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## THE FOOD DEHYDRATION INDUSTRY CHANGES STANCE

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Food dehydration has gone through many cycles of feast and famine. Prosperous times for this industry have been during wars. Peace-time uses of dehydrated foods declined sharply. After World War II, however, the food dehydration industry underwent a change. No longer considered a "war baby", it has grown into a full-time processing industry and now stands shoulder-to-shoulder with other food preservation methods.

Let's examine developments making this change possible. Then we shall look at foods being dried and briefly discuss drying methods. The future of the industry will be predicted.

Drying of foods is an ancient art. Used by prehistoric people, it extended consumption of food from seasons of abundance to months of shortage. Dates, figs, apricots and raisins were dried by early inhabitants of the Near East. They are dried in much the same ways today in that same area for the same reason. Other foods are dried for convenience or lower-costs in handling. During the late 1930's and early 1940's many research techniques, later to stimulate the dehydration industry, were initiated. During World War II dried foods became potent as a modern weapon. They were used not only by troops, but also by our civilian allies. Dried milk, eggs, and potatoes are well remembered by overseas soldiers. In this period, there was a vast expansion of drying plant capacity. At one time there were 139 vegetable dehydration plants in the United States. Maximum annual rate of production was 132 million pounds of dehydrated potatoes and 76 million pounds of other vegetables. On the other side of the conflict, Germany, too, had a large drying industry which produced 66 million pounds of dried potatoes in 1944.

Egg dehydration remained active for several years after World War II, but volume dropped sharply after the Korean conflict. Skim milk production, in contrast, expanded steadily throughout the whole post-war period. Dried onions and potatoes maintained a small volume, and gradually there developed the industry we know today. Potato processing plants are now in all of the important fall crop growing areas. Potato flakes, a development of the Department of Agriculture, provided the spark that helped accelerate this growth. Supermarket shelves presently stock a dozen different dried potato products.

During and immediately following World War II, many persons in government and industry were concerned at severe cutbacks expected in drying. USDA and the War Food Administration actively promoted a peacetime dehydration industry. Much research in food dehydration was initiated by private industry and the Department's Utilization Laboratories. The Quartermaster Corps of the Armed Forces was particularly important in research and fostering growth of our present drying industry. Probably drying, as it exists today, is largely a result of farsighted efforts and decisions made two decades ago.

Present Status of the Drying Industry -- Currently, skim milk is our largest volume dried food. Whey is another dairy product dried in large quantities. Dehydrated eggs are important, as are sausage and other pork products. Citrus, pulp, raisins, and prunes are substantial fruit items. Potatoes and onions are the major vegetables.

For most drying methods there is little information available on costs of drying. In the Marketing Economics Division of ERS we are currently conducting a study with this in mind. Results are not yet available. Costs of drying vary depending on the method used, product being dried, moisture content of the food, quality of dried food desired as a dried product, cost of utilities, scale of operation, and many other factors. Generally sun-drying methods are considered as the cheapest. Probably most fruits dried in this manner are dried for less than  $\frac{1}{2}$  cent per pound of water removed.

Spray-drying and drum-drying are among the lowest cost artificial heat drying methods although tray and belt-drying are also relatively inexpensive. These are generally less than 1 cent per pound of water evacuated. Explosive puff-drying, rotary-drying, and several of the other artificial heat methods are slightly higher, but still maintain relatively low cost levels. Foam-mat drying may have costs of about 2 to 3 cents per pound. Vacuum-drying is acknowledged as being an expensive drying method, and costs are in the range of 3 to 4 cents per pound. Freeze-drying costs are even more -- probably 7 to 25 cents per pound of water extracted. These cost figures cited are rough rule of thumb approximations and are given to show the general levels of costs.

Future of the Dehydration Industry -- One factor that has kept drying of foods from developing at a faster rate has been lack of quality in the finished product. This has been evidenced in poor flavor and texture, shriveled appearance, loss of nutrients, and poor rehydratability. In addition, packages have been poor, and many of the fruits have had a sulfur taste and odor. Other dried foods, particularly the meats, have had poor keeping qualities.

During the last two decades, however, newer drying methods including vacuum, foam-mat, and freeze-drying have raised quality levels. In addition, many of the older dehydration techniques have undergone extensive changes that result in higher qualities. New heat application methods may lower drying times to improve quality. Because of economies of scale operating in the drying industry, as well as in other areas of food processing, costs are expected to be relatively lower. Newer packages, uniquely designed for specific dried products are now on drawing boards and will be available. Higher qualities of dried foods, new and better processing techniques tailored for individual foods, lower costs, more quality control and better package design -- add up to a much larger drying industry than exists today. All these point to a better, more versatile drying industry with added application in our peacetime economy.

Grocery shelves today are stocked with many more dehydrated products than there were five years ago. In the future more and improved dehydrated foods will be available. This is not only at the consumer level, but in food service as well. Dehydrated food products of the future will offer convenience, storability, and utility that may not be obtained from other processed foods.