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An Analysis of Shifting Relative Prices and Marketing Facility Investments in the Context of Technological Change in the Developing Countries

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During the 1950's and 1960's, not very surprisingly, investments in the agricultural sectors of most of the developing countries were made on increasing crop production, especially the food grains. In spite of these investments, agricultural growth remained painfully slow, mainly because the local crop varieties had a low genetic potential. Until recently, therefore, these countries had to import huge quantities of food grains. In 1960, India, for example, imported 25.4% of the total wheat grains available in the country (production + imports). This figure increased to 41% in 1964 and 43.3% in 1966. [10] In Brazil, domestic wheat production accounted for only 4.25% of the total requirements in 1963-64. It increased to only 12.05% by 1966-67. [5] Turkey had to import 17.7% of its wheat requirement in 1961. During five years period of 1959 to 1963 Turkey imported an average of 561,000 tons annually. By 1968, the imports were still about 500,000 tons, with a domestic production of 8,400,000 tons. [25]

The importance of these imports becomes more pronounced when we examine their share in the distribution of food grains to the consumers. In India, for example, whereas imported wheat accounted for 43.3% of the total wheat grains available in the country in 1966, it represented 70 percent of the wheat distribution to the consumers. [10] Thus, imports weighed very significantly in the distribution systems of these economies

and a situation developed where (1) investment flowed mainly into the production programs, (2) domestic marketed surpluses being small, the internal marketing system remained neglected, and (3) marketing facilities development became heavily imports-oriented. As Brown puts it, 'over the past fifteen years, many large coastal cities in Asia, including Bombay, Calcutta, Djakarta and Karachi have been living from 'ship to mouth', depending on the wheat sent each year under the United States food-aid programs. For this reason, internal marketing systems designed to move food surpluses in these countries from the countryside to coastal cities or to other food deficit areas, have atrophied from disuse". [1]

With the introduction of new dwarf varieties of wheat and other improved seeds such as hybrid corn and miracle rice (IR-8) etc., production of food grains and especially of wheat, increased substantially after the year 1967-68. India's wheat production increased by 80 percent between 1966-70 and complete self-sufficiency is in sight by 1972. Pakistan increased its production of wheat by 60% between 1967 and 1969. The Philippines, a traditional importer of rice has become rice-exporter. [1] Turkey became surplus in wheat to the tune of 448,000 metric tons in 1969. This surplus is estimated to increase to 1,440,000 tons in 1972 and 1,870,000 tons by 1975. [25] Brazil decreased its dependence on imported wheats to less than 53% in 1970 and is expected to decrease it further to 40% in 1971 with domestic production increasing from 1.446 million metric tons in 1969 to 1.727 million tons in 1970 and 2.2 million tons in 1971. [17]

With this unprecedented increase in production, internal marketed surplus increased more than proportionately, because in the producing areas consumption needs of grains (which did not enter the market) were

already satisfied and almost all of the additional production flowed to the market:

$$Y_o = C_o + M_o$$

$$Y_o + \Delta Y = C_o + M_o + \Delta Y$$

$$= C_o + M_o + \Delta M$$

$$\because Y_o > M_o$$

$$\therefore \frac{\Delta Y}{Y_o} < \frac{\Delta M}{M_o}$$

Y_o: base year production

C_o: base year consumption by the producers including family, seed, contractual, animals and all other requirements, i.e. $(Y_o - M_o)$

M_o: marketed surplus

The magnitude of this increase in the marketed surplus is evident from a wheat market behavior study conducted in Punjab and Haryana States of India (Table 1). These are the two major wheat producing states in India.* Wheat production in Punjab increased by 100.8 percent in 1970-71 over 1966-67 production and market arrivals increased by 241.7 percent. Similarly in Haryana state, production increased by 99% and marketed surplus by 344.4 percent during this period.

