



## AGRICULTURAL MARKETING IN INDIA

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# Report on the COLD STORAGE AND TRANSPORT OF PERISHABLE PRODUCE IN DELHI.

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## FOREWORD.

Perishable commodities show the greatest possible seasonal fluctuation in supply and prices. Adequate provision of facilities for the cold storage of such commodities, *e.g.*, fruits, vegetables, eggs, fish, meat, etc., forms an essential feature of a proper system of distribution, inasmuch as it ensures controlled marketing, rational distribution and the elimination of waste. The need for proper cold storage arrangements is particularly felt in tropical countries like India. The Royal Commission on Agriculture reported in the following terms :—

“ Cold storage is in other countries playing such a remarkable part in the marketing of goods, both for export and for internal consumption, with results so generally profitable to the private enterprise undertaking the arrangements as well as to the farmer that we do not doubt that sooner or later there will be a similar development in India.”

Following on the above report, the Imperial Council of Agricultural Research have, for the last few years, arranged for experiments being conducted at Poona, particularly with reference to fruits. A study has been made of the temperature and humidity conditions under which different fruits should be stored and of the commercial storage life of different varieties of fruit. Experiments in ‘ Gas ’ storage and experimental shipment of mangoes to other countries are included in the experimental programme.

The subject had also been receiving active consideration of the Army authorities in India and they have recently decided to embark on a comprehensive scheme which envisages opening of cold storage depots in several places, *viz.*, Wana, Manzai, Bannu, Razmak, Mari Indus, Kohat, Thal, Quetta, Peshawar, Nowshera, Rawalpindi, Sialkot, Ferozepore, Lahore, Jullundur, Multan and Ambala. It is expected that these depots would be available for use on the 1st April 1938. The capacity of these depots allows for considerable space for civil use also. It is also proposed to open similar depots at other places, *e.g.*, Meerut, Agra, Muttra, Bareilly, Cawnpore, Jhansi and Lucknow. It is intended that these depots should cater for the requirements of both military and commercial interests. It is also understood that a cold storage depot would be operating in Delhi before the end of 1937. Necessary arrangements in this behalf have been

contracted for, and a company—The Cold Storage Co., Ltd.—has been floated for the purpose. The company proposes, among other things, to demonstrate the possibilities arising from cold storage facilities by trading in cold storage commodities, so long as the installations are not fully utilised by the trade.

The Defence Department have also been experimenting with the question of refrigerated transport and have had three types of vans under examination for railway transport and two types for road transport. It is anticipated that information with regard to the former will be available for issue to interested parties before the end of this year (1937). For the latter (road transport) they have particularly visualised for their cold storage traffic, an insulated van free of all mechanical contrivances or other delicate equipment. Vehicles of this type should appeal strongly to civilian users, as two bodies could be built for one chassis, one body could be of the insulated type and the other of the normal load-carrying type, the bodies being changed according to seasonal traffic. At the conclusion of the 1937 experiments, the Army authorities would be prepared to place the results of the tests at the disposal of the interested parties.

A special officer was added temporarily to the staff of the Agricultural Marketing Adviser to study the working of cold stores, ice factories and distribution of perishable produce, etc. The present report is the result of a short investigation made recently in Delhi Province to study the existing methods of storage and transport of perishable agricultural produce. Seasonal supplies and prices are examined with a view to showing the economic possibilities of applying improved methods of cold storage on a more extensive scale to some of the more important commodities. Although the study is very limited in its scope it is hoped that it may be of assistance to those interested in the development of systematic cold storage in this country.

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## TABLE OF CONTENTS.

	Page.
Introduction .. .. .	v
Chapter I.—Storage .. .. .	1
A.—Existing methods .. .. .	1
(i) Fruits and vegetables .. .. .	1
(ii) Meat .. .. .	1
(iii) Fish .. .. .	1
(iv) Eggs .. .. .	2
(v) Milk and other dairy products .. .. .	2
B.—Cost and efficiency of the present methods .. .. .	2
(i) Fruits and vegetables .. .. .	3
(ii) Meat .. .. .	3
(iii) Fish .. .. .	3
(iv) Eggs .. .. .	4
(v) Milk and other dairy products .. .. .	5
C.—Commodity price fluctuations .. .. .	5
(i) Seasonal and monthly .. .. .	5
(ii) Weekly .. .. .	6
(iii) Daily .. .. .	6
Oranges .. .. .	6
Apples .. .. .	7
Grapes .. .. .	7
D.—Advantages of systematic cold storage .. .. .	7
(i) General .. .. .	7
(ii) Hypothetical profit on storage .. .. .	8
(iii) Quantities available for storage .. .. .	10
(a) Fish .. .. .	11
(b) Eggs .. .. .	11
(c) Cauliflowers .. .. .	11
(d) Potatoes .. .. .	11
(e) Tomatoes .. .. .	12
(f) Peaches .. .. .	12
(g) Loquats .. .. .	12
(h) Ghee .. .. .	12
(iv) Terminal tax .. .. .	12
(v) Cold storage requirements (hypothetical) .. .. .	13

	Page.
<b>Chapter II.—Transport</b> .. .. .	15
<b>A.—Types and methods</b> .. .. .	15
(i) By rail .. .. .	15
(a) Goods wagon .. .. .	15
(b) Insulated vans .. .. .	15
(ii) By road .. .. .	16
<b>B.—Cost and efficiency</b> .. .. .	16
(i) Rail .. .. .	16
(ii) Road .. .. .	18
<b>C.—Nature and extent of wastage</b> .. .. .	19
<b>D.—Possibility of development</b> .. .. .	19
<b>Chapter III.—Note on ice factories and refrigeration plants</b> .. .. .	21
<b>A.—Ice factories</b> .. .. .	21
(i) Wet ice .. .. .	21
(ii) Dry ice .. .. .	22
<b>B.—Small refrigerating appliances and cold storage rooms</b> .. .. .	22
<b>Summary</b> .. .. .	24

## APPENDICES.

I.—Average wholesale prices (1932—36) and approximate monthly quantities (arrivals 1934) of certain perishable products available in Delhi .. .. .	29
II.—Seasonal average (1932—36) prices per ton of some of the important perishable commodities .. .. .	30
III.—Daily wholesale prices of certain important fruits .. .. .	31
Oranges .. .. .	31
Apples .. .. .	32
Grapes .. .. .	33
IV.—Cold storage of perishables .. .. .	35
Fruits .. .. .	35
Vegetables .. .. .	37
Meat, fish, poultry, dairy products, etc. .. .. .	38
Miscellaneous .. .. .	40
V.—Table showing the hypothetical costs, and returns by storing in the cold storage some of the important perishables sold in the Delhi market .. .. .	41
VI.—Approximate quantities of certain perishable commodities in cold store at Delhi during different months (hypothetical) .. .. .	42

17 Diagrams.

8 Plates.

## INTRODUCTION.

Cold Storage in foreign countries has given such a stimulus to the trade in perishables that all those interested in Indian marketing cannot but be impressed with its importance. In other countries mechanical refrigeration both for storage and transport has helped the development of horticulture, fishing, poultry-keeping, dairying and the livestock industries so that fresh supplies are now distributed evenly and continuously all the year round.

A marked effect of cold storage on the marketing of fruit and vegetables, for example, lies not only in holding these products beyond their natural season, but also in widening the area of production. This is important from the producer's point of view, but what is perhaps of even greater importance is the effect of refrigeration in reducing wastage and in making the system of distribution generally more efficient. From the consumer's point of view the effects are equally advantageous since owing to the greater regularity of supplies the differences in price between seasons of heavy and light production are much reduced. There is no such thing as over-production of fruit in this country ; it is clearly a case of under-consumption. The question at present in India is not altogether how many maunds of fruit can be produced but how much can be picked and marketed profitably within a very limited marketing period. Fruits and vegetables show the greatest possible seasonal fluctuations in supply due to their perishable nature. Once they have reached the stage of maturity they can only be picked for sale, or stored. Adequate cold storage facilities not being available the merchants are in the main forced to sell such produce immediately at any price they can realise.

We are all aware of the vital necessity for the people of this country to have at their disposal a wide range of wholesome protective foodstuffs, among the most important of which are fruits, vegetables, dairy produce, fish and other perishables. The provision of cold storage and refrigerated transport makes these commodities safe for the trade to handle, and gives the consumer a wider range of diet throughout the year and better value for his money.

Delhi province with an urban population of 4,47,442 according to the 1931 census, is an important consuming centre for fruits, vegetables, meat, eggs, fish, milk, and other perishable products. Further, a large proportion of the fruits imported into Delhi are redistributed to surrounding provinces and States such as the Punjab,

the United Provinces, Alwar, Gwalior, Bikaner, etc. It is estimated that about 11,000 tons of fruit are available for consumption annually in the Delhi province and more than 9,000 tons are redistributed. In regard to other perishables, it may be observed that the trade in vegetables such as potato, cauliflower, cabbage, tomato, etc., amounts to approximately 10,000 tons per annum. The fluid milk supply to Delhi City, New Delhi and suburbs equals nearly 25,000 tons annually. The meat and fish consumption of the urban districts exceeds 10,000 tons per year. Similarly large quantities of dairy products such as *ghee*, butter, etc. (4,000 tons), eggs (150 tons) and other provisions (200 tons) are annually consumed. The population of Delhi has been increasing in recent years and the local consumption as well as the trade in the distribution of perishable products is on the increase.



## CHAPTER I.—STORAGE.

### A.—Existing Methods.

In spite of the huge volume of trade no systematic storage of perishables is practised by merchants in Delhi to any appreciable extent and the majority of the commission agents and wholesale and retail merchants seem ignorant of the possible benefits of cold storage.

#### (i) FRUITS AND VEGETABLES.

So far as fruits and vegetables are concerned, the commission agent generally aims at disposing of all the consignments as quickly as possible but he has to store some packages if they remain unsold on the day of arrival. For this purpose he uses his godown which consists generally of a dark, ill-ventilated room and the adjoining verandah. (*See* plates facing page 3). Unsold packages are stacked in the godown in the evening and taken out next morning for sale. If the market is dull, the agent stores the packages for a day or two more. No cool storage is available for this purpose.

The fruit and vegetable merchant purchases his daily requirements early in the morning and tries to sell as much of his purchase as possible during the course of the day. The quantity left over in the evening is kept in the shop in ordinary baskets and taken out next morning for sale.

#### (ii) MEAT.

Meat from the slaughter-house is carried in ordinary open carts or tongas with all risks of contamination, etc., to the market where the butchers try to dispose of the supplies as quickly as possible on the same day. In the ordinary course of events the surplus remaining with the butchers at the end of the day is very small, probably less than one per cent. of the total daily supply. In the butchers' stalls, meat is often kept in an unprotected condition and is liable to be contaminated by flies, germs, etc. Two of the butchers keep their daily surplus meat in ice during summer months, but in the case of others, the surplus meat is stored by keeping it hanging in the stalls or by placing it in a wire gauze cupboard. The meat thus stored overnight is offered at reduced rates next morning as stale meat. Imported meat like pork, bacon and ham is stored by the provision merchants in refrigerators, but the trade in these is small and limited mostly to winter months.

#### (iii) FISH.

In the case of fish, however, the practice of ice storage is followed to a great extent. During the hot summer months, if a commission agent receives a quantity of fish by evening, he stores it in an ordinary wooden box with no special lining or insulation along with crushed ice, and takes the fish out next morning for auction. In winter months, however, fish is left overnight without any ice.

The retail fish merchant also keeps his supply under ice, particularly during the hot months. He uses a wooden cabinet or a small cement tank, with a wooden cover with galvanised sheet lining, in which he stores his fish with small lumps of ice. In the Gol Market, New Delhi, the fish shops have been equipped with this type of cement tanks for the storage of fish. (See plates on opposite page). There are some merchants in Delhi who keep a freezing cabinet run by a small refrigerating plant installed in their shops. They store and freeze the fish in the cabinet for supplying to customers in a frozen condition.

#### (iv) EGGS.

During winter egg merchants keep larger stocks of eggs than in summer, the ratio being 10 to 1. There is, however, no special place or method of storage, and eggs are stored in ordinary baskets and covered with gunny cloth. In summer the merchants try to keep their stocks as low as possible and the baskets are kept cool by keeping leaves of *Nim* or Margosa tree (*Melia Azadirachta*) along with the eggs and by wetting the gunny cloth which is put over the baskets.

In large hotels eggs are stored in refrigerators during summer months. The method is also followed by private persons possessing refrigerating appliances.

#### (v) MILK AND OTHER DAIRY PRODUCTS.

So far as milk is concerned, fresh supplies are available daily throughout the year and hence storage for long periods is not necessary. The distributors of milk store the fluid milk either in cans or bottles prior to delivery which takes place in a few hours. The *halwais* use shallow iron pans in which they boil and keep their milk till sold to the consumers or utilised in the preparation of sweetmeats.

Locally made butter is usually stored with ice or in refrigerators, the former being more common. The storage period varies from a few hours to about a couple of days. Long period storage is not practised as fresh supplies are available daily. Tinned butter and other milk products such as milk powder, Glaxo, Ovaltine, etc., which are imported are stored in the provision stores in a cool place, while cheese is generally kept in a refrigerator, particularly during hot days. *Ghee* is stored in sealed tins kept under ordinary storage conditions in a cool place. Ice cream is generally manufactured in ice cream pots using ice with salt, and storage is done in the pot itself until served. In large hotels ice cream is stored in a receptacle and kept in a refrigerator. It is understood that the storage period hardly exceeds a day.

#### B.—Cost and efficiency of the present methods.

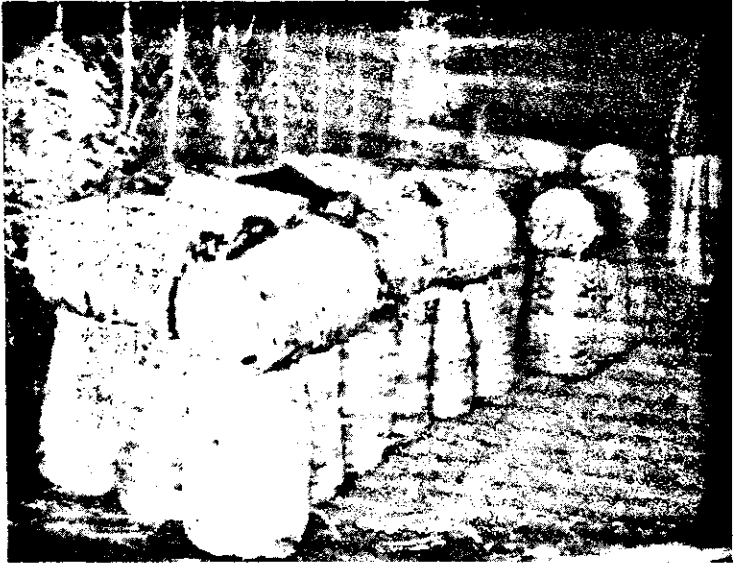
The monthly available supplies and approximate average prices of the different kinds of fruits, vegetables, fish, eggs, etc., are given in Appendix I. It will be observed that there are violent fluctuations in the seasonal supply of perishables and that wide variations in prices prevail in the case of almost every one of the important perishables. In the season of high supplies prices are low but rapidly



A fish merchant's shop in Gol Market, New Delhi.



Cement tank for the storage of fish.



A fruit godown in Subzimandi.



Arrangement of packages in a godown.

rise beyond the reach of the average consumer in scarcity months. Instances can be seen where the prices of certain perishables in time of scarcity rise incredibly high—as much as 3 to 5 times the prices in the height of season.

Many of the important fruits are received in Delhi from distant areas, such as Bengal, Bombay and Madras Presidencies, the Central Provinces, the United Provinces, Kashmir and Baluchistan. The time taken for their transport is usually one to three days and a large proportion of fruits often becomes soft and rather over-ripe, specially in summer, before they arrive in Delhi. The commission agents aim at disposing of such fruits as quickly as possible after arrival in order to avoid further possible losses due to the fruits becoming over-ripe and unmarketable. The surplus, after the local demand has been satisfied, is also immediately re-exported—regardless of the marketing conditions at the destination of exported fruit. This reduces the general price level of the perishables to the detriment of the producer.

#### (i) FRUITS AND VEGETABLES.

No special methods are used for storing fruits and vegetables. The living room of the commission agent is frequently used for storage and all other purposes such as retiring, effecting transactions, distributing wages, etc., and no special expense is incurred for storage. The commission agent does not charge anything to the consignor for the storage of his packages.

Storage is often done in an ordinary ill-ventilated godown which may be infested with rats, ants, etc. No attempt is made to improve the storage conditions and there is hardly any possibility of minimising the deterioration of stored perishables in such a type of godown. It is reported that potatoes stored in such godowns often suffer a loss in weight of as much as 20 per cent. during two months of storage.

#### (ii) MEAT.

The majority of merchants store their surplus meat in their own shops and hence there is no extra cost on account of storage as such. The two butchers who keep their daily surplus meat in ice during summer months incur extra expenditure only on ice, the rate of which is 6 to 8 annas per maund from August to April and 14 annas to one rupee from May to July. The quantity of ice used is generally equal to the weight of meat stored.

The existing methods of storing meat are obviously far from satisfactory from the point of view of public health and sanitation ; but since the quantity required to be stored by the merchants forms only a small fraction of the total daily supplies, they do not consider any improvement in the existing method to be necessary, so far as storage alone is concerned.

