Economic Advantages of Using Vegetable Protein Products in Scandinavia

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ABSTRACT

Sweden is a small country with different habits and traditions compared to the rest of Europe and even to the rest of Scandinavia. Numerous special conditions important for the economics of using vegetable protein are reviewed. Sweden is outside the EEC and has a protectionist agriculture policy. The food standards are rather special. Since 1973 government subsidies have been made for some important base foods like milk, cheese, meat and processed meat products. This has meant an increasing per capita consumption for these products as well as increasing problems of selling protein for substitution of meat or milk protein. A hesitancy to use vegetable proteins is due to, among other things, bad marketing and inferior products in the beginning of the 1970s. By tradition recombined meat products contain a lot of dry ingredients as, for instance, potato starch and rusks. The water content is high and the meat and fat contents are rather low. The process economy of using soy protein isolate lies very much in the possibility of better yield control. According to a Delfi Study, the future will bring an increasing usage of vegetable proteins in Sweden, while the total protein consumption, however, will not increase.

ECONOMIC ADVANTAGES OF USING VEGETABLE PROTEIN PRODUCTS IN SCANDINAVIA

Scandinavia is a group of countries with quite different habits, traditions and politics. Denmark, as an example, is within the Common Market but Sweden, Finland and Norway are not. As a detail from our product range, Denmark and Finland allow phosphates in sausages while Sweden and Norway do not. It would consequently be impossible to give a general picture of the use of vegetable proteins without making fundamental mistakes. My presentation must therefore just be valid for the conditions in my own country, Sweden.

When I talk about vegetable proteins I mean soy proteins, since most of my experience is taken from Karlshamns soy protein business and our cooperation with Ralston Purina.

TABLE I

Consumer Prices in a Situation without Food Subsidies, January 1977 skr/kg[a]

Product	Consumer prices		Price reduction %
	With subsidies	Without subsidies	
Milk	1.53	3.01	-49
NFDM	5.40	7.07	-24
Beef	28.00	33.54	-17
Pork	19.50	22.70	-14
Bread	6.20	6.45	- 4

[a]Source: Översyn av jordbruksplitiken.

PROTECTIONISM

Sweden is a small country with 8 million inhabitants. It is an old tradition from all political parties to support the so called policy of neutrality, which, if it is correctly pursued, also means a high degree of self-sufficiency. This means that the tendency in the country is rather protectionistic.

CONSERVATISM

Another fact which has a retarding effect on vegetable protein use is the well spread conservatism to the use of proteins. This is a result of four negative historical facts: 1. soy proteins were marketed as meat substitutes in the beginning of the seventies; 2. soy protein products which were introduced were of bad quality which resulted in off-flavors, flatulence problems, and texture problems; 3. the products were mainly marketed with no know-how in the background and with no technical assistance, which resulted in the use of too high levels and bad processing techniques; 4. protein was marketed as an enrichment which led to a discussion in mass-media whether we needed more proteins or not, since the Swedes already satisfied their needs with their normal supply of foods.

SUBSIDIZING OF FOOD

Through 1969-1970 there was a rather important increase in consumer prices on foods. The reason for that was substantial international raw material price increases, increase in the rate of interest and considerable increase in prices of farmer products.

From 1973, governmental subsidies to some important basic foods were introduced. The subventions included such foods as milk, cheese, meat and processed meat products. The reasons why the government didn't let the price increases affect the consumer prices was that groups with low incomes were believed to decrease the consumption of basic foods. Through the subsidies the costs for the consumers decreased considerably as shown in Table I.

