ENERGY AND MATERIALS CONSTRAINTS - OPPORTUNITIES AND CHANGING UNITED STATES FOOD INDUSTRY STRUCTURE, 1976 - 2000 A.D.

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Considers the affect of future energy and material costs on the structure of the food distribution industry

Introduction

The original conceptual work on "The Food Industry - 2000 A.D." paper[1] was done in 1969-70 with modifications in 1971. To say that we have had dramatic changes effecting the food industry since then borders on gross understatement. The question was raised recently as to whether or not the author's thinking in the "2000 A.D." paper had changed in light of some of these occurrences. As a partial response, the discussion which follows deals with the areas of energy and materials and the impact of real or artifical shortages in these items upon evolving structural change in the United States food industry over the next twenty-four years.

Energy and Materials

Given the present state of technology, the world and especially the United States (a sizeable user of both items) has been made aware quite rudely that both energy and materials have finite limits to their supply. In energy, ever rising demand has outstripped the ability of our rapidly dwindling fossil fuel reserves to provide for our needs. The ensuing escalation in quantities imported and price per unit of same threatens havoc upon our economy and exposes the roots of our entire institutional structure to mind-boggling changes.

Changes relative to materials have been more subtle due to lack of geographic concentration of supplies around the world and lack of organization among those who control those supplies. The implications, however, are the same as for energy. Also, both the potential harm to our society and the complexities of dealing with suppliers are much greater than with energy. We can change energy sources (at a sizeable cost). But what do you substitute for copper, lead, zinc or tin? (Petroleum based plastics?) Not hardly.

An Approach

As a vehicle to look at the impact of constraints in energy and materials supplies upon changes in United States food industry structure over the next twenty-four years, let's go through "Food Industry - 2000 A.D. - Revisited" and see if it should be written differently knowing what we know now.

"Food Industry - 2000 A.D. - Revisited" in a Nut Shell

Starting from the following assumptions relative to future (2000 A.D.) food consumption:

1. There will be many more food consumers in the year 2000 A.D. than today.

2. Disposable incomes will be much higher.

3. There will be little change in the areas where people live, hence life will be more within the urban context than today.

4. The housewife will spend an increasing amount of her time in a myriad of activities away from the home.

5. The housewife will want as little personal involvement as possible in supplying the family with its food needs.

6. The place of the meal in the social structure will tend to be diminished to the level of a simple intake of nutrients necessary to sustain life.

7. Emphasis in the entire human feeding and eating operation will be speed and convenience.

The purpose of the paper was to examine possible impacts upon current food industry structure if the vast majority of our nutrients were consumed in total meal units as opposed to separate commodities. The basic conclusion of the paper was that a fully integrated production, processing, distribution, and consumption system for meal units control offers many advantages at some considerable cost in terms of structural adjustment.

Basic Thesis

The main thrust of "Food Industry - 2000 A.D.," that the vast majority of our nutrients would be consumed in total meal units (as opposed to separate commodities) supplied by an increasingly integrated production, processing, distribution, and consumption system has not changed. If anything shortages in energy and materials will hasten the implementation of these concepts.

Questioning Assumptions Made in "Food Industry - 2000 A.D."

Recent events would cause one to question assumptions one and three. Current publicity on declining birth rates in this country would cause modification of assumption one. Rather than "many more," one might say "More" or as many (consumers) depending on at what level the birth rate settles upon.

With the near financial collapse of New York City and the ever increasing list of problems found in other metropolitan areas; more and more people have reached the conclusion that our major metropolitan governmental jurisdictions are or soon will be unworkable. The point at issue is, how much can we do to either solve these problems or make substantial revisions in our population distribution in the next twenty-four years. One can hope for significant progress in population redistribution; however, reality indicates a dim outlook in this area. In fact, housing trends indicate fewer single family units, while increased transportation costs--with greater subsidization of mass transit encouraged by environmentalists--makes greater concentration in the suburban-urban areas a near certainty. Even though we will continue to be a mobile people, it will be moving from one metropolitan area to another or movement within a metropolitan area. In all probability we will not see a dramatic reversal of the rural to urban migration which we experienced during the first part of the century.

