

gen. This area includes not only that located in the humid regions of the United States, but the western ranges as well.

One of the most troublesome problems ahead for the nitrogen industry, asserted Bear, is that of keeping other nutrients in balance with the much larger amounts of nitrogen that will be applied.

The Short-Term Problem. The short-term problem facing American agriculture is not so much how to adjust production to demand, but how to do it without reducing net farm income, says Russell Coleman, president of the National Fertilizer Association.

The answer, he declared, is to decrease unit cost of producing farm commodities, thus making it possible for farmers to earn as much or more profit from smaller acreages and smaller total output.

Quoting results of agricultural experiment station research throughout the nation, Coleman explained that farmers could easily reduce cotton production from the recent average of around 15

million bales to only 9 million bales without cutting the total net return realized from their cotton crop.

The nation's wheat crop could be cut by nearly one third while wheat growers would still make as much profit as now. In the case of corn, approximately the same net profit could be realized from a 2-billion-bushel crop as from the present 3-billion-bushel average national output, he said.

This would be possible, indicated Coleman, if every American farmer would put into practice the recommendations of his state agricultural experiment station as to fertilizer usage and other good farming practices.

In effect the experiment stations are suggesting that farmers produce maximum yields at minimum costs on as few acres as possible, he said. "If this advice were followed, American farmers could remove from cultivation millions of acres presently in need of rebuilding, but which undoubtedly will be needed to feed and clothe our future generations."

Biological Warfare Against Insects Appears Promising

Many farmers lose more cotton to insects than they take to the gin; annual damage \$261 million

DALLAS.—Biological warfare against insects gives promise of controlling destructive pests, says E. F. Knipling, USDA entomologist. Practical ways to utilize disease organisms have already been found, as indicated by the success of milky disease for controlling Japanese beetles, and viruses for curbing the alfalfa caterpillar and the European pine sawfly.

In a report before the eighth annual Beltwide Cotton Insect Control Conference here Dec. 2 and 3, the government official indicated research is yielding valuable information on other virulent insect viruses and microorganisms.

Great strides have been made in the use of systemic insecticides, he said, and certain materials now known will protect cotton against some insect pests for periods of six to eight weeks.

Urging his listeners at the National Cotton Council of America meeting to explore all possibilities, Knipling pointed to experiments now going forward on atomic radiations. "The latest information on screw-worm eradication, by releasing reared gamma-ray sterilized male flies among the wild population, suggests other possibilities," he commented. The unique method, he said, may be feasible for eradicating other insects present in small numbers at some period during the seasonal cycle.

Staggering Losses. If cotton insect control methods are so much better now

then 10 years ago, and if so many more farmers are practicing insect control than ever before, why is one bale in seven still lost to insects? This question was asked by K. P. Ewing, entomologist in charge of the USDA's Cotton Insects Section.

In the first place, said Ewing, cotton farmers and others in cotton production, through extensive education, have become more insect conscious. They know more readily how to recognize insects and the harm insects do. This has led to more accurate diagnosis and reporting of insect damage.

Another factor, he indicated, is that cotton is now grown on improved, more fertile land. Usually this land produces a more luscious plant, one which attracts insects over a long period. Consequently, there are more insects and they multiply more rapidly and longer than under less favorable host conditions.

Ewing said there was every reason to believe potential per-acre yields will continue to rise. Under such conditions insect problems will also increase unless new and improved methods of control are discovered, he warned. Research on systemic insecticides appears to promise the greatest immediate returns, he said, and seed treatment seems especially adaptable to cotton insect control in the seedling and early fruiting stage.

More Education Needed. "The fact that many of our farmers lose more cotton to the bugs than they take to the gin,"

says C. B. Spencer, Texas Cottonseed Crushers Association, "places emphasis on the need for a still more aggressive and effective educational program." With a drastic reduction in cotton acreage, it is of vital importance that industry work closely with agricultural leaders and cotton growers to ensure maximum yields from each acre planted to cotton.

Spencer said the 1953 Cotton Insect Survey Report, compiled by the National Cotton Council, revealed that cotton insects destroyed 1,430,000 bales of cotton and 585,000 tons of cottonseed, valued at \$261 million.

Shortcomings in Research. Weeds and diseases also make a tremendous drain each year on productive resources that are used for cotton production, said J. D. Fleming, Oklahoma Cotton Ginners Association. The industry urgently needs more scientific facilities and programs that will put it on a more equal footing with competitors, he asserted.

The chemical fiber industry, said Fleming, spends many times more money on utilization, production efficiency, and quality than does the cotton industry.

Fleming emphasized that shortcoming of cotton have their parallels throughout American agriculture. Less than 5% of the Federal Government's \$2 billion allocation for scientific development is for agriculture.

"From 3% to 5% of the dollars we collect from sales of agricultural chemicals is plowed back into research," said W. W. Allen, Dow Chemical, and president of the National Agricultural Chemicals Association. This amounts to \$9 million a year in research for agricultural chemicals alone.

Outlining American industry's contribution to agricultural research, Allen said the estimated cost of developing a single insecticide is approximately \$1.5 million. This cost includes research to synthesize the compound and run preliminary screening tests, \$500,000 for testing in the field, and construction of a pilot plant in which to produce enough for large-scale testing of small quantity sales. These and other costs, he emphasized, run the total expense up quickly. Thousands of chemicals are screened, but less than one in 5000 passes to the next stage.

On the Cover

Pesticides in the Tropics

Banana plantation laborer applies Bordeaux mixture from a stationary spray system to control a fungus leaf spot known as Sigatoka. Central pumping station supplies the spray material, which must be applied 16 times or more a year, to a grid-like pipe system on top of the ground with take-offs for attaching hose.

Photo, Courtesy United Fruit Co.