These increases in domestic marketed surpluses are unprecedented in quantities and the speed with which they have occured within a short span of only 3-4 years. The market structure and facilities oriented mainly towards the handling of imports at coastal points and their shipment from

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*Of the 1970-71 Government Wheat Procurements in India, Punjab accounted for 74.4%, Haryana 15.2 percent, and 10.4 percent rest of the Indian states. [11]

Table-1

Increases in Production and Market Arrivals of Wheat in the Punjab and Haryana States of India, 1966-67 through 1969-70

Year	Production			Marketed Surplus		
	Million tons	Percent increase over 1966-67	Percent increase over previous year	Million tons	Percent increase over 1966-67	Percent increase over previous year
			Punjab			
1966-67	2.45	--	--	0.82	--	--
1967-68	3.34	36.3	36.3	1.64	100	100
1968-69	4.49	83.3	34.4	2.32	182.9	41.5
1969-70	4.92	100.8	9.6	2.80	241.7	20.7
			Haryana			
1966-67	1.06	--	--	0.18	--	--
1967-68	1.44	35.8	35.8	0.35	94.4	94.4
1968-69	1.52	43.4	5.5	0.45	150	28.6
1969-70	2.11	99.0	38.8	0.80	344.4	77.8

Source: Calculated from K.S. Gill, "Wheat Market Behaviour in Punjab and Haryana in Post Harvest Period 1968-69 to 1970-71", PAU, Ludhiana, (India), 1971.

ports to the consuming areas, became utterly inadequate and out-dated to handle these internal surpluses. In West Pakistan, for example, the 1969 grain harvest was estimated at 14 million tons, of which 9 million tons required storage facilities. Total storage capacity was only 5.5 million tons, resulting in a net deficiency of 3.5 million tons of grain storage facility. [24] In India, total storage capacity was estimated at 5.7 million tons in the year 1967-68 and a large part of it was in the port areas which reflected the previous reliance on PL-480 imports. [23] In the Philippines, introduction of high yielding varieties created new problems in drying, processing and storage of grains. Commercial facilities had been developed within the framework of a traditional system of marketing. A completely new system is now required for new varieties and increased surpluses. AID estimated that in case of rice alone, the Philippines will need .85 million tons additional storage space to carry a two month supply for the country. [22]

Kenya changed position from a deficit to a surplus country in corn and will be an increasingly larger exporter of corn over the next decade. "The speed with which the Government solves the problem of handling costs of corn from points of production to shipside at Mombasa will greatly affect the volume of these exports." [10] In Turkey, the government has been buying enough wheat from the farmers to support prices 30 percent above world level in 1969, but it was "too early, however, to judge the ultimate success or failure of this marketing program in view of the small proportion of the total wheat production of Turkey which actually came from the HYV". At this stage, Turkey is in fact facing the same problems of inadequate and inappropriate market facilities as is being faced in other developing countries. [25] Brazil, Columbia, Paraguay

and El Salvador in Latin America are reported to be experiencing tremendous increases in wheat and corn production and are facing the problem of both traditional markets and market facilities not oriented towards serving the new increased internal marketed surpluses. [20]

A country need not necessarily have to change completely from the position of an importer to that of an exporter to encounter the problems of marketing facilities lagging behind; the mere occurrence of substantial increases in the domestic marketed surplus is often sufficient to throw the traditional marketing system out of gear. This is the aspect that remained ignored in the development efforts of the LDC's. The agricultural policy remained production-oriented and market research and development did not receive the needed attention. No scientific criteria were developed to expand and develop marketing systems in these countries. As a result, congestions in the markets, delays and difficulties in storage and transportation, etc., occured in most of the producing areas in these countries. This led to some serious thinking in these economies on reorganizing and developing the market facilities. West Pakistan, for example, requested assistance from USAID in 1968 to determine means of increasing available grain storage. The government of Pakistan arranged a Rs.12.5 million loan from Canada under the Mondale amendment to PL-480 in order to assist the financing of their crash grain storage construction program. [7] India launched upon a program of building extensive storage capacity, widening of the old market yards, constructing some new markets, regulating the old ones and streamlining the transportation system from the producing areas to the consuming areas. Brazil started building its rail and road transport to facilitate shipments of wheat from the producing regions of Southern Brazil to the seaports to move it on to the consuming

areas in the north. All such efforts again are being made without much of a scientific basis and criteria.