Automation

The trend toward replacing labor with capital in the food industry is

well documented and effects both energy and materials. The issue here has to do with automation to replace man's effort as opposed to automation to extend man's capacity to do work. Heretofore, we have concentrated our efforts in taking a given amount of physical work, formerly done by man or animals on a farm, in a plant, warehouse or store and performing the same tasks with some sort of mechanical device. This is all well and good as long as the cost of energy and materials does not exceed the cost of labor; and the machine does the job as well or better than man could. We are fast reaching the point where serious questions can be raised as to the economics of our latest efforts in automation. The "mechanized grocery warehouse" is a prize example. It may not only cost too much to replace the man with energy and materials; but also the productivity of the machine (especially with union-environmentalist-government restrictions) may be lower and the amount of aggravation from the system may be higher. Also, one can find many places where the person really has not been replaced. Thus, the situation has both elements of cost, human and machine, with the corresponding total productivity decrease.

The author has been quite appropriately reminded that the most effective combination of men, machines, and technology in the case of the mechanized grocery warehouse has not yet been accomplished; but is not beyond the capacity of man's mind to achieve. In addition, the capital requirements for such a facility may well be beyond what one firm could justify in a given area. This could open the door for joint ownership of the facility by any number of grocery firms. If automation is viewed as an extension of man's activities and the agreed upon goal of management, labor, government and consumers is increased productivity from the combination of men and machines; then the outlook is much brighter. An example might be the use of advanced management information systems where the man plus the machine could consider a wider range of alternatives in a short period of time for more effective planning. This is something the man himself or the machine (replacing routine manual action of man) itself could not get done. Then the sum of the productivity of the combination is greater than the sum of the productivity of the separate parts.

Specifications

It is commonly assumed, but more difficult to document, that it takes more energy and materials to produce the higher ranges of the quality spectrum than for the lower ranges in a commodity. The prize current example is the downshift in beef grades by the USDA. The energy and materials used to produce the grains necessary to achieve the higher grades under the old system apparently proved to be too costly. Hence, one sees the shift to "short grain fed" beef from "long grain fed" beef.

Transportation

Rapidly rising costs of fuel, the need to reorganize and restructure several Northeast railroads, the increasing costs of the trucking system (due partly to regulatory and union restrictions) and similar problems in the ocean transportation system, are all indications that our transport system needs to be re-evaluated and changes made to improve productivity and service levels.

The crux of the transport issue was raised in an earlier paper[2] and has to do with mobility. There are at least four aspects of mobility to be considered here: (1) energy technology,

(2) long range transport of food from production to consumption areas; (3) intermediate "storage" for processing of food products, and (4) redistribution of food for ultimate consumption. Each will be discussed in turn.

Petroleum based energy technology has given us the mobility and flexibility that our food industry system needs to function. Given the present state of technology, take away petroleum based products and mobility and flexibility are severely impaired. Alternate energy sources to come on stream for the next twenty-four years, are fixed place energy technologies (save energy cell technology still in its infancy). Hydrogen fusion-technology which could easily save us is not scheduled to be commercially feasible by 2000 A.D. From this one can easily visualize the potential disruption of our present system without the presence of an adequate replacement. Not a happy thought!!

Life would be much simplier if food production and consumption areas were adjacent to each other. However, given the present food industry structure, foods must be moved over long distances to reach the point of consumption. In the past, truck transport (relatively free from regulatory and union problems with cheap energy and materials) was able to capture a large share of food industry business. But, with removal of cheap energy and materials, plus increasing regulatory and union problems; trucks will not be as productive as in the past. The combination of bad management, regulatory and union problems that seriously limited railroad efficiency has put us in an even more unfavorable position. How do we get food products over these long distances?

