PIOCA IN ERALA

By
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BUREAU OF ECONOMICS
AND STATISTICS, TRIVANDRUM
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Contents

PREFACE

This brochure touching various aspects of tapioca crop in the State has been prepared by Sri P. R. Krishna Pillai, Research Officer of this Bureau. Tapioca is one of the important crops of the State accounting for about 11% of the cropped area. Sri. Krishna Pillai has tried to present a picture of the advantages and possibilities of stepping up production of tapioca in the State. He has taken special efforts to prepare this brochure.

Bureau of Economics and
Statistics, Trivandrum,
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P. P. PHILIPOSE
Deputy Director

SECTION I
INTRODUCTORY

Tapioca also known as Cassava, is a native of tropical South America. Brazil is reported to be the place of its origin but its cultivation has now spread nearly to all tropical countries of the world where it forms an important article of human consumption as well as food for live-stock. It is also used for the manufacture of starch powder, alchohol, glucose and other derivatives of starch.

According to Mac Millen, tapioca was introduced into Ceylon and India, by the Portugese in the 16th century, while Burkhill states that in 1840 it was freshly introduced direct into India from South America.

Tapioca is the formost tuber crop in India both in area and total production. Kerala is the only place where tapioca is extensively cultivated. While attempts have been made to extend its cultivation to other parts of India, Kerala remains the chief producing area with more than 123500 hectares under the crop.

Tapioca is known by several local names in differant countries. In America it is more

commonly known as 'cassava' or 'manoic' while the name 'tapioca' denotes certain market forms of its starch. In Philippines there are several native names for the plant, eg. 'camoty cashy' meaning tree of sweet potato. In Kerala it is known as 'Kappa' or 'Maracheeni.'

Tapioca platns have tall, thin and straight stems which are marked along their length by numerous leaf scars. Some of the varieties are non-flowering and do not branch. All flowering varieties branch at the top before flowering.

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SECTION II
CULTIVATION

Tapioca is mainly a tropical crop and has not been succesfully cultivated on a large scale beyond the 25th parallel on both sides of fhe equator. It thrives best under a warm, humid climate such as exists in the west coast of South India, Malaya, Java and other places. The crop does not thrive in very cold climate and even a light frost kills all the leaves. The crop can be grown upto an elevation of 914 metres in the trpiocal belt.

If the crop is harvested during the periods of heavy rainfall, as is done in certain regions, the stems are planted within a week or 10days. At present planting in Kerala is done almost through out the year. This is possible as this area gets the benefit of two monsoons. However the main planting season is April-May.

The crop is usually harvested from 8 to 10 months after planting, by pulling out the plants with hands. The tubers are then severed from the stem with a sharp knife, collected in baskets and marketed. The yield is highly variablel. The

average yield per hectare in Kerala is about 13 to 15 tonnes of raw tubers. In Malaya and other places yields up to 63 tonnes per hectare have been reported. At the Tapioca Research Station at Trivandrum, production upto 50 tonnes per hectare has been achieved from high yielding hybrids under intensive cultivation.

As the fresh tubers cannot be kept in good condition for more than a week, a part of the production is preserved as dried chips. The tubers are cut into thin round slices and dried in the sun after parboiling (by plunging the slices in boiling water for about 10 minutes). Parboiling helps to reduce insect attack on the chips during storage.

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SECTION-III
VARIETIES

Tapioca is purely a vegi:ative propogated crop. Due to natural cross fertilization so many varieties have been evolved. There are at present over two hundred varieties of which the principal commercial varieties under cultivation a:e given below.

1. Kalikalan
2. Anyian
3. Nadumangadan
4. Ullannoor
5. Kattan
6. Sunderi vella
7. Elamuriyan
8. Thulavilla
9. Vellarotti
10. Vellathotta
11. Pachathondan.

Varieties differ greatly in the colour of the plant parts. The stems may be greenish, white, light or deep reddish brown. The true colour of the skin is seen only in the young top portion, the older portion being covered by a thin whitish layer.

The plant grows to a height of 1.25 to 4.5 metres depending on the variety and the environment. The following are the improved varieties of tapioca supplied from the Tuber Research Centre, Trivandrum.

1. H–96/44
2. H–105/4½
3. H7-/49
4. H9/49
5. H10/49
6. H12/49
7. H20/49
8. H21/49
9. M4 } Selected from
10. M5 } Malayan Varieties
11. M6 }

The yield of tapioca per hectare depends on factors such as soil, the variety used, the manure applied etc. The yield varies considerably from place to place. Wide variations in yield have been noted in plants in the same locality.

SECTION-IV

EXTENDING THE AREA UNDER TAPIOCA

Tapioca grows well in diverse soils and can also produce economic yields even in depleted soils which are considered unsuitable for other cash or food crops. This is due to the superior ability of the tapioca plant to extract nutrients with the help of feeder roots which can penetrate the soil as much as one metre deep for obtaining nourishment from the deeper strata which are inaccessible to several other crops. Considerable scope exists for expanding the area under cultivation of this crop in Tamil Nadu, Andhrapradesh, Maharashtra, Assam, Orissa, West Bengal, Tripura, Andaman & Nicobar Islands and so on, where it has already been shown to grow well. Promotion of cultivation of tapioca in these areas needs to be vigorously pursued.