Also, the governments in most of these countries adopted policies of interfering with the normal trade operations mainly through the instrument of regulated prices. In some cases, governments entered the market to partially and sometimes completely replace the private trade. India introduced a system of support, procurement, and distribution prices* and the government entered the market as the biggest buyer and seller of food grains, especially of wheat, rice and maize. India plans to build up buffer stocks of five million tons of food grains managed by the Food Corporation of India (a government body) by the year 1973-1974. [9] The government has many public agencies operating in the market such as food corporation of India (FCI), state food and civil supplies departments, cooperative supply and marketing federations, central warehousing corporations and state warehousing corporations, etc., which have reduced the private trade very considerably. The government of Kenya guaranties a minimum return to the growers for wheat and corn and establishes an incentive price to the producer and often suffers losses to the treasury on the export of corn. Government marketing organizations operate to receive corn from the producer and then export it. [21] The government of Morocco through office cherifien interprofessionel des cereales (OCIC) controls the prices of bread wheat, wheat flour and seminola from the point of

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*Support price is the minimum guaranteed price announced by the government prior to the sowing season in order to influence production decisions of the farmers. Procurement price is announced just prior to the marketing season. It is the price at which government pays for the food grains it purchases. Distribution price is the price at which government sells food grains through flour mills, cooperatives, fair price shops and to the military, etc.

production or imports to the ultimate retail price. Other products under government price control include rice, tobacco, raw cotton, vegetable oils and sugar. Government controled market handling and distribution accounts for as much as 25 percent of the total cereal production in the country. [19] Pakistan has a system of floor (support) prices and procurement, storage and government distribution. The government owns more than 25% of the total grain storage facilities in the country. [24] The Turkish government has a comprehensive price support system to assure stable producer prices on the one hand and adequate consumer supplies on the other. [25] Columbia has a price support program for major crops. It purchases and allocates a large proportion of domestic wheat and is responsible for all imports and their allocation. In Brazil, the government controls the prices of important products including corn, cotton, coffee, etc., to keep them in line with the needs. Many governments have been operating substantial storage facilities too. [20] The Philippines have a Rice and Corn Administration (RCA) with a responsibility to administer farm and retail prices, buy, sell and import these food grains, and facilitate "nationalization" of grain marketing. [22]

The governments in most of the LDC's have thus entered the agricultural produce markets in three major ways: (1) controlling and administering the prices, (2) developing and expanding the marketing facilities, and (3) taking the market operations partially but very substantially into their own hands. All of this market intervention started due to the conditions of scarcity, is now continuing through the food grains self-sufficiency stage and is likely to even expand as the internal marketed surpluses keep mounting. At this stage, it is worthwhile, therefore, to examine and develop some rational criteria and a framework for analysis

of these policies, particularly in the context of technological change and shifting relative prices. This paper is an attempt to suggest a framework for analyses of (1) the system of government controlled prices and (2) investments in the marketing facilities for these countries. The rationale for government controls and operation of markets are not discussed here.

Analysis of Price Support

Agricultural prices perform three main functions: (1) as an allocator of resources, (2) distributor of income and (3) as an influence on capital formation. [15] Historically, however, agricultural price policy has been used negatively to keep the food and raw materials cheap for the growing industrial sector and to provide economic surpluses for investments in the industrial sector. A negative price administration of this type has been an important aspect of policy in the early phases of development in capitalistic as well as socialistic countries. [13] Only recently has it been recognized that a certain critical minimum rate of agricultural growth is a prerequisite for general growth of the economy. This critical minimum growth rate is, however, quite high for many developing economies, which underlines the reasons for a production-oriented positive price policy. A system of guaranteed prices for food grains and other important agricultural products is, therefore, followed in most of the LDC's. An FAO survey reported that in 1965, fifteen countries had adopted support prices for wheat, ten for barley, and sixteen each for maize and rice in Eastern Europe, Asia, Africa and Latin America. [6] Although acceptance of a price support policy for agricultural products is very widespread, determination of the level of support prices remains

a baffling problem.* The level of these prices, in fact, depends on the objectives that are sought to be achieved through the instruments of price policy, which differ from country to country and time to time. In the developing economies, the over-riding consideration is to step up the rate of growth of agricultural production. The support price policy has to be, therefore, production-oriented especially to assure the producers of the profitability of adopting new production technology which might be otherwise doubtful due to slumps in agricultural prices following good harvests.

