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HAZARDS IN MARKET RESEARCH AND INTELLIGENCE

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INTRODUCTION

The preceding papers have dealt in depth with the physical and financial problems of fertiliser development in India. With an awareness of these problems, how does a market analyst cope with them? What is the function of market research? For purposes of this paper the functions of market research are defined in terms of the process of analysis and projections of present and future fertiliser demand and supply requirements. What are the requirements and how will they be met? This is the realm of market intelligence—the process of gathering, processing, interpreting, and communicating the technical and political information needed in the decision-making system. Thus, for our purposes, the process of market intelligence is the act of market research.

When a market analyst has to consider all the problems discussed in the papers of the last two days, he is likely to make errors in judgement. These errors occur in part because of the general psychology of a market analyst and the basic nature of the industry in which he works.

1. A market analyst is basically an optimist, which is not always an asset.
2. It is easier to build an argument for a new endeavour (i.e., a new plant) than it is to build a case against it.
3. The fertiliser industry is made up of people orient to efficiency in production but not necessarily to efficiency in marketing.

MARKET RESEARCH HAZARDS IN DEMAND ANALYSIS

What are some areas where errors in judgement can be made ?

Seminar on Fertiliser Marketing 1968, Proceedings New Delhi, Fert. Assoc. of India

The following four considerations have particular importance when attention is devoted to the demand side of fertiliser market research.

Failure to consider changing crop/fertiliser price ratios:

As additional farm products are brought forth in an expanding agricultural economy, prices of these crops often decline. If the change is of a fairly large magnitude, it will significantly alter the fertiliser/crop price ratio and thus alter the economics of fertiliser use. In the United States right now we are struggling with this problem over an extensive area, particularly with wheat and feed grains. Increased foreign and domestic production of these commodities has resulted in depressed prices. Growers of these crops will be forced by price and/or government programmes to limit their fertiliser consumption and industry's sales potential for these crops. When crop prices to the farmer go too low, the farmer will not buy fertiliser. This has been proved in many countries over long periods of time.

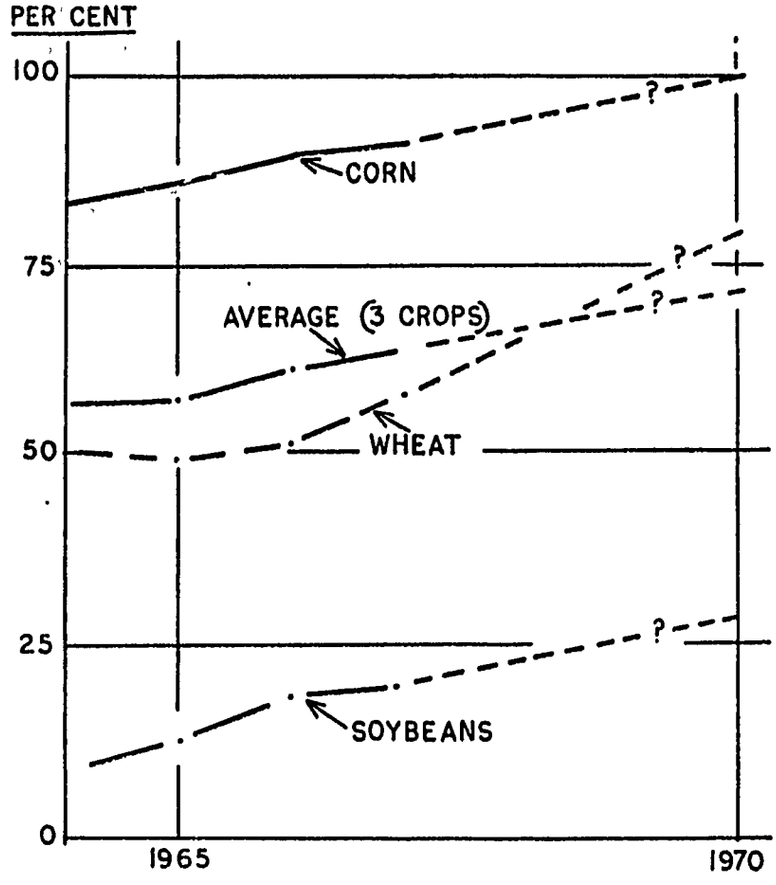
Failure to analyse stage of maturity of fertiliser use :

Closely allied with the foregoing is the failure to analyse properly the stage of maturity of fertiliser use on major crops. When major crops are first fertilised, the potential for additional fertiliser is great, both in terms of percentage of crop fertilised and additional application rate per acre. Over a period of time, however, 90-100 per cent of the major crop becomes fertilised, thus reducing future potential in terms of added acres.

