, nonchemical pest control and cultivation methods have gained wider acceptance among large and small growers nationally who must confront problems of pest resistance, a shrinking pool of federally approved pesticides, health effects of pesticide exposure among farm workers, and environmental impacts of conventional agrichemicals. "The organic area is growing," says Harold S. Ricker, staff director of the USDA's National Organic Program. "Growers are definitely serious about trying to do something about these problems."

Organic methods are also gaining respect from a number of cotton growers throughout California (and in the arid high plains of Texas), much to the surprise of skeptics who said it couldn't be done. In California, more chemicals are used on cotton than on any other crop, almost half of which are defoliants or dessicants. But some cotton growers are succeeding with organic methods such as crop rotation with legumes; reliance on beneficial insects; composting and use of cover crops as main sources of nutrients; aerial spraying of zinc to promote cotton boll maturity; and pre-harvest water cut-off to aid natural dessication.

However, the major barrier to large-scale organic cotton production in California remains a lack of effective alternatives to chemical defoliation. Conventional defoliants facilitate mechanical harvesting by eliminating leaves that may jam the picker. Defoliation also prevents chlorophyll staining from live leaves and helps reduce seed cotton moisture content, a key cause of composting during storage. Without conventional defoliants, farmers must pay for hand-labor or harvest without defoliating and risk moisture contamination.

According to Brian Baker, CCOF technical coordinator, organic cotton growers are undeterred by the obstacles. Once established, cotton can hold its own against weeds without conventional herbicides, and a program of rotation, tillage, and timely cultivation can keep hand-labor costs to a minimum. Says Baker, "To date, CCOF has certified 1500 acres with 6000 more in the pipeline and more to come." In addition, a growing market for higher-priced organically farmed cotton is helping defray the roughly 15% increase in production costs largely due to labor. Hoping to reap marketing benefits from environmental consciousness, some brand-name manufacturers are willing to pay almost twice the conventional cotton price.

Still, despite success stories, cautions have arisen against fully embracing organic farming methods. Leonard Gianessi, senior research associate at the National Center for Food and Agricultural Policy in Washington, DC, says the idea that researchers could develop a program to find effective nonchemical substitutes for all uses of chemical pesticides is not realistic. He sees increasing concern among entomologists over biological control methods, such as breeding and releasing natural predators to reduce pest populations, which may carry unrecognized risks including the possibility of insect species extinction. Gianessi also points to current uncertainties surrounding use of microbial pesticides in terms of their impact on people, animals, and the environment.

USDA's Ricker is optimistic. He says his program is focused on developing national standards for organic production, processing, and marketing. Ricker characterizes most organic growers as "serious business people who are concerned about their environment and work methods. They have demonstrated they can apply organic production techniques on a large scale and in all environments."

Joshua Ets-hokin

Cotton club. Organic growing methods are gaining acceptance as cotton farmers search for alternatives to chemical pesticides and defoliants.

Ozone-Friendly Chemicals

As the federal government begins to phase out chlorofluorocarbons (CFCs) for contributing to stratospheric ozone depletion, scientists are searching for alternative chemicals that are considered "ozone friendly."

Scientists at the National Oceanic and Atmospheric Administration announced in January that extensive research on hydrofluorocarbons (HFCs) shows that they will not destroy the ozone layer as CFCs do. A. R. Ravishankra, a chemist at the NOAA laboratory, said HFCs are about 50,000 times less destructive of ozone than CFCs and remain in the atmosphere only 15 years, whereas CFCs linger for 50 years.

The NOAA studies began last March after an Oxford University scientist suggested that the fluorine in HFCs could possibly combine with carbon in the atmosphere to create a reaction that would destroy ozone. This was a "plausible speculation" that has been proven wrong.

The HFCs could possibly replace

CFCs in air conditioners, refrigerators, and other mechanical cooling systems. The CFCs have also been used as industrial cleaners and as propellants in aerosol cans, though they are no longer used as propellants in the United States.

The EPA has also had success in developing substitute chemicals for CFCs. EPA scientists are looking at 11 possible candidates, and of these, two look especially promising, according to N. Dean Smith, senior project scientist in the Stratospheric Ozone Protection Branch of EPA. Both chemicals are fluorated propanes and have been undergoing testing since November by the U.S. Navy.

So far, the testing has been successful. "The research on these two is progressing at a much faster pace than we had anticipated. At this rate, they could be marketed within a couple of years," Smith said. The chemicals have already passed tests for flammability and thermaphysical properties. In tests for atmospheric lifetime, however, the results were not what the scientists had hoped for. One of the chemicals was found to have an atmospheric life of 7.8 years, which is acceptable, but the lifetime of the other chemical was determined to be 62 years, which is longer than desirable, Smith said. This figure is currently being retested. Other ongoing tests on the chemicals include those for toxicity and performance.