#### (iii) FISH.

The fish merchants keep their supplies in ice storage. For this purpose, they use a container in which they keep fish along with crushed ice. (*See plate facing page 15*). The cost of storage is the

cost of ice and the depreciation of the container. The latter is almost negligible and the ice is purchased at rates already given above. The merchants usually require an equal weight of ice per day for storing fish in winter and double the weight of the fish in summer.

This type of refrigeration obviously cannot freeze the fish but only keeps it in a chilled condition. It fairly serves its purpose, however, when the storage period is limited to a few days and the method is cheap and easily applicable. The demand for frozen fish is, however, growing in Delhi and some merchants have installed a refrigerating plant in their shops for this purpose. The demand for this is higher in winter when Government officials and their families are quartered in Delhi. The output, costs and charges of a freezing equipment installed by a local merchant are stated to be as follows :—

Cost of equipment	..	Rs. 2,000.
Daily capacity	..	160 lbs. of fish freezing at 1½° F.

The total costs per winter month are calculated as follows :—

			Rs. a. p.
Operating cost (average)	..	..	35 0 0
Depreciation at 10 per cent. per annum (distributed over 6 winter months)	..	..	33 5 0
Interest at 6 per cent. per annum (distributed over 6 winter months)	..	..	20 0 0
Repairs and other contingencies	..	..	10 0 0
		Total	98 5 0

The average daily output in winter is 100 lbs. of frozen fish and the cost of freezing comes to approximately a little over half an anna per lb. (or Rs. 70 per ton\*).

The extra price realised by the sale of frozen fish (approximately 2 annas per lb.) more than justifies the installation of such an equipment.

#### (iv) Eggs.

The methods of storage adopted by merchants do not require any special equipment or material and as such there is no extra cost or charge for storage.

\*NOTE.—(1) The above calculations do not allow for the rent of the extra floor area occupied by the freezing plant.

(2) The plant remains practically idle during summer months as the demand for frozen fish is then almost negligible in New Delhi owing to the move of the Government of India offices to Simla and the availability of cheap supplies of river fish during this period. It is, however, possible to use the plant with slight modifications during summer months for other purposes like the storage of ice creams.

# DIAGRAM N<sup>o</sup> 1.

COMMODITY.....ORANGE.

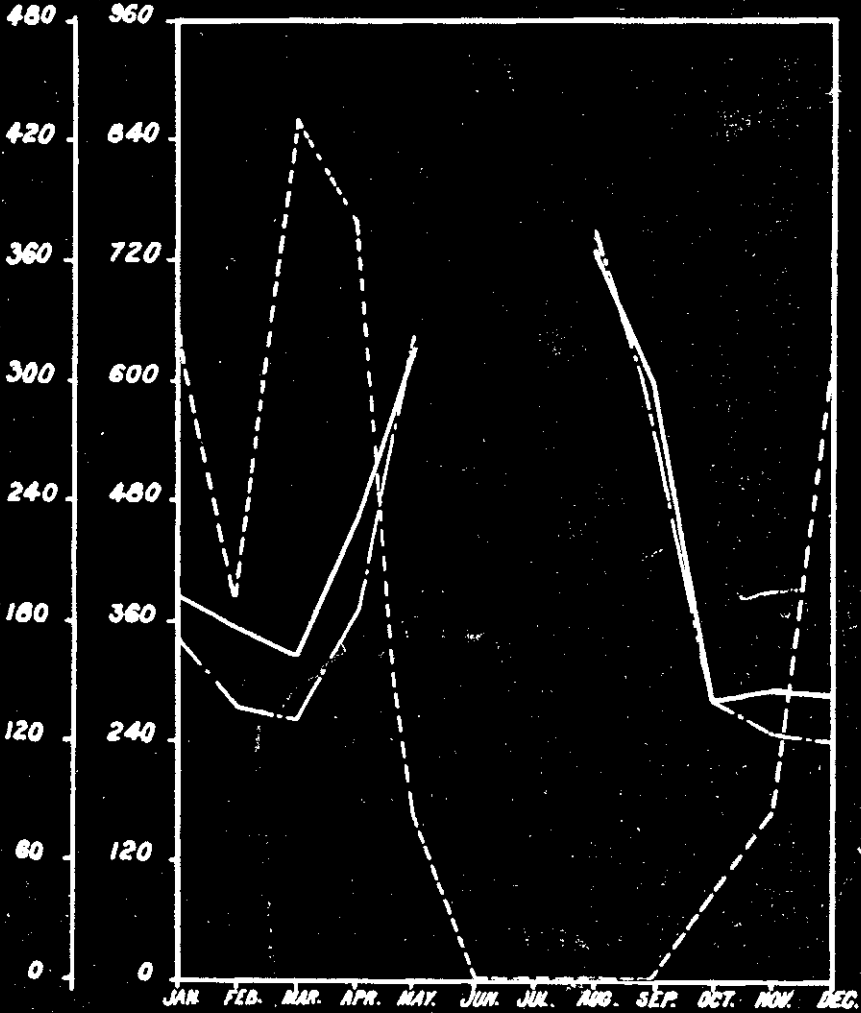
QUANTITY. -----

PRICE 1<sup>st</sup> QUALITY. \_\_\_\_\_

" 2<sup>nd</sup> " \_\_\_\_\_

PRICE PER TON.  
(IN Rs)

QUANTITY  
(IN TONS)



[Vide Appendix I.]

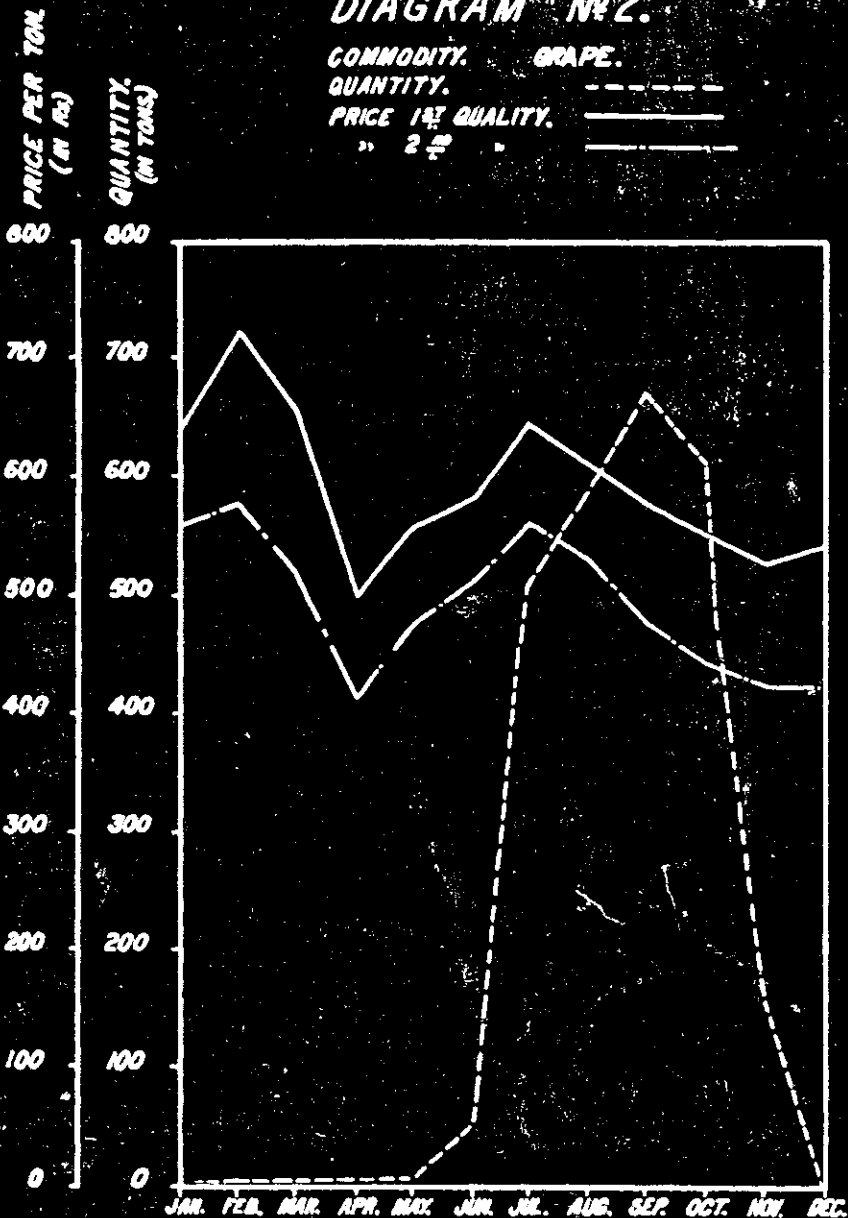
## DIAGRAM NO. 2.

COMMODITY. GRAPE.

QUANTITY. -----

PRICE 1<sup>st</sup> QUALITY. \_\_\_\_\_

" 2<sup>nd</sup> " \_\_\_\_\_





During the cold season, these methods are found to be fairly satisfactory, as no merchant normally keeps his stock for more than a week or 10 days. In the summer months, however, there is a huge wastage due to the eggs becoming stale. Instances are common where this is as high as 50 per cent. Due to this and also to the fact that the consumers' demand for eggs during summer months is at its minimum, the egg merchants' stocks are at their lowest during this period.

(v) MILK AND OTHER DAIRY PRODUCTS.

The question of storage is not important so far as the trade in fluid milk is concerned. In the case of locally made butter, the existing methods are fairly satisfactory since fresh supplies are available daily. The trade in tinned butter and other dairy products is largely confined to the winter months of the year, and in this case too the existing methods are considered fairly satisfactory by traders.

**C.—Commodity price fluctuations.**

Under existing conditions of storage and distribution it is not possible to control the quantities and prices of the various perishables in and out of season. Generally speaking, prices are low in the season of high supplies but soon become prohibitive for the average consumer in time of scarcity. Seasonal and daily price fluctuations are a common feature with the majority of perishables in Delhi and one of the main causes apparently is the absence of systematic cold storage.

(i) SEASONAL AND MONTHLY.

The various diagrams included in this report indicate the extent of monthly variations in prices in the case of important perishables. In the case of oranges, for instance, the months of high supplies are from October to May and during this period the average price realised for first and second qualities comes to about Rs. 177 per ton. The months of low supplies are from June to September when the prices for first and second qualities range from about Rs. 300 to Rs. 375 per ton. Appendix II indicates the extent of seasonal price fluctuations for the important perishables (*See also* Diagrams Nos. 1 to 16). From these it may be seen that in every month of the year—except perhaps May and June—the supply of one perishable commodity or another is at its height and that a serious depression in prices almost invariably coincides with the peak of supplies. For example, in the full season July-October, the average price of first and second quality grapes is about Rs. 550 per ton, but in February the price rises to over Rs. 650 per ton. The average price of first quality apples is as low as Rs. 480 per ton in the height of the season, September-January, but rises to as much as Rs. 630 later. Tomatoes in full supply from December to February are only worth Rs. 120 to Rs. 175 per ton but later command Rs. 300 to Rs. 400. These are only a few of the available examples.

## (ii) WEEKLY.

Apart from the monthly price fluctuations, however, weekly and even daily price variations are a common feature, particularly in fruits and vegetables. The following few price quotations secured from the books of a leading wholesale fruit merchant in Delhi, illustrate the extent of weekly price variations in the case of oranges and apples.

Months and weeks.	Prices.	
	Oranges. (1st quality.)	Apples. (1st quality.)
	(per 100). Rs. a. p.	(per 5 seers). Rs. a. p.
January 1934—		
1st week .. .. .	3 12 0	2 14 0
2nd ,, .. .. .	3 10 0	1 14 0
3rd ,, .. .. .	2 10 0	1 11 0
4th ,, .. .. .	2 8 0	1 4 0
May 1934—		
1st week .. .. .	5 15 0	4 8 0
2nd ,, .. .. .	3 12 0	3 8 0
3rd ,, .. .. .	4 6 0	4 8 0
December 1934—		
1st week .. .. .	2 3 0	2 4 0
2nd ,, .. .. .	3 2 0	3 8 0
3rd ,, .. .. .	2 12 0	3 12 0
4th ,, .. .. .	3 0 0	2 12 0

## (iii) DAILY.

Appendix III gives figures indicating the extent of variations in daily wholesale prices of a few of the important perishables. It will be observed that the fluctuations in the daily prices of these perishables are very irregular.

*Oranges.*—The price of oranges, for example, during April 1936, was Rs. 3-10-0 per 100 on the 6th, the next day Rs. 3-5-0 and the day following Rs. 3-2-0 followed by a drop to Rs. 3-0-0 and rise to Rs. 3-8-0 again in the next two days. Frequent daily fluctuations of 8 annas per 100 or about Rs. 35 per ton are a serious matter. The risk of such large variations causes the margin of distribution costs to be higher than need be, to the detriment of both producer and consumer.

Other examples are as follows :—

*Apples.*—The fluctuations in the price of apples also show a marked difference. In January 1936, on the 12th the price per 5 seers was Rs. 1-12-0. Next day it dropped to Rs. 1-9-0, rising to Rs. 1-14-0 the day after. In February, the price was Rs. 2-8-0 on the 5th and 7th followed by a drop to Rs. 2-5-0 on the 6th and 8th. The fluctuation is still more marked in August. On the 5th the price was Rs. 2-3-0, followed by a sharp drop to Rs. 1-14-0 on the 6th and a rise to Rs. 2 the following day. There was again a drop to Rs. 1-14-0 on the 8th and Rs. 1-11-0 on the 9th.

*Grapes.*—The price of grapes also shows curious variations. On 28th July the price was Rs. 2-12-0 per 5 seers, which dropped to Rs. 2-8-0 the next day, followed by a rise again to Rs. 2-12-0 the day after.

As well, as the day to day variations in price, there is also under existing conditions, a certain amount of variation in prices of fruits and vegetables during the course of sale on any particular day. The fruit merchant ordinarily sells about 70 per cent. of his stock during the day in winter and about 85 per cent. to 90 per cent. in summer. To accelerate sale he has often to reduce the prices of his supplies by about 15 per cent. to 25 per cent. by the end of the day in summer in order to avoid further losses by deterioration of fruits before the next day. He seldom does so, however, in winter months when his supplies mainly remain in a good condition for a longer period.

With the vegetable dealer nearly 30 per cent. to 40 per cent. of his daily stock sometimes remains unsold during a day in winter and 20 per cent. to 25 per cent. in summer. About 10 per cent. to 15 per cent. of his daily stock in summer becomes stale and unmarketable but no such wastage is reported in winter months. He is, therefore, compelled to reduce the prices considerably in summer to effect quick sale of his supplies. It is reported that the prices of some vegetables, (*e.g.*, tomatoes) often decrease by 25 per cent. to 30 per cent. in evening time as compared to the prices in the morning hours of the same day. In summer the decrease in prices is often as high as 50 per cent.

#### **D.—Advantages of systematic cold storage.**

##### *(i)* GENERAL.

In view of the foregoing facts, it seems possible that improved methods of storage can be successfully adopted in Delhi in the interest of both the consumer and producer. Systematic storage would even out the seasonal and daily supplies of perishables, control the prices, and enable the consumer to obtain a wider range of produce both in season and out of season at a price within his reach. It would also minimise the loss due to over-ripening and deterioration of the perishables which results in the course of their disposal in present circumstances. If the goods are in proper condition when put into

store there is very little risk of deterioration of quality under modern improved methods of storage, and it is possible to sell or export the stored produce when the market conditions are most favourable.

It should apparently be possible for growers or merchants, instead of selling their produce at reduced prices, to store the surplus quantities of perishables in the specially constructed chambers of a cold storage depot in the full season, and take them out for sale in time of scarcity when prices are at a higher level. When perishables are kept under controlled storage conditions as regards temperature, humidity, gas contents of the atmosphere, etc., their edible life is much longer than if kept under ordinary atmospheric conditions. It is, however, necessary that the products should be in first class condition at the time of storing, so that they can remain firm and marketable after removal from the stores, with the minimum of deterioration.

At present, knowledge regarding the response of Indian fruits and other perishables to cold storage conditions is not so full as could be wished. The cold storage experimental plant at Poona is doing valuable experiments on a few fruits and seed potatoes. The information available from the experiments in Poona and also the optimum storage treatment and approximate period of storage of several perishables as studied in America and Europe are given in Appendix IV.

#### (ii) HYPOTHETICAL PROFIT ON STORAGE.

Owing to the fact that systematic storage is not practised in Delhi on a commercial scale, it is not possible to give actual examples of profits arising out of storage, and only hypothetical results can be given at this stage. It should be possible to realise extra profits by storing perishables in the full season and marketing the same in scarcity months at higher prices, if the cost of storage and the losses due to wastage in storage are less than the extra price realised. The costs and losses vary with each perishable commodity depending upon the optimum storage treatment and the keeping quality of the perishable. It is anticipated that in a modern cold store fitted with the latest type of equipment to control the various conditions of storage, the losses due to deterioration would be at a minimum. When the costs and losses are low the stored products can often be profitably marketed at rates much lower than those which usually prevail during scarcity months. This would provide a profit on storage and at the same time enable the consumer to purchase perishables at the reduced rates and consequently the volume of demand in scarcity time would increase.

Certain important perishables consumed in and exported from Delhi may be considered. The factors (excluding the costs of storage or hire of storage accommodation) taken into account when estimating the hypothetical profits may be explained by taking the case of one perishable, *viz.*, orange.

Basing calculations on the average of prices of oranges obtained during the last five years, it has been found that in March and April

the Nagpur oranges sell in the Delhi Markets at Rs. 164 and Rs. 230 per ton for the first quality, and Rs. 131 and Rs. 183 per ton for the second quality respectively.