Increase in domestic sales :

For the past four years the Department of Agriculture has collected sample statistics of fertiliser use on a relatively large number of farms scattered at random across the United States. The USDA does not claim that the sample is large enough to establish an absolute level. We believe, however, that it is worth looking at some of the trends these data show (Figure 1).

In 1964 in the 13-state North Central areas of the United States—the great corn and wheat belt—83 per cent of all the corn was fertilised with nitrogen fertiliser. By 1967 about 91 per cent of the corn in this area was fertilised with nitrogen. The corresponding figures for wheat are 51 per cent and 58 per cent; for soyabeans, 8.5 per cent and 20 per cent. More and more farmers are using fertiliser. On those crops, such as corn, where there have been large increases



Acreage fertilised with nitrogen as per cent of total crop acreage (3 Crops—East and West North Central States)

Source : Statistical Reporting Service, "Fertilizer Use on Selected Crops in Selected States : 1967," Jan. 1968, U.S. Dept. of Agriculture, Washington, D.C.

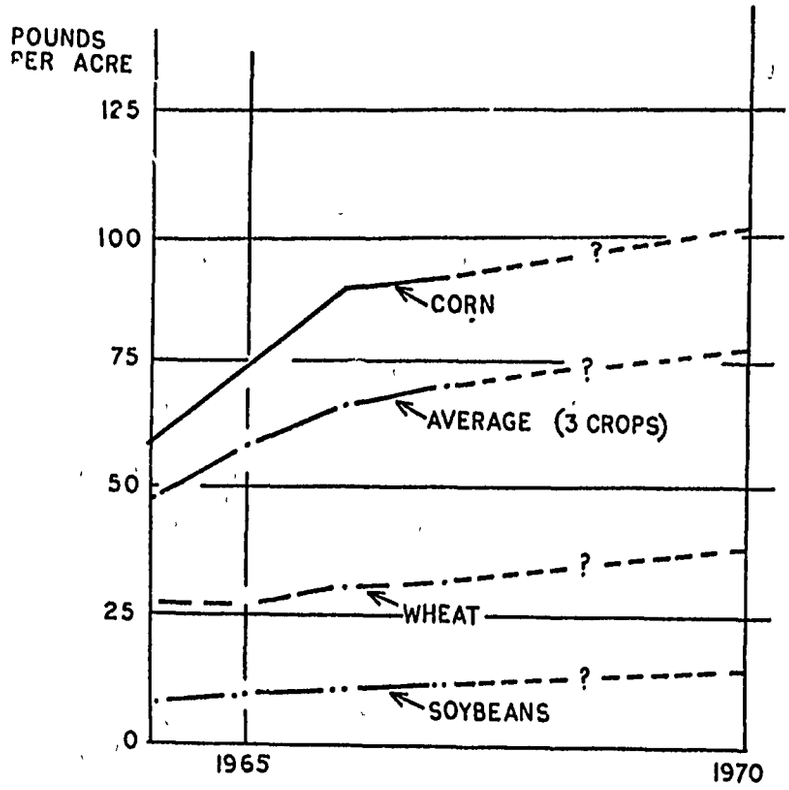
FIGURE I

of fertiliser use in the past, we are rapidly reaching the maximum in terms of acreage fertilised.

Some may say that increases in total fertiliser use will continue as they have in the past, based upon increased rates per acre. According to this USDA sample, farmers in 1964 applied an average of

57 pounds of nitrogen per acre to their corn which was fertilised. By 1967 they were applying on an average 94 pounds of nitrogen per acre of corn fertilised. It is interesting to note, however, from Figure 2, that although application rates are still going up they are climbing more slowly.

