

AGRICULTURE-INDUSTRY

# The Soybean Goes to Town

## Used in Scores of Products, From Noodles and Beer to Steering-Wheels and Paint, Chinese Bean Shows Versatility

By DR. FRANK THONE

**S**OYBEANS have been champed by pigs, and soybean hay and silage chewed by placid cows on American farms for a good many years now. But pigs and cows are not as a rule excitable animals, so that this transplanted Chinese crop has gone on in the even tenor of its way without stirring up very much talk outside of farm circles.

But now, almost suddenly, the soybean has started to go to town. Industry has discovered the soybean as a raw material, out of which all manner of things, from glue to doorknobs, may be made, and city folk have begun to see visions of the country rolling back to prosperity in a magic chariot popped out of a soybean pod.

### Food for Recovery

Well, not exactly that, perhaps; but it is true that there has been a lot of boom talk about soybeans in industry. Wise industrialists cross their fingers when they hear talk of this kind. Most of them can remember things at least as much as seven years: they have had their fill of boom, and want no more out of that dish, thank you. But as an element making for recovery, and increasingly important in the development of new businesses, they are quite awake to the existing possibilities of this agricultural gift from Old Cathay, and some of them are having chemists look still further into possibilities as yet unexplored. And at the University of Illinois, noted for both agricultural science and chemistry, Government action has made possible the opening of a special soybean research center. Soybean things are all set to begin happening.

But what then can these much touted soybeans do?

Really, quite a lot. We all saw an impressive array of motorcar gadgets at the Century of Progress in Chicago a few years ago, that Henry Ford had started making out of the solid parts of soybeans—dashboard panels, gearshift knobs, distributor cases, and so on. He's still making them by hundred-thousands.

But these are not the really important products of soybeans. Such things can be made in a dozen different ways, out of the dozen new products of the organic chemist's arcanum, lumped rather vaguely as "plastics." The shiny gadgets on your car or radio may be made of soybeans, or of Bakelite, or of something else of less familiar name. In this field, soybeans have plenty of competition; it is as much Henry's gifts as a first-rate industrial showman as their own merits that have given these soybean products so much of the spotlight.

### Wallpaper and Glue

Besides their use in these solid forms, that you see whole and by themselves, soybean plastics have begun to get into a whole series of applications in which they are combined with something else. Beautiful high-grade wallpapers coated with a soybean product, for example, and laminated wallboard in which the thin sheets of wood veneer are solidly held by a vise-gripping soybean glue. These soybean adhesives particularly will bear watching.

But soybean plastics are rather less than half the story, as industry sees it. The best thing that the soybean brings to town is its oil.

It is the oil in the soybean that makes it blessed above all other beans, in the eyes of industry. The digestible part of

most beans consists of about one-quarter protein, three-quarters starch, and no oil. The corresponding part of the soybean consists of one-third protein, two-thirds oil, and no starch.

That oil is one of the relatively few kinds in the world that can be used in the making of paints, enamels, etc. That is what has made the soybean such a welcome guest at the council tables of industry and on the laboratory bench of chemistry.

### Oil Requires Processing

It isn't all plain sailing, mind you. You can't just take a bushel of soybeans, squeeze the oil out of them, mix in zinc oxide, white lead, or what have you, and proceed to daub it on your house. Like all other paint oils, soybean oil requires processing, and it works best when mixed with one of the other paint oils, like linseed oil or the newer product of the South, tung oil—also a Chinese immigrant.

Moreover, tung oil paints have to face the conservatism of painters and the paint business, who have always regarded "b'iled linseed 'n' white lead" as an unbeatable combination—the only proper stuff to coat a house with. However, science has a way of winning over tradition in the long run, particularly when science-backed business is able to point out to farmers that they can thus use one of their own products at home. Besides its use in paint, soybean oil is enjoying increasing utilization in baked finishes on automobile bodies, electric refrigerators, etc.



THE CROP LOOKS GOOD: IN A SOYBEAN FIELD DOWN SOUTH



**SOYBEAN CUPBOARD—WELL FILLED**

There are three ways of getting the oil out of soybeans. Oldest is pressing, and it is also the least efficient process, leaving a good deal of oil in the seed-cake. A second and much more efficient mechanical process is known as expelling; it applies terrific pressure for short periods to quite small quantities of the beans, and gets out a much greater percentage of the oil. A still newer process, also highly efficient, is extracting. The ground beans are submitted to the action of a chemical solvent, like benzene, which dissolves out practically all the oil. The volatile solvent is then distilled off and condensed, to repeat the process on the next batch.