A great advantage is that tapioca can be profitably grown even on lands, other-wise of marginal utility only. At present there are vast areas of such lands in our country which are either lying fallow or being used to raise other

crops with greater efforts and heavy investments. These marginal utility lands can be very profitably used for growing tapioca.

Another unique character of tapioca is its capacity to adapt itself admirably well to erratic conditions. It needs moisture only in the early stages of its growth to get established and there after this plant has the capacity to with-stand drought of considerable intensity and duration. The plants achieve this by reducing transpiration loss by shedding the lower leaves. In India by and large, the rainfall is low over large regions and its distribution is also not uniform. Only 11% of the total area gets more than 75% of the rainfall. 75% of the total rainfall is received during a short period of 4 months (June–September) and the remaining months are comparitively drier. Therefore in several tracts with inadequate rainfall, tapioca can be grown with advantage. Significant results have been obtained in several parts of Africa by introducing a high yielding variety of tapioca in waste lands, too dry for the profitable cultivation of any other food or cash crop. The same needs to be done in our country as well as in

areas of scanty or irregular rainfall. As already stated, tapioca will tolerate long dry seasons once it is established and therefore use of improved farming methods or wider use of the slow maturing varieties will permit tapioca to penetrate these extremely dry areas.

Tapioca is also free from the ravages of serious pests which take a heavy toll of many other crops.

It is also resistant to the deadly locust attack. Tapioca mosaic is the only virus disease which of late, is attaining serious proportions in certain regions, but this can be controlled by using stems of resistent strains for propagation. The cost of cultivation of tapicca is comparatively low as it is easily propagated and requires less labour. It has been estimated that 30 mandays are required for producing 1 tonne of tapioca while 150 mandays are needed for 1 tonne of rice and 80 for one tonne of maize. Tapioca is also not season bound and hence the planting time can be varied to suit the farmers' time schedule provided enough moisture exists at the time of planting. The harvesting can also be delayed consi-

derably if necessary, without any serious deterioration of the tubers. Thus wide range of flexibility in the timing of planting and harvesting will enable the farmers to utilise their spare time after attending to the main crop or chief avocation. This will obviate the necessity to hire large number of labourers during the peak planting and harvesting seasons as in the case of many other seasonal staple crops.

Short duration varieties, even as short as a month, are available in Kenya and if imported they can be used to the best advantage. For instance in several localities in Kerala one crop of tapioca is raised after one crop of paddy. This tapioca crop fetches an additional income to the farmers as otherwise after the paday crop, the land more often lies fallow due to shortage of water and labour raising a second paddy crop.

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Section V.

MARKETING OF TAPIOCA

Tapioca became prominent in the State by the latter half of the 19th century consequent on the introduction of a suitable Malayan variety into the state by the famous Maharaja Visakom Thirunnal in the erstwhile Travancore State who gave all encouragements to its proper cultivation. In the famine year of 1861 and 1882 tapioca has come to the rescue of the people and is said to have saved a disastrous situation.

The important market centres for dried tapioca are Changanacherry, Ernakulam and Kottayam. Changanacherry is the most important distributing market in the state. White chips from such far off places as Kattakada, Nedumangad etc. also sometimes find a place in the market of Changanacherry.

Chips are freely sent to Quilon and other coastal areas from Kattakkada, Pathanapuram and other parts of the State. Alwaye and Parur markets draw their supplies mainly from Kunnathunadu and Changanachery. Ernakulam market is mainly fed by Changanachery and by the producing cen-

tres of the Northern parts of the State. Transactions in dried chips take place outside the market centres.

The major part of the raw tapioca do not find their way into the markets. The transactions in raw tubers mainly take place outside the markets on way sides, producers, compounds etc. During the season it will be a common thing to see raw tapioca being sold every where on the sides of roads, village market centres, evening market centres and common places in the villages. Hence it is not possible to arrive at a figure with any degree of accuracy regarding the arrivals of raw tapioca in the various places.

Pearl sago is manufactured from tapioca on a large scale factory basis at Salem in Tamil Nadu. Perhaps Salem is now producing enough of sago to meet the internal demand in India and Sago is being imported in this State also from Salem.

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Section VI

EXPORTS AND IMPORTS OF TAPIOCA

Tapioca for long had been only a food crop of the State but with the commencement of World War II it became industrially important. The starch requirement of the Textile Industry in India were formerly met by imports only. But with the commencement of World War II the Textile Industry was forced to depend mainly on indigenous production. The tapioca starch indutry in the State then developed on a Cottage Industry basis and exports of starch from the State commenced.

The exports in 1952–53 represent exports from the entire Travancore-Cochin area. The exports by water and road are estimated figeres based on the information collected from trade sources. From the statement it would be seen that the total exports under the different products of tapioca amounted to about 63,000 metric tonnes when calculated in terms or raw tubers to the value of Rs. 80 lakhs. Starch is estimated at 25% by weight of the raw tubers and the chips and flour at 40% by weight of the raw tubers.

Tapioca has been exported in the from of dry chips by all routes viz rail, road and sea.

In the State the manufacture of starch is mainly done on a cottage industry basis. The waste in the manufacture of starch consisting of the fibrous matter locally called as 'Kothu' is dried and marketed.

It is estimated that 40% of the total production of tapioca is dried and converted into chips. In the northern and southern taluks about 30% is generally dried. In central taluks more than 60% of the total production of tubers is dried and converted into chips.The loss on storage transport and marketing is estimated on an average at 12% on dried chips. The loss on storage is high in chips dried without parboiling.