Various criteria can be used for determining the level of these prices**, such as cost of production, ruling price, and parity prices. All of them have their merits and demerits. Although heated discussions often take place on cost of production, it is generally accepted that the current cost of production and even ruling price criterion can not be made the basis for determining the level of support or procurement prices. The parity price approach if modified and properly adjusted, has a good scope for determining a rational level of these prices. Various parities can be worked out, such as: (1) between prices of agricultural and non-agricultural commodities, (2) between prices of individual agricultural

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*Here no attempt is made to examine the desirability of support prices or controlled prices. It is generally recognized that short of perfect market conditions, some sort of government interference in the price mechanism is essential especially in the situation of large number of small producers, not very scrupulous trade, vagories of nature and over all objectives of expanding the production of food grains and other agricultural commodities.

**Although support, procurement and distribution prices are always at different levels, no distinction is made in this discussion, because here the emphasis is on methodology only. Once the level of one is determined other prices can be derived easily.

commodities and general agricultural prices, (3) between prices received for farm products and paid for farm inputs, and (4) between prices received for farm products and paid for farm and family expenditure items put together.* None of these levels based on different parities can be considered uniquely appropriate. The various approaches provide a range of prices within which a parity price should fall to remain within justifiable limits. An average of the different parity prices can give a starting point to the policy-maker for making his own adjustments. As an example, different estimates of parity prices for selected agricultural commodities in Punjab (India) for the year 1969-70 are given in Table 2.

These estimates, however, have an element of a strong bias due to the differences in the absolute base values for costs and returns. A given percentage change on a small base will not equate with the same change on a large base. The input or cost prices normally have a smaller base compared to the output prices. The generally accepted computation of parity price is: $\frac{\bar{C}_p}{\bar{W}_p} \cdot C_{p_t} \cdot W_{t+1}$; where $\bar{C}_p$ is the time series average price index of the commodity, $\bar{W}_p$ the average of the appropriate price index with which parity is to be maintained, C_{p_t} the actual price of the commodity in the current year and W_{t+1} the unit price index for the next year for which projection is made. This needs to be adjusted with "variable cost:gross returns" ratio. The deflated parity index ($\bar{P}d$) will be: $\bar{P}d = 100 + \Delta\bar{P} \cdot \frac{V}{G}$; where '$\Delta\bar{P}$' is the percentage point change in the price index from the base period, 'V' is the variable costs, and 'G'

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*For a more detailed discussion of these methods, see Johl, George, and Singh. [13]

Table-2 Different Estimates of Parity Prices for Selected Agricultural Commodities, Punjab (India): 1969-70

Rupees per Quintal

	Parity with 1952 fixed base whole-sale price index	Parity with ten-year average as base whole-sale price index	Parity with adjusted base whole-sale price index	Parity with prices of inputs (base 1952-53)	Parity with prices paid for inputs plus consump-tion (base 1952-53)	Average of parities
Wheat	82.93	76.82	82.84	91.27	81.51	83.07
Gram	92.15	80.83	87.20	101.52	90.56	90.45
Maize	69.01	60.91	65.68	76.02	67.80	67.88
Bajra	62.79	69.46	74.44	69.38	61.69	67.55
Rice (paddy)	58.73	48.37	52.22	64.70	57.70	56.34
Barley	60.55	60.87	65.62	66.75	59.54	62.67

Source: Reproduced from Johl, et.el. [13]

the gross returns per unit of output of the particular farm product.* The adjusted parity price can be then worked out as $C_{p_t} \cdot \bar{P}d$.**

This approach avoids the pitfalls of the unadjusted parity formulae. It takes account of the effects of technological improvements on per unit costs and returns and at the same time can take care of the relative price changes of agricultural products and of agricultural and non-agricultural as well as input-output price levels in the economy. This approach has a built-in mechanism for adjusting the product prices to any reduction in the unit cost of production as a result of technological innovations. In the developing economies where (1) continuous changes are taking place with respect to the use of improved production technology, (2) there exist producer-consumer conflicts of interests, (3) stability of prices is a crucial factor to avoid the damaging influences of inflation, (4) inter-sectoral flow of capital is important for the growth of the economy and (5) governments are riddled with the problems and responsibility of setting rational prices to achieve desired allocational and distributional goals, the adjusted parity price approach holds promise as a guide in determining reasonable levels of support prices.

