FOOD TECHNOLOGY

Tomorrow's Dinner

Microorganisms, such as yeast, for producing protein are promising sources of food for humans. One-celled plants that grow on ponds are also promising.

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➤ WHERE IS tomorrow's dinner coming from? That is the question scientists are already asking. Birth rates are shooting up. Usable farm land is decreasing. What are we going to do for food when we run out of land to feed more millions of hungry mouths?

Scientists say that the problem of sufficient food for future generations requires some drastic action right now. The world's population has doubled since 1800. In the United States alone, it is estimated that there will be 35,000,000 more people by 1975. With these extra people there will be more homes built, more schools, more churches. There also will be more highways, parking lots, drive-in theaters, and industrial buildings. All of these structures and many more will cover up ground that once was used for raising food. Not only will there be more and more people to eat the food of the future, but there will be less and less land on which to raise it.

Only a partial solution of the problem is to be gained by draining swamps and turning them into crop-raising fields. Complete use of all desert areas and tilling slopes and peaks of mountains can add only a limited amount of arable land. In the face of ever-increasing population curves, scientists are looking to the sea and lower forms of life for an answer to food shortages in the future.

Cheap Energy

Microorganisms have a high degree of efficiency in using energy. They can get this energy from cheap carbohydrates. Now these are discarded in the form of sewage, wastes from sugar mills, sawdust from lumber mills, corncobs, old newspapers, and similar waste in a thousand other forms, Scientists say that microorganisms can convert these wastes into food. Microorganisms can make sugars, fats, starches and proteins from these wastes. They can do it more efficiently than the farmer can raise crops on his land. For example, microorganisms can convert the produce from one acre of farm land into ten times as much protein as could be produced by raising cattle on the land.

Actually, the production of fats by microbes is not a new thing. The Germans undertook this during World War I in order to relieve severe shortages in the diet. Yields of more than 64% fat were obtained by using certain microorganisms. A yield of 50% is a good average. This is about as much fat as nuts contain. It is more fat than corn or cottonseed or soybeans contain, although these are commercially pressed or extracted for cooking oils.

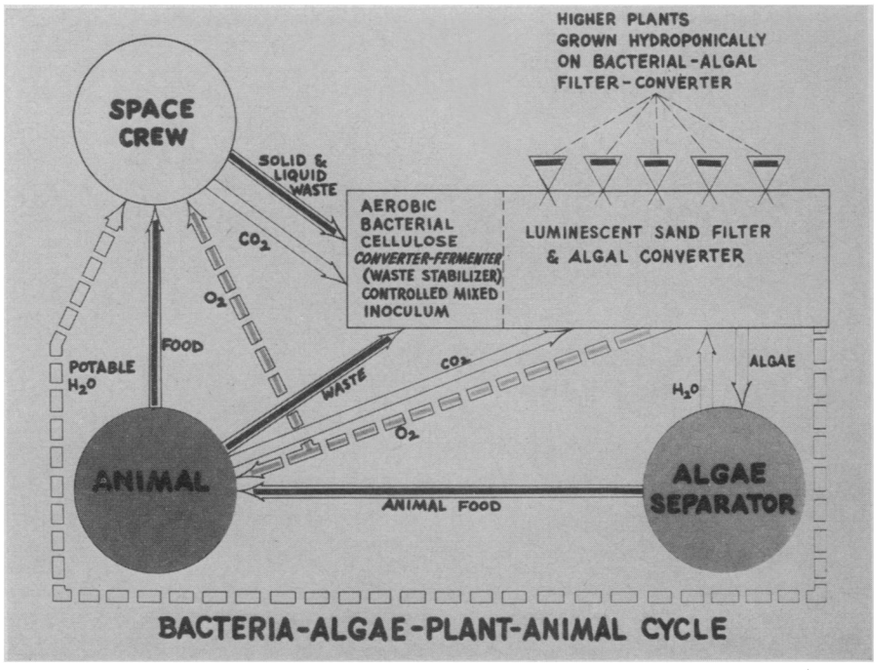
Although the proteins of most microorganisms are deficient in some amino acids, scientists are relying on using them to feed future generations. Bacteria, for example, could be a valuable source of a high protein food. Intensive research in this direction has been started at the Mississippi Agriculture Experiment Station, State College, by Dr. Lois Almon and her associates. So far, taste panels agree that baking powder biscuits made with two percent dead bodies of bacteria taste just as good as biscuits made from ordinary flour. The bacteria contribute 12 important amino acids to the diet.

