rice, but that it will be used as a rice extender. Introduction into the diet may have to come at famine times or by a concerted educational effort on the part of nutrition and social experts among the working class. There is also hope that it may be introduced through public service programs. For instance, bread was unknown in Japan until it was introduced in the school lunch program. The children accepted it, grew to like it, and now ask for it in their homes.

Acceptance of boulgour has a good chance of succeeding. A small scale experiment at the Women's Christian College, Madras, India, reports favorable results but on such a small scale as to question national acceptance. India and other rice consuming countries would now like to see a large-scale acceptance test.

Los Angeles Smog Found Cause Of $1 Million in Crop Damage

THE BILL FOR CROP DAMAGE due to smog in the Los Angeles area is estimated to run to about $1 million per year, according to the recent report of the Stanford Research Institute.

The principal crops affected by smog are spinach, endive, beets, romaine lettuce, alfalfa, and oats.

Peculiar types of markings on leafy vegetables have been noticed for some time in the Los Angeles area. These discolorations were named "fog burn" by the farmers because they seemed to be associated with the appearance of severe fog or smog. Crop damage was first observed with leafy vegetables since the market value of these crops, such as lettuce, is closely associated with their appearance. Smog damage usually appears suddenly. One day the plants may have a healthy appearance while a few days later following a heavy smog the plants will appear discolored, wilted, and resemble cooked or burned vegetables.

Lawns and shrubbery are also affected by smog. However, it is not possible to estimate the extent of economic loss to other than economic crops.

As part of the over-all study of smog in the Los Angeles area SRI conducted a detailed research project on the relationship between smog and crop damage. The objectives of this research were to: learn if the crop damage resulted from an airborne contaminant, and if so if its occurrence correlated with other measured aspects of the smog phenomenon; map the areas of crop damage to see if the damage pattern might indicate the origin of contaminants; learn what chemicals could cause damage resembling fog burn; develop fumigation techniques that would duplicate as nearly as possible smog damage observed in the field; accurately describe smog damage to plants as distinct from other injuries.

The SRI researchers report that smog damage to crops is due to phytotoxic effects of airborne gaseous impurities. In a series of experiments designed to duplicate smog conditions, plants grown in greenhouses ventilated with unfiltered, smog, air developed markings similar to those observed on plants grown in open fields. However, plants grown under similar conditions in an atmosphere of filtered air developed no markings.

There was no geographical pattern of smog damage in Los Angeles county indicating that smog damage is not due to local area conditions.

Institute workers were able to duplicate most of the various types of plant injury by laboratory fumigations. Typical smog injury was obtained by placing the plants in an atmosphere with the reaction products of ozone and unsaturated hydrocarbons or ozone and automobile exhaust. No other gaseous mixtures were found which could produce smog type effects on plants.

An experimental smog mixture was developed consisting of reaction products of ozone and 1-hexene which would duplicate most of the effects observed in field crops. Gasoline vapors, blamed by some for smog damage, did not produce injury at concentrations equal to or far in excess of those which would be expected in the Los Angeles atmosphere.

The Stanford report is a summary of research conducted by the institute in Los Angeles county during the last 6 years. The report discusses the peculiar problems of Los Angeles smog. One rather unique condition contributing to the smog problem in that area is the presence of an inversion ceiling in the atmosphere for about 260 days of the year. This ceiling prevents upward turbulence from carrying off the pollutants which are discharged into the atmosphere. Thus the materials which are discharged into the atmosphere as a result of the burning of fuel and waste are trapped over the area and the resulting interactions between these combustion products and the atmosphere lead to the formation of smog.

The chemical activity resulting in smog may be due to the presence of large

Typical Crop Damage Due to Smog

	Tan Necrotic Areas
Spinach **Endive** **Beets** **Radish** **Celery**	First observed within a few hours after smog. Damage is first observed as a "cooked" grey green color on surface of leaf. This is usually followed by progressive dehydration of the affected areas until shriveled brown areas develop throughout the entire thickness of the leaf and leave tan necrotic spots. Chlorosis is often found throughout the tissue.
	Silverleaf
Spinach **Romaine Lettuce** **Endive** **Beets** **Celery**	Oily appearance develops on surface of leaf within 4 to 8 hours after smog, depending upon severity. Lower surface develops a definite silvering after 1 to 3 days. Following a light smog the silvering effect is very faint and does not usually progress into more advanced stages.
	Upper Surface Glazing
Spinach **Radish**	Less frequently observed than Silverleaf. When it does occur, is very noticeable as glazed areas on the upper surface of the leaf, usually white to silvery in color. This type of injury causes heavy crop losses since the leaves break down rapidly after harvesting.
	Chlorosis
Spinach **Endive** **Beets** **Radish** **Celery**	Observed most frequently in young plants. The leaves become yellowish in color, are curled and appear to have tiny punctures on the upper surface.
	Lower Surface Bronzing
Spinach **Romaine Lettuce** **Celery**	Initial symptom is oily appearance as in case of silverleaf, but it becomes shiny brown rather than silver. Usually appears in small spots rather than large areas.