In other words, in many of the major crops in the U.S. we are working in the upper reaches of the production function. (This is commonly referred to in textbooks as Stage Two). At some time in the future the Indian fertiliser industry will also reach this stage in maturity.



Nitrogen application rate per acre
(3 Crops—East and West North Central States)

Source : Statistical Reporting Service, "Fertilizer Use on Selected Crops in Selected States : 1967," Jan. 1968, U.S. Dept. of Agriculture, Washington, D.C.

FIGURE 2

Erroneous judgments based on short-run performances :

Another hazard lies in not judging correctly the preceding points when making projections of future effective demand based upon short-run past performances at high compounded rates. For example, suppose fertiliser use has been growing 20 per cent per year in a certain region for the past five years. This 20 per cent, compounded annually, has been on a larger and larger base each year—and cannot continue indefinitely. Increasing use for a 5-year period at 20 per cent compounded rate may be relatively easy in a large region when the base period selected is small. Such an increase on a base level of 100,000 tons leads to approximately 250,000 tons use figure. It may be relatively simple to add to the total distributing system sufficient facilities to handle a additional 150,000 tons of material. If, however, the base starting point is 1,000,000 tons, it may be very difficult or impossible to add the facilities to take care of 1,500,000 additional tons as projected by a 20 per cent compounded increase.

The rate of growth resulting from increased acreage fertilised will decrease when approximately 90-95 per cent of the acreage of the crop in question is fertilised. The rate of growth resulting from increased rates per acre will begin to decrease sharply as the optimum economic rate is approached. Your acreage and fertiliser use statistics and agronomic personnel can help determine where you stand on both counts.

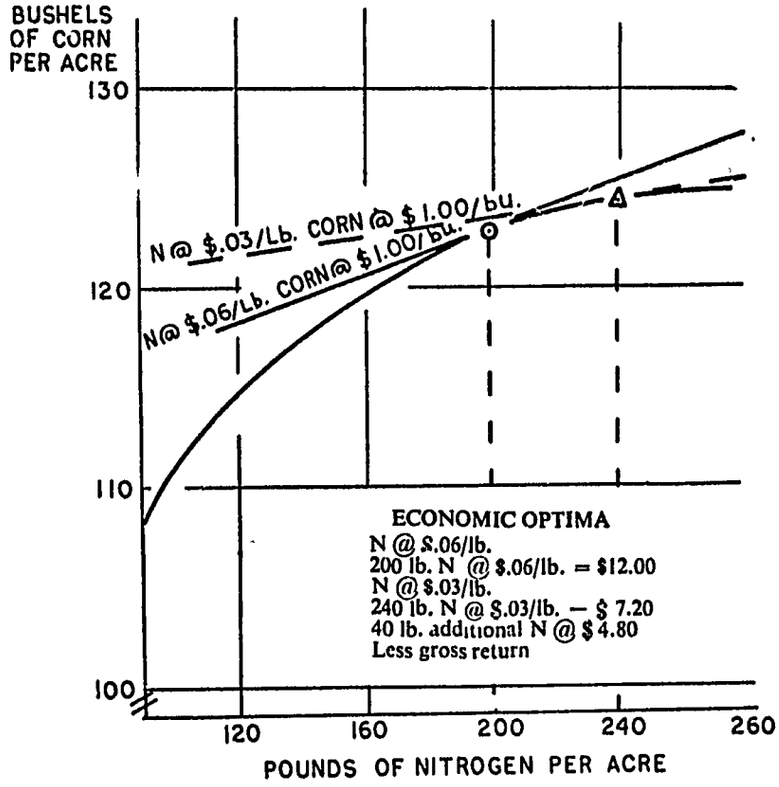
Projections based upon compounded annual increases may be excellent for a short-run period of time—one to three years; for longer periods, such projections can be misleading to administrators and financially disastrous to the fertiliser industry.

Too much reliance on price cuts to sell fertilisers :

Finally, on the demand side we witness repeatedly a situation that does not seem to have any single solution. In the early stages of growth of a fertiliser industry, high prices of fertiliser may well curtail or prevent its use. This is especially true in areas where agriculture is generally of the bare subsistence type. In these stages, subsidies may well be indicated as an instrument of national policy to bring forth greater food and fibre production.