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Utilization:-

The production of tapioca in the state in 1952-53 was estimated at 15 lakhs metric tonnes. It increased to 46 lakhs metric tonnes in 1969-70.

Tapioca from the state is exported in the form of starch flour and dried chips. The total exports in 1952-53 was about 63,000 metric tonnes only. The main Industrial productions of tapioca in the state is starch. The state exports various products made from tapioca which together in terms of raw tuber would come to about 2 lakhs tonnes in 1969-70.

Besides raw tuber (41,000 tonnes) the other products exported were edible chips (1226 tonnes) unedible chips (12,749 tonnes) starch (6,547 tonnes) Glucose 7,000 tonnes,) flour (22,678 tonnes) and other products (2,339 tonnes .

The starch factories in the state use up about 50,000 tonnes of tapioca as raw material per year.

The other product of Industrial importance is the dried chips. The white dry chips could be

converted into flour and used for various purposes. Starch could also be manufactured from this. The dried chips left after the exports is consumed as food in the State.

The other industrial product is the pearl Sago manufactured from tapioca. There are only very few factories manufacturing sago in the State. There is scope for developing sago industry in the State on a well organised Cottage Industry basis.

The handloom industry in the State uses tapioca starch for sizing the yarn, and for stiffening clothes. The bakeries, hotels and restaurants use it for preparing biscuits and other articles of food. The handloom industry is estimated to consume about 812 metric tonnes of starch equivalent to 3250 metric tonnes of tubers.

The laundries in the State consume about 560 metric tonnes of starch equivalent to 2240 metric tonnes of tubers per year. The annual consumption by bakeries and restaurants in the State is estimated at 50 metric tonnes of starch and 149 metric tonnes of flour equivalent to 615 metric tonnes of raw tubers.

Thus the total demand for Industiral purposes in the State is 6104 metric tonnes of tubers. This is 42% of the net available quantity. There is no special demand for any particular variety for exports as only the dry chips, flour and starch alone are generally exported.

The types of tapioca products exported from the State for industrial purposes are starch flour, drid chips and waste (kothu). The first quality starch is extensively used in the textile mills for sizing and finishing clothes. The second quality starch is used mainly by hotels, and match factories, for the manufacture of adhesives etc. The dry chips exported is converted into flour and used for the manufacture of starch or used as an article of food.

The dry chips left over after exports are consumed as food only. The dry chips are in good demand particularly during the monsoon months.

The waste(kothu) obtained in the manufacture of starch is also exported to a certain extent. It is used for the feeding of live-stock, poultry, pigs and also powdered and mixed with second quality starch for the manufacture of adhesives etc.

The most important industrial product of tapioca in the State is starch. Tapioca has a higher starch content. The starch content varies in different varieties ranging from 22 to 32 per cent in raw tubers. The starch is stored as food in the cells of tubers. The tubers do not contain any fatty matter and hence the manufacture of starch from tapioca tuber is a simple process. The outer skin and the inner rind of the tubers are first removed and then the entire tubers washed well to get rid of all soil particulars. The tuber tissue is then mechanically disintegrated to separate the starch granules from the developing cell walls. The thoroughly disintegrated stuff is put in water, stirred well and the residue that is the waste material consisting of fibrous matter, etc. called "kothu" is pressed out and removed. The starch that settles down in the water is cleaned and purified by repeated washings and then dried thoroughly.

The kothu is also dried. Formerly the tuber-tissue was disintegrated by rubbing the tuber surface on a hard surface by human labour. Now machanical means of disintegrating the tubers have been devised and these devices are working satisfactorily.

The manufacture of starch gives an additional income to a good number of working class families in the State.

The other product of industrial as well as household importance is the white dried chips. The white dried chips are made by removing the outer skin of the tubers and then slicing them and drying in the sun for a period of 3 days. The cost of preparing the stuff consists of the cost of peeling chopping and drying.

The other industrial product of importance is sago. Sago is not manufactured on a large scale. For preparation of sago, starch is to be prepared first. The starch before it is completely dried is passed through series of mashes of desired size. It requires practical skill and experiences for the manufacture of sago. The cost of manufacture of 3 Kgs. of sago will be about 50 paise roughly including the cost of raw tubers.

SECTION VII

METHODS AND COST OF TRANSPORT OF TAPIOCA

Tapioca and tapioca products entering into the internal trade are transported mainly by road and water. Very little is transported by rail But the very few movement by rail is important for export trade.

1. By road:-

Raw tubers of tapioca for the internal trade are transported from the centres of production to the consuming centres on head loads, cart loads and in motor lorries. In the southern parts, women folk in this tapioca trade carry head loads of tapioca tubers from the production centres to the village markets etc. Generally when the distance is comparatively short no extra cost is involved in such transports as the stuff is carried on head loads by the parties themselves with out luggaging any additional labour.

Bullock carts are often used for fhe transport of raw tubers as well as dried chips from the centres of production to the consuming centres and to the assembling and distributing markets. This

is the case when the distance is generally 20 to 30 kilo metres. The capacity of the carts slightly varies with the places. It generally varies from 500 to 700 kgms.

There is no fixed charge for the bullock carts. The rates are generally fixed by bargaining. Raw tubers are generally transported as loose stock in bullock carts and dired chips are transported either as loose stock or packed in second hand gunnies.