Yeast may be even more important as a food of future generations. In pointing out the significance of yeast as a food at the Pasteur Fermentation Centennial in New York, Dr. Marvin J. Johnson, University of Wisconsin, Madison, prophesied that yeast's future is sound. Today, Dr. Johnson said, yeast is used both in baking and in animal foods. Humans have been reluctant to accept yeast as a major food item. But increasing world population may force the use of yeast. It may be particularly important in tropical countries. There are many carbohydrate sources in such areas, Dr. Johnson explained, but little protein. Yeast could be a major source of protein in the diet of these countries.

The most amazing thing about yeast is the rate at which it can produce food. A 1,000-pound-steer can produce about one pound of beef in 24 hours, but the same weight of yeast can produce 100,000 pounds of high-grade protein in the same time! This is why yeast is so interesting to scientists.

The first all-out effort to manufacture yeast on a large scale for food was made in Germany during World War II. A special kind of yeast called *Torulopsis utilis* was used to convert sawdust to food. Germany produced 16,500 tons of food per year this way. It was a great aid to them in extending their food supplies during the war years. Germany felt that yeast was such an important source of food that more than one dozen yeast factories were in various stages of construction and operation at the close of the war.

The United States has also been vitally interested in yeast as a food. A yeast plant has been in continuous operation since 1948 in Rhinelander, Wis. It produces more than 12,000 pounds of food per day. About 20% of this is being used for human food. The rest goes into feed for animals and poultry.



FOOD FACTORY—This complicated diagram may be the blueprint for tomorrow's dinner. It is one of the schemes scientists are now working on at the U. S. Armed Forces' Quartermaster Food and Container Institute for finding unique food production processes to feed future generations.

If you like soup or sausage, you may be eating some of the yeast produced in Rhinelander.

In India, several tons of U. S.-produced torula yeast have been subjected to nutritional trials. The Chinese Nationalists have constructed a large torula yeast factory in Formosa with the aid of U. S. technicians. They are expecting to produce 800,000 pounds of food per day. Plants have also been set up in South Africa, Jamaica, Switzerland, France, Sweden, and Hawaii.

Scientists stress that the role of yeast in the diet is that of a supplement. Ample evidence is available to show that yeast, added to diets deficient in essential amino acids, is highly beneficial to both man and animals. In future generations, as the shortage of animal protein is felt more, yeast is expected to assume tremendous importance in the diet. It will be a big asset in furnishing food for the future.

Food from the Sea

Research is being conducted not only on land sources of food, but in the sea as well. The oceans cover approximately 80% of the earth's surface. Scientists picture them as one vast hydroponic farm. Gilbert B. Levin of Resources Research, Inc., startled delegates to the International Symposium on Saline Water, recently held in Washington, D. C., with the idea that both food and water for future generations can come from algae which can grow in salt water. Here's how it would be done: Algae of a certain type take up large quantities of salt when the sun shines on them. When the sunlight is stopped, the algae lose the salt. Mr. Levin envisions the use of the algae to desalt seawater for drinking purposes. Later the algae would themselves be desalted to provide food.

The yield of food produced by algae is fantastic. Take the algae that grows on the surface of ponds, for example. It is a little one-celled plant that depends on the magic of sunlight for its growth. It is called Chlorella. Chlorella can produce more than 15 times as much food per acre as soybeans, one of our major farm crops. A large share of this food is protein, about 15 tons of it. And two or more tons of fat are produced per acre at the same time. This is more than double the total weight of soybeans that a farmer could expect to get from the same amount of land.

There is no question in the minds of scientists but what the farms of the future will actually be factories. Farms, as we know them today, will be used to produce carbohydrates. The carbohydrates will in large part serve as an energy food for yeasts, one-celled plants, and microorganisms. These simple forms of life will be housed in food factories. Here they will use the energy of carbohydrates to combine nitrogen of the air with carbon dioxide to form protein food. They will take up minerals that come from the sea and from the land, and change these into nourishment for man and animals, both. They will make edible fats and sugars and starches from by-products and waste that are now being thrown away.