When this general approach carries over into more mature market situations, market analysts frequently predict that decreased fertiliser prices will automatically sell appreciably more fertiliser. With response curves operating in the area of diminishing returns

(i.e., corn and wheat in the United States) and assuming farmers are economic optimizers, it can be proved mathematically that a decrease in price will lead to increased use in terms of tons but a decreased sale of fertilisers in terms of dollars. (Figure 3).

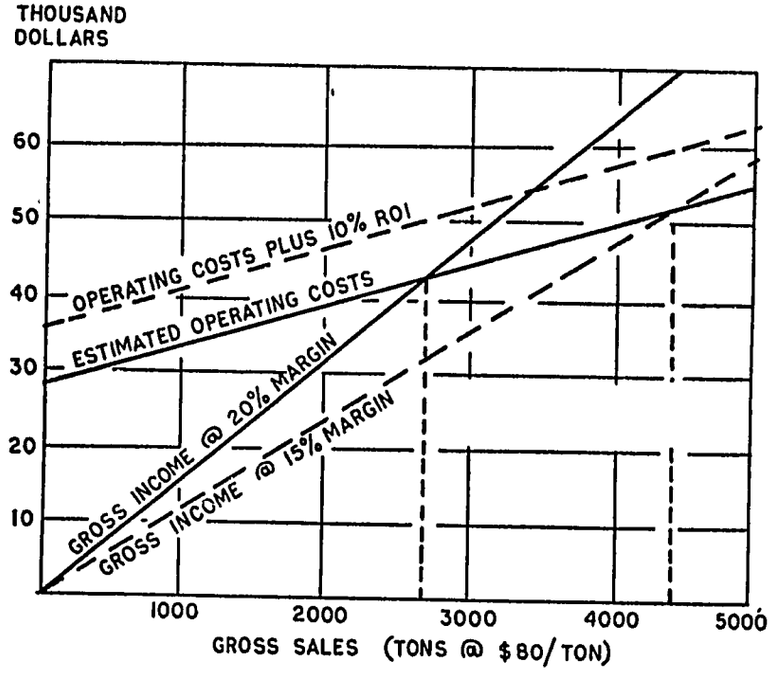


Economic optimum N fertilisation rate for corn

FIGURE 3

Just as serious perhaps has been the failure of many to analyze in detail the costs and returns that could be expected from alternative distribution systems. Bulk blend facilities have been built in many areas of the United States—and we understand in Canada as well—with such high investments and low throughput that it would be a physical impossibility to break even on the blending facility itself. This was done sometimes knowingly and sometimes unknowingly.

Figure 4 shows the position faced by a hypothetical bulk blending fertiliser operation. The operation is assumed to have a total investment of $75,000, annual operating expenses of $28,500, and a variable cost per ton throughput of $5.50.



Hypothetical breakeven points from fertiliser sales with decreasing margins on sales

ASSUMPTIONS

Total investment — $75,000
Annual fixed operating cost — $28,500
Variable costs/ton — $5.50

FIGURE 4

If operating at a gross margin of 20 per cent, the operator can break even at approximately 2,700 tons throughput. To make a minimum 10 per cent return on investment (ROI), however, he must move over 3,400 tons at 20 per cent gross margin.

If by chance he decides to cut his margin to 15 per cent and try to increase sales, he must then operate at over 4,300 tons to break-

even and at over 5,500 tons to make a bare minimum 10 per cent nondiscounted, pretax return on investment.

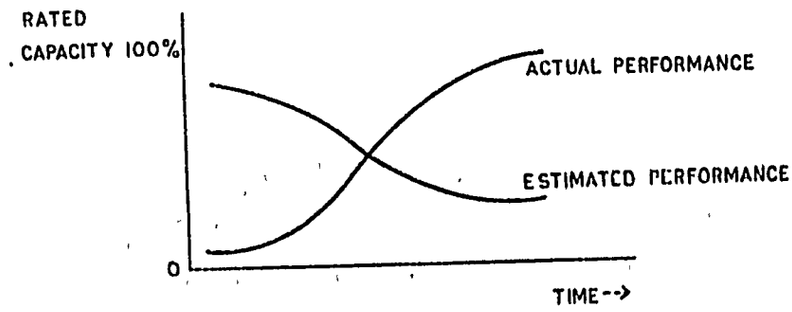
It is obvious from Figure 4 that a substantial increase in sales is required to make up for small price decreases in a fertiliser market which faces a relatively inelastic demand curve. In short, the fertiliser retail dealer must be allowed to maintain realistic margins on sales if he is to be able to continue his very valuable function for the industry and for the nation.