#### **Economical and Efficient**

Extraction is thus very economical as well as very efficient. It can also be used in rather small plants, such as a farmers' cooperative group could set up for themselves. However, it has the element of danger that is always present where inflammable liquids are being vaporized. A leak in the apparatus, a chance spark or careless cigarette—and you have another industrial disaster. At least two such soybean oil extractor explosions have occurred within recent months. Manufacturers of extractor apparatus, having learned from the fatal experience of others, are now bending every effort toward making their machines at least as leakproof as the coils of a mechanical refrigerator.

The residue of the soybeans, after the oil has been taken out, is the press-cake, which is the raw material of the soybean plastic products. But by no means all of it goes to make knobs or wallpaper surfacing or glue. The farmer himself wants by far the greater proportion of it back, for it is one of the greatest high-nitrogen stock feeds known, having an edge even on the old favorite cottonseed meal for that purpose. Also, if he likes, he can spread it on the soil and plow it under, as fertilizer.

As a matter of fact, probably the larger part of the soybean crop never goes to town at all, except indirectly. The beans were first grown in this country a couple of generations ago for stock feed, and in large measure they serve that purpose still.

#### **For Mixing With Silage**

The plants, which stand up straight and bushy, can be cut and cured for hay, or they can be fed into the silage cutter green, mixed with green cornstalks, to be served up during the winter as "bovine sauerkraut." Silage with a soybean addition has a higher protein content than straight cornstalk silage, which is of course very desirable from a meat-and-milk making viewpoint.

The versatile soybean also has another important role to play on the farm. Like all members of the legume family, it harbors colonies of bacteria in its roots, which capture nitrogen from the air and make it available as food for the higher plants. Soybeans are therefore often grown simply to be plowed under, as green manure. They have been given official recognition as a "soil-building crop" in the new soil conservation program of the U. S. Department of Agriculture; farmers are to be given benefit payments for planting soybeans and then plowing them under.

While soybeans have been grown in America for a couple of generations at least, their wide cultivation is relatively recent. As late as the beginning of the present century, there were only about eight varieties of them in the United States, though China, where they have been grown for centuries, had several hundred kinds of them.

#### **Fifty Varieties Listed**

During the past three decades, however, many more varieties have been imported, and new ones originated by American breeders to fit American conditions. Probably more than a thousand kinds of soybeans, altogether, have been tested in this country. At present, seedsmen list some fifty varieties.

Last year's soybean crop was the biggest ever harvested in the United States; it was well over 30,000,000 bushels. Most of it was grown in the Corn Belt states, for soybeans and corn seem to like about the same things, in soil, temperature, and rainfall. A big boost was given to the acreage as an indirect result of one year of dreadful heat, 1934. Chinchbugs, that thrive on heat and drought, swarmed in billions of billions, ruining vast acreages of corn and small grains. Since soybeans can be planted late and still mature at least a hay harvest, much of the devastated acreage was re-planted to soybeans. In Iowa alone, the soybean acreage was increased seven-fold in that one year. "It's an ill bug that brings no benefits."

The soybean's versatility is not a matter of American ingenuity alone. We have thought of new uses for it, to be sure, but the Chinese, during their many centuries of acquaintance with it, have produced practically every form of food from it. They make a soybean milk, which looks and tastes like cow's milk (except for a slightly "beany" flavor), and in a cowless land is the daily drink of millions of children. The residue, a soybean curd, looks and tastes very much like cream cheese.

#### **A One-Ingredient Meal**

The beans themselves are boiled for the table, and eaten in a dozen other ways, including the succulent bean sprouts you fish for in your plate of chow-mein, and salted parched soybeans



**THE BUSH AND THE BEANS**

that are much like roasted peanuts. It is quite possible to make up a reasonably complete, appetizing meal out of soybeans alone.

We are beginning to appreciate their value as food, too, in the Occident. Canned soybeans are on the market, and soybean flour is at a premium among knowledgeable housewives.

And finally, there is our old friend, the soybean sauce of the chop-suey restaurants—that dark stuff in the hair-tonic bottles, that has such a tangy, salty taste. It is made by fermentation, and after proper aging is shipped to this country. That is, the cheaper kind of "dragon's blood" comes here. The really choice varieties, aged in jars for years, with daily exposure to the sun, are for merchants and mandarins, not export.

It is this sauce, incidentally, that gives the bean its name. Called *sho-yu* in Japanese, *tsü-yu* in the Chinese of Canton, and with other variants in pronunciation, it easily becomes *soya* or *soy* in English. The original form of the word means "salted bean sauce."

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#### ZOOLOGY

### Robs Hawk of Mouse, But Pays Back Five

**A** HAWK in the Lava Beds National Monument, California, lost a lunch recently, but gained a dinner, all in the cause of science.

Field Naturalist Joseph S. Dixon and Dr. R. M. Bond of the National Park Service staff were making a biological reconnaissance of the area, with special emphasis on the bird life.

