Nutrient Delivery System: A Human Feeding Concept for 2000 A.D. and Beyond

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Examines the nutrient needs of United States citizens in 2000 A.D. and beyond and offers some ideas on how they might be provided.

Introduction

In medical circles, the talk is about creation of life in a test tube, the rearrangement of genes and interchangeable parts for human beings. Space researchers are probing the outer reaches of our galaxy and thinking about travel to other galaxys. Meanwhile in agriculture, we are still talking about a new sweet corn variety, rate of gain on beef cattle, and how to make two blades of grass grow where one did before.

IT'S TIME FOR A CHANGE IN PERSPECTIVE!

The scenario which follows will look at the essentials of a conceptual framework designed to provide America's, and maybe part of the world's future nutrient needs. The framework may frustrate some because the traditional brick and mortar of institutions and the color, flavor, texture, and odor of present commodities have been minimized so that the reader may concentrate on nutrients as the essential element to be dealt with. For those of you who feel disoriented, have faith. The author will eventually return the principles of form and institutions to the discussion. If the reader will focus upon nutrients and on their production, distribution and consumption, this paper will be much more meaningful.

It is traditional in such works to list assumptions regarding life styles in the future period under study. This will not be done here so as to concentrate on the nutrient delivery concept. The author feels that the system under consideration is flexible enough to meet the needs of a wide variety of life styles.

Why Another System?

The question that springs into the reader's mind at this point is, "What's wrong with our system? We supposedly are the best fed people in the world. Why can't we keep the system which gives us this bounty for ever?"

There are three basic reasons why we need to look at alternative food (nutrient) delivery systems. They are all interrelated, but will be discussed individually.

First has to do with energy. We in the United States have had our first experience with the "energy crisis". Whether it was real or contrived and the current seriousness of the "crisis" is not the issue here. We are using up a fixed supply of fossil fuels at an ever increasing rate. One can argue about the rate of increase in use of fossil fuels and about the extent of the fuel resource. However, to do this is to miss the forest for the trees. The point is that eventually our society will grind to a halt for lack of fossil fuel, if we don't develop a suitable alternative source of energy. This point, some say will come by 2000 A.D. Others say it will come at varying intervals for the next several centuries there after.

There has been no estimate of the total energy requirements for the food delivery system that we presently use in the United States. One partial comparison indicates that Chinese wet rice agriculture produces in excess 50 B.T.U.'s of energy for each B.T.U. of human energy expended in farming, while our farming system yields one fifth of one B.T.U. per B.T.U. of fossil fuel energy expended. Whether these proportions are correct or not, few would doubt that much of our farming advances have been made by the application of fossil fuel energy.

In addition to farming, one must consider the energy used in processing, packaging, transportation, storage, distribution, and consumption of food in this country. Total energy requirements for the food industry in this country today could easily exceed 30% of our total energy use.

The second has to do with available supplies of critical metals. Tin, copper, and alluminum are examples. Iron ore is fast reaching the stage of being short. Our total food distribution system is based on use of metals. If these are limited then alternatives must be found.

Third, the total population-resource balance in this country becomes a limiting issue. For example, given the assumption of adequate metal and energy, what happens is we don't have enough water or clean air or any of a variety of minor, but essential elements? The point is for many years we have been blessed with an over abundance of resources and relatively few people. Presently we are reaching the point where our way of living, specifically to this article, our food production and distribution system may be described as using too many resources for what it gives us in return.

Hence, the need to look to other possible systems to provide us with our nutrient needs. This article is designed to stimulate interest in looking for positive alternatives to provide our citizens of the future with their nutrient needs.

A Way of Looking at Change in the Food Industry

For many, this short word picture of one alternative system for satisfying the food (nutrient) needs of our people in 2000 A.D. or beyond may be completely unpalletable. And given existing experience, training, values and biases of many, this is understandable; though limited - even erroneous. There are three thoughts which may help make such an exercise easier to tolerate.