Marketing Facilities Investment:

The crucial market facilities, especially where the produce is physically exhibited before transactions in a market place, include (1) transport from the points of production to the primary whole-sale market

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*The variable costs and gross returns can be taken for high yielding varieties at improved levels of production technology because the major purpose and emphasis of support prices is to introduce and accelerate the pace of adoption of the new technology.

**For an actual application of this formula, see Johl, et. el. [13]

place (for assembling) and from the primary market to the secondary whole sale markets and consumption points, (2) storage at production points at the primary, secondary, and terminal markets, (3) market yards with all the ancillary facilities for shopping, rest and convenience, (4) financing institutions and arrangements and (5) organizations to regulate and operate the markets in an orderly fashion.

When the trade is in the private hands, all these facilities tend to develop or recede in response to the marketed surpluses and changes in their flow patterns. Facilities tend to be modest and are often lacking in many respects but they remain more flexible to adjust to the changing need. Yet, in the developing countries where a majority of the producer-sellers are small with very low or no staying power, it is often a buyer's market. The economically weak, small producer-sellers are often exploited and many malpractices prevail. In India and Pakistan prior to the government regulation of markets, for example, a maund, which was the most popular measure of weight, varied between 16 seers and 45 seers with different weights for buying and selling. There were a multiple number of unwarranted deductions and the farmer-seller did not have any say in, or even knowledge of, how the price of his produce was settled between his commission agent and the buyer. It is not very surprising, therefore, that the governments in these countries started regulating and controlling the markets.

Since the private trade responded to the changing patterns and quantities of market arrivals only passively and did not interact positively to stimulate production, the governments, having a very great stake in the production programs, endeavored to make the markets not only responsive but attractive enough to provide meaningful incentives for higher

production. This led the public agencies to further regulate and control the markets and in most of the countries to enter the market, influence and dictate prices and develop institutional facilities for transport, storage and financing, etc. Much needed as they were, these facilities and the creation of organizations to regulate and handle the market operations involved huge investments. Moreover, these investments tended to be inflexible, especially when only current problems were considered in making these investments. The development of coastal facilities in many countries, discussed earlier, is a classic example of the inflexibility of investments made in market facilities in response to the immediate needs of these shortage economies.

If public agencies have to play an increasing role in the marketing of agricultural products in the LDC's, it is to be recognized that as more institutional facilities are developed, heavier and heavier investments will be involved. These investments will be much more inflexible as compared to the private marketing facility investments.* It is, therefore, essential that marketing facility investments be made judiciously with a view not only to meet the challenge of the immediate needs and problems, but more so based on estimates of future changes in the product mix and flow of marketed surplus over space and time. Trade-offs in the economies in costs and degree of flexibility to cope with the changes in

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*Here no arguements are offered to justify or oppose the public take over of the market functions or interference with the market organization. It has its own merits and demerits and each country has to decide on whether or not public interference, control and take over is required; if so, to what extent and in what form depending upon its economic, socio-cultural and political structure and objectives. This paper recognizes the fact of public participation, control and operations and proceeds on this basis.

the future deserve a careful consideration in these planning models and designs. The following variables, therefore, need to go into the decision matrix for market facility investments:

(1) Production estimates of different farm products for each year over a fairly long period of 10-20 years. Quite a few programming models are already available and have been used on a pilot basis to obtain such production estimates in various countries. Particular mention is made here of the simulation model for the Nigerian economy developed at Michigan State University [12], the Day, Singh and Mudahar recursive programming model applied to the Punjab (India) agriculture [3, 18], the Duloy, Norton sectoral model on Mexico [4] and the Fletcher, Graber, Merrill and Thorbecke model for sectoral analysis of Guatemala agriculture [7, 8]. Even a much simpler but a comprehensive approach can be used as attempted by Cummings for India [2] and Johl and Kaul for Punjab. [14]

(2) Production elasticities of marketed surpluses of various commodities:

$$E_{s_j} = \frac{\Delta S_j}{\Delta P_j} \cdot \frac{P_j}{S_j}$$

where 'S_j' stands for marketed surplus from 'P_j' production of the 'j'th product.