Mr. Dixon, in his quest for facts, peered over a rocky eminence into a hawk's nest. Inside the nest lay a fine specimen of kangaroo mouse. Mr. Dixon coveted the specimen for his collection, so carried it away. Evidently, however, his conscience hurt him as he thought of the disappointment of the hawk, when it discovered the theft. So shortly he returned from the base of the cliff, carrying five field mice which he carefully laid on the nest.

David H. Canfield, Superintendent of Crater Lake National Park and also in administrative charge of the Lava Beds National Monument, reported the incident, saying that in view of it he would be glad to lend Mr. Dixon the price of a lunch anytime, with the expectation of getting a dinner back.

Science News Letter, August 1, 1936

#### INVENTION

### Individual Loudspeakers Quiet "Drive-In" Theaters

**N**EIGHBORS of "drive-in" motion picture theaters, the kind where patrons drive in and sit in their autos while seeing and listening to the show, would not be annoyed by the loud blasts of the screen's loudspeakers, if a new way of quieting the "talkies" should go into widespread use.

Individual loudspeakers for each car is the feature of the invention for which a patent (No. 2,045,180) has just been granted to G. Douthwaite of Los Angeles, Calif. Each parking space in the open air theater would be provided with a loudspeaker. A car would pull

into the parking space and drive up a ramp until the radiator of the auto would almost contact with the cone of the loudspeaker.

In this way sound would travel from the loudspeaker, through the radiator of the car, through the dashboard into the auto proper. Each car would thus be literally coupled to a loudspeaker through its radiator. It is claimed that sound is confined to the car, and little escapes to the open air and the surrounding neighborhood.

Like parking meters, the system also may be conceivably used for radio listening on a meter basis. Cars not provided with auto radios could pull into such a radio listening station, and tune in.

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# DOCUMENTATION

As the result of the activities of the Documentation Division of Science Service, various documents, reports and publications are brought together relating to the problems of scientific documentation, particularly the application of microphotographic duplication to scientific publication and bibliography.

There will appear occasionally under this heading news notes, comments and bibliography relating to documentation.

The following Science Service Documents will be sent upon request, without charge, so long as the present duplicated supplies last:

#### General

Activities of Science Service in Scientific Documentation—Doc. 72, 8 pp., Feb. 10, 1936, 2d ed.

International Institute of Documentation Congress—Doc. 91, 4 pp., Oct. 17, 1935.

Microphotographic Duplication in the Service of Science, Watson Davis. Reprinted from *Science*, May 1, 1936, Vol. 83, No. 2157, pp. 402-404.—Doc. 182.

#### Scientific Publication and Bibliography

Project for Microphotographic Publication of Periodicals—Doc. 46, 2 pp., July 11, 1935, and Doc. 67, 2 pp., Aug. 2, 1935.

Method of Selecting for Use in Bibliography, Watson Davis—Doc. 57, 2 pp., July 23, 1935.

Procedure in Building Bibliographical Files, Watson Davis—Doc. 58, 1 p., July 24, 1935.

Proposal of Bibliographic Department of Documentation Division of Science Service, Helen M. Davis—Doc. 61, 4 pp., July 26, 1935.

A Proposed Photoelectric Selecting Mechanism for the Sorting of Bibliographic Abstract Entries from 35 mm. Film, R. H. Draeger—Doc. 62, 1 p., July 27, 1935.

Comments on Scientific Publication and Bibliography Suggestions—Doc. 63, 10 p., July 31, 1935, and Doc. 68, 2 pp., Aug. 2, 1935.

Publication and Bibliography Deficiencies—Doc. 73, 3 p., Aug. 16, 1935. Reissue of portions of Memorandum of Aug. 19, 1933.

#### Priority in Scientific Publication

Priority in Scientific Discoveries and Microphotographic Publication, Harry Goldsmith—Doc. 163, 8 pp., March 18, 1936.

#### Auxiliary Publication Service

Memorandum on Auxiliary Publication Method, Watson Davis—Doc. 151A, 1 p.

Preparation of Documents—Doc. 152, 1 p., Jan. 20, 1936.

Cooperative Agreement for Utilization of the Publication Service of the Documentation Division of Science Service, Inc.—Doc. 153, 2 pp.

Questions and Answers About the Auxiliary Publication Service—Doc. 173, 3 pp., Apr. 24, 1936.

Cooperation with Science Service (suggested notice for journals cooperating in Auxiliary Publication Service)—Doc. 174, 1 p., Apr. 29, 1936.

Journals Cooperating and Considering Auxiliary Publication Service—Doc. 175, 3 pp., May 15, 1936.

Comments on Bibliofilm Service and Auxiliary Publication Service—Doc. 176, 2 pp., May 15, 1936.

Bibliofilm Service (See *SNL* June 6, 1936)

Circular of Information—Doc. 141, 2 pp.

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