NEW SOURCES OF FARM PROFITS

A radio talk by Dr. Henry G. Knight, Chief, Bureau of Chemistry and Soils, delivered through WRC and 30 other radio stations associated with the National Broadcasting Company, at 2 P.M., Eastern Standard Time, Tuesday, August 13.

Have you ever been in the Chicago Stockyards and packing plant district? If you have, I'll wager that after your first visit you brought away two impressions. One centered around the permeating odor of the district. The other had to do with the marvelous efficiency of the packing plants -- and the no less marvelous monotony of the way everybody told you -- "yes sir, those packers use everything but the squeal."

But monotonous or amusing -- whichever the remark seems to you -- it holds, all neatly compact, a profound industrial truth. The truth of profit in putting wastes to work.

No doubt a good many of you have thought about this truth and wondered how thoroughly the principle can be applied to farming -- how many new sources of farm profits can be found in what are now regarded as waste materials.

The tonnage of this material produced annually reaches a truly amazing figure. For every pound of grain, harvested and sold, from 1 to 3 pounds of residue in the form of straw and stalks are left upon the farm to be disposed of in the best manner possible. For every pound of seed cotton sent to the gin from 1 to 2 pounds of cotton stalks are left in the field. I am not sufficiently bold to attempt to estimate the amount of culls and waste in the fruit industry, but it is large enough to command serious attention. Likewise, there is a big waste of the root crops. Probably not more than 50 per cent of the sweet potatoes grown find a satisfactory market.

Everybody has a stake in the research that we conduct in the Department of Agriculture to find ways of converting agricultural waste materials into useful goods. Every process discovered not only gives a new source of profit to the farm producer, but benefits the public as well.

The idea of finding farm profits in former wastes is not a new one. It was put into practice generations ago by farmers. Cull apples and the poorer grades are converted into cider or into vinegar. Unmarketable sweet potatoes are marketed indirectly by feeding to livestock. But to use many present waste materials is beyond the scope of the individual farm and beyond the financial ability of most farmers. Large industrial plants are necessary in order to take advantage of the economics of quantity production. The processes through which the raw material must be put are often highly technical, and operations must be carefully controlled so that uniform products may be turned out. These products may represent a change in the physical state of the parent material, through a separation of the

parent material into its component compounds, or they may be new substances not present at all in the original material.

One of the first farm wastes to be used in America upon a large scale was cottonseed. Before the Civil War cottonseed was allowed to decay about the gins or was thrown into the nearby water courses to be carried away by the spring freshets. At that time cotton was grown for the fiber only. Through the intervention of chemical science, over thirty different commercial products are now produced from cottonseed and the price received from this is reflected back to the farmer in the price paid for seed cotton. Of the better known products of this material we have cottonseed cake for feeding livestock, and cottonseed oil. Even the very short fibers left on the cottonseed after ginning operations, known as cotton linters, are now taken off and used in the cellulose industries to be made up into fiber -- the rayon which goes into your Sunday socks -- or into the brilliant lacquers which have made our automobiles and our furniture reek of the rainbow.

Sugarcane bagasse until a few years ago was burned under the boilers of the sugar mills. Now the bagasse is made into insulating lumber used in building trades and in refrigeration. The market for this and similar materials has expanded enormously during the past few years. Wheat straw, which in many sections of the West is burned in the stack, is being made into paper and fiber board which find wide uses in industry. Just a few days ago I read a book which was printed upon paper made from cornstalks, and there is no good reason, except for the conomics of the situation, why cornstalks, straw, sugarcane bagasse, etc., could not be used for the manufacture of paper pulp, artificial fibers, or lacquers.

Let us consider for a moment one of our oldest agricultural wastes, straw, and look over some of the possible uses a chemist sees in it. The straw may be burned and the mineral ingredients left upon the land as fertilizer. This is a common and questionable practice in many parts of the country. Where coal or wood is expensive or scarce straw may be burned direct or it may be briquetted, after a binder has been added, and used as a fuel; straw may be scattered upon the land and turned under to enrich the soil; straw may be fed to livestock or by a process recently discovered it may be converted into compost by artificial means. In any of the three methods named it eventually is returned to the soil. But it may also be subjected to dry distillation. Then you get such products as straw carbon, tar, oils, pyroligneous acid, methyl alcohol and illuminating gas. At least one factory in the United States has been using this process, and it seems to offer considerable possibilities.

Straw may be subjected to a process employed in Switzerland and Germany for converting wood waste into stockfeed and thus transformed to a stockfeed or even a human food. By a process of hydrolysis straw may be converted into a number of chemicals; by a milder treatment it may be converted into paper in which only the cellulose fraction is used, or it may be converted into straw board where the straw itself is little changed chemically. Some of these suggestions, as will be noted, have been used commercially, but considerable experimental work is necessary before other processes can be made commercially practicable.

From low grade corn, alcohol is produced for industrial purposes. Use another process of fermentation and you get from corn butyl alcohol, acetone and other products widely used in industry. The fermentation industries now produce, annually, products valued at $113,000,000 -- rather an imposing figure. Further, corn is separated, into corn starch and corn oil leaving as a residue stock feed, which adds other millions to the above. The starch is further converted into corn sugar. Except for industries of this type it would be difficult to find markets for certain grades of corn.

A number of years ago the citrus growers of California asked the Bureau of Chemistry to help them work out uses for the citrus culls and wastes. Just getting rid of the culls then cost growers a dollar a ton. Through the application of chemical science, by-product factories were established which are now producing over a million dollars worth of valuable commercial products consisting of lemon oil, orange oil, citric acid; pectin, and stock feed, returning to the growers approximately $13 per ton for this waste material. This simply shows what may be done if careful attention and study is given to the problem of finding new sources of profit.

Careful inquiry should be made into the possible utilization of other waste fruits. The Bureau of Chemistry and Soils has recently been wrestling with the problems of finding uses for cull sweet potatoes. Our investigations show that a starch can be extracted having properties similar to Irish potato starch from which very valuable destrine can be made. The possibility of utilizing such materials as sweet potatoes, Irish potatoes and broken rice seem to be rather encouraging. We may even look forward to discovering methods of making valuable new materials from present wastes. An example is the recent discovery in the Bureau of Chemistry and Soils of a method of making the raw chemical gluconic acid from glucose sugar by a process of fermentation. As the calcium salt it will undoubtedly find wide use in medicine as a means of raising the calcium content of the blood for it seems to be the only calcium salt which will give quick and satisfactory results. For this peculiar property it may also find a wide use in livestock feeding. In that case it will increase enormously the use of glucose -- and glucose is made from corn.

Wherever there is waste or residual material in any considerable volume the question should be asked if it can be converted into a source of profit. This may not be easy to accomplish, but we have made such marked advances during the past few years that we have hopes that we will be able to obtain satisfactory markets for all of the products of the farm rather than for the half or third that is now considered marketable material. The hope lies in more intensive research.

Further information upon the subject may be obtained by addressing the Bureau of Chemistry and Soils, Washington, D. C.