The two basic approaches to the problem during the next twenty-four years are (in a grossly over simplified form) (1) improve the system we have or (2) move the people to the food. Even if we could unravel the tangled regulatory and institutional situation in food transport, we are still faced with the declining fossil fuel and materials situation. Thus, barring some completely new technology in food transport; one must consider the alternative of moving the people to the food.

All one would be asked to do here is a major physical restructuring of the population distribution in the next twenty-four years. Impossible!! Well, maybe so. But it may be necessary in the longer run.

Behind all this discussion is the possibility of some "new" transport technology which will save us from our present dilemma. If one is to surface, it must be nonfossil fuel consuming and low materials using. This writer is not aware of any such technology on the drawing boards. If such exists, he would welcome information on the subject.

So for the next twenty-four years we are pretty much stuck with "patching up the old wagon" and getting the job done with it. This is not a very bright outlook. However, developments in processing technology, packaging and food industry system integration may well provide relief for the present system. They do not eliminate the need for major structural and legal reform in the transport industry to allow for increased productivity, if not basic societal survival.

The greater the mobility of a system, the easier it is to allow for intermediate stops, along the path from

production to consumption, for "processing." The "meal concept" coupled with a highly integrated institutional framework is better equipped to deal with the loss of flexibility than are current systems.

Redistribution of food products for ultimate consumption in the population centers is another version of the case to move the food to the people or the people to the food. Currently, we move food into population centers to stores or feeding establishments, but let the individual transport himself to the food from his place of residence. With increasing cost/difficulty of individual transport, thought must be given to getting the food (meals)closer to the people. It is much more economical (from an energy and material standpoint) to move things (food products) than people. At least for the way we now move people it certainly is. This could mean smaller stores serving smaller neighborhoods. It even could mean door to door service with meals (for immediate or future consumption). Such changes may seem to be regressive to some. However, when considered in terms of energy and materials use; there are considerable efficiencies to be gained. The distribution of "meals" to larger apartment and condominium complexes has already been discussed and the principle need not change.

Synthetics

Shortages in energy and materials will serve to speed the acceptance and implementation of "synthetic" substitutes for today's food products. This will come partly from production cost advantages and partly from pure absence of alternatives. Thus, we can expect the use of synthetic foods to be accelerated. The transport system would gain also because it does not require near the energy or materials to move "soy protein" to market as it does red meat...in either today's sides of beef, boxed beef or in the still experimental retail cut and packaged fresh or frozen form.

Packaging

We are truly a "prepackaged society." Vast amounts of energy and materials are utilized in the creation, transport, utilization and disposal of packages in all forms. "Food Industry - 2000 A.D. - Revisited" did not attack the packaging materials issue directly. Rather it choose to speak of "bulk presentation of perishables" and "further processing" into meal units. Most assuredly the bulk food products, meal components and the meals must be packaged during their movement through the marketing channels to insure product preservation, sanitation and protection. Also, packaging has performed a merchandising and informational role. Of late, the information portion of the role has gained in stature, e.g. nutritional labeling, code dating, unit pricing and universal product code. Signs are for more information to be required and thus less merchandising to be allowed.

The basic "first processing--further processing" concept discussed in "Food Industry - 2000 A.D." is still valid. In fact, it is more important now than ever. There is a tremendous amount of energy used in the creation of packages especially metal and glass containers. One of the biggest wastes of energy and materials has been in the transport and handling of consumer size packages over long distances. The weight of container, carton and packing medium are much greater than the drained weight of product. The height of folly in this regard are the canned fruit drinks which carry a very small percent by weight of nutrient and thus we are

shipping basically water and container, sometimes over great distances.. Also, we are discovering that the disposal of those metal and glass containers is becoming an ever more expensive job in terms of energy and materials--not to mention the environmental problems that are caused.