Motor lorries are also used for the transport of tapioca and tapioca products both in the internal and in the export trade. Raw tubers are transported in lorries to the consuming centre from the centres of produotion. Lorries are often used for the transport of dried chips over long distances in the State and also for the transport of dried chips from the State to other places in the adjoining State of Tamil Nadu. The cost of transport by motor lorries depends upon the distance to be covered.

In the case of transport by lorries, raw tubers rate transported as loose stock with ou any

packing and dried chips are transported packed in second hand gnnnies. Tapioca starch packed in gunnies are also transported internally over small distances by bullock carts and over long distances by motor lorries.

2. By rail:-

Hardly any tapioca or tapioca procuct in the internal trade is moved by means of rail but rail forms an important means of transport for the tapioca products in the export trade. Tapiooa prodcts are freely booked in small consignments as well as in waggon loads frcm almost all the important railway stations situtaed in or near the producing centres. All pronucts of tapioca as stated earlier are transported by rails. Tapioca procucts are exported from the State to the different detinations in the adjoining State of Tamil Nadsuch as Kadayanllur, Tinneveli Sivakasi etc. Tapioca products are also exported to other centes such as Hubli, Bombayetc.

Tapioca products are despatched in rail, packed in gunnies. For railway bookings the commodity has to be taken to the railway station either in

carts or in lorries and booked for which there will be an additional expenditure, the expenditure there on depending mainly upon the distance to the station from where the stuff has to be brought.

3. By water:-

Country boats or canoes or vallams are used for the transport of tapioca and tapioca products both in the internal as well as in the export trade.

Raw tubers of tapioca from the centres of production are transported in canoes to the consuming centres wherever facilities exist. In low lying Kuttanad area of the State, fresh tubers arrive during tapioca season in large quantities in canoes.

Tapioca chips are also transported in canoes from Changanacherry market to the different coastal consuming centres.

There are no fixed rates in the case of transport by water. The rates are often fixed by bargaining with the vallom Moopens (brokers) who arrange the canoes or rarely with canoe men direct.

4, By Sea:-

Tapioca products are exported from the State by steamers also. Major portion of export by sea go to Bombay. Bombay imports from this State tapioca starch, flour and powder and dried chips. A few consignments of starch go to Calcutta also by steamer.

The industrial possibilities of tapioca are well known. Exports of tapioca products from the State for the past few years were subject to restriction imposed on movements consequent on the situation created by the war and the scarcity of the staple food for rice in the State.

Tapioca responds very well to manuring. With effective manuring the yield could be considerably enhanced. The Tapioca Research Station in the State is now distributing high yielding improved varieties. The present system of cultivaion also requires improvement. By following proper cultural practices and by popularising improved varieties and by proper and effective manuring the yeild of tapioca could be increased considerably in the State.

SECTION VIII

STEPPING UP THE OUTPUT FROM THE EXISTING TAPIOCA FIELDS.

In Kerala there is immense scope for intensive tapioca cultivation as the agtro climatic conditions are very conducive to the luxuriant growth of this csop. It is indeed unfortunate that inspite of our age old familiarity with tapioca,the average yield (10 to 20 tonnes per hectare.) here is extremely low compared to the appreciably higher yield achieved in several other countries particularly Brazil, Madagascar, Java and Malaya. For example, yields as high as 150 tonnes per hectare have been reported from Brazil under ideal condition as early as in 1955. The yield potential of tapioca is indeed tremendous and the urgent need for stepping up yield rate cannot therefore be over emphazised.

Breeding for high fertility conditions will have to be the pre-requisite if any substantial improvement in the yield of tapioca is to be expected within a short period. Any programme of improving production by soil fertility has to be accompanied by growing tapioca strains which

will efficiently utilise the added fertility and not those strains which are now adopted to low fertility conditions. Alongside this we have necessarily to build up genetic immunity in tapioca plant against the sericus virus disease known as tapioca 'mosaic' which has assumed sericus proportions of late particularly in Kerala and reduces the yield considerably. In other words production and resistance breeding in tapioca must go hand in hand. This approach now is a 'must' for a crop like tapioca if any radical improvement is to be expected. By adopting suitable plant breeding techniques, the Central Tuber Crops Research Institute at Trivandrum has already evolved certain hybrids of tapioca which in test plots have proved to be of very heavy yields. One strain thus developed involving superior exotic materials gave as high yield as 63 tonnes of tubers per hectare under samifertilization conditions and also showed high degree of resistance to 'tapioca mosaic' disease. Intensive efforts are also underway at the Institute to breed varieties of tubers with enhanced starch content and one such strain which is at present under intensive evaluation studies

has recorded 30 to 35% starch content in tubers on fresh weight basis. Cetain varieties from Brazil have been reported to possess as high as 40% starch content. Therefore proper utilization of such improved strains can bring manifold increase in the starch yield per unit area which can consequently lead to a drastic reduction in the cost of manufactured starch.

Thus it may be seen that condsierable scope exists for stepping up production and lowering the cost of raw materials at the sametime, assuring more profits to the grower. This would also lead to better and proper utilization of our indigenous starch resources and lesser dependence on imported raw material for the manufacture of starch. It will also enable the country to compete in the inter-national market with other cassava (Tapioca) starch producing countries and thereby earn valuable foreign exchange. There is no doubt however that ready accpetance of superior quality tapioca starch from our country in several European and American markets cannot be achieved satisfactorily until there is some guarantee of regular

supplies. Assured supplies of high quality starch can be obtained only by the establishment of modern highly machanised tapioca starch facteries. It would also be necessary to set standards of purity that would satisfy consumers in other countries, since they are often selective in their purchases.