The five years' averages of the highest scarcity prices for the first and second quality in the same market were Rs. 366\* and Rs. 376\* per ton respectively during the month of August. It may therefore be possible to store with advantage, say 320 tons, *i.e.*, a fifth of the imports of March—862 tons, and of April—760 tons, and release the same for sale in the subsequent months. The following particulars indicate the extent to which such storage may prove to be a profitable proposition.

*Particulars.*

- (1) Quantity stored. 320 tons.
- (2) Average purchase price per ton. Rs. 177.
- (3) Cost of purchase. Rs. 56,640.
- (4) Interest at 6 per cent. p. a. for 3 months on total purchase price. Rs. 850.
- (5) Total cost (excluding cost of storage). Rs. 57,490.
- (6) Maximum loss† during storage (10 per cent.) 32 tons.
- (7) Quantity available for sale. 288 tons.
- (8) Average selling price in scarcity season per ton. Rs. 371.
- (9) Total realisations. Rs. 1,06,848.
- (10) Total balance available. Rs. 49,358.
- (11) Balance available per ton. Rs. 154.

There is thus a balance of Rs. 154 per ton of stored oranges, which, it is considered, should leave a substantial margin of net profit to the person putting the produce in cold storage after paying the charges in connection with the hire of cold store and other incidental expenses.

On a similar basis and taking into consideration the prices of first and second quality products (*vide* Appendix I), the costs and returns have been calculated in the case of a few important perishables and the results tabulated, *vide* Appendix V. From this it will be seen

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\*NOTE.—It is rather surprising to find prices for the second quality to be higher than those for the first quality. It is therefore necessary to observe that oranges sell by count (*i.e.*, in hundreds) and not by weight. Actual weights of 100 oranges of the first and second quality were taken and prices per ton were then calculated.

†The storage experiments in Poona indicate that oranges can be kept in cold store for a period of three months with less than 10 per cent. wastage.

that allowing for interest and wastage during storage there would be a net balance of over a lakh of rupees on five commodities alone, *viz.*, oranges, grapes, apples, mangoes, and potatoes. Considering the possibility of storing other products, such as peaches, plums, cabbages, cauliflowers, peas, tomatoes, fish, meat, poultry and game the total profit that might accrue would evidently amount to a considerable sum in the course of a year.

The following summarised statement prepared from Appendix V shows the costs and hypothetical returns on oranges, grapes, apples, mangoes and potatoes respectively.

Name of commodity.	Period of storage (months)	Costs and hypothetical returns per ton.				
		Costs.			Selling price.	Balance.
		Purchase price.	Charges due to interest and wastage.	Total.		
Rs.	Rs.	Rs.	Rs.	Rs.		
Oranges ..	3	177	40	217	371	154
Grapes ..	4	498	75	573	652	79
Apples ..	4	465	72	537	630	93
Mangoes ..	1	224	35	259	338	79
Potatoes ..	5	75	22	97	200	103

These calculations consider only some of the important commodities and are based on existing price differentials. When storage facilities are available on suitable terms, they might be applied with profit to several other perishables if the price differentials justify their storage. The calculation takes no account of any profit which might arise from the fact that merchants who deal in highly perishable commodities may avail themselves of the preservation facilities by storing their supplies for a few days when the market is dull and selling them when the market is favourable.

The costs of storage have also been left out of consideration because in ordinary commercial practice charges vary according to the nature of the commodity. It seems clear from the foregoing calculations that this practice is justified since some commodities cannot carry as high charges as others.

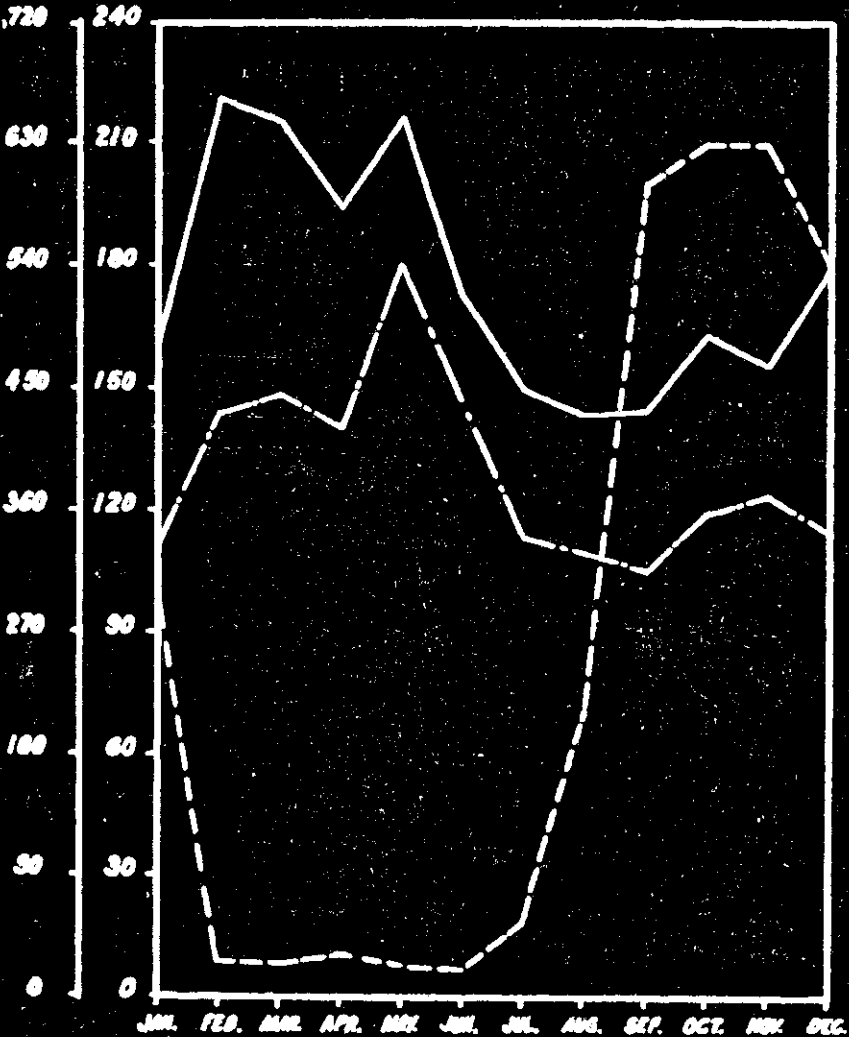
### (iii) QUANTITIES AVAILABLE FOR STORAGE.

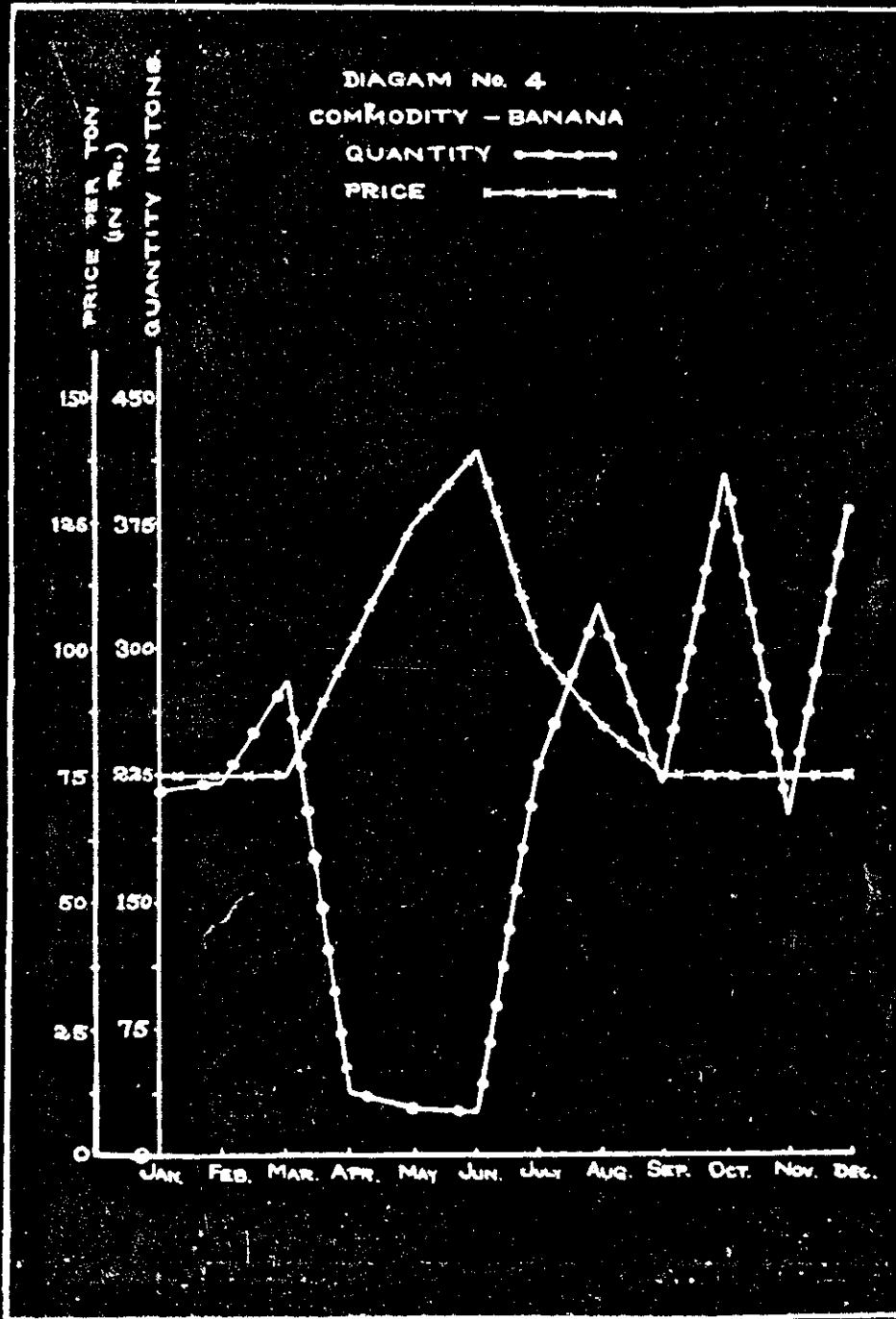
The monthly quantities of various perishables available for sale or distribution in Delhi and their average prices are given in Appendix I. This serves as a guide to the possibility of developing organised cold storage.

†The storage costs would be defrayed from the balance and the remainder would represent profit on the transaction.

### DIAGRAM № 3

COMMODITY.           APPLE.  
 QUANTITY.           -----  
 PRICE 1st QUALITY.   -----  
 " 2nd                 . . . . .







(a) *Fish*.—Apart from a small quantity imported from sea-ports, all the Delhi supply is river fish. Trade in sea fish would, however, rapidly increase, especially in winter months, if storage facilities were available. Since there is a great variety of sea fish and it is considered better in quality, it is expected that there would be a good demand for it. It is roughly estimated that about 20 tons of sea fish and about 50 tons of river fish would be consumed monthly in winter if supplies were available at moderate rates. All the winter supply can possibly be imported from ports, such as, Bombay, Karachi, etc. in October when the price of sea fish is generally at a low level. Taking the case of pomfret, for instance, it is understood that they can be had in Bombay at about Rs. 500 per ton whilst the average retail price in Delhi is Rs. 0-12-0 per seer or Rs. 840 per ton. With suitable refrigerated transport available, there seems a reasonable possibility that Delhi would act as a centre for the re-distribution of fish in summer months to the surrounding hill stations, such as Simla, Mussoorie and Naini Tal. All the supply should be preferably frozen and imports and exports done under refrigerated condition.

(b) *Eggs*.—The storage of eggs is a more difficult problem than that of fish owing to the difficulty of ensuring a supply of really fresh eggs. Storage can hardly be a successful commercial proposition unless the supply of eggs is in a fresh condition as well as in large quantity. Egg grading and packing stations on the lines of those already operating in the North-West Frontier Province and Travancore should make it possible to provide a large number of tested and guaranteed fresh eggs which are capable of being put in cold store till market conditions improve.

(c) *Cauliflowers*.—It is estimated that about 270 tons of cauliflowers are imported in January at an average price of Rs. 48 per ton. The price rises to Rs. 125 per ton in April when the supply is almost *nil* (see Appendix I, Diagram No. 12). It would seem profitable, therefore, to store cauliflowers in the second fortnight of January for sale in April.

(d) *Potatoes*.—The storage of potatoes for local consumption may not be a commercial proposition since supplies increase in response to an increased demand during the winter and the present price differential (see Appendix I, Diagram No. 5) is probably largely due to differences in quality of potatoes from different areas available in the Delhi market. The potatoes from the Simla hills, for instance, always sell at a higher price than the Meerut potatoes. It seems advisable to store potatoes for seed purposes. It is stated that at present potatoes are imported for seed purposes for which the growers at Meerut pay about Rs. 200 per ton. If, however, they store their tubers in a cold store for seed purposes, there would be a substantial saving on this account as can be seen from the summarised statement of Appendix V given on page 10.

Experiments carried out by the Malir Co-operative Society, Karachi, indicate that the stored potatoes do not lose their germinating power after months of storage. On the other hand, during the

storage period, the eye-buds become well developed, and experiments show that it requires only 6 to 6½ maunds of the stored tubers per acre, whereas from 14 to 18 maunds of fresh tubers are necessary for planting. Apart from any profit due to storage, therefore, there would be an additional advantage in the fact that less seed would be required per acre. It may be observed also that in the course of ordinary storage much loss of weight and damage occurs through bacterial and fungoid diseases and the ravages of the potato moth which might possibly be eliminated by cold storage.

(e) *Tomatoes*.—The supply of tomatoes in February approximates 65 tons at about Rs. 174 per ton. The price rises to nearly Rs. 280 per ton in the next month (Appendix I, Diagram No. 14) and hence it seems that tomatoes can be profitably stored in February for sale in March at higher prices.

(f) *Peaches*.—(Appendix I, Diagram No. 9). In July about 100 tons of peaches locally produced and about 30 tons imported are available in the market. About a third of the supply might apparently be profitably stored and sold in August and September when higher prices are the rule.

(g) *Loquats*.—(Appendix I, Diagram No. 10). Loquat is a delicate fruit much relished by the people of Delhi and the neighbouring provinces. Locally produced supply in April and May is nearly 200 tons, out of which probably a third could be stored for sale in scarcity time. No experimental data are, however, available regarding its keeping quality.

(h) *Ghee*.—In the months of June, July and August as much as 750 tons of *ghee* is imported. Due to external high temperature, *ghee* is partly liquified and often runs to waste due to leaking tins. It is possible that merchants might avail themselves of cold storage facilities to store good quality *ghee* (estimated to be 10 per cent. of the total imports) in summer, which would prevent wastage and maintain quality.

#### (iv) TERMINAL TAX.

Delhi is ideally situated as an important re-distributing centre for commodities such as tobacco products, condensed milk, baby foods, other provisions, etc., and the distributors may be expected to avail themselves of the storage facilities in Delhi. Unfortunately the incidence of Municipal terminal tax (Octroi) has to be taken into account in some cases—fortunately not as yet for fruit—and distributors would, therefore, have to enquire regarding the position in certain cases. The terminal tax per maund of gross weight on certain perishables at present is as follows :—

	Rs. a. p.
<i>Ghee</i> , butter and cream .. .. .	1 8 0
Tobacco (foreign cigars, cigarettes, cheroots, etc.)	0 8 0
Tobacco (Indian) .. .. .	0 2 0
Fresh meat, fish and eggs .. .. .	0 2 0
Wet ice .. .. .	0 0 6

As terminal tax is intended to fall on produce actually consumed in the City, it would appear that imported produce entering a cold storage depot in Delhi and subsequently re-consigned direct for consumption elsewhere should be exempt from the tax or any tax paid should be refunded. This would, however, be a matter for negotiation with the Municipality.

(v) COLD STORAGE REQUIREMENTS (HYPOTHETICAL).

Based on the estimated figures in the preceding section, the total quantities of a few of the important perishables which might profitably be preserved in cold storage at Delhi in different months are given in Appendix VI.

These figures only approximate the aggregate probable demand in relation to only five of the important perishables, and do not represent the sum total of all kinds of perishable products.

Taking the figures for what they are worth, the possible paying load in different months, working on a basis of 450 tons storage capacity, is approximately :

100 per cent.	for 2 months,
95 per cent.	for 2 months,
87 per cent.	for 1 month,
84 per cent.	for 1 month,
55 per cent.	for 1 month,
49 per cent.	for 1 month,
40 per cent.	for 1 month,
24 per cent.	for 1 month,
16 per cent.	for 1 month,
13 per cent.	for 1 month,

or an average of 63 per cent. per month.

It may be noted in regard to cold storage that it can hardly be a commercial proposition unless there is a high percentage of paying load throughout the year. Appendix I and Diagram No. 17 show that in every month of the year, apart possibly from May and June, the seasonal supplies of one vegetable or another in Delhi are at their peak. It would probably be safer, however, to provide a smaller cold store (with provision for extension) and run it on a higher proportion of paying load than risk a capital expenditure on a bigger store in anticipation of a full demand.

The above calculations are unfortunately theoretical although they are based on facts of supplies and prices as they actually are. Information as to costs, charges and returns if supplied by actual experiments would be appreciated by producers and merchants much more than mere theoretical calculations.

