OFF-SEASON CULTIVATION AND STORAGE AS MECHANISMS TO STABILIZE ONION PRODUCTION IN SRI LANKA

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Sri Lanka imports 34,000 mt of large onion annually at an expenditure of approximately Rs 300 million (1984-1988 average). Local production of this commodity must be increased three- to four-fold if it is to meet immediate demand. Sri Lanka is self sufficient in red onion.

Onion cultivation is restricted to a few agro-ecological regions in the Dry Zone because of the crop's specific environmental requirements. There has been some success in shifting its cultivation to non-traditional areas and producing it during off-seasons.

Several factors must be considered before large onion production is extended to new environments. The crop, which is relatively new to Sri Lanka, requires a high level of management and has specific environmental requirements. In addition, an indiscriminate increase in production of such a perishable commodity could result in a market glut and declining prices. The price variability of both red and large onions could be reduced by off-season production and provision of appropriate storage facilities. Both off-season production and storage involve high risk, investment and skills. Investors should be sufficiently compensated if they undertake such activities. Hence, strong government commitment to support such investment is urgently needed.

PREVIOUS SUPPLY AND DEMAND ESTIMATES

Many estimates of onion supply and demand have been made, some based on consumer demand surveys, others on assumptions. The high variability evident in these estimates is due to a lack of sufficient reliable data.

The methodology for assessing onion demand discussed in this paper is yet another approach and is intended to be a gross indicator of the magnitude of the situation rather than a serious academic exercise.

ESTIMATION OF DEMAND

The following assumptions are made to calculate the present level of demand:

a) Annual demand for red onion (A)

As red onion is no longer imported, the present level of production is assumed to be adequate to meet local demand. A five year average of local production between 1985/86 and 1988/89 was used.

b) Annual demand for large onion (B)

Average imports for the 5-year period, 1984-1988 and local production in Yala 1989 are used to assess the magnitude of demand.

c) Total annual demand for red and large onion (D)

Red onions and large onions are more closely substituted when there is a large price difference between the two commodities. Hence, the annual demand for all onions is assumed as the sum of demand for red and large onions:

$$D = A + B$$

d) Monthly demand for red, large and all onions is calculated by dividing total annual demand by 12 with an adjustment of 40 and 20 percent, respectively, for extra demand during April and December (festival periods).

IMBALANCE BETWEEN SUPPLY AND DEMAND

The monthly deficits and surpluses between onion supply and demand are given in Table 1.

Some interesting trends in supply and demand are illustrated in Graph 1. If price is taken as an indicator of demand, the two curves behave identically, reflecting their close substitution and response to the level of production.