(3) Marketed surpluses of various products worked from estimates of (1) and (2):

$$S_j = S_{jt-1} + \frac{\Delta P_{jt}}{P_{jt-1}} \cdot E_{s_j} \cdot S_{j_{t-1}} \quad \text{(t is time descript)}$$

(4) Import and export components: M_j and X_j, over the whole period of planning.

The point of importance here is that these estimates of annual magnitudes

of marketed surpluses as well as import and export estimates have to be made for a fairly long period to cover the lifetime of the major market facility investments. Also, these estimates have to be made with respect to time flow and patterns of arrivals and distribution.

Total annual flows can be estimated as under:

(a) Internal flows: $S_{jt} + M_{jt}$

(b) Terminal flows: $M_{jt} + X_{jt}$

In a deficit economy, import flows are important because they form a significant portion of the marketed quantities. In a surplus economy, they may not be so because only the quantities surplus of domestic needs may be exported. Anyway, coastal facility investments have to be done cautiously with respect to size and flexibility because they can be rendered surplus due to: (1) increases in domestic production, (2) spread of imports and exports over a longer period and (3) increasing inland facilities of storage, transport, etc. In this case peak needs can also be reduced by judicious time-distribution of shipments.

In the case of domestic surpluses, however, peak market arrivals cannot be so easily avoided; interior marketing facility investments, therefore, must be made keeping in view peak arrivals. Here it is not a question of annual quantities, but of seasonal peaks. Flexibility in the quantum of a facility is more important here because otherwise either the capacity will run short of the requirements in crucial peak period(s) or it will remain unused in the slack season(s), thereby raising the overhead costs per unit of marketed surplus. Yet, there are certain facilities that cannot be made so flexible. Examples are permanent storage structures, rail tracks and market-yards. Net investment in such facili-

ties during any time period (ΔI_t) will be governed not by the average but by the highest volume of marketed surplus over the life period of the investment:

$$\Delta I_t = \phi \left(\sum_{j=1}^{n} \sum_{t=1}^{k} \Delta S_{jt} \right).$$

Negative changes should be ignored; ΔS_{jt} should be the net addition of marketed surplus of the jth commodity in period 't' over the previous highest peak; 'j' would run from 1 to n crops and 't' from 1 to k seasons over the lifetime of the investment under consideration. Each season only the peak arrivals should be considered in order to satisfy the criterion of optimum point on investment, i.e. $I_t = \sum_{j=1}^{n} S_{jt}$ and a feasibility criterion of $I \geq \sum_{j=1}^{n} S_{jt}$ in physical terms.

There is always a scope of trade off between the facility investment and incentives for more orderly and spread-out marketing of the produce. To the extent some incentives can be used, such as gradually increasing procurement prices from harvest to the lean period in order to reduce the extreme peaks, they reduce the pressures on market facilities. As an example, Figure 1 and Table 3 indicate that over 85 percent of the wheat arrivals in Punjab and Haryana states of India are received in the market in less than three months. Within this period only 10 to 15 days are most critical. If market facilities do not match with the arrivals during this period, i.e., the feasibility criterion $I \geq \sum_{j=1}^{n} S$ is not met, even one season's damage can be higher than the costs of additional facilities needed.

