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# Agricultural Letter



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**SOY PROTEIN AS A MEAT SUBSTITUTE** has received growing acceptance throughout the food industry in recent years. Soy protein is available to consumers in forms ranging from blends to totally synthetic products. While various soy protein products have been on the market since the early Sixties, their acceptance started growing with the introduction of bacon bits made from soy protein in the early Seventies, and gained further acceptance with the widespread introduction of soy protein blended with ground beef in 1973.

There are three basic forms of soy protein used as meat substitutes. One form is manufactured from soybean meal via an extruding process and commonly used as an extender in ground meats. Extruded soy protein has no flavor of its own but adopts the flavor and texture characteristics of the meat that is extended. It is produced in the dehydrated form with a protein content ranging from 51 to 54 percent. Prior to blending with ground meat, water is added and the resulting hydrated mixture contains about 18 percent protein, a proportion similar to most meats. Although soy protein meat blends can be made in any ratio, the soy protein mixture typically accounts for 25 to 30 percent of the total weight of the final product. The U.S. Department of Agriculture restricts the blend ratio for ground meat utilized in the school lunch program to a maximum of 30 percent soy protein.

Another form of soy protein is a refined concentrate containing from 60 to 70 percent protein. This is usually mixed with water prior to blending. Like the extruded protein, the concentrate soy protein combines with the carrier protein to form a homogenous product that maintains its structural and nutritional integrity when cooked.

The third form of soy protein is the isolate, about 90 percent protein. This is manufactured by a spinning process and then coagulated into fibers that are stretched by a series of rolls. The amount of the stretch determines the degree of coarseness. The fiber is fabricated to resemble a specific meat, such as ham, or combinations of meats, such as sausage.

These products are referred to as meat analogs, a totally synthetic product. Artificial flavoring and coloring are incorporated into the meat analogs in an attempt to give them the same physical characteristics as the product they are designed to represent. From a nutritional standpoint, meat analogs usually have three to five times as much protein and considerably less fat than the real thing.

The price of extruded soy protein ranges from about 25 to 30 cents per pound. However, once hydrated, the price drops to 8 to 10 cents per pound. The price of a 30 percent soy-ground beef blend is about 25 percent lower than the price of the real

product. For instance, if ground beef costs 75 cents per pound, the cost of the blend product would be about 55 cents per pound.

Meat analogs are usually higher in price than the real product. Most of the meat analogs are aimed at specialty markets such as dietary and health foods. Nevertheless, some of the meat analogs, such as bacon bits, have captured a significant share of the consumer market. However, current technology has not reduced the manufacturing cost of most other meat analogs to a level competitive with the real product.

**High meat prices** in 1973 enhanced the adoption of soy protein blends. A new soy-ground beef blend was introduced to the retail market last year and in some areas accounted for more than one-quarter of the ground beef sales during the late spring and summer months. The blend was usually priced 15 to 20 cents a pound below regular hamburger. Sales of blends remain strong in many stores, and in some instances the soy-ground beef blend is presently outselling hamburger on a regular basis.

Institutional markets have readily accepted the soy-ground beef blend. Some observers estimate that in many areas, soy-ground beef blends currently account for over one-half of all ground beef used by schools. The savings for high-volume institutional purchasers are significant, and most observers expect soy protein meat blends to continue to capture an increasing share of this market.

Soy protein products will likely continue to increase their share of the total meat market. A U.S. Department of Agriculture study indicates that vegetable protein extenders—primarily soybeans—will probably displace a significant quantity of the meat in institutional markets by 1980. The retail market is expected to develop at a slower pace. The study considered a minimum and maximum level of potential substitution and estimated that the number of animals displaced would range from 4 to 8 percent of estimated 1980 production. Livestock numbers will increase between now and 1980 but at a slower pace than if there were no meat substitutes. By the same token, additional soybeans will be required but the necessary increase in production levels will probably be minimal.

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