The success of any scheme of this kind is essentially dependent upon the management having full knowledge and experience of cold storage business. When the matter was discussed with some of the leading commission agents and wholesale merchants in Delhi, it was

found that they would co-operate in regulating the market by the use of cold storage, provided there were a reasonable guarantee that the stored products would remain in much the same condition as they were prior to storage. In their view the cold storage facilities should be provided near the Subzi Mandi which is the wholesale market for fruits and vegetables. There seems, however, little possibility of their combining together to take the initiative themselves, raise capital and have their own storage facilities as has been done in Hyderabad (Deccan) by a few wholesale merchants. They would apparently welcome a cold storage company offering them storage facilities on suitable commercial terms.

The main purpose of this survey is to indicate the possibilities of a cold storage depot in Delhi—to inform those dealing in perishables what the sources, seasons of supply and prices of different commodities are, when they can be stored and for how long. It is naturally difficult to foresee how the establishment of a cold storage depot in Delhi would affect the supplies and prices, and how far the latter would contribute towards the expansion of trade in perishables on the one hand, and to popularising cold storage on the other. Calculations of profit must therefore necessarily remain hypothetical.

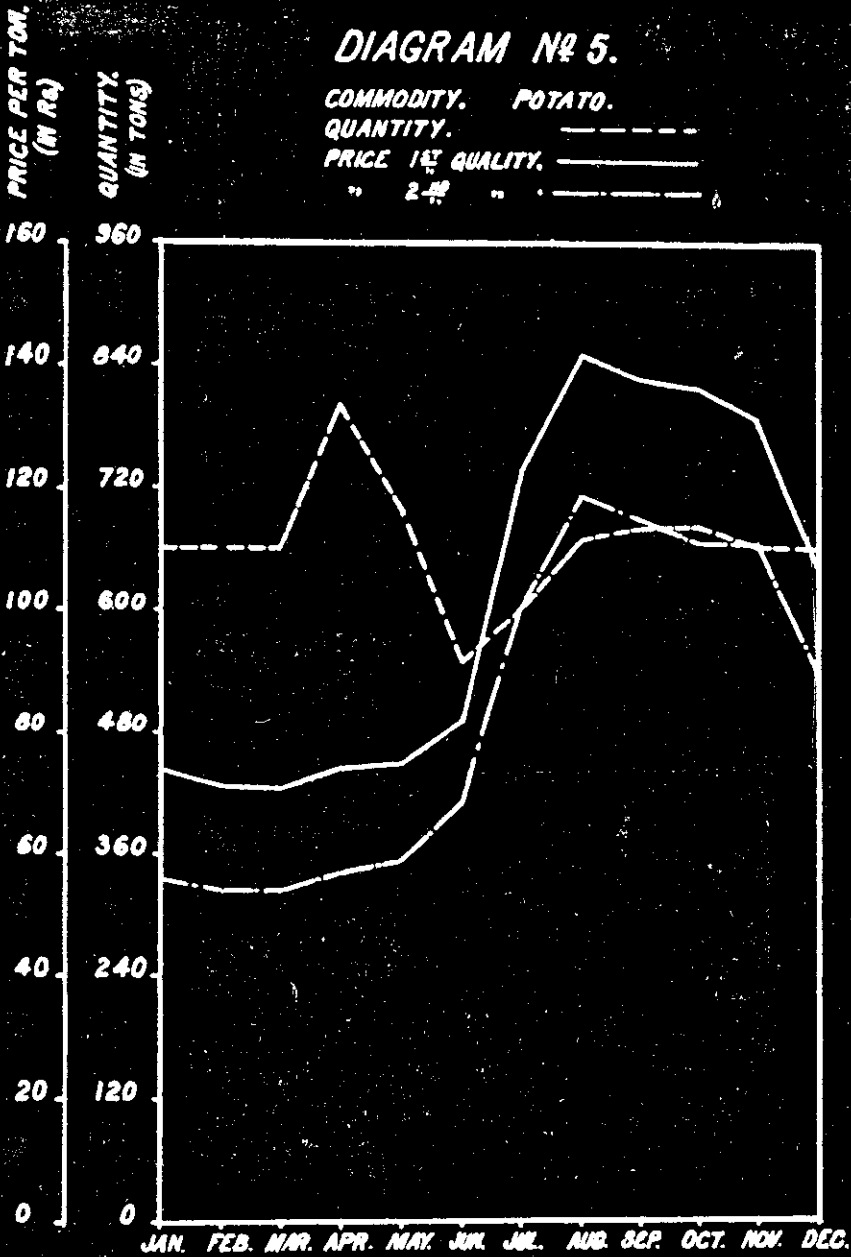
### DIAGRAM № 5.

COMMODITY. POTATO.

QUANTITY. -----

PRICE 1<sup>st</sup> QUALITY. \_\_\_\_\_

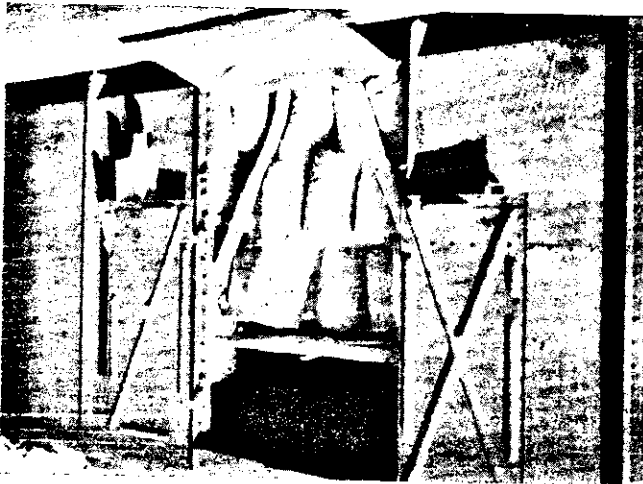
" 2<sup>nd</sup> " . . . . .



Facing page 15.]



A container for keeping fish. *Note the lumps of ice.*



A goods wagon.

## CHAPTER II.—TRANSPORT.

## A.—Types and methods.

## (i) BY RAIL.

The import and export of perishables to and from distant provinces such as Bombay, Madras, the Central Provinces, the North-West Frontier Province, Baluchistan, etc., is mostly done by rail. Three types of wagons are in use for this purpose.

(a) *Goods wagon*.—This type of wagon is generally built of iron sheets but some have wooden sides and floors ; some are provided with ventilation and others not. The wagon, therefore, gets very hot in summer (*see* plate on opposite page). There are no shelves in the wagon for placing fruit packages and the consigners have to prepare temporary platforms inside for this purpose. The carrying capacity of a four-wheeled wagon varies from 14 tons to 23 tons, the floor area varying from 165 square feet to 215 square feet.

(b) *Insulated vans*.—On the 31st December 1936 there were on the North Western Railway 167 insulated vans with the ice bunkers at the ends of the vehicles replenished through openings in the roofs, and 23 insulated vans with ice bunkers at the ends replenished through the main door of the van. The latter type is not appreciated by consignors of fruits owing to the door of the van being opened *en route* for ice to be replenished and to the fact that the end compartments have to be partially unloaded for this purpose.

The number of these vans despatched to Delhi for the carriage of fruit from stations on the North Western Railway was :—

1934	..	..	..	..	558
1935	..	..	..	..	37
1936	..	..	..	..	575

The weight of fruit loaded in these vans averages 110 maunds per wagon, the principal description of fruit loaded being grapes, peaches and pomegranates.

The railways provide a four-wheeled goods wagon (first type) for a minimum load of 120 maunds when packed in boxes and 100 maunds when otherwise packed, and merchants usually avail themselves of the facility.

Most of the wagon loads are booked by passenger trains for which the freight rates are higher than for the goods train. The speed of the goods train is very low (*e.g.*, from Nagpur to Delhi, a distance of 679 miles, it takes 5 to 6 days) and the use is more or less restricted to the transport of potatoes and some hard fruits such as pomegranates for short distances of about 200 to 300 miles.

The insulated vans are generally used for the transport of grapes, peaches and pomegranates from Chaman, Gulistan, Kila Abdulla,

Kuchlak, Quetta and Yaru. The vans booked for the stations beyond Delhi are re-iced at the Delhi main station.

The import of fish from Karachi, Calcutta, and Bombay (about 7 tons per month in winter) is effected in refrigerated condition by packing the fish along with ice in wooden boxes, though the boxes themselves are put in ordinary goods vans (see plate facing page 15). All other perishables are transported under ordinary unrefrigerated condition.

#### (ii) BY ROAD.

All perishables produced locally around Delhi are brought into the market by head load, carts, tongas, etc. Fish is carried by head load or pack animals.

Motor lorries play an important part in the transport of various perishables. Large quantities of oranges from the Punjab, apples from Rawalpindi and mangoes and guavas from the United Provinces are brought into Delhi by motor lorries. They also carry large quantities of oranges, bananas, grapes, etc., from Delhi to important towns in the Punjab and the United Provinces.

Ordinary passenger lorries are used for this purpose. Temporary scaffolding is constructed inside the lorry on which packages are placed in rows. Some boxes are also placed on the roof and tied down by ropes. The sides of the lorry being open it is supposed that there is satisfactory circulation of air due to movement of the lorry. The carrying capacity of a lorry varies from one to two tons. Motor lorries usually travel by night and the packages are directly taken from and delivered at the wholesale markets.

### B.—Cost and efficiency.

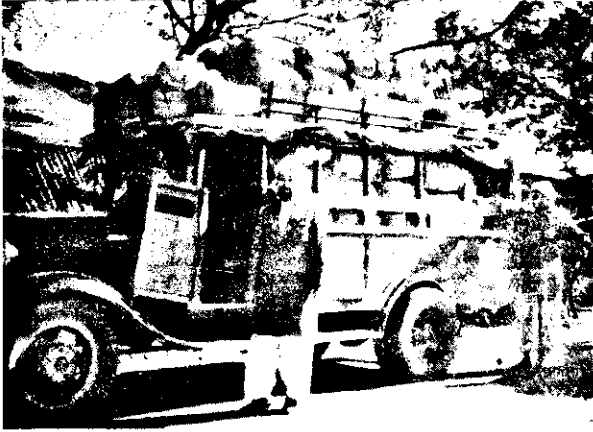
#### (i) RAIL.

The general freight rate for perishables such as fruits, vegetables, fish, fresh meat, milk, ice cream, Indian sweetmeats and eggs (in boxes or strong baskets) by passenger and parcel trains is half the parcel rates. The particulars of rates are given in coaching tariffs issued by the various railways, from which the freights can be calculated. The half parcel rate between Karachi and Delhi, a distance of 905 miles, for example, would be Rs. 4-1-0 per maund, the full rate being Rs. 8-2-0 per maund for distances between 900 to 925 miles on the North Western Railway. On certain sections of some railways (*e.g.*, the North Western Railway) the freight on fresh fruits has been reduced to  $\frac{1}{4}$ th and even to  $\frac{1}{8}$ th the parcel rate. The freight rate from Delhi to Lahore and Rawalpindi is, for instance,  $\frac{1}{4}$ th the parcel rate while that from Delhi to Meerut is  $\frac{1}{8}$ th the parcel rate.

Concession is allowed in the form of provision of wagons between Delhi and certain stations, *e.g.*, Quetta and Chaman and sometimes a lump sum is quoted for wagon load of perishables, as for instance, from Nagpur, Jalgaon, Bassein Road, Rawalpindi and Lahore to Delhi.



[Facing page 16.]



A motor lorry carrying fruit packages.

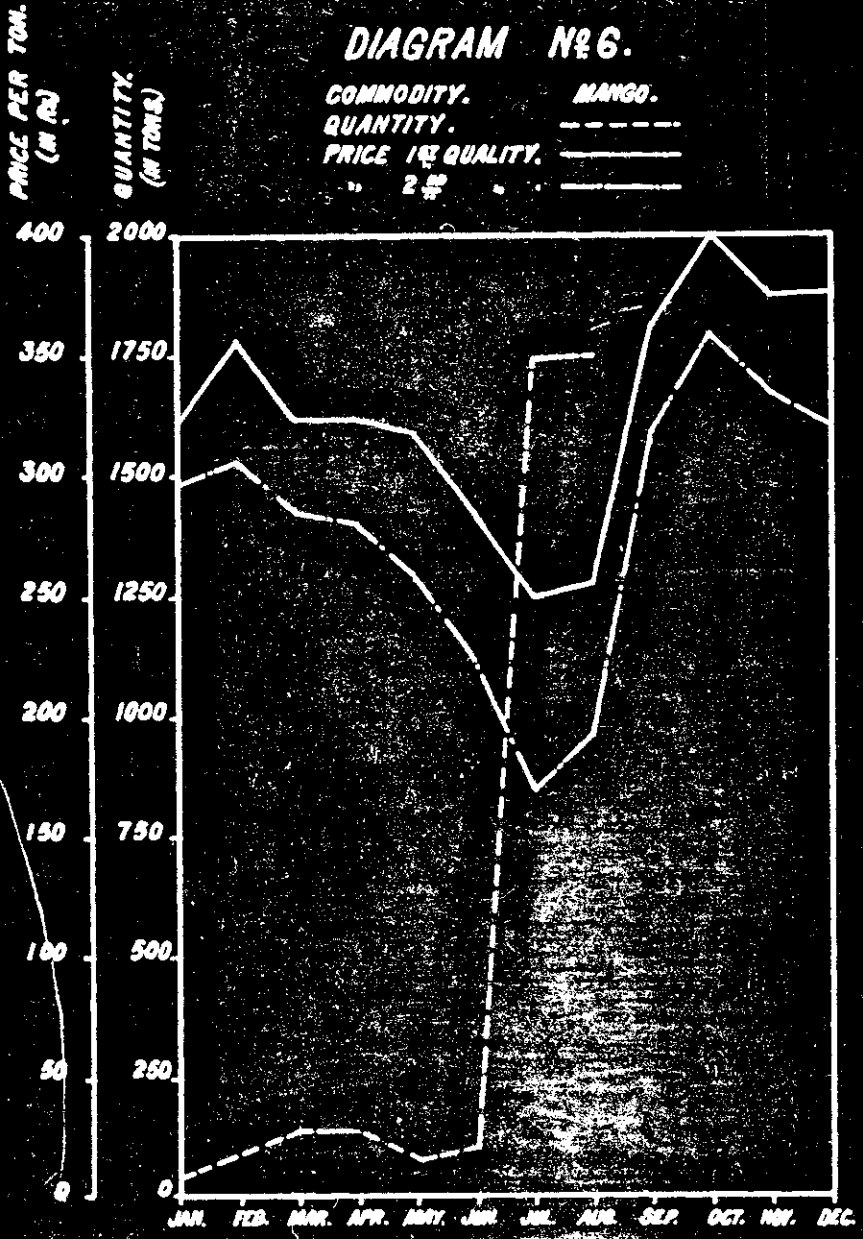


A refrigerated display case for frozen fish.

[Vide Appendix I.]

### DIAGRAM N° 6.

COMMODITY. MANGO.  
QUANTITY. -----  
PRICE 1<sup>re</sup> QUALITY. -----  
" 2<sup>de</sup> " -----



The following table gives the approximate concession rates for four-wheeled wagons running from certain important stations to Delhi :—

Station.	Product usually transported.	Concession charge for wagon load.	Usual charge for a wagon load at rates for smaller lots.
		Rs.	Rs.
Nagpur .. ..	Oranges .. ..	464	1,968
Jalgaon .. ..	Bananas .. ..	473	1,368
Bassein Road ..	Bananas .. ..	490	2,306
Rawalpindi .. ..	Apples .. ..	374	720
Lahore .. ..	Oranges, etc. ..	274	477

In the case of grapes arriving in Delhi from Quetta and Chaman cold storage vans are provided on condition that the minimum load will be 100 maunds. There is no concession in freight and half parcel rate is charged, namely, Rs. 3-14-6 per maund from Chaman to Delhi. The extra expenditure involved by the use of cold storage van is the cost of charging it with ice. About 2 tons of ice is put in each van which carries about 100 to 120 maunds of grapes.

In addition to the freight charges, there are other expenses such as charges for delivery of consignments to and from station. Wagons containing perishables in bulk or in loose condition such as bananas are unloaded by the railways at a charge of Rs. 5 per wagon. If the consignment is not charged at wagon rates the unloading charges are 4 pies per maund of actual weight. In other cases the unloading is done free of cost.

As already stated, most of the fruit traffic is done in ordinary goods wagons which have no arrangements for air circulation and get hot in summer. The result is that the fruits coming from long distances and remaining two or three days in such a wagon do not generally arrive in a satisfactory condition. It is reported that wastage upto 25 per cent. takes place due to deterioration of the fruit during transport in summer.

The insulated vans used for the transport of grapes are more efficient than the goods wagons. Though there is no method of control of temperature yet the interior of the van remains cooler than the outside temperature throughout the period of transport. No precise information about the temperature and its variation during transport is available. Experiments carried out privately in Calcutta

in 1934 on an insulated van having one ice bunker situated at its far end recorded a temperature of 65°F. even after 20 hours from the commencement of the experiment.