One of the main reasons why the producer-sellers rush their produce to the market is that they do not expect the prices to go high enough to match with their storage and withholding costs. [11] These peaks can be

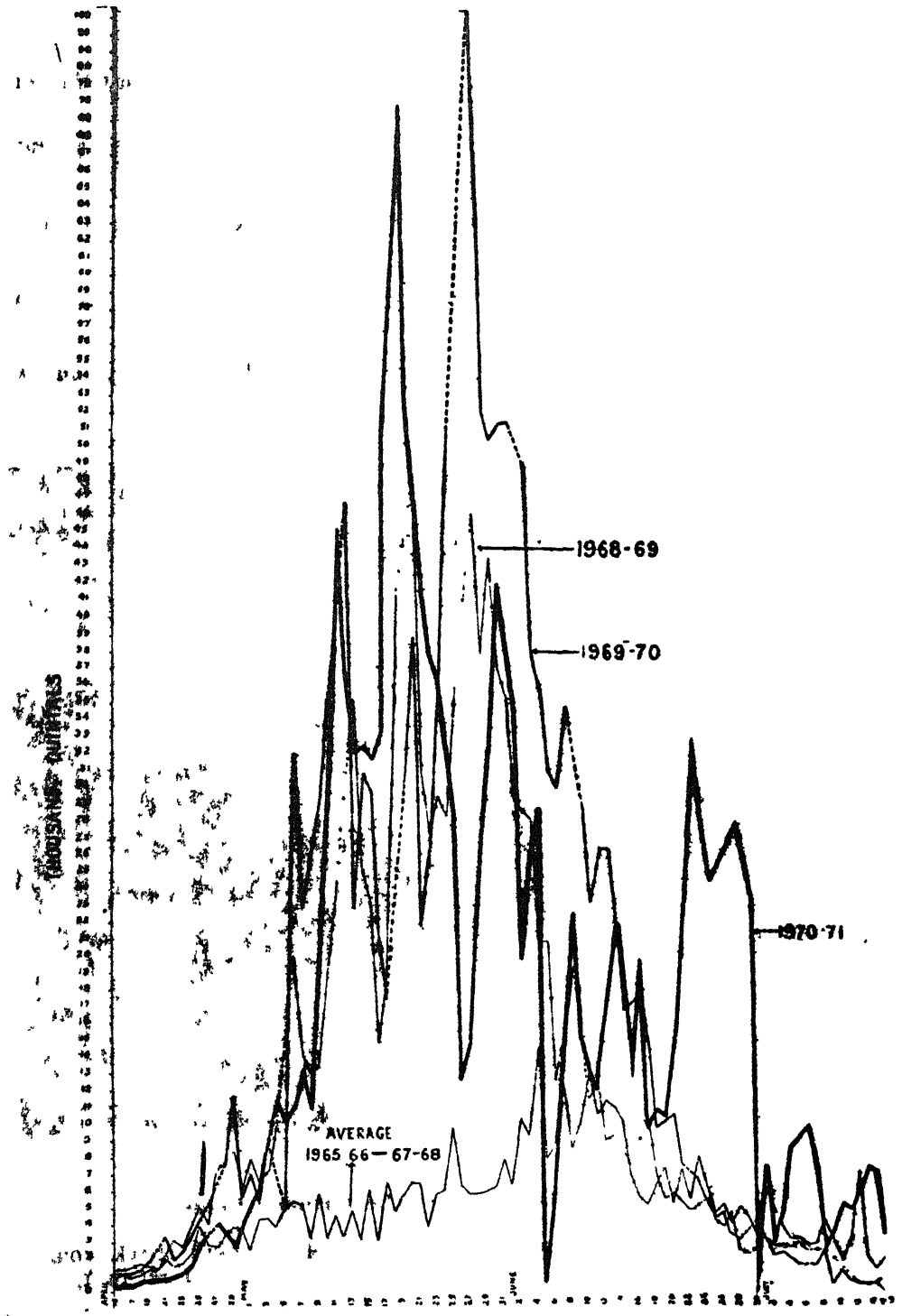

Fig. 1 Pattern of daily wheat arrivals in Khanna, Doraha and Ludhiana markets, Post-harvest period 1965-67 (average) through 1970-71.

Source: Gill, K.S. [11]

Table-3

Wheat arrivals in selected markets compared over post-harvest periods, Punjab, India, 1965-67 through 1970-71.