amounts of ozone occurring naturally in the atmosphere over the Los Angeles area. The SRI report says that the Los Angeles area has the highest concentration of ozone on the earth's surface. Ozone concentration seems to correlate with manifestations of smog, and ozone concentrations seem to be the best single measurement of smog intensity in the Los Angeles basin.

The mechanics of ozone formation in the atmosphere are not adequately explained by any existing theories according to SRI. When the ozone formation is understood then perhaps smog formation can also be explained.

Industry

FMC Maps Out Plans for New Fairfield Division

MORE DETAILS are now available on Food Machinery and Chemical Corp.'s recent purchase of the Fairfield, Md., facilities of U. S. Industrial Chemicals Co. (AG AND FOOD, Aug. 4, page 814). Newly created Fairfield Chemical division, which came into being on Sept. 1, will take over USI's production of insecticides, herbicides, grain protectants, and other chemicals manufactured at fairfield. Among the plant's leading products are pyrethrins, allethrin, and piperonyl butoxide.

The new division will supplement the chemical activities of FMC's other divisions, including Westvaco, Chlor-Alkali, Westvaco Mineral Products, Ohio Apex, Niagara Chemical, and Buffalo Electro Chemical. A producer of SST, BHC, lead arsenate, calcium arsenate, and sulfur compounds, the parent company is a major factor in the ag chemical field. FMC also has a basic position as a producer of chlorine, caustic, phosphoric acid, and other important raw materials.

The Fairfield division is expected to become a center for diversified organic chemical production in the FMC family. Currently a producer of IPC and chloro-IPC, the Fairfield plant is likely to expand its activities in the direction of other carbamate compounds. Its general activities in the herbicide field will be intensified.

In accord with previous policy, the Fairfield division will serve as a supplier of raw materials and basic concentrates to manufacturers of agricultural chemicals. It will not enter the field of consumer products.

The staff of the new division will remain essentially what it was when part of USI. New manager of the division is R. B. Stoddard, who previously served as coordinator of insecticide operations for USI. W. S. Blondheim, plant manager, will be in charge of activities other than sales and research. Herman Wachs has been named director of research, with headquarters in Baltimore.

Other USI personnel now with the Fairfield Chemical division include W. E. Dove, director of entomological research, and H. A. Jones, director of the Fairfield laboratory. J. A. Rodda will be sales manager, with headquarters in New York.

Branch offices of the new division are being established in Chicago, Kansas City, New Orleans, San Francisco, and other cities.

Urea Now Coming from Allied's Omaha Plant

Initial production of urea has been obtained at the new Omaha, Neb., plant of Nitrogen Division, Allied Chemical & Dye. Ammonia facilities at this plant went into operation in April. The plant was constructed at a cost of approximately $25 million.

Urea will be sold for use as a fertilizer and as a cattle feed supplement, as well as a raw material for plastics and other items.

Both the ammonia and urea facilities incorporate processes developed through research in Allied Chemical's laboratories. The engineering and construction work in connection with these facilities were done by Catalytic Construction Co.

Chemical Enterprises Buys 9 Farm Chemical Distributors in NW

Chemical Enterprises, Inc., has acquired nine companies engaged in distributing anhydrous ammonia and other farm chemicals in Washington, Oregon, and Idaho. The nine companies were acquired from W. C. McCall of Portland, Ore., who will continue as a director and president of the companies. The companies are located in the wheat growing sections of those states.

According to Chemical Enterprises, this most recent acquisition will help to balance out its activities, giving equal emphasis on cotton, corn, pastures, rice, and wheat. The company distributes

Farm Editors See Experiment Stations as Guests of APFC

Seventeen editors of some of the nation's best-known farm magazines were guests of the American Plant Food Council on a week-tour of selected land-grant colleges and experiment stations throughout the country. The first stop on the tour (Aug. 16) was the University of Wisconsin. L. E. Engelbert, department of soils, at the University (extreme left) is shown telling a group of editors about the soils and agriculture of Wisconsin. The Wisconsin trip took editors to the University's laboratories, classrooms, and experimental fields. Editors were also shown a modern fertilizer mixing plant