MARKET RESEARCH HAZARDS IN SUPPLY ANALYSIS

Now let us turn to hazards on the supply side of fertiliser market analysis—that side with which most of you have very close ties. There are several hazards to watch for, including those mentioned next.

Underestimating level of fertiliser production:

In the early stages of growth of an industry or a new technology within an industry, market research often overestimates actual production of plants in relation to rated capacities. In later stages, as the industry or technology is developed and trained, experienced operators and engineers become available, market reseach traditionally and habitually underestimates actual production in relation to rated capacity. This is illustrated by Figure 5.



Actual vs. estimated production performance

FIGURE 5

In the United States we have several examples of the above in the ammonia industry. When the 1,000 to 1,500-ton-per-day plants were being constructed, market research projected high operational rates for them as soon as they were completed. In fact, as is usually the

case with completely new plants, most of the early large plants sustained long and costly delays before becoming 100 per cent operational. Market research, during the initial period of extended delays, began projecting delays and low operating rates for the future large plants. Yet, within the past year actual experience with the new plants has been better than projected (based upon the earlier troubles). This hazard may well be accentuated in countries in which the entire industry is relatively new.

Changes in availability and prices of various inputs :

Market research in many cases throughout the world fails to consider the probability of changing availability and resulting changed prices of all input factors required for production as an industry or a new technology within an industry increases in size and complexity. This has led to improper estimates of actual supply of product and major errors in cost estimations as a result of increasing prices of input factors as their availability decreases.

For example, in the United States several NH_3 plants were built to use tail gas from petroleum refineries as their hydrocarbon source. Upon start-up of plant operation it was learned that the tail gas was inconsistent in both quantity and quality, and costs went up accordingly. In many developing countries, plants have been built upon the basis of existing electric power availability. It was found later that this power was either unavailable or available irregularly. Thus, the plants operated at less than full capacity and production costs remain high.

Estimating costs only at optimum operation :

Another fault in supply analysis has been a common one of estimating production costs based upon optimum—100 per cent—operating rates of productive facility. Seldom, if ever, is this approached in practice; thus, seldom, if ever, are the actual production costs in the "ballpark" of the estimated production costs per unit ton of product.

Generally, the vast expenditures for production systems in the United States, and most probably throughout the world, during the past decade have been preceded by a high degree of detailed planning on the costs and returns from those production facilities, assuming full-scale operation. Some companies have spent large sums on distribution systems to ensure that production facilities could operate

at full capacity. It is our impression, however, that little analysis has been made of the costs and returns of these production facilities on the assumption that they operate at less than full capacity. Undoubtedly additional efforts are being made in the United States and elsewhere towards such analyses after the experience of the past two years.

Such analyses should be much more complex than anything which can be presented today. They should, however, include at least three major segments of cost: bare production costs; costs of sales and administration; and some specified level of return on investment. If they do not include cost figures for all three categories, there will always be the tendency to set margins so low—in order to increase volume—that the net result to the firm will be financial disaster.

Table I

Illustration of variation in total NH_3 costs in a theoretical NH_3 plant at various operational levels[1]

Operational level (per cent of capacity)	Bare production cost	Sales and admin. force @ $1 milion/yr.	10 per cent ROI pre-tax nondiscounted	Total
	.....	.....Per ton NH_3	.....	
100	$17.50	$3.03	$4.85	$25.38
95	18.03	3.19	5.11	26.53
90	18.61	3.37	5.39	27.37
85	19.26	3.56	5.71	28.53
80	20.00	3.79	6.06	29.85
75	20.83	4.04	6.47	31.34
70	21.79	4.33	6.93	33.05
65	22.88	4.66	7.46	35.00
60	24.17	5.05	8.08	37.30
55	25.68	5.51	8.82	40.01
50	27.50	6.06	9.70	43.26

1. The following assumptions are used in making these computations:
   a. Bare production costs at 100 per cent capacity=$17.50 per ton including depreciation but excluding ROI—1,000/tpd capacity.
   b. Variable costs per ton=$7.50 including natural gas, catalysts, electricity, and utilities.
   c. Sales and administrative force operating at annual cost of $1 million.
   d. Total investment=$16 million.