1. Develop a futuristic attitude. Don't be afraid to look ahead. Realize that present actions influence future behavior. All looks ahead carry the risk of error due to changes in conditions. However, it is better to have looked ahead and been partially wrong than not to have looked ahead at all.

2. Anticipate rather than react. Man is a reactive creature by nature. However, the pace of change has accelerated to such a rate that reaction is hardly possible before the next change is upon us. In the future, the rate of acceleration of change will only increase. Thus, if reaction is out of the question; we must learn to try to anticipate.

3. Attack problems of the future with tools of the future. One of the greatest mistakes that man can make is to take a tried and true method of problem solution into a future situation and expect it to work. Failure to allow for changing conditions is our most common error.

The question can legitimately be raised, "What can be accomplished by this exercise?" We will cut our minds free; let them wander for a brief moment; then bring them back to reality. What earthly good can this bring? For those who are not willing to sincerely ask the question - is there a better way? - precious little can be gained. However, for those few who will ask the question, we might be one step closer to solving problems involved in providing for the food (nutrient) needs of our people in 2000 A.D. or beyond.

The Goal of This Nutrient Delivery System

Stated simply, and perhaps naively, the goal of the nutrient delivery system concept under discussion is to provide adequate nutrition for all our citizens. This presents a tremendous challenge to the

"nutrient industry" in terms of establishing commonly agreed upon nutritional goals and moving ahead to provide these elements for the country.

As we engage in planning the lives of our future generation, it might be useful to think in terms of some sort of minimum "guaranteed level of nutrition". There are many ways that this could be accomplished. However, those are beyond the scope of this current effort and may be considered in future writings.

Criteria for Success of Nutrient Delivery System

There are two basic criteria which can be used to measure the effectiveness of one food (nutrient) delivery system against another.

These are:

1. Less total energy use
2. A more favorable balance in the population-resource ratio.

These criteria require an entirely different perspective from traditional criteria of least cost and input-output efficiency. It is not the purpose of this article to develop finely honed methods to use these new criteria. However, this surely will be done sometime in the future. The basic suggestion is being made here that not only are we looking at a different system for providing nutrition for future generation; but also we are evaluating its success or failure by different criteria.

The Nutrient Delivery System

This series of words has been coined for a definite purpose. Each word was chosen specifically with both individual and collective meaning. The word system is used to emphasize the point that one must consider the entire scope of food delivery as a coordinated system - part of an integrated process moving from point of nutrient production, extraction, or manufacture, through further processing, preparation and preservation (if necessary); into distribution and consumption. In addition, the point of view here is to start with food or nutrient needs and work the entire system to satisfy these needs. Also, that the entire operation will be planned from start to finish.

The word nutrient is used to emphasize that the important item being delivered to people is the nutrient and not the form in which it may be grown, processed, or consumed. The nutrients being considered here are all the elements necessary to sustain life such as vitamins, proteins, carbohydrates, fats, minerals, and others. Once one can free his mind from the traditional form of products carrying nutrients to people, then he can open up an almost endless range of possibilities for new food items.

The word delivery is used to convey the sense of movement of the nutrients to the consumer as demanded in an acceptable form, distributed by the most efficient means possible, and produced or manufactured under optimum conditions of scale and quality. With costs of storage, multiple handlings, waste and money spiraling, the sense of fluid motion helps to keynote the urgency for efficiency of operation as well as effectiveness in want satisfaction.

A digression is necessary here to discuss a number of relevant items:

1. Transportation - The need for an efficient system of transportation to move inputs into the manufacturing-processing phases of the system and on through the distributive phases is so obvious that it might be overlooked. Comments on the role of transportation in this system will be made later.

2. Data Handling - For both information and control purposes, data will be transmitted on the latest EDP system or possibly laser beam system. The concept of a total data handling system for the entire country for the total nutrient delivery system, consumers included, is quite within the realm of possibility.

3. Environmental Concerns - From both the pollution and waste disposal point of view, this system can be designed to minimize environmental damage while maximizing needs satisfaction (again a matter of perspective).