ADJUSTMENTS TO BALANCE SUPPLY AND DEMAND

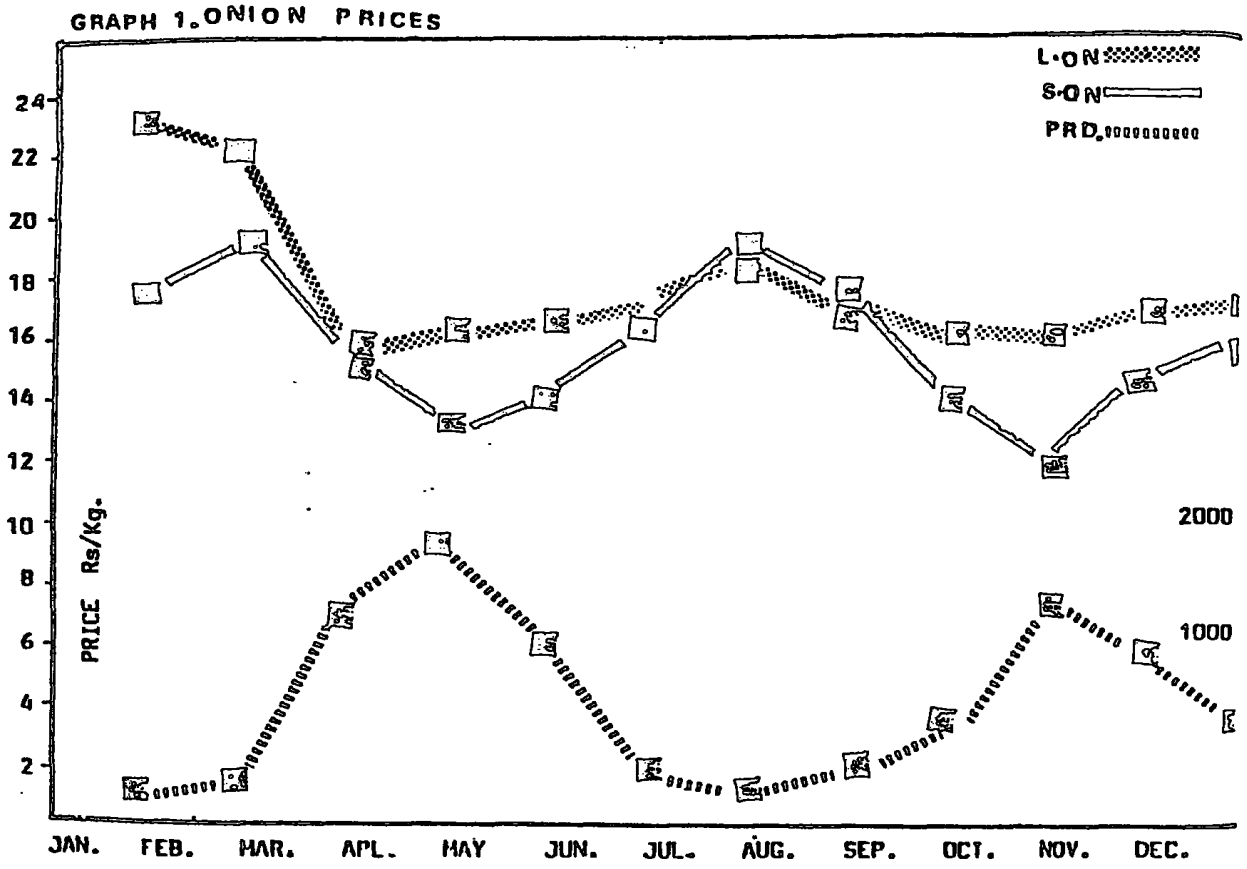
Commercial onion cultivation is presently restricted to a few agro-ecological regions in the Dry Zone. While some success has been achieved in cultivating red onions in non-traditional areas and during off-seasons, a similar expansion

TABLE I : SUPPLY AND DEMAND OF ONION

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Local production of red Onion (mt) Avg.Yr.85/86 to 88/89	7200	11744	15492	6641	4137	2531	4275	10999	12701	10542	3308	2247	92017
Local production of Large Onion (mt.) Yala 89	-	-	-	-	-	-	-	1484	6476	4360	103	-	12423
Local production of all Onions (red & large) (mt.)	7200	11477	15492	6641	4137	2531	4275	12483	19177	14902	3611	2247	104173
Adjusted demand for Red Onion (mt.)	7282	7282	7282	10195	7282	7282	7282	7282	7282	7282	7282	8739	91750
Adjusted demand for Large Onion (mt.)	3688	3688	3688	5164	3688	3688	3688	3688	3688	3688	3688	4426	46470
Adjusted demand for all Onion (mt.)	10970	10970	10970	15359	10970	10970	10970	10970	10970	10970	10970	13161	138220
Deficit/surplus of red onion (mt)	-82	+4195	+8210	-3554	-3145	-4751	-3007	+3717	+5419	+3260	-3774	-6488	-7389
Deficit/surplus of large onion (mt)	-3688	-3688	-3688	-5164	-3688	-3688	-3688	-2204	+2788	+672	-3585	-4426	-34047
Deficit/surplus of all onion (red & large (mt.))	-3770	+507	+4522	-8718	-6833	-8439	-6695	+1513	+8207	+3932	-7359	-10914	-34047

Source : Based on AR & TI,CHE & DOA data

in large onion production has not yet occurred. Because large onion is a perishable product, an indiscriminate increase in production will result in a market glut and a price decline. Therefore, efforts to increase large onion production should be accompanied by the development of strategies to stabilize prices. Two such strategies are off-season production and storage.