PER CAPITA CONSUMPTION

As a result of subsidies, the meat consumption increased 24% through 1973-1976, even if the bad times resulted in a

TABLE II

Per Capita Consumption of Meat in Sweden (kg)

	1973	1974	1975	1976	1977
Beef	14.2	16.4	17.7	18.4	17.1
Pork	26.6	29.5	30.9	33.1	33.5
Others	2.8	2.8	3.0	2.8	2.6
All Meats	43.6	48.8	51.6	54.3	53.2

TABLE III

Meatball Formula

	Without soy protein	With soy protein
Minced meat	400 g	300 g
Bread crumbs	38 g	38 g
Onion, spices	6 g	13 g
Salt	6 g	9 g
Water	200 g	250 g
Soy protein	---	40 g
	650 g	650 g

decrease of the beef consumption during 1977 (Table II).

Since the price of meat has been extremely low during the last four to five years, the meat substitution argument has been a rather bad argument for selling protein to meat processors, which by far is the largest potential market. Another reason for this is that Swedish meat products already by tradition are much substituted.

Swedish traditional meat balls have, for example, a meat contents of an average 55% of meat, if one studies different cook books. Swedish nonbranded sausages have, as another example, meat contents of only 30-40%.

The concept we therefore must use is to optimize the dry ingredient part of the products with more functional ingredients than the traditional ones. That requires a lot more of technical assistance to the customer than was used when soy proteins were introduced in the beginning of the seventies. Soy proteins and especially the isolated soy proteins are noncommodity products and should be treated as technically very sophisticated products to be successful on the market.

CONSUMER PACKAGE

As an example of the more traditional meat substitution thinking, I want to tell you about Karlshamns' consumer package of textured soymeal. The product was introduced as a meat substitute. We have chosen a meatball formula as an example of how substitution was recommended (Table III).

The product today has a rather small but safe market, and is bought mainly by vegetarians and people who prefer a more vegetarian diet. The product is very cheap and suffers from the fact that it is technically a rather simple product.

RAW MATERIAL ECONOMY IN RECOMBINED PRODUCTS

Swedish recombined meat products contain a lot of dry ingredients with different properties. Since the meat content is low and the free water therefore is high, the need of good waterbinders with good texture properties is high (Table IV).

The products based on soy are today, with no competition, the most interesting protein products. Soy and particularly soy isolate is more generally useful in its function and properties, and therefore is easy to argue for technically as well as economically compared to other protein ingredients.

Soy isolate has the properties which are much appreciated in a meat system: (a) good gelling properties; (b) good water-binding; (c) good fat-binding; (d) no off-flavors.

The carbohydrate-dominated ingredients are normally much cheaper. Potato starch, as an example, is a very cheap ingredient and should be optimized in a meat product formula. This category, however, needs assistance from the protein ingredients. Soy isolates have in this respect shown good combination effects.

TABLE V

Meatballs

	1	2	3
Meat content in raw product	50 %	52.2%	55 %
Process yield	83.5%	87 %	87 %
Meat content in fried product	60 %	60 %	63.2%

PROCESS ECONOMY

One area where soy proteins are successful is in minced meat products. By tradition, meat balls is the biggest product. In Sweden there is a law that says that in a meat ball which is marketed on the consumer market the meat contents must be minimum 60% in the fried product. This means that even if we can show that soy proteins give as a result an improved process yield, it is of no value because in that case you must add more meat to the product, and this does not result in a better economy.

The example in Table V shows a meatball with 50% meat (No. 1). The process yield is 83.5%. After frying, the calculated meat content was 60% and following the law.

Earning money through adding soy proteins and in that way binding more water to increase the yield is impossible if the meat content is not corrected as in No. 2. In this case the yield was increased from 83.5% to 87%, and in order to still have 60% meat calculated on fried product, the meat content was increased from 50% to 52.2%.

No. 1 and No. 2 are theoretical examples. In order to have a margin to the 60% meat content fixed by law, the manufacturer often uses a situation like No. 3, where the meat content is 63.2% in the finished product.

Economy, however, lies in the fact that it is possible to *control* the yield better through having an ingredient which levels out the variations in yield, which is a result of the variations in the meat quality and water-holding capacity. This makes it possible to come closer to the ideal situation in No. 2.