4. Quality Standards - Under this system, quality standards will be formed at consumer level and work their way back to point of production and manufacture. This will require a perspective change in regulatory agencies as well as most of today's agricultural industries personnel.

5. Portion Control - Starting from consumer food or nutrient needs, the concept of portion control is a natural to follow all the way back to point of production of manufacturing. It will be interesting for the producer or manufacturer to have to think of consumer portions for a change.

An Example Nutrient Delivery System

In order to bring some semblance of form into the discussion, let us imagine a nutrient delivery system for 2000 A.D. and beyond and briefly describe how it might work. First, we are dealing with nutrients - all the elements necessary to sustain life such as vitamins, proteins, carbohydrates, fats, minerals, and others.

Second, let us assume that the source of these nutrients is granite rock and sea water.

Third, this could mean that basic production (extraction) plants (based on economies size) would be set up near the source of granite and along the coast of the country. As the basic nutrients were extracted from the granite and/or sea water, they could be distributed to further processing plants or temporarily stored in anticipation of future demand. The point of cost saving here would be in storing and transporting only the nutrients, a considerable saving from the present system. Just to make things more dramatic, let us assume that these nutrients are in a non-perishable form (see discussion of perishability to follow).

Further processing plants could be located near to points of consumption and thus minimizing transportation cost. Plants would not have to gear up to seasonal demands so investments could be smaller and facilities would be better utilized through more nearly continuous use. Labor could be more effectively utilized during the entire year.

Production of basic elements could be geared more closely to consumption and the need for investments in storage facilities at various points along the system would be minimized. Of course, some storage will be needed, both to allow for a certain amount of flexibility in the system and for national security (if we have that problem by this time). The whole approach would yield better supply management, thus reducing present gluts and droughts which rake havoc on all parts of the system currently.

With regard to packaging, bulk containers could be of reuseable materials capable of being sanitized to meet appropriate health standards. For consumer size packages, a biodegradable material can be developed which will be light weight, capable of being sanitized, and disposable without harming the environment.

Nutrients so produced and processed could be delivered to retail stores, institutional kitchens, restaurants, fast food operations or homes in either bulk or individual portions depending upon need. They could be served in a ready to eat condition or be warmed up at home if necessary.

In total, we are looking at a consumption oriented delivery system designed to provide adequate nutrients for the 2000 A.D. and beyond population of the United States (maybe the world). From a number of strategically located further processing plants, complete meals or meal components will be shipped directly to points for consumption or direct resale for consumption. Form of these meals will be limited only by the imagination of man. Basic elements (nutrients) will be shipped in bulk from point of manufacture, extraction or production, on a lowest cost basis and be made up into meals on a demand basis. Raw imputs could come from granite or sea water. To top it off, the entire system will be controlled by an electronic data system with input into and feed back from all institutional segments of the system.

Form in Which Nutrients are Presented for Human Consumption

Man, through the ages, has become accustomed to the intake of his nutrition in essentially the form which we know it today - commodities, apples, potatoes, beef steak, or some modification of these commodities; e.g., bread, cheese, french fried potatoes. The habits of many centuries will not be broken in a mere 27 years or in a century or two. However, food items may be delivered for consumption in the traditional form, but be either synthetically augmented or entirely synthesized. Thus the possibility of beef steak, synthesized using our example from granite and sea water, together with appropriate filler material, may be rather far fetched, but possible. If a nutrient delivery system meeting our criteria can be developed, the step from the possible to the feasible is not too large.

Eating

The satisfaction that one gains from eating can be roughly divided into two categories - physical and physchological. The physical area has mainly to do with replenishing the supply of elements necessary for life. Although there are those who maintain that there is great satisfaction to be gained from physically devouring a big steak or a juicy red apple. In the physical area, man has made considerable progress in terms of discovering the relationships involved between the intake of various nutrients and the effect on the individual under study.