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SECTION-IX

THE INDUSTRIAL POTENTIAL OF TAPIOCA

The industrial potential of tapioca is indeed very great. A small country such as Thailand is exporting tapioca starch worth about 8½ million dollars every year. Before the secoud World War large exports of tapioca starch were from Malaya and Java, and when this supply was disrupted during the war, starch for use in the textile industry in India was largely supplied by Kerala (Travancore–Cochin). It was then realised that this crop could be utilised as a very profitable industrial raw material. The importance of tapioca increased tremendously in our couotry. With the increased demand for tapioca startch, cultivators in Kerala became actively interested in the expansion of tapioca cultivation. Vast areas, once planted with other crops, had been converted into tapioca fields and large areas of new lands were also planted with tapioca, since the cultivators found it much more profitable to concentrate on this crop. The preparation of tapioca starch on a cottage industry basis becamc a thriving industry. There was a time when almost every

where in Kerala one could see men, women and childern enthusiastically rasping tapioca tubers for extraction of starch. But thir boom for tapioca starch was short lived and this crop unfortunately has slowly lost its pride of place. Of late however there are again visible signs of steady increase in the demand for tapioca tubers. Several starch factories are now functionating in different parts of the State. A systematic and planned approach foster and enlarge this developing demand for its starch can undoubtedly bring prosperity to our country particularly to Kerala which enjoys ideal agro climatic conditions for raising tapioca crop.

The industrial requirements of tapioca starch or other tapioca products can be broadly divided into two categories:

1. Industries where no stach except tapioca starch can be used because it possess certain special properties not found in others.

2. Industries which do not specifically require tapioca starch products but makes the choice on the basis of cost and market conditions.

Here tapioca has to compete with other products in the market. It is in this field that of late, this crop has been looing ground. There are, however, possibilities of improving the situation as discussed below.

When an analysis of this problem – its causes and remedies is made it would be seen that the cost of finished starch is the main hurdle to the popularity of tapioca starch and its products. An ideal solution lies in bringing down the cost of the raw material itself, without curtailing the growers returns. If the production of raw tubers can be increased substantially, a lowering of the market price can be expected. This has to be achieved mainly by stepping up considerably the per hectare output from the existing fields.

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Section X

THE INDUSTRIAL UTILITY OF TAPIOCA

1. TAPIOCA STARCH

Tapioca is one of the important sources of starch in the world. The low cost starch, its tuber yields has innumerable uses in industries either as such or in the from of its derivatives like dextrines adhesives, oxidised cold soluble and pregelatinized starches etc. Textile industry is the largest consumers of its starch which is being used extensively in sizing, finishing and printing. Cassava or Tapioca starch gelatinises almost completely and forms a cdolourless, odourless and transparant soft gel when set unlike cereal starch which is slow and more difficult to gelatinise The gelatinizing temperature of cassava (tapioca) starch is 160°F while those of several other range from 167°F to 180°F. Moreover the gel is relatively stable and netrogradation does not occur as in corn starch or potato starch It also gives a more viscous paste after prolonged boiling. These excellent colloidal properties accord tapioca starch a pride of place amongst

the various starches from other sources. In textile printing it serves as a base for the thickner in the printing paste. It is very useful in paper making as a sizing material for hardening and stiffening purposes and to improve the writing surface. Tapioca is in good demand in laundries due to the fine gloss it is reputed to impart to the fabric. Tapioca dextrin has a very good remoistening property.

It is therefore exclusively used for postage stamps and envelope flaps. As an adhesive, tapioca dextrin is used in paper wrappings, paper boxes in foundries, in the manufacture of colours, chemicals, cordage carpets etc. As it is more readily made in-to a paste it is preferred in certain types of explossive such as an ingredient of dynamite, short gun shells etc. In leather industry the starch paste is used along with tanning extract to increase the penetratingy capacity of the liquid and to improve the qualit of leather. It finds wide use for sealing cigarettes. It is used in silvering compounds, in shoe making, straws, match heads, in the manufacture of pharmaceutical and toilet preparation etc. In the manu-

facture of corrugated cardboard and plywoods it is widely used. Another new use is a constituent of the drilling fluid in oil boring.

Liquid glucose, syrup glucose, solid glucose, power alchol etc. are some of the very important commercial products for the manufacture of which tapioca starch is used as a base.

2. FOOD INDUSTRY:

Tapioca starch is also extensively utilized in food industry. For the manufacture of pearl sago in Salem tapioca tubers are exclusively used. Similarly tapioca flates siftings, vermicelli, semolina, macroni and several other products are made from tapioca. Tapioca starch is extensively used as an ingredient of puddings, cakes, salad etc.

Due to its easy digestibility, tapioca starch is a preferred ingredient of baby foods. Ripe bananas and tapioca starch mixed together form a popular baby food in U.S.A. Possibilities for manufacturing baby food should be explored in Kerala also as both bananas and tapioca are available in plenty in the State.