Table 1 on page 175 shows a highly simplified analysis of the costs of producing NH_3 in a theoretical new 1,000 ton-per-day plant on the United States Gulf Coast.

It should not be implied that these figures or this analysis represents the true costs. The analysis is presented for illustrative purposes only—to illustrate that these very low "production costs" that we in the United States hear rumours about may be completely misleading to management of firms charged with earning a return on stockholders' investments. They may be equally misleading when used by sales departments in selling present and future production of the plants.

In this illustrative Table and accompanying Figure 6 several assumptions have been made. First, it is assumed that the bare production cost of NH_3 "at the spigot" is $17.50 per ton including dep-

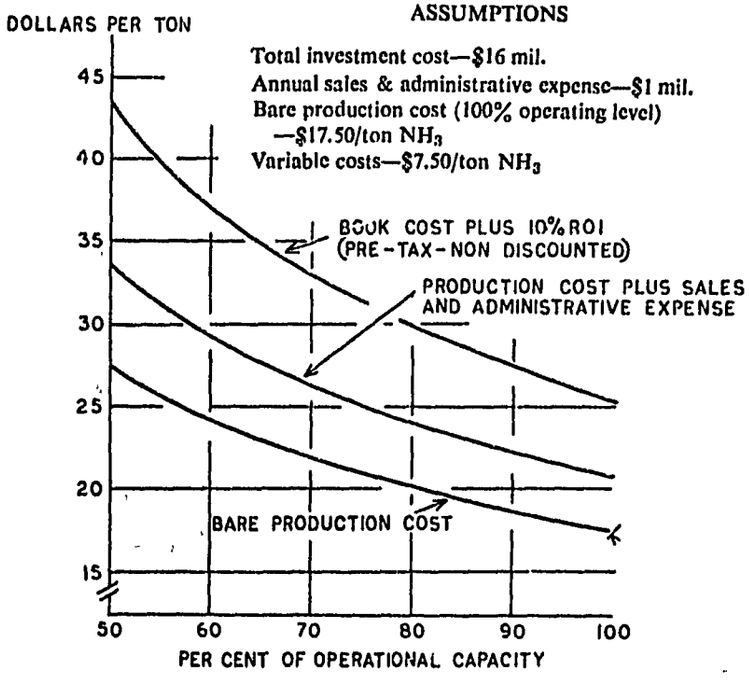


Illustration of variation in total cost per ton NH_3 with varying levels of operational capacity

FIGURE 6

reciation but not including return on investment. It is further assumed that $7.50 of this cost is variable cost, i.e., out-of-pocket cost for gas, electricity, utilities and catalysts. In addition, it is assumed that the total cost of operation of the sales force and general administrative offices is $1 million annually.

Then, for illustrative purposes only, we have inserted the tonnage cost to cover a return on investment of 10 per cent (on an assumed total investment of $16 million), pre-tax and nondiscounted. It is fully realized that this rate of ROI is very small, since larger returns could be had on numerous tax-exempt municipal bonds.

One quick glance is enough to indicate that this $17.50 "production cost" does not serve as a proper guide to management. Even if the plant can operate at 100 per cent of capacity, the true costs are nearer $25 per ton—and these true costs must be returned or top financial management will not long abide by decisions made and based upon this theoretical low "production cost."

Even worse is the case in any such industry when decisions are made based upon this low "production cost" at 100 per cent capacity operating level and then, due to a general oversupply situation, the plant must operate at 60 per cent capacity. Then true costs per ton which must be returned may more than double this $17.50 "production cost."