It has to be stated, however, that the railways have successively experimented on different types of insulated vans and though it is difficult to claim that any particular type of vehicle has been perfect, the trade so far has not justified the production of such vehicles on a more extensive scale. The few vehicles that each company constructed were soon out of use and were shifted to other railways for trial on their lines, but there also they did not meet with favour. Ever since 1917 different types of such vehicles have been produced on the North Western Railway, Madras and Southern Mahratta Railway, Bombay Baroda and Central India Railway, East Indian Railway, Eastern Bengal Railway and other major broadgauge railways. To quote a very recent example, in 1930 at the instance of the Calcutta trade, cold storage compartments were constructed in six bogey parcel vans. The service, however, has not developed, the traffic having remained fairly constant since 1932. It also appears that the success of the refrigerated transport does not merely depend upon the availability of certain types of insulated vans but on a proper management and service of these vans during actual transport. It is necessary, for instance, that the insulated vans (with ice bunkers) are supplied to the trader just when he wants them, and that during transport of the goods there is some agency to look after the temperature variations, and keep the supply of ice at full. It is probable also that a more extensive use of insulated vans depends on the creation of suitable traffic and on the establishment of cold storage depots at suitable centres. It seems reasonable to anticipate that when a sufficient number of cold stores run on commercial lines are available at central points upcountry a more regular business in perishables will develop and refrigerated transport will assume an importance all its own.

#### (ii) ROAD.

Considerable inward and outward traffic is carried by lorries between Delhi City and places in the Punjab and the United Provinces (*see* plate facing page 16). The rates for the lorries for carrying perishables vary from time to time depending upon the distance, competition amongst lorry owners, possibility of getting return load, etc. The transport charges by lorry from Rawalpindi to Delhi are about Rs. 1-8-0 per maund, while the half parcel rate by rail is about Rs. 2 per maund. The railway, however, has recently been charging at quarter the parcel rate. In spite of this reduction in rates, merchants and commission agents prefer transport by lorry since their time, labour and trouble of consigning and taking delivery of packages at the railway station is saved. Motor lorries are loaded and unloaded in the markets under the supervision of the agents and merchants, and hence there is less chance of the packages getting damaged during handling and transhipment. The consignments do not generally get hot during the period of transport since lorries usually travel by night and there is movement of outside air around the packages. The longest period

for which the packages remain in the lorry is usually 36 hours when the lorry takes two nights to run from Rawalpindi to Delhi. The running between Delhi and places such as Lahore, Amritsar, Saharanpur, Cawnpore, etc., is normally completed within one night. It is estimated that 60 per cent. of the total re-export trade is done by motor lorries.

### C.—Nature and extent of wastage.

The loss incurred during the transport of fruit in wagon loads by rail is due to deterioration as well as loss of weight. The actual amount of loss depends upon factors such as nature of fruit, stage of maturity, time taken for transport, condition of transport, the average atmospheric temperature, etc. In winter it is found that there is little deterioration of fruit during transport and all consignments arrive in a comparatively satisfactory condition. But considerable wastage is reported to occur in summer in the supplies of fruits imported from distant places.

Many of the packages of oranges coming from the Central Provinces in the months of March, April and May, contain fruits which are either ripe or turning ripe at the time of booking and those fruits remaining for about 2 to 3 days packed in wagons with no air circulation, become soft and over-ripe by the time they reach Delhi. Cases have been reported where nearly 25 per cent. of the total quantity of fruits imported in April and May (about 900 tons) become over-ripe and as much as 50 per cent. of these are sometimes damaged and unmarketable. Though it is nearing the end of season the low level of imports in May of oranges can also be accounted for by the fact that considerable risks are involved in consigning ripe fruit in wagon loads to distant places such as Delhi.

Similarly, bananas coming to Delhi in summer from distant places such as Khandesh district, often suffer from the unsatisfactory conditions of transport. In July and August the imports into Delhi approximate 550 tons out of which 50 per cent. are usually ripe. It is roughly estimated by the trade that 25 per cent. of the ripe fruit become soft and unmarketable.

The amount of wastage in the case of oranges and bananas, as estimated by the commission agents in Delhi, must be accepted as it is not possible to ascertain the actual extent of ripening during transport unless information is made available regarding the percentage of fruits in different stages of maturity at the time of booking a consignment.

In addition to this direct wastage considerable loss is incurred due to the fact that the presence of a large percentage of ripe fruit in a consignment appreciably lowers its price in the market. The loss becomes more serious in summer, since at that time, the general price level of fruits such as oranges, bananas, etc., is higher than in winter. (See Appendix I.)

### D.—Possibility of development.

Apart from the transport of grapes from Quetta and Chaman, the existing facilities of transport for perishable products are not

satisfactory from the point of view of conservation of quality. This obviously puts a limit on the distance over which perishables can be transported economically. In consequence, low prices are a common feature of a number of perishable products. In order, therefore, to widen the market, avoid wastage in transport and get produce of the requisite quality and ripeness for putting in cold stores it would apparently be advantageous to have better refrigerated transport facilities.

Refrigerated transport of perishables, however, is more complicated than their storage. Whereas a cold store always uses mechanical refrigeration, refrigerated transport has to depend, in a majority of cases, upon one or the other refrigerating medium such as wet ice, dry ice, eutectic salt ice, etc., as well as upon suitable containers. Mechanical refrigeration presents difficulties on account of the weight and space occupied. The design of containers depends upon the refrigerating medium and also upon how the transport is to take place, *viz.*, by rail, by road, etc.

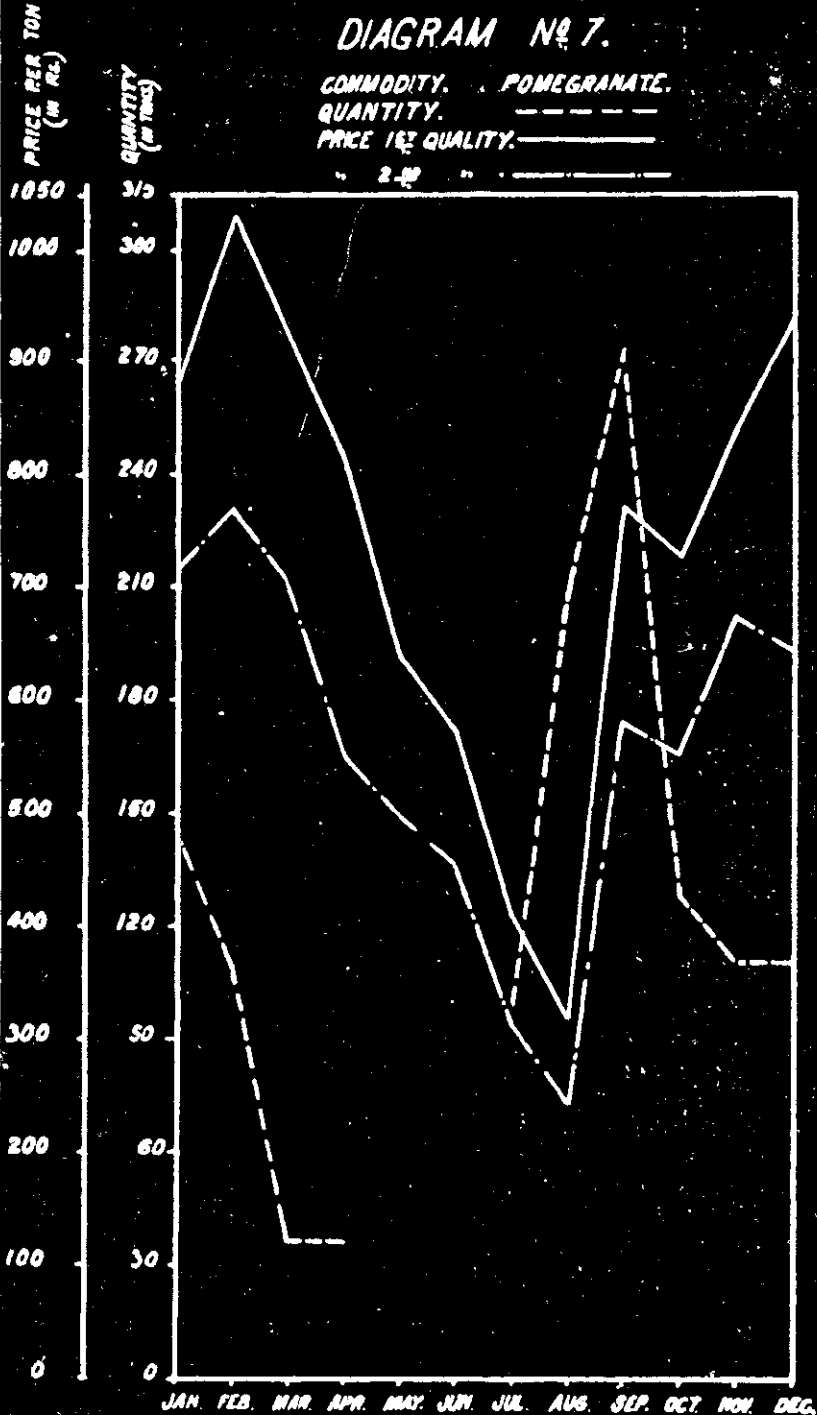
As far as is known no extensive experiments with accurate records have been carried out in India on the refrigerated transport of perishables. It is, however, necessary that the subject be studied and information gathered to ascertain the extent of the probable benefit to be derived from refrigerated transport. Recently (July 1937) a joint experiment to investigate various aspects of the problem was instituted by the Imperial Council of Agricultural Research, the Defence Department and the Railway Board.

The success of a scheme of this nature depends essentially upon the availability of light durable containers and cheap refrigerating mediums. The system of refrigerated transport of perishables is still in its infancy in India and hence the production of refrigerants such as dry ice, eutectic salt ice, etc., has not developed to any very great extent. There are, however, reasons to believe that the industrialists of this country are carefully studying the subject and would take up the business of production of refrigerants and containers on a commercial scale, if sufficient demand is forthcoming from producers and merchants. Refrigerated transport would be a great asset in the development of the trade in perishables and would considerably enhance the anticipated benefits to be derived from cold storage.

### DIAGRAM No 7.

COMMODITY. POMEGRANATE.  
 QUANTITY. -----  
 PRICE 1st QUALITY. \_\_\_\_\_

" 2nd " -----

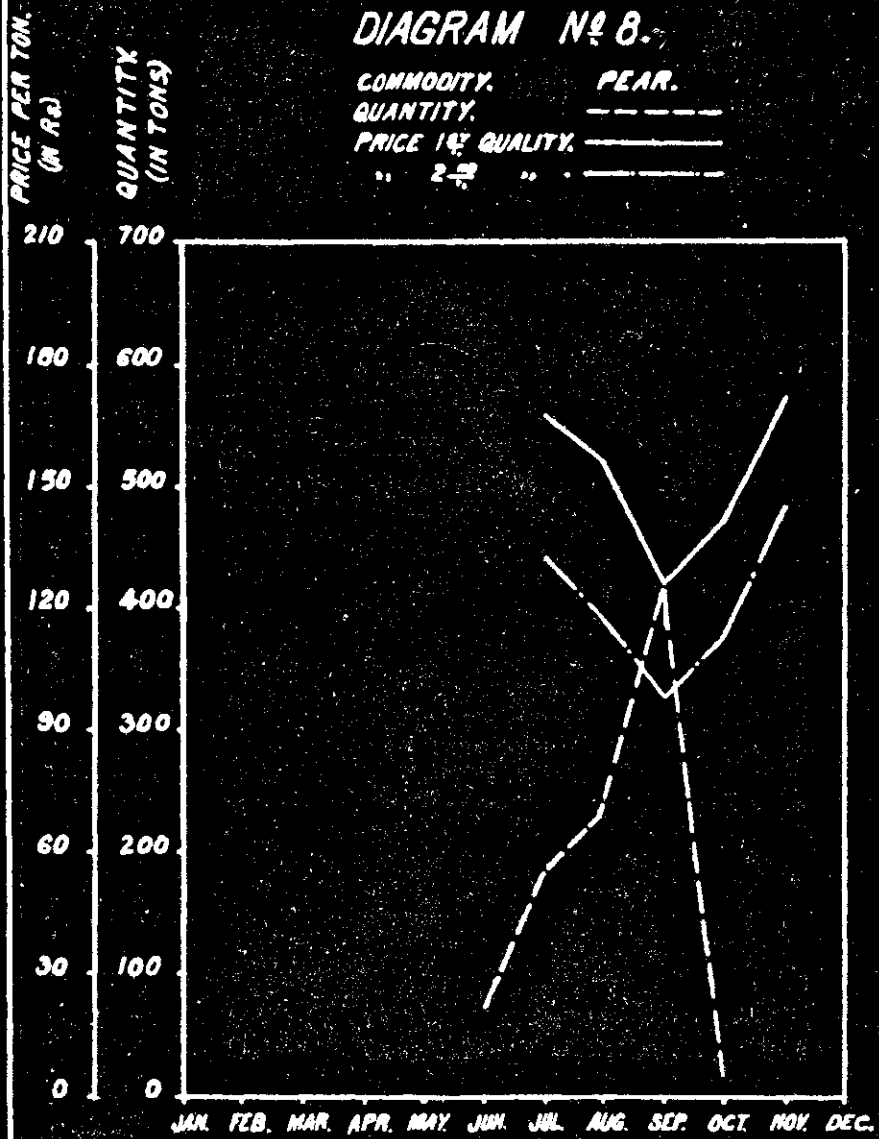


JAN FEB. MAR. APR. MAY. JUN. JUL. AUG. SEP. OCT. NOV. DEC.

[Vide Appendix I.]

### DIAGRAM No 8.

COMMODITY. PEAR.  
QUANTITY. -----  
PRICE 1<sup>st</sup> QUALITY. -----  
" 2<sup>nd</sup> " -----





### CHAPTER III.—NOTE ON ICE FACTORIES AND REFRIGERATION PLANTS.

There are neither commercial facilities in Delhi for storing perishables in cold storage chambers nor is there any arrangement for maintaining freezing temperatures in the course of transport. Apart from the indigenous methods of storage the other methods adopted privately to a small extent by traders, hotel-keepers and private individuals are storing perishables with the use of ice and in frigidaire and small privately constructed cold storage rooms. Ice vans are used for transporting grapes from Quetta and Chaman. The existing facilities are thus limited to ice and small private refrigerating appliances.

#### A.—Ice factories.

##### (i) WET ICE.

Wet ice is used for preservation purposes by fish merchants whose annual demand is estimated at about 140 tons. A few of the meat merchants also store their surplus supplies with ice, for which the annual requirement is estimated at about 20 tons. From June to September, the ice vans carrying grapes from Quetta and Chaman *en route* to Bombay, Calcutta, etc., are re-iced at Delhi and for this purpose about two to three tons of ice is used every day during this period. The annual consumption on this account is estimated at 240 tons.

The supply of ice is obtained from the ice factories in Delhi, where there are two distilled water ice factories with a capacity of 185 tons a day and two other smaller factories using raw water with 40 tons of ice per day capacity. These factories have ammonia compressors and are run by steam engines using about 55 tons of Bengal coal for a day's full output.

All the four factories are privately owned and the total investment is estimated at about 10 lakhs of rupees. The operating costs vary in accordance with the output, but they are estimated for one factory at 6 to 7 annas per cwt. under conditions of maximum output. The same factory which works intermittently during winter has operating costs of about Re. 1 per cwt.

The period of working to the maximum capacity is from May to July, inclusive. In August and September the daily output approximates 140 tons. From November to February three factories are completely closed down, while the fourth runs for about 16 hours a week. They re-start work in March and gradually attain full output with the advent of summer.

Most of the production is consumed locally. Small quantities (about 8 tons a day) are exported from May to August to the surrounding places like Gurgaon, Bhivani, Rewari, Rampur and Alwar. About 8 tons of ice is sent to Patiala and Meerut each winter month as the ice factories in those places remain closed during winter.

About one-fifth of the exported ice in summer is transported in ordinary motor lorries. The ice blocks are packed in ordinary

gunny cloth and the average loss due to melting is estimated at about 5 lbs. per cwt. per hour of travel. Larger quantities are, however, carried by rail. The rate of loss due to melting is the same as when the ice is transported by motor lorry. The railway freight rate is 4 annas for the first maund and 2 annas for every subsequent maund for every 50 miles. The rate for every subsequent 50 miles is half that charged for the first 50 miles.

The wholesale prices of ice in Delhi are variable. During May to July, the rate is about Rs. 1-8-0 per cwt. while from August to October, the price varies from 8 to 10 annas per cwt. The rate for exported ice is nearly Re. 1 per cwt. excluding freight. The rate of military supplies is 14 annas a cwt. including delivery.

#### (ii) DRY ICE.

Dry ice (solid carbon dioxide) is not manufactured in Delhi at present. Recently, however, efforts were being made to start a limited company in New Delhi for the manufacture of dry ice. The capital requirements of this company were placed at about 10 lakhs of rupees. The company when started would, it was hoped, be able to produce dry ice at an estimated cost of one anna per pound. So far as can be ascertained, however, the proposals have not yet taken concrete form and the company has not started to function.

It may be observed that the freight rate for dry ice is half the ordinary parcel rate. The product requires to be carefully packed as a precaution against personal injury in handling.

### B.—Small refrigerating appliances and cold storage rooms.

The growing interest in the preservation of perishables in cold is shown by the fact that the demand for refrigerating units is continually increasing in Delhi in recent years. Enquiries made of the refrigerator distributors indicate that the demand for domestic units in particular is on the rise and that the public is becoming refrigerator-minded.

About 115 units of different sizes varying from 4 to 15 cubic feet were sold during the last three years and 80 per cent. of these were purchased by private individuals for domestic use. The 4 cubic feet model is the favourite for household purposes since the size suits the average domestic requirements. The larger size units of 8 to 15 cubic feet capacity are preferred by hotels and restaurants. The price of units differs with different makes and is usually between Rs. 600 to Rs. 750 for a 4 cubic feet model, while for one of the 15 cubic feet capacity, the price is nearly Rs. 2,000. The average life of a unit is stated to be about 10 years. Some of the distributors guarantee free repairs in the first year of purchase. The refrigerator distributors also hire out their units. On an average the number of units on hire is 50 during the year. The hire charges vary from Rs. 20 to Rs. 30 per month with free repairs. The total storage space of all these small refrigerators operating in Delhi is estimated at 750 cubic feet.