As for the psychological area, we are dealing with such elements as the visual image of food products, the old factory sense, palatability and in some cases touch. It might be said that at the end of a big meal our stomach is full of physical satisfaction and our mind is full of psychological satisfaction. In this latter area, man hasn't even scratched the surface in terms of researching the complex set of interrelationships involved. In terms of the possibility of satisfying some or all of our future food or nutrient needs with synthetic or synthetically supplemented foods; the physical problems can be solved. Man's greatest challenge lies in the psychological area.

Back to our example again, it may be entirely possible to add certain substances in the filler of our synthesized beef steak which will greatly expand the psychological satisfaction to be gained from consuming this product. This has all sorts of frightening implications. However, its accomplishment is not as "far out" as one might think.

Perishability

The condition which requires more investment to attempt to arrest and puts more constraints on the current food distribution system is that of perishability. Just think. It may be a fool's dream, but if it were possible to remove the element of perishability, as we did in our example, from the entire food production or manufacture and distribution system; what a different situation there would be. All of man's mechanical and technological contrivances designed to arrest deterioration of food products would be eliminated. Coolers, cookers, freezers, and other gadgets would disappear from farms, processing plants, transportation units, warehouses, stores, restaurants, feeding institutions, and homes. It is recognized that certain types of "final preparation" equipment such as warming ovens could be necessary in the future. The tremendous aggregation of capital designed to "preserve" food items in some way or to speed "fresh" items to the consumers before they spoil would not be needed. In short, we could essentially "scrap" our present system and design a new one to feed our people more efficiently and effectively.

Institutional Change Needed

Should such a system evolve, drastic changes would be required at all institutional levels in the food industry as it exists today. An essentially completely vertically integrated system such as being considered would combine the function being performed by existing institutions into different arrangements. At home, consumption would involve eating ready to eat or

ready to cook meals or components with little or no preparation at the home. Restaurant or institutional feeding would evolve into extensions of processing plants. Warehousing or wholesaling as we know it today would be either absorbed by the processor or performed in a minimal amount at point of consumption. Processing would broaden itself to incorporate almost all the preparation of the nutrient laden meals and components. Farming could provide part of the basic elements for processing, but only in terms of vehicles for the nutrients to be put in meals.

If drastic is an appropriate word to describe the changes necessary for the food industry institutions to go through under this system, then the author is at a loss to find the proper word to denote changes necessary in the governmental and educational institutions involved. Given the orientation of these institutions to "natural foods" and the traditions attendants there-to, little short of complete dissolution and a fresh start will be appropriate. The real problem here is to get adequate impetus together to bring about such change in these rigidly intrenched institutions.

Such a total nutrient delivery system could quickly run a-foul of existing anti-trust legislation; and can violate the moral principles in such institutions as the family farm and the individually owned and operated small business. Therefore, society must wrestle with the costs and benefits of such a monopoly oriented system.

Expanding the Nutrient Delivery System to the World

To expand the parameters of such a system from this country to any part of all of the world would involve basically problems of scale. The sources of the nutrients would probably be different in various parts of the world and the process of nutrient extraction may be different. Also nutrients may be shipped into deficit areas from surplus areas based upon the principle of comparative advantage. To feed the starving masses of Asia and Africa and Latin America, one might consider nutritional supplements to traditional foods. This could be followed by synthetic forms of traditional foods and finally a gradual introduction of new foods. Of course, this all must be done within the context of keeping population throughout the world in line with available resources. It is in no way desirable for the resource rich countries to support the unchecked population growth of the resource poor countries by supplying them with nutrition at the expense of future generations' food supply.

The development of such a nutrient delivery system might prove to be a national asset in terms of the balance of payment picture between energy-short countries (USA) and the nutrient-short countries (Persian Gulf).

A Parting Thought

Has all this been a fantastic dream? The writer hopes not. We have stripped our present food production and distribution system to its essential element - nutrients; stretched the time frame out to 2000 A.D. and beyond; and asked the question, "Is there a better way to provide nutrition for our future generation?"

This is the challenge. Can we meet it?