3. Live Stock Industry.

The low cost and high productivity potential of tapioca offer immense remunerative possibility of utilizing this crop as an excellent feed for live stock as well. Experimental feeding of animals in differant regions of the world have demonstrated the suitability of tapioca nations particularly for cattle, chicken, sheep, goats, horses,etc. It is also found to have a high total of digestive nutrients and as such has been proved to be very good feed for working bullocks. There are immense possibilities of bringing down the cost of production of milk, eggs, beef etc. by substituting the costly cereals concentrates which are at present used as animal feed with the low cost tapioca because it has been confirmed by experiments in several countries that tapioca nations do not adversely affect the milk and egg yield at all. For milch cows it has been proved that the weekly milk yield, fat percentage fat corrected milk yield and total fat are not at all affected by either partial or complete replacement of oats with tapioca. Tapioca fed pigs put on more fat as compared to those fed on grains.

Considerable quantities of tppioca as manioc meal, cosetles or Kekonte are being imported by European countries to be used as animal feed. It will not be difficult for Kerala to take advantage of this huge demand and to earn much needed foreign exchange provided, of course the production of tapioca tubers can be considerably stepped up at low cost.

Besides, in India with a record cattle population in the world very effective use can be made of low cost tapioca as cattle feed in place of costly cereals and pulses which can be released for human consumption. Despite these advantages there has not yet developed any where in India a true live stock feeding industry based on tapioca. There is however no doubt that the utility of tapioca as feed for live stock offers immense possibilities particularly in India when it can be produced in abundance and therefore the development of such an industry based on tapioca and its products deserves urgent attention.

Further, tapioca stems can be used for the manufacture of hard boards. The ashes of tapioca stalks of certain varieties are also being used as

cooking salt, dye, snuff etc. in certain countries.

In view of the above and in the interest of national economy it has now became necessary to give tapioca a good industry base more or less on the pattern adopted in other countries. Further more, this may be the only surplus indigenous raw material available for starch making after meeting the food and feed requirements. It should be possible for us to stop the import of maize for starch making and lean on tapioca as a raw material for the mannfacture of starch and on tapioca starch to meet our requirments for the various industries.

In the last few years tapioca has become a product with a substantial and rapidly growing export volume. It is winning a large place as a raw material for the European Economic Community thriving compound animal feed industry.

The animal feed industry is the only really dynamic export outlet for tapioca. The great bulk of the tapioca sold for this purpose goes to the Federal Republic of Germany, the

Netherlands and Belgium. These three countries are in fact the only really important manoic importers in the E. E. C.

Eventhough the growth of the livestock population in the above three countries is not very impressive, compound feed consumption is rising rapidly as farmers strive to boost productivity.

The current surge of manoic exports to Europe is some thing of a renaissance rather than a really new phenomenon.

Manoic has long been known as a raw material for compound feeds as it was extensively used before world War II. But after the war manoics use declined considerably. Grains became cheaper, more German manoic imports were regulated by Goverment until 1958.

Germany alone accounts for more than 70% of the E. E. C's total 'manoic' imports. Between 1962 and 1966 Germany's manoic imports almost doubled risising from 366100 to 701700 metric tonnes. This represents an average annual increase of 18%.

Obviously the key factor that provides the very foundation of the market for manoic as a food stuff is the size of the compound feed industries in each of the countries, which is dependent on size of the live stock population.

Currently the content of manoic in compound feeds averages about 10% in Germany and only about 3% in Netherlands. But even in the Netherlands where the market for compound feeds has reached or approaching the saturation point, there is still considerable room for growth of manoic imports.

Manoic is used for pig feed but even for pigs its use is limited because much manoic tends to produce execessive fat and lowers the meat quantity. Manoic is also used though in lesser amounts in poultry feed. The rising number of pigs in the Netherlands and Belgium should bring an increase in demand for manoic at least partly off setting the Netherlands decline in per head compound feed consumption of pigs and cattle.

One of the really critical factors governing manoic market condition is the relationship between its price and the prices competing feed stuffs. If the trend of higher grain prices continues, competitiveness of manoic will be improved.

Manoic meal imports recive different tariff treatment from dried roots. The introduction of the E. C. C. tariff on manoic meal (seven years before a levy was applied on dried roots) is one of the factors behind a highly significant trend in manoic trade.

Brazil, Indonesia and Nigiria are the larger producers of manoic. Brazil alone accounts for about 30% of the world production but exports only a small share of its output.

On the other hand, the worlds largest exporter of manoic products is Thailand. It was deliberately develcped as a cash crop, through agricultural diversification programmes.

Two of the major problems in the manoic trade are freight rates and deterioration during transit.

Freight rates for manoic shipments from Asia are very high. Manoic chips in bulk, the most commonly traded item bear the highest rate which creates serious problems particularly for Thailand.

Moulding, heating and sweating during transport present another problem. Obviously the longer the voyage the more severe the risk o deterioration. Users have to pay on extra insurance premium to cover this risk.

Thus in both freight rates and the deterioration problem, African producers have a major advantage because of their proximity to the market. If African countries can develop their manoic production and improve shipping facilities and achieve the ability to supply large quantities on a steady basis, they have excellent prospects of winning a large share of the growing European manoic market.

Let us hope that the Tapioca Expansion Board Constituted by Kerala Government will play a vital role in stepping up the production and exports of tapioca in Kerala.