There must be much more economic analysis of total costs incurred—not only at the full operating capacity level but also at more realistic operating levels. It is only by such realistic analysis that top management in the fertiliser industry of any nation can be expected to make sound decisions.

Total system cost analysis:

A fourth and most important hazard is that market analysis often fails to analyse all production and distribution costs in a total system concept. Most cost analyses have been made based upon the "bare bone" production costs with no emphasis given to analysis of requirements in terms of investment costs and operating costs of distribution outlets if the material is to be supplied to the farmers in the form and at the time he requires it. For instance, in the United States it is well known that ammonia is in some cases being produced at a total cost of less than $20 per ton. By the time this same ammonia is delivered to the farmer's field and applied, the cost usually exceeds

$70 per cent. This can be broken down as follows (with no inclusion for profit) :

$20/ton	FOB point of production
$25/ton	Plant storage, barging, terminal storage, trucking, field storage, and wholesalers' selling costs
$25/ton	Retailers costs in storage, handling, trucks, applicators, and merchandising
$70/ton	

In the United States and other areas, total investment in fixed facilities to fulfill the distribution and marketing functions may equal or even exceed the investment in production facilities. A producer of fertiliser may think the investment cost of $40 million for a nitrogen plant is high. If he is expected to distribute this fertiliser, however, he soon finds that an additional $40 million or more investment may well be required to cover the costs of fixed facilities within the total distribution and marketing channel. We now have many situations illustrated by Figure 7.

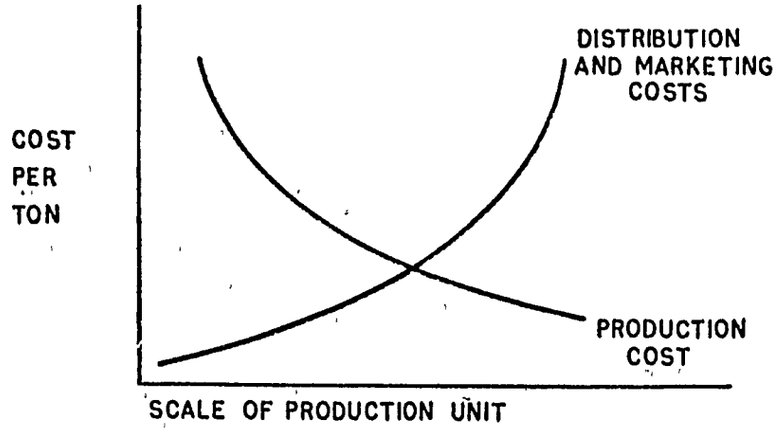


FIGURE 7

Effect of plant size on production costs and distribution and marketing costs

The high cost of distribution and marketing facilities is not a

phenomenon connected only with the free enterprise system. It is common to the fertiliser industry of the world. The requirement for large expenditures in this area springs from the many functions which must be performed if fertiliser is to be successfully produced and distributed.

To be economically successful, a fertiliser plant must operate 12 months a year. Farmers use fertiliser in one or two periods of the year; thus, there are requirements for large amounts of storage facilities to hold the fertiliser produced in the off season until such time as it is needed by farmers.

The very nature of farming, with its high degree of uncertainty resulting from weather, also results in need for large fixed investment in the distribution and marketing system. It is impossible to predict which area of the country will have a drought and therefore require smaller amounts of fertiliser. It is impossible to predict which week of the year good weather will come and thus lead to increased immediate need for fertiliser within a specific area. So, large regional warehouses must be established closer to the end-use area than to the large, centralized production point.

To the best of our knowledge, there is no optimum configuration for a distribution and marketing system for all countries. There is no one optimum configuration even within any one single country. It has been found worldwide that distribution and marketing facilities must be fitted to the requirements of the particular type of farms within an area.

It has often been said that anyone can produce fertiliser at a profit but few can produce and distribute at any large profit level, because of the failure to plan for and make adequate money and trained manpower available for its marketing. If any one or two major error in market research could be pointed out, they are these : (1) Alternate plans of action in case the production facilities are forced to run at a level below 100 per cent capacity. A relevant range would be 50-80 per cent, and (2) The failure to make adequate planning, funds, and skilled manpower available for the required distribution and marketing channels.

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