In this case soy proteins, especially soy isolates, have

TABLE IV

Water-binding Ingredients

Ingredient	Water-binding capacity	Price (Skr/kg)	Price correlated to water-binding (Skr/kg)
Bread crumbs	2	3.00	1.00
Potato starch	4	3.00	0.60
Non fat dry milk	1	6.00	3.00
Textured soy flour	2	5.00	1.67
Soy isolate	4	10.00	2.00
Caseinate	2	10.00	3.33
Spray dried Blood plasma	7	20.00	2.50
Egg powder	3	35.00	8.75

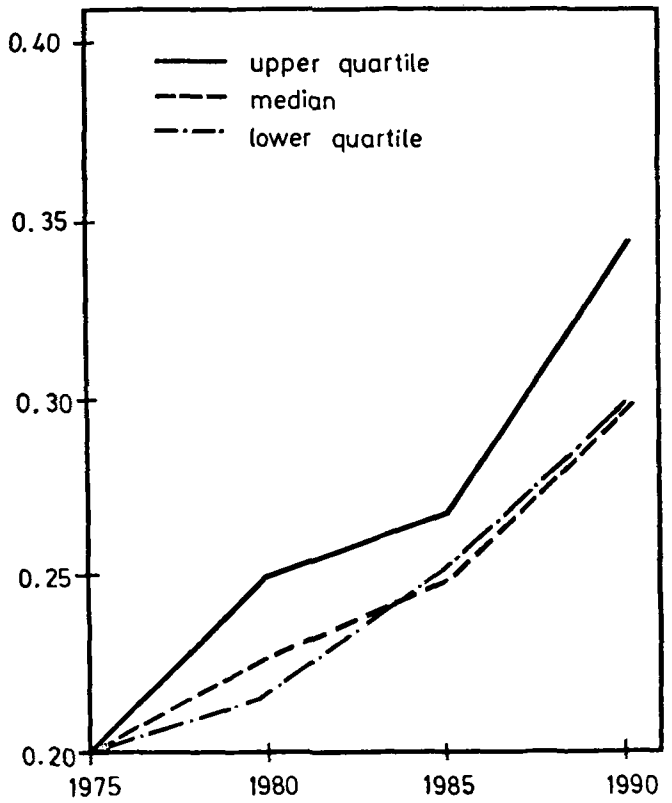

FIG. 1. Possible development of the relation between nonanimal protein and animal protein in protein-rich recombined products. Relation 1975:020.

been shown to act as buffers of the system. Addition of soy isolate makes it possible to minimize the meat content (like in No. 2) in the recipe so that the manufacturer does not have to have a margin to the minimum level (like in No. 3). Instead of using as in this case 55% meat, he can use only 52.2%, a difference of 0.30-0.35 SKr/kg.

FUTURE

What is the future for protein-rich recombined products in Sweden by 1990? The Swedish Food Institute asked 30 Swedish experts in a Delfi Study. The result was that products made of 100% unconventional proteins are not expected, but the relation between nonanimal to animal protein will increase from 0.20 today to 0.30 in 1990 (Figure 1).

The total protein consumption, however, will not increase. The protein coming from recombined products will increaese from 10 to 20%.

CONSUMERS' ATTITUDES

As I mentioned before, there is a rather conservative opinion on soy protein in the industrial market. We, however, don't find that this is relevant for the consumer. We recently made a consumer attitude study among 2,000 consumers. The consumer has little knowledge of soy protein, and 80% of those who were asked didn't know or didn't answer the question about the reason for use of soy protein. Among those who knew about soy protein, nearly all had positive reasons for their use: economic reasons, 7%; nutritional reasons, 5%; humanitarian reasons, 2%; other reasons, 4%.

Only 2% said that off-flavors were a reason for not using soy proteins.