	Post Harvest Season						
	Average for 3 years 1965-66 to 1967-68	Arrivals in quintals			Percent increase over Column No. 1 during		
		1968-69	1969-70	1970-71	1968-69	69-70	70-71
Punjab							
Ludhiana	146912	270522	311490	315018	84	112	114
Khanna	255834	615044	860757	783460	140	236	206
Doraha	65597	164693	262361	260362	151	300	297
Mullanpur	51374	172812	290086	319191	236	465	521
Haryana							
Karnal	61696	161768	300044	431516	162	386	599
Taraori	21034	62727	94759	139206	198	351	562

Source: Gill, K. S. [11]

considerably reduced with a more rational pricing policy. The criteria of facility investment should, therefore, be to meet the needs of absolute peaks duly moderated with price and other policy instruments.*

The same criteria can be used for coastal marketing facilities. Here the volume of commodities has to be both imports as well as exports. There is much more opportunity for dovetailing the inflows and outflows on port handling and storage of commodities. Peaks can be more easily smoothed out. Inland capacities are in fact a good trade off for some of the coastal market facilities. Inland storage, transport capacity and market organization can relieve much of pressures on coastal facilities. However, the opposite trade off is not as feasible. Coastal facility investments are much more, and sometimes severely, circumscribed in their ability to relieve pressures on internal market facilities, especially in the situation of suddenly increasing domestic marketed surpluses. These possibilities, therefore, should be carefully looked into before making additional investments on coastal market facilities. For example, development of inland storage capacities and efficient road transport can be a considerably better alternative than development of huge storage facilities at seaports and railway terminals. Coastal facility investments, once made, become irretrievable; a change in domestic surpluses vis-a-vis import and export needs can render these facilities surplus, while serious bottlenecks may be occurring in the internal markets. This situation has been very markedly demonstrated in India, Pakistan, Brazil, Turkey and Philippines in the last 2-3 years.

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*It is therefore critical to know the response of the producer-seller to various price and other incentives with respect to the pattern of marketing of their produce in order to determine the optimum marketing facility investment needs.

The criterion of any net facility investment in coastal market during any time (ΔI_{c_t}) should therefore be:

$$\Delta I_{c_t} = \phi \left\{ \left(\sum_{j=1}^{n} \sum_{t=1}^{k} M_{jt} + \sum_{j=1}^{n} \sum_{c=1}^{k} X_{jt} \right) - \sum (\Delta I_t) \right\}$$

Here 'ϕ' is the coefficient of facility requirements per unit commodity volume; M_{jt} and X_{jt} are the imports and exports of jth commodity during period t; 'j' runs from 1 to n commodities and 't' runs from 1 to k seasons in the life period of the facility. Period 't' can vary from a week to a season of any duration depending upon the period of typical turn-over involved. $\sum$ indicates the trade-off coefficient between inland and coastal facility investments.*

In conclusion, the agricultural production growth of most of the developing countries has been so impressive in the last 3-4 years that it has very considerably decreased their dependence on imports especially of food grains. Very likely some important food deficit countries will be becoming surplus in the near future. This shift from heavy dependence on imports to fast-increasing internal surpluses is changing the bundle of market problems. Government regulations, control and operations in the market need to be, therefore, more carefully designed in view of the new situation and changing economic environment so that the domestic market becomes fully responsive to the production changes and at the same time keeps up the incentives for higher and better production. Government pricing of the agricultural products needs to be carefully structured

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*Coefficient ϕ is the technical coefficients and can be easily determined by the agricultural engineers. Coefficient $\sum$ is also a technical coefficient which can be determined by the engineers and economists jointly.

to reflect the general market demand and supplv conditions on the one side and not to be a disincentive to the producers' efforts on modernization of production on the other hand. Where public investment in market facilities becomes desirable, a rational criteria of balancing the capacities with peak needs moderated with other policy elements, needs to be followed so that a reasonable allocation is made for coastal as well as internal market facility investments. Investment in more flexible facilities may be more costly per unit of marketed commodity, vet, it needs to be weighed against the irretrievability costs of fixed investments under the constantly changing marketed quantities and their temporal as well as spatial flows and patterns.

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