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APPENDIX I

Cost Per Hectrae of Tapioca—1968

Sl.No.	Name of District	Rs. per hectare
1	2	3
1	Trivandrum	928.72
2	Quilon	1017.64
3	Alleppey	1123.65
4	Kottayam	1301.69
5	Ernakulam	871.91
6	Trichur	733.59
7	Palghat	629.85
8	Kozhikode	901.55
9	Cannanore	1148.55

Gross Income Per Hectare—1968

Sl.No.	Name of District	Rs. per hectare
1	2	3
1	Trivandrum	1565.98
2	Quilon	1649.96
3	Alleppey	1906.84
4	Kottayam	2274.87
5	Ernakulam	1667.25
6	Trichur	1254.76
7	Palghat	1247.35
8	Kozhikode	1808.04
9	Cannanore	1899.43

APPENDIX-II

Area and production of tapioca in Kerala 52-53 to 66-67

Crop	Units	1952-53	1953-54	1954-55	1955-56	1956-57	1957-58	1958-59	1959-60
1	2	3	4	5	6	7	8	9	10
Tapioca	'000 hectare	204.72	242.45	225.68	221.13	208.51	213.96	223.87	240.76
Total food Crops	,,	1424.54	1495.15	1501.86	1507.81	1481.14	1487.10	1501.00	1542.38
Production of Tapioca	'000 tonnes	1514.35	1826.26	1593.59	1594.10	1848.82	1510.89	1551.74	1672.94

Grop	Units	1960-61	1961-62	1962-63	1963-64	1964-65	1965-66	1966-67
1	2	11	12	13	14	15	16	17
Tapioca	'000heatare	242.20	236.67	221-62	209.91	209-37	229.68	244.65
Total food Crops	,,	1565.06	1539.53	1601.84	1604.49	1608.94	1635-32	1676.82
Production of Tapioca	'000 tonnes	1683.00	1644.60	1534.97	2523.57	2763.20	3095.66	3409.67

Source:- Fact Book on Agriculture 1966.

APPENDIX— III

Area, Production and average yield of tapioca in India 1950-51 to 1966-67

Sl.No.	Tapioca	1950-51	1955 56	1960-61	1961-62	1962-63	1963-64	1964 65	1965-66	1966-67
1	2	3	4	5	6	7	8	9	10	11
1	Area. in '000 hectere	236	243	247	265	274	244	240	261	NA
2	Production ('000 tonnes)	1283	1787	1969	1892	1757	2821	3029	3361	NA
3	Yield per hectares Kg.	5436	7354	7186	7140	7115	11557	12605	12806	NA

Source. Records and Statistics.

Quarterly Bullettiu of Eastern Economics, New Delhi.
Vol. 19-No-2

APPENDIX-IV

Tapioca

Area under crop in hectares. (District wise)

Districts.	During the years 57-58 to 67-68										
	1957-58	58-59	59-60	60-61	61-62	62-63	63-64	64-65	65-66	66-67	67-68
1	2	3	4	5	6	7	8	9	10	11	12
State	218965	228879	238862	242206	236680	221621	209910	207509	229684	244647	297646
Trivandrum	55714	58500	56030	56918	56464	52286	50183	48114	53844	59228	72735
Quilon	56932	59892	60419	58050	55773	55773	54841	53089	57699	63359	94165
Alleppey	24309	27500	27164	28217	27981	29939	26590	24060	23035	22262	25113
Kottayam	32066	30111	44540	44231	44171	41412	39263	41413	43815	42833	32526
Ernakulam	16517	15573	16835	17732	15481	13010	13680	11381	13568	16105	23072
Trichur	6405	6640	7523	7632	7578	5240	4636	5107	4137	7243	10278
Palghat	3344	3422	3271	3351	3311	2394	2648	6276	6476	7124	10757
Kozhikode	12425	16242	18346	18994	18410	14056	12208	12208	19687	2053	22214
Cannanore	6253	5999	6634	7081	7511	7511	5861	7723	7523	5956	6786

Source:- Season and Crop Report, Bureau of Economics and Statistics

APPENDIX-V

Production of Tapioca in tonnes (District wise)

During the years 1957-58 to 67-68

Districts	1957-58	58-59	59-60	60-61	61-62	62-63	63-64	64-65	65-66	66-67	67-68
1	2	3	4	5	6	7	8	9	10	11	12
State	1511230	1552132	1667210	1683135	1615033	1540365	2524220	2763187	3095653	3409663	4198357
Trivandrum	393196	413166	389436	395607	392151	363109	642693	591302	758662	823269	1042293
Quilon	402134	423001	419938	403471	387649	387649	605918	626450	695220	919118	1292885
Alleppey	171646	194225	188801	196120	194478	208092	293707	350314	349211	280857	328930
Kottayam	226524	212667	309571	307426	307009	287831	621164	727626	755809	732873	597503
Ernakulam	116667	109988	117012	123246	107599	90426	202686	134296	155218	119500	293706
Trichur	45224	46898	52290	53050	52670	36420	40745	35902	46789	82136	116964
Palghat	23577	24167	22737	23290	23014	16640	24603	78761	67047	92825	138227
Kozhikode	87805	85649	127513	132013	127960	97695	101163	150158	201595	239572	275898
Cannanore	44207	42371	46101	49212	52203	52203	51511	67885	66127	89518	111901

Source:- Season and Crop Report, Bureau of Economics & Statistics

APPENDIX-VI

Area under tapioca in each district during the year ending 30th June '68

Sl.No.	Taluks	Hectares
1	2	3
1	Trivandrum	72735
2	Quilon	94165
3	Alleppey	25113
4	Kottayam	32526
5	Ernakulam	23072
6	Trichur	10278
7	Palghat	10757
8	Kozhikode	72214
9	Cannanore	6786
	Total	297646