When we asked them to rank different unconventional proteins, soy protein was the most positive and blood protein the most negative protein as shown in Figure 2.

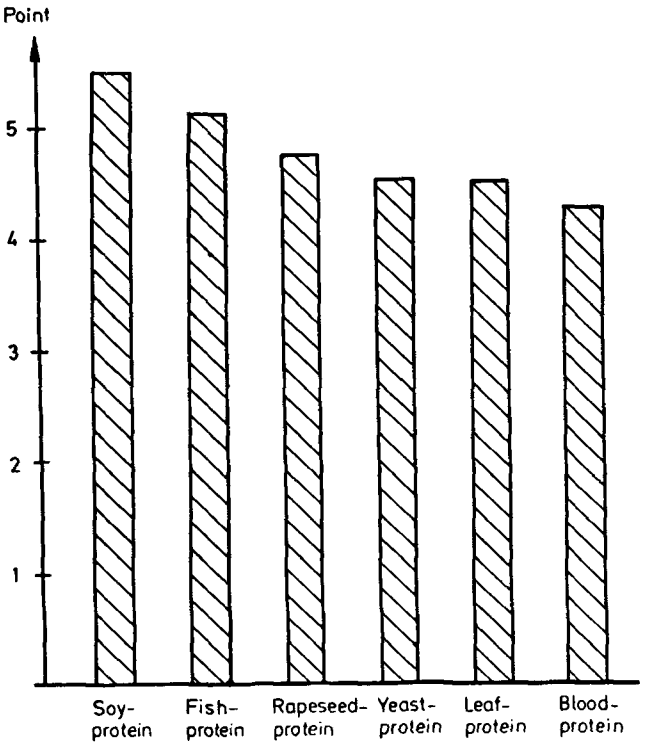

FIG. 2. Ranking of different unconventional proteins by consumers.

ECONOMICS FOR SOCIETY

I will give you two examples which describe the traditional argumentation for vegetable proteins, through comparison between the costs of animal and vegetable proteins. When soy proteins were introduced in the late sixties, one could meet calculations like this in Sweden: total market for minced fresh meat, 70,000 tons, which corresponds to 13,600 tons animal protein.

If 25% of the animal protein were substituted with vegetable protein, the use would be 3,400 tons, which was technically possible. If animal protein costs 75 Skr/kg and vegetable protein 10 Skr, the society would earn 65 x 3,400,000 = 221 million Skr through this substitution. This, however, was a theoretical simplification which had no relevance in the reality since the consumer didn't accept the quality of such a product that time, as it contained a rather simple textured soy protein product.

The Delfi Study referred to pointed out that the relation of nonanimal to animal protein will increase from 0.20 to 0.30 on protein-rich recombined products until 1990. An approximate estimation of the quantity tells that the market for this category is 250,000 tons. The protein content is roughly 10% in these products, which means 25,000 tons of protein, and today 4,200 tons of nonanimal protein. According to the results of the Delfi Study, the increase of nonanimal protein will result in a new market of 1,700 tons, provided that the consumption of recombined products will remain constant.

The market for recombined products obviously will increase, and so will the animal protein need for this product category, so a figure of 2,000 tons' increase to this dominating group seems realistic. The traditional way of calculation would say that the society would earn 65 x 2,000 = 130 million Skr. However, we at Karlshamns think that the essential advantage for society doesn't lie in the fact that vegetable protein will substitute animal protein, but that vegetable protein will complement animal protein in increasing amounts and make better products from a sensory and nutritional point of view. This will be a result of the improved quality and functionality of modern

vegetable protein. Use of vegetable proteins in industrial countries will, according to my opinion, not increase because of lack of resources or bad economy, but because new vegetable protein with better quality and functionality continuously will be developed. The economic advantage of this is impossible to calculate. This opinion also supports the more and more presented theory that use of vegetable proteins results in an increase in the use of more expensive raw materials like meat, at least in industrial countries like the Scandinavian.