The urgency of the testing by the navy is due to the fact that a CFC currently used in air conditioning and cooling systems on board ships has to be phased out by the end of next year, Smith said. It appears that the two chemicals being tested by EPA have the capability of replacing CFCs in navy equipment. If either fails to be an acceptable replacement, the navy faces very inconvenient alternatives, Smith said. One would involve using another chemical such as a hydrochlorofluorocarbon, but that will also have to be phased out in time. Another choice would be to use a newly proposed substitute chemical, such as an HFC proposed by the NOAA, but the navy would have to change all of its equipment to adapt to the new chemical.

Industry is also interested in the 11 new EPA chemicals for use in chillers, heat pumps, air conditioners, supermarket food coolers, and foam blowing. Chemical companies are talking to EPA about the substitutes. If tests prove successful, chemical producers will discuss the possibility of producing large quantities of these chemicals for commercial use.

Toxic Reporting

The EPA released a proposal January 6 that will require manufacturers to report more of the chemicals they release into the environment. EPA nearly doubled the number of chemicals on the Toxic Release Inventory list, from 320 to more than 630.

"These chemicals have been assessed for a while, for carcinogenicity, effect on the environment, and effect on human health, and it was determined that they met the criteria to be added to the list," said Gwen Brown, an EPA spokesperson.

Of the 313 new chemicals on the list, 170 are used in the production of pesticides and herbicides. The EPA plans to provide citizens with new information about their potential exposure to these chemicals.

EPA Administrator Carol Browner called the expansion of the list of chemicals "an important step forward in . . . putting people first. We believe Americans have a right to know about the toxic chemicals they are exposed to."

Manufacturing facilities have been required for the last five years to report toxic chemical emissions into the air, water, and the ground through annual TRI forms under Section 313 of the Emergency Planning and Community Right-to-Know Act. The TRI is based on acute human health effects, carcinogenicity, or other chronic hazards of the chemicals. The public can access the reports through the TRI database.

Citizens groups and environmentalists have used the reports to hold manufacturers accountable and seek emission reductions. "Citizens have used [statistics] to put a spotlight on companies and provide an incentive for them to reduce emissions," said Ed Hopkins of Public Citizen, a Washington-based advocacy group that examines the release numbers each year in an attempt to establish trends.

Among the chemicals added to the list are the widely produced compounds bromine, caprolactam, carbon monoxide, chlorinated paraffins, chlorofluorocarbons, hydrochlorofluorocarbons, man-made mineral fibers, nicotine, nitrogen dioxide, ozone, and sulfur dioxide. Several pharmaceutical ingredients that are proposed include diphenylamine, lithium carbonate, pentobarbital sodium, and tetracycline hydrochloride.

The proposed additions that are used to manufacture pesticides include benomyl, the active ingredient in DuPont's controversial fungicide Benlate. Other active ingredients of pesticides proposed for the list include alachlor, aldicarb, bromacil, diazinon, and malathion.

The proposal requires that manufacturing facilities include the additional chemicals on their 1996 TRI forms, which cover releases for 1995. After expansion of the list, EPA anticipates receiving about 26,000 more reports and hearing from 2,400 more facilities. Industry costs of reporting are projected at $155 million the first year and $85 million the second year.

EPA is also planning to require additional types of industries to report toxic emissions. "We plan later this year to announce a second phase to the list, although we are not sure of a date yet," Brown said. The second phase will include additional facilities as well as more chemicals, she said.

Currently, only manufacturers are required to submit TRI reports. The new TRI proposal will require manufacturers of pesticides to report the release of chemicals into the environment, but it will not require farmers, the major users of such chemicals, to make any reports. Environmentalists have been campaigning with EPA and Congress to hold farmers accountable for information on pesticide use because runoff from farmland is a major cause of river and lake pollution.

Toxic Chemical Release
Sec. 313(d)

(1) In General.—The Administrator may by rule add or delete a chemical from the list described in subsection (c) at any time.

(2) Additions.—A chemical may be added if the Administrator determines, in his judgment, that there is sufficient evidence to establish any one of the following:

(A) The chemical is known to cause or can reasonably be anticipated to cause significant adverse acute human health effects at concentration levels that are reasonably likely to resist beyond facility site boundaries as a result of continuous, or frequently recurrent releases.

(B) The chemical is known to cause or can reasonable be anticipated to cause in humans—
- (i) cancer or teratogenic effects, or
- (ii) serious or irreversible—
  - (I) reproductive dysfunctions,
  - (II) neurological disorders,
  - (III) heritable genetic mutations or
  - (IV) other chronic health effects.

(C) The chemical is known to cause or can reasonable be anticipated to cause because of—
- (i) its toxicity,
- (ii) its toxicity and persistence in the environment or
- (iii) its toxicity and tendency to bioaccumulate in the environment,

a significant adverse effect on the environment of sufficient seriousness, in the judgment of the Administrator, to warrant reporting under this section.