What all this means is that bulk preservation of perishable products will come into use faster and more farther along the channel toward ultimate consumption. This will mean that "consumer packaging" of meals or meal components will be done within or very close to the centers of population. This will have the benefit of (1) better utilization of first processing facilities, (2) primary storage in lower cost production areas, (3) bulk transportation of mostly product and less container, (4) flexibility at point of further processing and meal assembly, (5) flexibility for distribution.

As far as packaging materials are concerned, metal and glass containers will be replaced by a "bio-degradeable" or effectively recycleable material to protect the meals and meal components on their short journey from further processing plants to point of ultimate consumption. The packaging area is one of the most fruitful when one is looking for future energy and material savings.

"Food Industry - 2000 A.D." makes the point several times regarding the movement of the processing activity back down the marketing channel from home, store, restaurants, and wholesalers to some undetermined point. This has not changed. However, the interesting situation which will most probably occur is one of moving the processing activity further away from the consumer in terms of institutional level yet closer in terms of geographic proximity. Should this be true, the logic and economics of utilizing several institutional layers to distribute meals and meal components over the final relatively short distance can be seriously questioned. The next bit of discussion will hopefully shed some light on the subject.

Institutional Terminology

In this regard, "Food Industry - 2000 A.D." (while recognizing the problem) took the path of least resistance in dealing with the matter. Traditional institutional names and areas were used in the discussion. Events of the past five years, have lead the author to think of the United States Food Industry in terms of a "production-processing-distribution-consumption system. Present and future economic pressures will cause the forces of integration to continuously blend consumption into distribution, and distribution into processing, and processing into production until the theoretical "oneness" of the system has been achieved.

Many energy and material related problems in the food industry have to do with the "interface" between the various institutional levels within the existing structures. Thinking and acting in the framework of a total food industry system concept can "highlight" these "interface" problems and set the stage for their solution. The activities or functions performed may be no different than those of today. However, in the total system concept many are unnecessary and even counter productive.

Immediately and forcefully the issue is raised. Can the food industry become one vast institution with many attendant parts? The answer, though unpalatable to many, must be yes, it can. Allowing for proper human organizational

arrangements (to be discussed in another paper), the physical parts of this total system could very well maximize productivity under such a concept.

A Way Out

Can we find a way out of this seemingly inevitable energy and materials crunch by 2000 A.D. without a drastic change in our life style and/or standard of living? The general response to no one's surprise is yes. A proper blend of alternative technologies (process, transport, energy, packaging and information systems) and institutional changes (the total systems concept) steming from an industry and country wide commitment (including massive educational effort to upgrade the economic literacy of the masses) to solve the problem, with generous amounts of money and luck, will do the trick.

Will we do it? This is quite another matter. Though the author has maintained and hoped always to keep a positive attitude, recent governmental action (or more appropriately inaction) on energy and materials casts a large gray cloud over the whole proceedings. It becomes increasingly difficult for our bureaucratic system to "get itself together" to act on any major problem. The principal of "entropy" has set in and will require a tremendous force with dynamic leadership to generate the activity described above.

Back to the Beginning

In response to the question: has the author's thinking in "Food Industry - 2000 A.D." changed in light of recent energy and materials problems?; the answer is in principle, it has not.

The whole idea of meal units and integrated systems was designed to be less resource consumptive than our present system. What has been done here is to recognize some conditions which will make the concept come about more rapidly than anticipated earlier. Also, some discussion on related topics has been provided to help increase understanding of the total situation. The entire experience is useful, even if no changes are foreseen. Cognizance must always be taken of changing conditions as one seeks to plan for future events.

FOOTNOTES

[1]"The Food Industry - 2000 A.D. - Revisited," Journal of Food Distribution Research, Volume II, No. 1, September 1971.

[2]"Energy Technology as a Constraint to Future Food Industry Productivity," Journal of Food Distribution Research, Volume VI, No. 1., February 1975.