In addition, a couple of leading hotels and a dairy firm have constructed special storage compartments run by small sulphur

dioxide plants. The total capacity of these cold rooms is estimated at about a thousand cubic feet.

Apart from these, three provision merchants in Delhi possess freezing cabinets run by a refrigerating plant to freeze and preserve their fish supplies. A show case is also attached to the equipment. The frozen fish fetches a higher price and the price difference fully justifies the installation of such an equipment (*see* plate facing page 16). The total capacity of these special freezing cabinets is estimated at 300 cubic feet.

**SUMMARY.**

1. Delhi is an important market for perishables both for local consumption and redistribution. The total annual trade in fruits and vegetables is estimated at 20,000 tons and 10,000 tons respectively. The milk supply amounts to nearly 25,000 tons per year, while the consumption of other dairy products such as *ghee*, butter, cheese and eggs is over 4,000 tons per year. The total annual consumption of fish and meat is estimated at 10,000 tons.

2. Statistics of supplies and prices of perishables indicate that there are violent fluctuations in the seasonal supply of perishables and wide variations in prices prevail in the case of almost every important perishable.

3. Fruits and vegetables are stored in ordinary godowns and shops with no arrangements for ventilation, light, sanitation and regulation of temperature and humidity.

4. Fresh supplies of milk and meat are available daily and no appreciable quantities are required to be stored.

5. Eggs are stored under ordinary conditions in baskets. In summer there is a heavy loss and instances are common where 50 per cent. of the eggs go stale and bad.

6. Some fish merchants store supplies of fish with ice which keeps the fish in a chilled condition for a few days. The quantity of ice used for this purpose is estimated at 140 tons per year. The demand for frozen fish is rising and three provision stores have installed refrigerating plants to keep fish in a frozen condition. Estimates of costs and profits on these plants indicate that while the cost comes to a little over half an anna per lb. of fish, the extra price realised is about 2 annas per lb.

7. That the demand for the cold storage of perishables is on the rise is evidenced by the fact that the use of small refrigerating units has been increasing during the last three years for domestic, hotel, and restaurant purposes. Two of the leading hotels have constructed special storage compartments to store their perishable requirements.

8. There is, however, no commercial cold store where producers and merchants can store their perishables. In consequence there is no facility for evening out supplies in the full season and stabilising the seasonal price fluctuations.

9. There appears to be a need for starting a commercial cold store in Delhi. It is estimated that by storing oranges, grapes, apples, mangoes, and potatoes, there would be a net balance of over a lakh of rupees per annum out of which a substantial portion would be net profit to the trade. There are besides several other fruits, vegetables, dairy products, fish, eggs, meat and game, which can be successfully put into cold store.

10. Considering the present volume of trade in perishables in Delhi, it is estimated that there is room for a commercial cold store of about 400 tons capacity with a satisfactory paying load.

DIAGRAM NO. 9  
COMMODITY - PEACH  
QUANTITY

1 - IMPORTED  
2 - LOCAL

PRICE

1 - IMPORTED  
2 - LOCAL

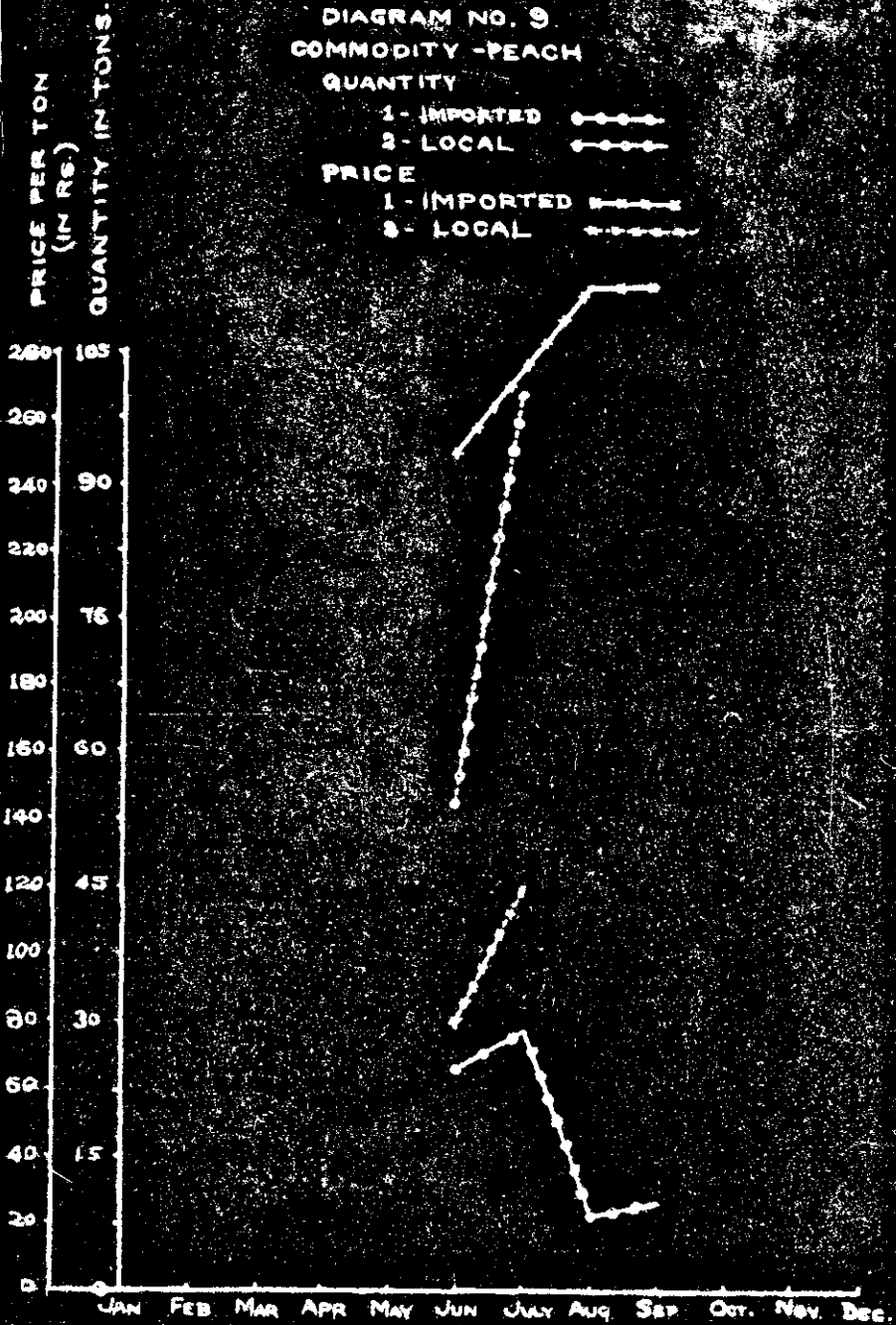
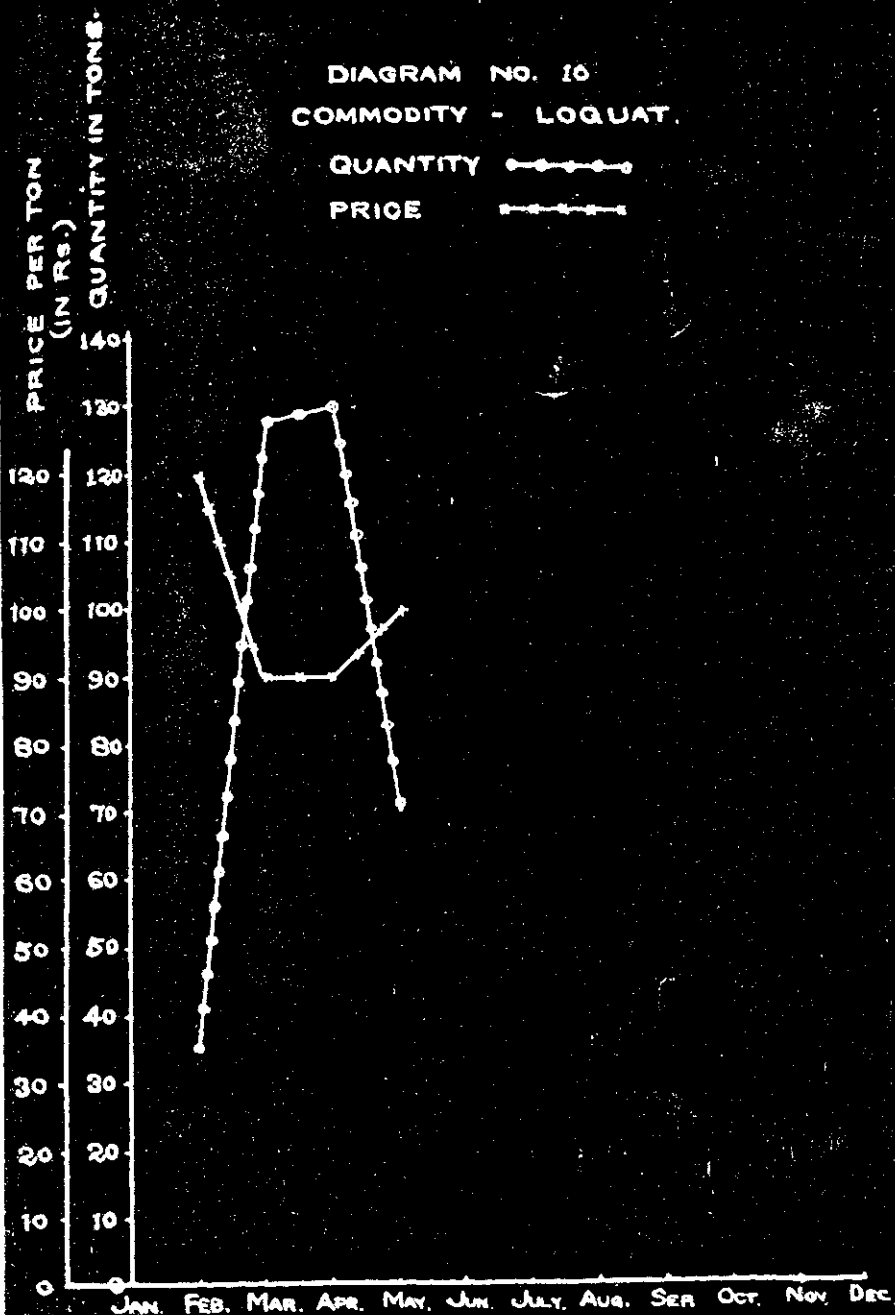


DIAGRAM NO. 10  
COMMODITY - LOQUAT.

QUANTITY —●—●—●—  
PRICE —■—■—■—■—



11. Most of the fruit traffic by rail is done in ordinary goods wagons which have no arrangements for air circulation or temperature control and which get hot during the summer months. This results in considerable loss due to deterioration in quality as well as loss in weight.

12. Grapes from Chaman and Quetta are transported in iced vans.

13. Insulated fruit vans are also employed for carrying perishables, but their use is limited only to some sections of certain railways.

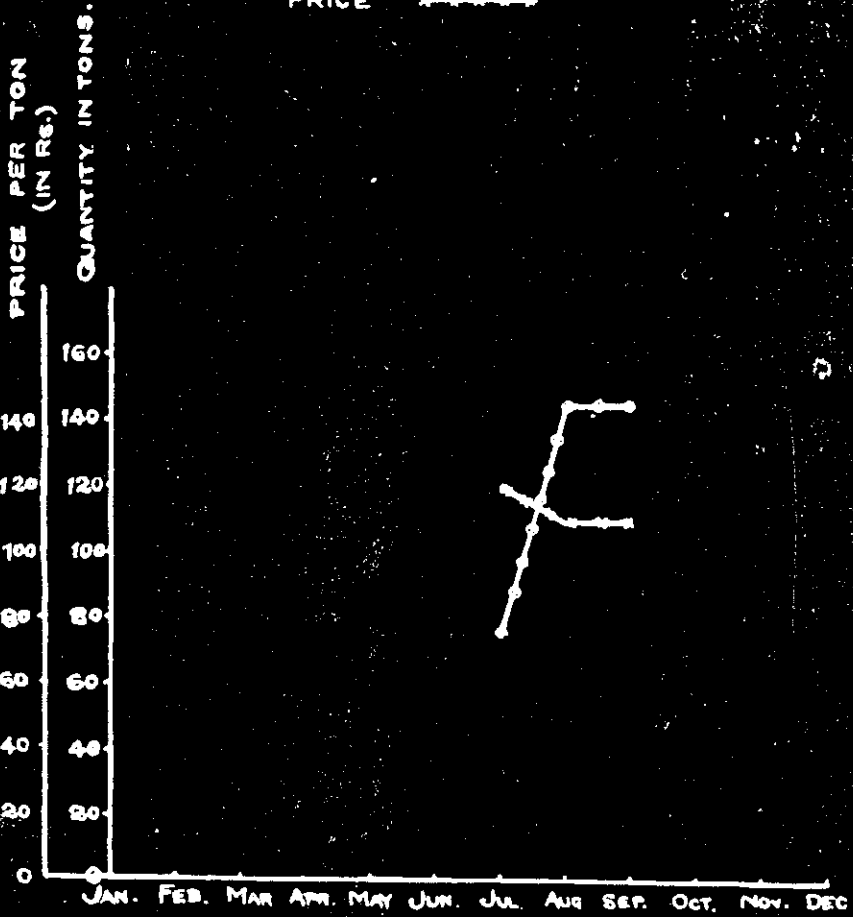
14. Refrigerated transport would be an asset in the development of the trade in perishables and would considerably enhance the advantages to be derived from systematic cold storage.



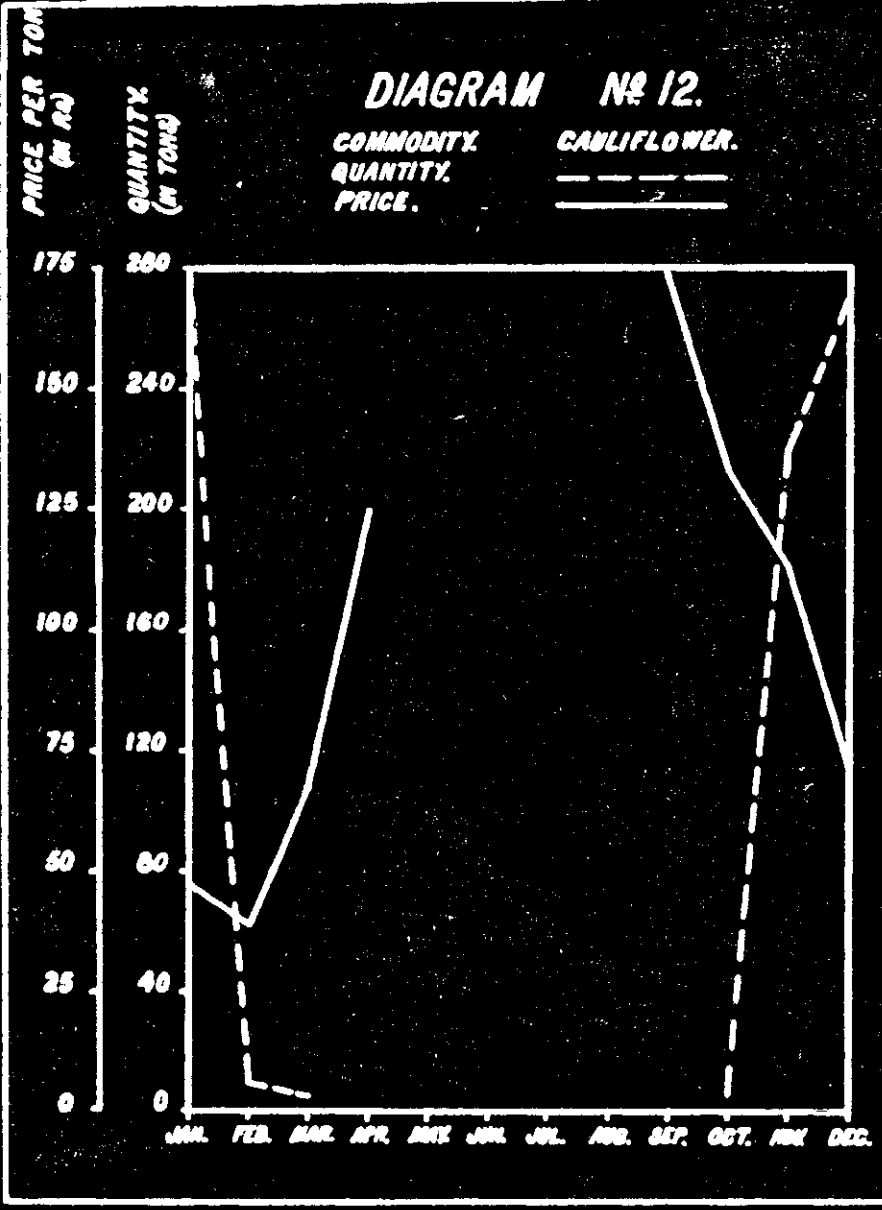


DIAGRAM NO. 11  
COMMODITY - LIME

QUANTITY —●—●—●—  
PRICE —+—+—+—+—



[Vide Appendix I.]