APPENDIX-VII

District wise production of tapioca during the year ending 30th June 1968

Sl.No.	Taluks	Tonnes
1	Trivandrum	1042293
2	Quilon	1292885
3	Alleppey	328980
4	Kottayam	597503
5	Ernakulam	293706
6	Trichur	116964
7	Palghat	138227
8	Kozhikode	275898
9	Cannanore	111901
	Total	4198357

Appendix-VIII

List of tapioca based industries in Kerala

1. Lekshmi Starch Factory, Vallakkadavu, Trivandrum-8
2. Leksnmi Starch Factory, Kundara
3. Mada Chemical Industries, Manchalloor, Pathanapuam.
4. Pamya Starch Iudustries, Angadi, P.O. Ranni
5. Tapioca Products, Chethunad, Chalakudy,
6. Kovalam Starch Industries, Kovalam P.O. Trivandrum District.
7. S.P. Iyengar, Anaval Street, Trivandrum.
8. M/S. Rajan Starch Factory, Thoongampara Oroothambalam P.O.
9. Padma Tapioca Starch Mills, Vazhavilagam Toppu, Balaramapuram P.O.
10. M/S. Jabbar Starch Factory, Anthiyoor, Balaramapuram.
11. Razeeria Mills, Killade, Kattakkada.
12. Tom Casav Trading Co., Chittattinkara, Vattiyoorkavu P.O., Trivandrum.
13. M/S, Muruga Starch Factory, Balaramapuram.
14. M/S. Nedumdhalil Starch and Sago Production Centre, Pothenicode P.O. Muvattupuzha.

15. Lekshmi Starch Factory, Ltd., Palluruthy, Cochin-6.
16. Excellent Starch Factory, Allapara, Ernakulam District.
17. M/S. Premier Starch Mills, Pampady, Thiruviluamala, Trichur District.
18. M/S. Anamangad Starch Sago Rice and Flour Factory, Perinthalmanna.
19. M/S. Mannarghat Starch Sago Industries, Mannarghat.
20. M/S. Kerala Starch and Sago Rice Works, Thoottu, Via. Perinthalmanna.
21. M/S. Tapioca and Starch & Sago Rice Products, Anamangad, Via. Perinthalanna.
22. Varapuzha Sago Starch Factory, Vallapuzha P. O., Via Shornur.
23. Manimooli Sago Factory, Manimooli P. O. Nilambur.
24. National Flour Mills, Tobacco Street, Calicut
25. M/S. Lekshmi Starch Factory, West Hill Street, Calicut.
26. M/S. Kerala Oil Mills and Industries, Karaparambu, Calicut. 10.
27. M/S. Ganesh Flour Mills, Copra Bazaar, Calicut-1

28. P. Moideen Koya Hajee Flour and Oil Mill, Tea Factory Road, Copra Bazaar, Calicut-1.
29. Bharat Trading Company, Building No.TV-19, 19 A. Fort Road, Cannanore.
30. Prabhu Flour Mills, Chalel Road, Tellicherry
31. M/S. Mubarack Rice and Flour Mills, Tobacco Street, Calicut.
32. M/S. Starch India (P) Ltd., P.B. No.9, Chalakudy.
33. Sri C.K. Achuthan, Padma Manufacturing Industries, Padma Estate P.O., Ambalavayal, Calicut.
34. Koovappady Block Starch and Sago Industrial co-operative Society, No (5 E 25, Pulluvazhy, P.O. Perumpavoor.
35. Nediyanga Tapioca Starch Workers IndustrialCo-operative Society, No. c.22, Nediyanga P.O, Via. Trikkur, Calicut District.
36. M/S. Jaya Babu Starch Factory, Nedumangad P.O.
37. M/S. Leela Starch Industries, Neyyattinkara P.O
38. M/S. Amir Tapioca Starch Industries, Balaramapuram.
39 Shereef Flour Mills, Balaramapuram P.O.

40. M/S. Sankar Starch Sago Factory, Mundathicode, Trichur.
41. Jaya Lekshmi Industries, Vijayan Chathannoor, Vijayannur, Palghat.
42. Suresh Flour Mills, Regular Road, Kozhikode
43. M/S. Oriental Columbia works, Flour Mill Operators, Kattukara, Kozhikode.
44. M/s. Pallikara Starch and sago Industries (P) Ltd., Kanayankode P. O. Palghat.
45. M/s. Beena Tapioca products, Edathoor, Calicut.
46. Aysha Flour Mills, Baliapatam, Cannanore.
47. M/s. Kidurakuzhi Cattle field Factory, Venganoor P.O. Vizhinjam.
48. M/s Kamala Starch Industries, Pallichal, Balaramapuram P.O.
49. Subitha Industries, T. C. 33/1414, Chalai, Attakulangara. P.O.
50. Jawahar Mills, Balaramapuram P.O.
51 Rengina starch Factory, Muttukara, Nedumpra, Quilon.
52. Palat Starch Products, Alamkara, Palghat.
53. Alam Tapioca, Pulverizers, Kozhikode.

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Errata

Page	line	For	Read
17	4	requirement	requirements
25	15	produotion	production
26	17	detinations	destinations
29	5	agtro	agro
34	10	approach foster	approach to foster
35	3	looing	loosing
36	14	odolourless	colourless
37	19	penetratingy	penetrating

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