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**APPENDICES.**

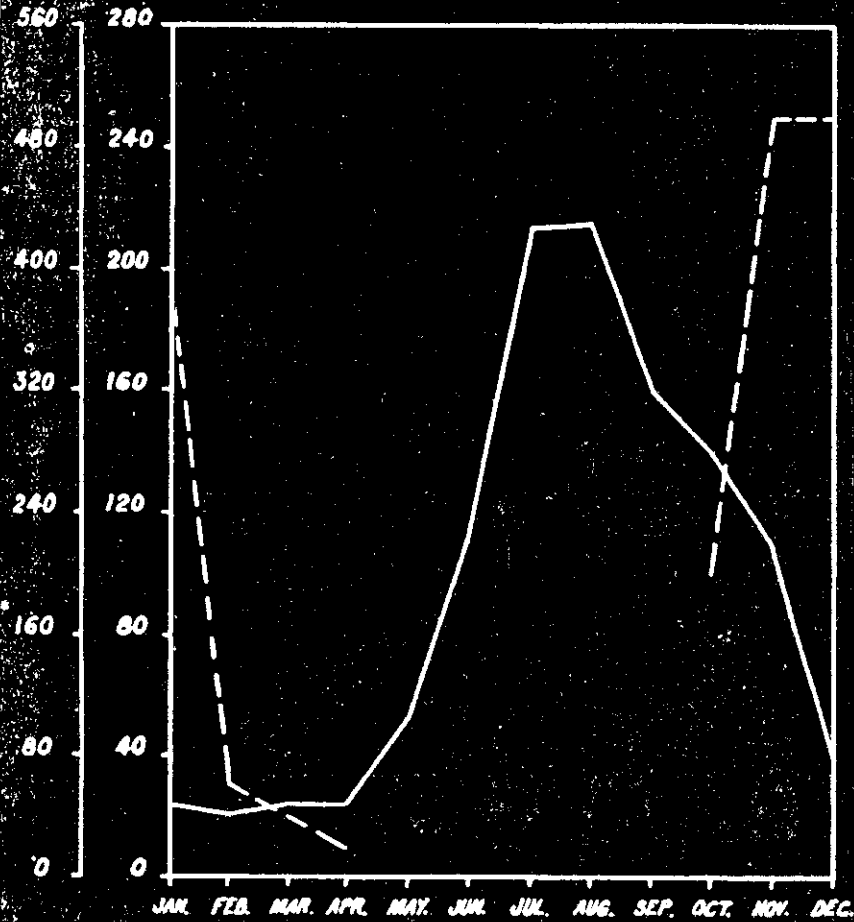


Commodity	January.			February.		
	Quantity (in tons).	Average price.		Quantity in tons.	Average price.	
		1st quality.	2nd quality.		1st quality.	2nd quality.
Oranges .. .. Imported (Nagpur) ..	650	Rs. 193	Rs. 173	382	Rs. 177	Rs. 138
Grapes .. .. Imported (Quetta and Chaman)	1	644	562	2 (Nasik).	726	577
Apples .. .. Imported (Kashmir) ..	100	480	334	9	661	431
Bananas .. .. Imported (Bombay and Madras Presidencies). (1 md. = 30 dozs.)	215 (Madras).	Average. 75		220 (Madras.)	Average. 75	
Potatoes .. .. Imported (Simla and Meerut).	660 (Meerut).	74	56	660 (Meerut).	71	54
Mangoes .. .. Imported (United Provinces and Madras Presidency).	32 (Madras).	322	297	92 (Madras.)	355	305
Local .. ..	..	..	..	..	..	..
Pomegranates .. .. Imported (Baluchistan, N. W. F. P. and Afghanistan).	146 (Baluchistan and Afghanistan).	881	714	110 (Baluchistan and Afghanistan).	1,030	768
Local .. ..	..	..	..	..	..	..
Pears .. .. Imported (Peshawar) ..	..	..	..	..	..	..
Local .. ..	..	..	..	..	..	..
Peaches .. .. Imported (N. W. F. P. and Baluchistan).	..	Average.		..	Average.	
Local .. ..	..	..	..	..	..	..



### DIAGRAM № 13.

COMMODITY. CABBAGE.  
 QUANTITY. ————  
 PRICE. —————

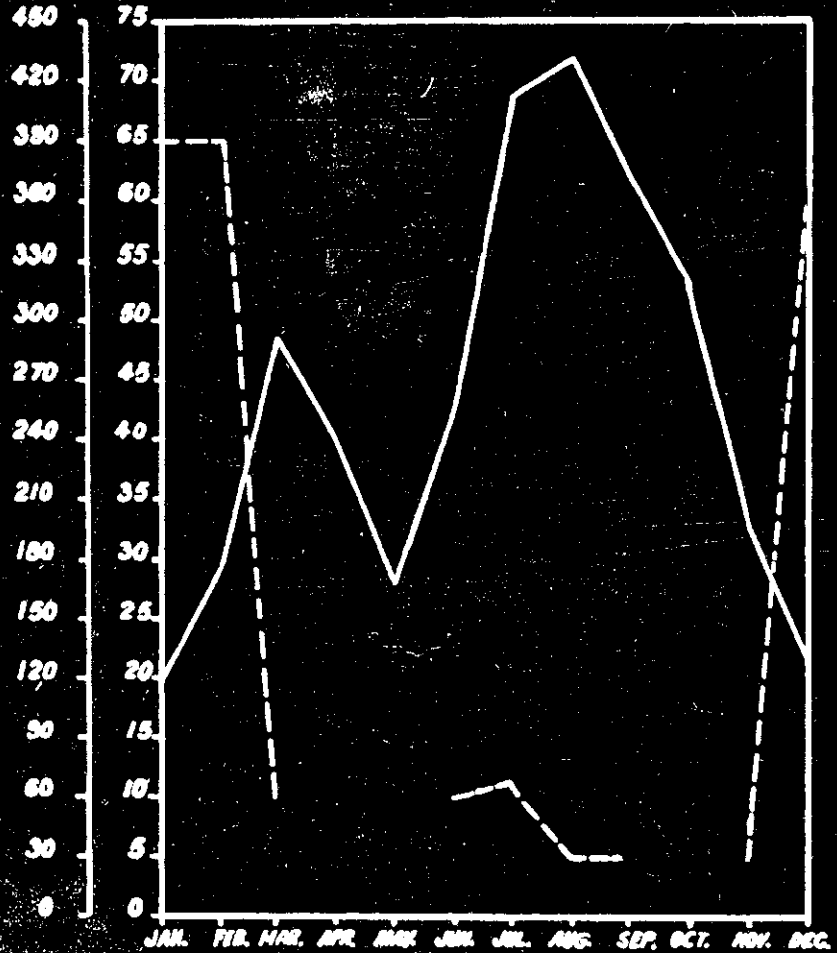


[Vide Appendix I.]

### DIAGRAM № 14.

COMMODITY.  
QUANTITY.  
PRICE.

TOMATO.





## APPENDIX II.

*Seasonal average (1932-36) prices per ton of some of the important perishable commodities.*

Commodity.	Season of high supplies.			Season of low supplies.			Remarks.
	Period.	Average price.	Minimum price.	Period.	Average price.	Maximum price.	
1. Oranges*	..	Rs. 177	Rs. 129½	June to September	Rs. 331	Rs. 371½	† This price rules throughout July and August.
2. Grapes*	..	537	477	December to May ..	549	652	Average price in October is only Rs. 498, while throughout February the average price is about Rs. 652.
3. Apples*	..	408	374	February to July ..	515	601	First quality apples sell at about Rs. 465 per ton during September to November. During February to April the prices of these apples rise to about Rs. 630 per ton.
4. Bananas†	..	79	75	April to June ..	122	140	Prices are for the year 1934 only.
5. Cauliflowers†	..	79	48	February to October	108	175	
6. Cabbages†	..	157	48	February to September	206	430	
7. Tomatoes†	..	141	120	March to November	297	430	

\*1st and 2nd quality.

† 1st quality only.

## APPENDIX III.

*Daily wholesale prices of certain important fruits.*

ORANGES (first quality).

(i) *Month—April.*

Date.	Price for 100 fruits.						Price.		
	Rs.	a.	p.	Rs.	a.	p.	Rs.	a.	p.
1	..	..	..	..	..	..	3	10	0
2	..	..	..	..	..	..	3	8	0
3	..	..	..	..	..	..	3	8	0
4	..	..	..	..	..	..	3	6	0
5	..	..	..	..	..	..	3	14	0
6	..	..	..	..	..	..	3	10	0
7	..	..	..	..	..	..	3	5	0
8	..	..	..	..	..	..	3	12	0
9	..	..	..	..	..	..	3	0	0
10	..	..	..	..	..	..	3	8	0
11	..	..	..	..	..	..	3	10	0
12	..	..	..	..	..	..	3	10	0
13	..	..	..	..	..	..	3	4	0
14	..	..	..	..	..	..	4	4	0
15	..	..	..	..	..	..	4	8	0
16	..	..	..	..	..	..	4	0	0
17	..	..	..	..	..	..	3	8	0
18	..	..	..	..	..	..	3	8	0
19	..	..	..	..	..	..	3	8	0
20	..	..	..	..	..	..	3	4	0
21	..	..	..	..	..	..	3	8	0
22	..	..	..	..	..	..	4	0	0
23	..	..	..	..	..	..	4	10	0
24	..	..	..	..	..	..	4	14	0
25	..	..	..	..	..	..	5	4	0
26	..	..	..	..	..	..	5	6	0
27	..	..	..	..	..	..	5	6	0
28	..	..	..	..	..	..	5	2	0
29	..	..	..	..	..	..	4	8	0
30	..	..	..	..	..	..	5	0	0

(ii) *Month—November.*

1	..	..	..	..	..	..	4	8	0
2	..	..	..	..	..	..	4	12	0
3	..	..	..	..	..	..	4	10	0
4	..	..	..	..	..	..	4	10	0
5	..	..	..	..	..	..	4	12	0
6	..	..	..	..	..	..	4	12	0
7	..	..	..	..	..	..	4	14	0
8	..	..	..	..	..	..	4	14	0
9	..	..	..	..	..	..	5	8	0
10	..	..	..	..	..	..	5	8	0
11	..	..	..	..	..	..	5	12	0
12	..	..	..	..	..	..	5	6	0
13	..	..	..	..	..	..	5	2	0
14	..	..	..	..	..	..	5	0	0
15	..	..	..	..	..	..	5	0	0
16	..	..	..	..	..	..	4	2	0
17	..	..	..	..	..	..	3	8	0
18	..	..	..	..	..	..	3	12	0
19	..	..	..	..	..	..	3	8	0
20	..	..	..	..	..	..	3	8	0



## Daily wholesale prices of certain important fruits—contd.

## APPLES (first quality)—contd

(ii) Month—August.

Date.	Price for 5 Seers.						Price.	
							Rs.	a. p.
1 .. .. .	2	3	0					
2 .. .. .	2	2	0					
3 .. .. .	1	15	0					
4 .. .. .	1	15	0					
5 .. .. .	2	3	0					
6 .. .. .	1	14	0					
7 .. .. .	2	0	0					
8 .. .. .	1	14	0					
9 .. .. .	1	11	0					
10 .. .. .	1	14	0					
11 .. .. .	2	3	0					
12 .. .. .	2	3	0					
13 .. .. .	2	3	0					
14 .. .. .	2	3	0					
15 .. .. .	2	3	0					
16 .. .. .	2	2	0					
17 .. .. .	2	2	0					
18 .. .. .	2	0	0					
19 .. .. .	2	0	0					
20 .. .. .	1	14	0					
21 .. .. .	1	11	0					
22 .. .. .	1	10	0					
23 .. .. .	1	9	0					
24 .. .. .	1	9	0					
25 .. .. .	1	8	0					
26 .. .. .	1	8	0					
27 .. .. .	1	8	0					
28 .. .. .	1	10	0					
29 .. .. .	1	8	0					
30 .. .. .	1	10	0					

## GRAPES (first quality).

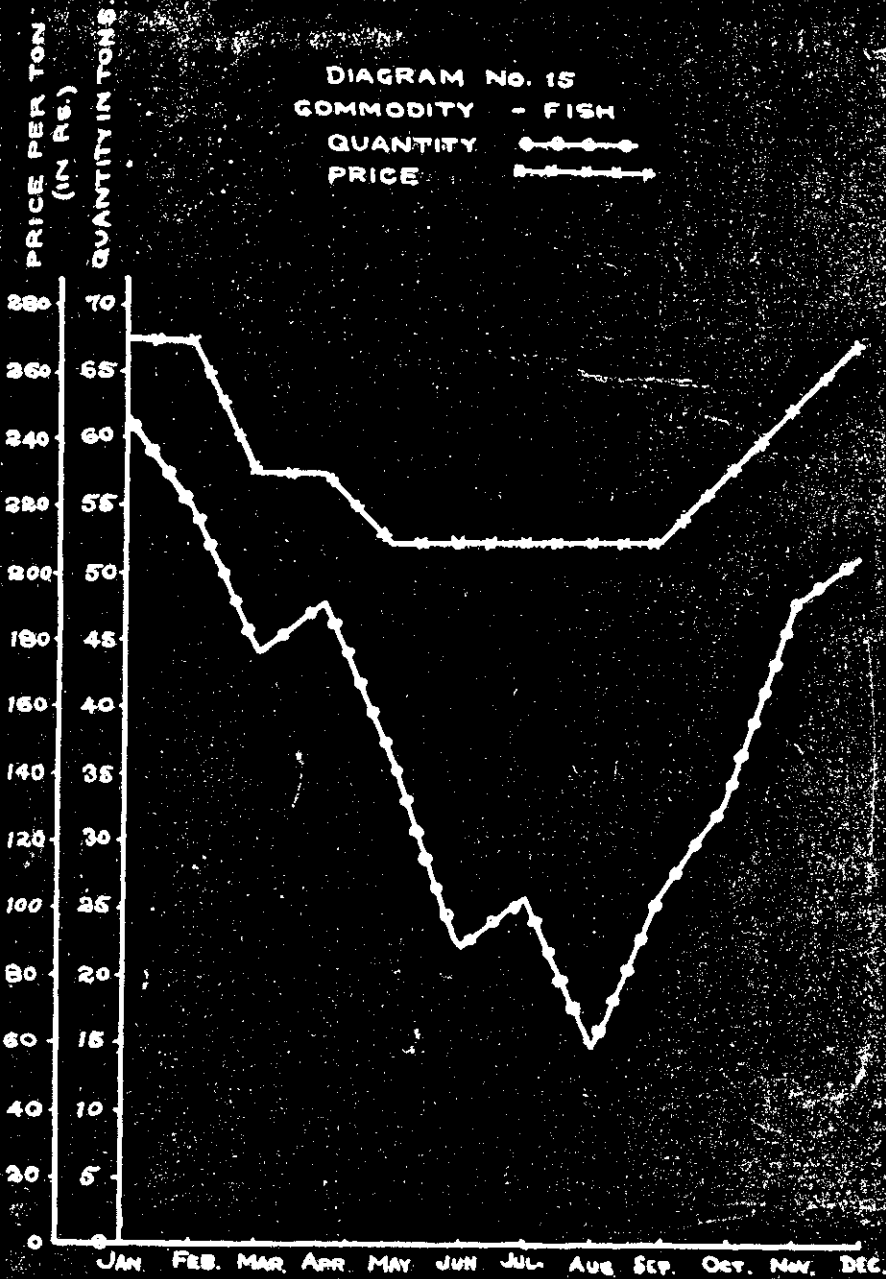
## Price for 5 seers.

(i) Month—July.

Date.	Price for 5 seers.						Price.	
							Rs.	a. p.
6 .. .. .	3	0	0					
7 .. .. .	3	0	0					
8 .. .. .	3	0	0					
9 .. .. .	3	2	0					
10 .. .. .	3	4	0					
11 .. .. .	3	2	0					
12 .. .. .	3	3	0					
13 .. .. .	3	0	0					
14 .. .. .	3	0	0					
15 .. .. .	3	0	0					
16 .. .. .	3	0	0					
17 .. .. .	3	4	0					
18 .. .. .	3	2	0					
19 .. .. .	3	1	0					
20 .. .. .	3	0	0					
21 .. .. .	3	0	0					
22 .. .. .	3	0	0					

DIAGRAM No. 15  
COMMODITY - FISH

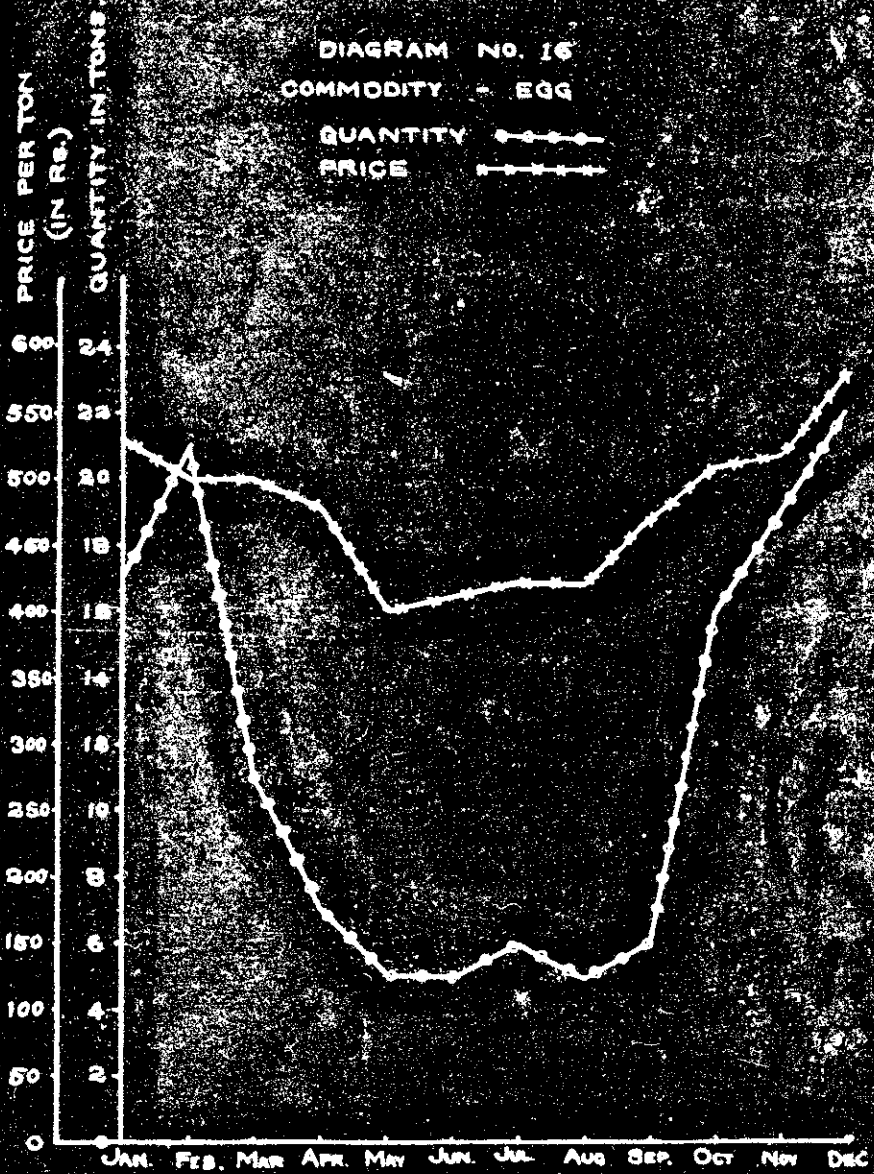
QUANTITY —●—●—●—  
PRICE —■—■—■—■—



[Vide Appendix I.]

DIAGRAM NO. 16  
COMMODITY - EGG

QUANTITY — ○ — ○ — ○ —  
PRICE — — — — —



*Daily wholesale prices of certain important fruits—contd.*GRAPES (first quality)—*contd.*(i) *Month—July—contd.*

Date.	Price for 5 seers.						Price.		
							Rs.	a.	p.
23 .. ..	..	..	..	..	..	..	3	2	0
24 .. ..	..	..	..	..	..	..	3	3	0
25 .. ..	..	..	..	..	..	..	3	0	0
26 .. ..	..	..	..	..	..	..	2	14	0
27 .. ..	..	..	..	..	..	..	2	14	0
28 .. ..	..	..	..	..	..	..	2	12	0
29 .. ..	..	..	..	..	..	..	2	8	0
30 .. ..	..	..	..	..	..	..	2	12	0
31 .. ..	..	..	..	..	..	..	2	10	0

(ii) *Month—October.*

							Price.		
							Rs.	a.	p.
1 .. ..	..	..	..	..	..	..	3	0	0
2 .. ..	..	..	..	..	..	..	3	0	0
3 .. ..	..	..	..	..	..	..	2	12	0
4 .. ..	..	..	..	..	..	..	2	12	0
5 .. ..	..	..	..	..	..	..	2	12	0
6 .. ..	..	..	..	..	..	..	3	4	0
7 .. ..	..	..	..	..	..	..	3	12	0
8 .. ..	..	..	..	..	..	..	3	8	0
9 .. ..	..	..	..	..	..	..	3	8	0
10 .. ..	..	..	..	..	..	..	3	5	0
11 .. ..	..	..	..	..	..	..	3	5	0
12 .. ..	..	..	..	..	..	..	3	6	0
13 .. ..	..	..	..	..	..	..	3	9	0
14 .. ..	..	..	..	..	..	..	3	12	0
15 .. ..	..	..	..	..	..	..	3	8	0

## APPENDIX IV.

## COLD STORAGE OF PERISHABLES.

*Fruits.*

Serial No.	Kind of fruit.	Optimum conditions.			Approximate commercial storage life.
		Stage of maturity.	Temperature of storage °F.	Relative humidity per cent.	
1	Apples—				
	(i) Rome Beauty ..	Fully mature ..	31—32	85—88	5 to 6 months.
	(ii) McIntosh ..	Do. ..	Do.	Do.	2 to 3 „
	(iii) Baldwin ..	Do. ..	Do.	Do.	5 to 7 „
2	Apricots—				
	(i) Fresh .. ..	....	32	85—90	12 „
	(ii) Dry .. ..	....	32	60	
3	Bananas (Sonkel) ..	Green .. ..	56	80—85	4 weeks.
4	Black berries ..	Fresh and just ripe	40	80—85	1 to 2 „
5	Cantaloupes .. ..	....	33	..	3 months.
6	Cherries .. ..	Just ripe ..	32—34	80—85	2½ to 3 weeks.
7	Cranberries .. ..	....	32—33	..	4 „
	Figs—				
	(i) Fresh .. ..	....	55	..	4 „
	(ii) Dry .. ..	....	32—33	60	12 months.
9	Gooseberries .. ..	....	35	..	6 months.
10	Grapes .. ..	....	34—36	..	4 months.
11	Grape Fruits (Marsh) ..	Fully mature ..	45	85—90	6 to 8 weeks.



APPENDIX IV—*contd.*COLD STORAGE OF PERISHABLES—*contd.**Fruits—contd.*

Serial No.	Kind of fruit.	Optimum conditions.			Approximate commercial storage life.
		Stage of maturity.	Temperature of storage °F.	Relative humidity per cent.	
12*	Mangoes—				
	(i) Alphonso .. ..	Green and mature	45—48	85—90	9 weeks.
	(ii) Peter .. ..	Do. .. ..	48	85—90	4 "
	(iii) Fazrizafrani .. ..	Ripe .. ..	43—45	85—90	6 "
13	Melons .. ..	....	31—32	..	6 "
14*	Oranges—				
	(i) Nagpur .. ..	Yellow .. ..	40	85—90	3 months.
	(ii) Malta .. ..	Orange .. ..	35	85—90	4 "
15	Papaws .. ..	....	45	..	2½ to 3 weeks.
16	Peaches (Elberta) .. ..	Ripe .. ..	35	85—90	4 "
17	Pears .. ..	Just ripe .. ..	33	85—90	3 to 6 months.
18	Pine apples (Sugar loaf) .. ..	Slightly ripened .. ..	50	..	2 to 3 weeks.
19	Plums .. ..	Firm but beginning to colour.	40	..	4 "
20	Prunes (dried) .. ..	....	32	60	12 months.
21	Raspberries .. ..	....	33	..	1 to 2 weeks.
22	Strawberries .. ..	....	35	..	6 "

\* Results of experiments conducted in India (Poona cold store).

APPENDIX IV—*contd.*  
COLD STORAGE OF PERISHABLES—*contd.*  
*Vegetables.*

Serial No.	Kind of vegetable.	Optimum conditions.		Approximate commercial storage life.
		Temperature of storage °F.	Relative humidity per cent.	
1	Asparagus .. ..	34	85	4 weeks.
2	Beans (green) .. ..	33	80—85	3 to 4 "
3	Beets .. ..	32—33	..	4 "
4	Cabbages .. ..	32	85—90	3 to 4 months.
5	Carrots .. ..	36	80—85	4 to 5 weeks.
6	Cauliflowers .. ..	40	80	3 to 4 "
7	Celery .. ..	34—35	95	3 months.
8	Cucumber .. ..	50	80	4 weeks.
9	Egg plant (Brinjal) .. ..	35	..	2 "
10	Lettuce .. ..	40	85	2 to 3 "
11	Mushrooms .. ..	32	..	8 to 12 months.
12	Onions .. ..	34—36	..	
13	Parsnips .. ..	33	80—85	4 weeks.
14	Peas .. ..	36	80—85	4 "
15*	Potatoes—			
	(i) Gharwal .. ..	35	85—90	10 months.
	(ii) Mombasa .. ..	35	85—90	6 "
	(iii) Scotch Up-to-date .. ..	35	85—90	6 "
16	String beans .. ..	35	80	3 to 4 weeks.
17	Tomatoes—			
	(i) Bonnie Best .. ..	45	80	6 weeks
	(ii) Red Rock .. ..	45	80	4 "
	(iii) Marglobe .. ..	45	80	3 to 4 "
18	Turnips .. ..	31—32	..	1 to 2 "

\* Results of experiments conducted in India (Poona cold store).

APPENDIX IV—*contd.*COLD STORAGE OF PERISHABLES—*contd.**Meat, fish, poultry, dairy products, etc.*

Serial No.		Optimum conditions.		Approximate commercial storage life.
		Temperature °F.		
1	Bacon—			
	(i) Smoked .. ..	30—31	1	month.
	(ii) Fresh .. ..	0 (Storage 15 to 20).	12	months.
2	Beef—			
	(i) Chilled .. ..	30—32	6	weeks.
	(ii) Frozen .. ..	0—10 (Storage 15—20).	12	months.
3	Butter .. ..	0—5	12	„
4	Cheese—			
	(i) Swiss .. ..	38—40	8	„
	(ii) American .. ..	34—35	8	„
	(iii) Roquefort .. ..	38—40	8	„
5	Cream (frozen) .. ..	0	4	„
6	Eggs—			
	(i) Crated .. ..	30—31	10	„
	(ii) Canned .. ..	0—5	12	„

APPENDIX IV—*contd.*COLD STORAGE OF PERISHABLES—*contd.**Meat, fish, poultry, dairy products, etc.—contd.*

Serial No.	_____	Optimum conditions.		Approximate commercial storage life.
		Temperature °F.		
7	Fish—			
	(i) Fresh .. .. .	0		12 months.
	(ii) Chilled .. .. .	(Storage 10). 34		1 month.
8	Games—			
	(i) Frozen .. .. .	0—10 (Storage 10—15).		12 months.
	(ii) Chilled .. .. .	28—30		1 month.
9	Ham (Smoked) .. .. .	31—32		1 „
10	Hogs—			
	(i) Smoked .. .. .	30—32		1 „
	(ii) Fresh .. .. .	0 (Storage 10—15).		12 months.
11	Liver .. .. .	31—32		1 month.
12	Meat of sheep, lamb, etc.—			
	(i) Chilled .. .. .	30—32		4 to 5 weeks.
	(ii) Frozen .. .. .	0 (Storage 15—20).		12 months.
13	Oyster .. .. .	30—33		..
14	Poultry—			
	(i) Frozen .. .. .	5 (Storage 0—10).		12 months.
	(ii) Chilled .. .. .	28—30		6 weeks.
15	Sausages (Smoked) .. .. .	31—32		12 months.

APPENDIX IV—*concl'd.*COLD STORAGE OF PERISHABLES—*concl'd.*

## Miscellaneous.

Serial No.	Name.	Optimum temperature °F.
1	Beer, Ale, etc. .. .. .	33
2	Cider .. .. .	30
3	Furs and woolens .. .. .	40
4	Honey .. .. .	45
5	Tobacco .. .. .	50—60
6	Wines .. .. .	40—45
7	Yeast .. .. .	31—32

APPENDIX V.

Table showing the hypothetical costs\* and returns by storing in the cold storage some of the important perishables sold in the Delhi market.

Name.	Commodity.	Particulars of storage.			Details of expenditure.				Returns.					
		Quality.	Period of storage.	Quantity to be stored.	Maximum loss during storage (10%).	Average purchase price per ton.	Total purchase price.	Interest at 6% per annum on total purchase price.	Total.	Quantity available for sale.	Average selling price in season per ton.	Total returns.	Total balance available.	Balance available per ton.
Oranges	..	Nagpur—just ripe—first and second qualities.	3 months from March and April.	320	32	Rs. 177	Rs. 56,640	Rs. 850	Rs. 57,490	288	Rs. 371	Rs. 1,06,848	Rs. 48,358	Rs. 154
Grapes	..	Quetta and Chaman—firm and sound—first and second qualities.	4 months from October.	250	25	498	1,24,500	2,480	1,26,980	225	652	1,46,700	19,710	79
Apples	..	Kashmir—fully grown and firm—first quality.	4 months from September, October and November.	200	20	465	93,000	1,860	94,860	180	630	1,13,400	18,540	93
Mangoes	..	U. P.—green but mature—first and second qualities.	1 month from August.	100	10	254	22,400	112	22,512	90	338	30,420	7,908	79
Potatoes	..	Meerut—first quality (for seed purposes).	5 months from May	110	11	75	8,250	208	8,458	89	200	19,800	11,344	103

NOTE.—The quantities stored in various months are estimated at about 1/5 to 1/3 of the imports in those months. The stored quantities of potatoes approximate the demand by Meerut producers.

After defraying the storage costs and other incidental expenses from the balance, the remaining will be the Storer's extra profit.

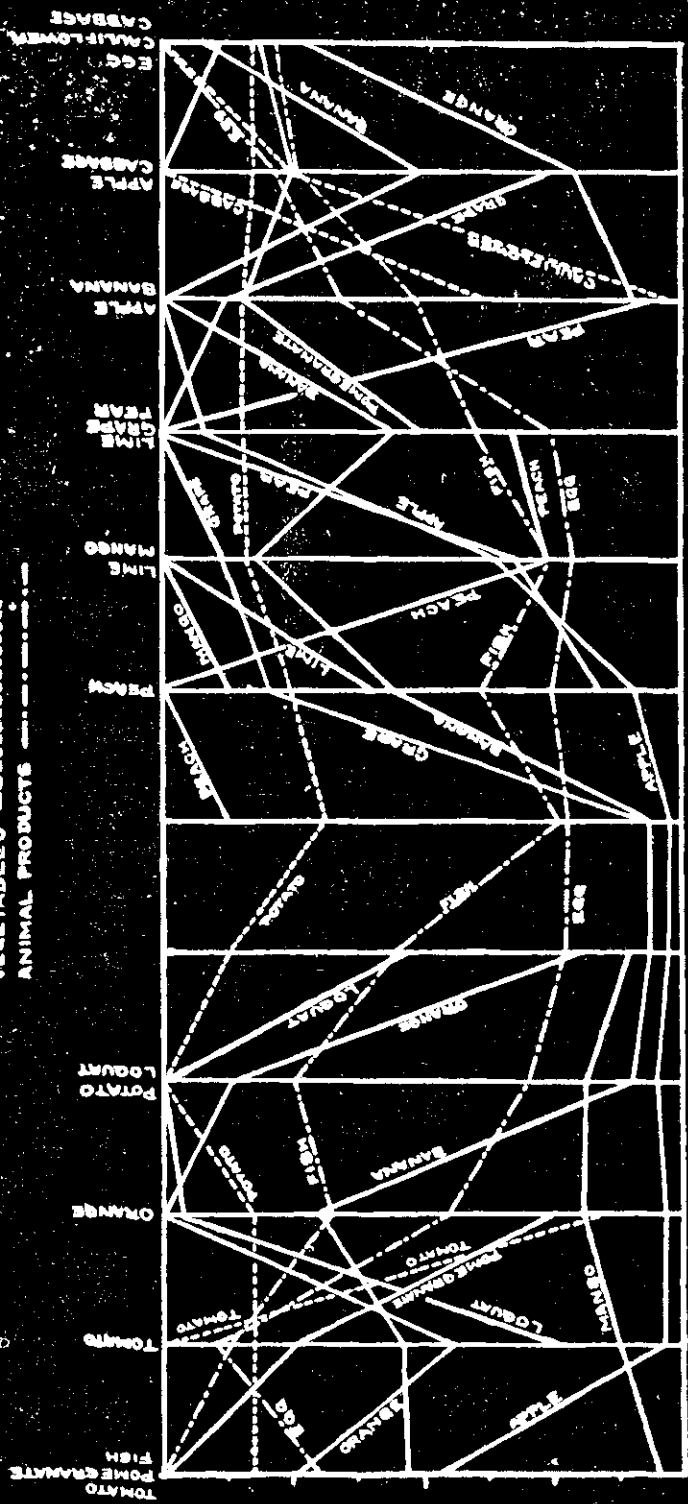
\*Omitting costs of storage or hire of storage accommodation.

DIAGRAM NO. 17  
 SEASONAL MOVEMENTS OF IMPORTED PERISHABLES  
 IN THE DELHI MARKET

FRUITS ————

VEGETABLES - - - - -

ANIMAL PRODUCTS - · - · -



JAN. FEB. MAR. APR. MAY. JUN. JULY. AUG. SEP. OCT. NOV. DEC.





## APPENDIX VI.

*Approximate quantities\* of certain perishable commodities in cold store at Delhi during different months.*

*(Hypothetical).*

(Tons.)

Month.	Orange.	Grape.	Apple.	Mango.	Potato.	Total.
January .. ..	..	250	200	..	..	450
February .. ..	..	250	130	..	..	380
March .. .. .	..	..	60	..	..	60
April .. .. .	180	..	..	..	..	180
May .. .. .	320	..	..	..	110	430
June .. .. .	320	..	..	..	110	430
July .. .. .	140	..	..	..	110	250
August .. .. .	..	..	..	..	110	110
September .. ..	..	..	..	100	110	210
October .. .. .	..	..	70	..	..	70
November .. ..	..	250	140	..	..	390
December .. ..	..	250	200	..	..	450

\*See also diagram No. 17.