Graph I

OFF-SEASON ONION PRODUCTION

The monthly hectarage of red and big onion needed to theoretically balance supply and demand are shown in Table II. Potential areas for production were identified on the basis of monthly rainfall, availability of ground and surface water, soil suitability, and incidence of pests and diseases. The months which appeared to be suitable for planting were checked against crop performance during the past 5 years.

Off-season Production of Large Onion

Large onion is a relatively new crop in Sri Lanka. Our experience with its off-season production is limited compared with that of red onion. Further, its specific environmental requirements, susceptibility to pests and diseases, and the ideal harvesting conditions it requires restrict its off-season expansion to non-traditional areas.

The most important factors influencing bulb formation of large onion are photoperiod and temperature. Research on the adaptation of various onion cultivars to specific environments and seasons is still being conducted. As a result, the suggestions made in this paper are provisional.

Large onion cultivation could be expanded to non-traditional areas (already identified) which are suitable for its off-season production (Table II). However, nursery management would require extra care because this phase could coincide with the rainy period. Establishing the crop with dry sets reduces this risk.

Storage as a Means of Stabilizing Onion Prices

Onion storage is important in Sri Lanka where production of this highly perishable commodity is seasonal. Storage contributes to price stability, makes the commodity available to consumers at reasonable prices during off-seasons, and provides producers with an opportunity to receive higher prices when the commodity is scarce. Traditional storage results in appreciable losses by growers and middlemen. Providing appropriate storage requires a heavy investment in infrastructure and maintenance.

An understanding of the factors affecting storage is vital for those investing in storage. There is an urgent need to upgrade knowledge and skills in postharvest technology of persons involved in producing, handling and storing large onion. This area has high priority in current agricultural extension programs. Research is also being conducted on post-harvest technology on onion.

TABLE 11 : ADDITIONAL EXTENTS TO BE PLANTED IN DIFFERENT MONTHS AND POTENTIAL AREAS IDENTIFIED FOR PLANTING

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Additional extent of red onion to be planted. (ha)	363	321	485	307	—	—	—	385	662	754	8	—	3285
Addtional extent of large onion to be planted (ha)	400	286	286	286	171	—	—	278	343	286	286	286	2908
TOTAL (ha)	763	607	771	593	171	0	0	663	1005	1040	294	286	6192
Puttalao	8	8	8	8	8	8	8	8	8	8	8	8	
Jaffna	8	8	8	8	8	8	8	8		8	8	8	
Ratnapura	8	8	8	8						8	8	8	
Matale	8	8			8								
Mulativu	8	8		8	8	8	8						
Batticaloa	8	8		8	8	8	8	8	8	8	8	8	
Vavuniya	8	8	8	8	8	8	8	8					
M'eliya													
Trincomalee	8	8		8							8	8	
Killinochchi	8	8		8	8	8	8						
Kurunegala	8	8	8						8	8	8		
Mahameli 'M'	8	8			8	8							
Badulla	8	8											
Monaragala	8	8								8		8	
Hambantota	8	8		8	8	8		8	8				
Polonnaruwa	8	8		8	8	8		8	8				
Malawe	8	8		8	8	8		8	8				
Kandy	8	8		8	8	8		8	8				
Agoara	8	8		8	8	8		8	8				
Mannar	8	8		8	8	8		8	8				
Anuradahapura	8	8		8	8	8		8	8				
Syst.B	8	8		8	8	8		8	8				
Syst.C	8	8		8	8	8		8	8				
Syst.G	8	8		8	8	8		8	8				

8 Potential areas for onion cultivation

Source: Based on data from AR&TI.C.M.E. & DOA

FACTORS AFFECTING STORAGE

Cultivars

Extensive studies have been done to evaluate the storage quality of onions. A study by Thompson et al. (1972) showed that poor keeping cultivars generally have low dry matter content, low soluble solids, low pungency and a high water content, particularly just after harvest. The cultivar Red Creole was successfully stored under the high temperatures and humid conditions prevalent in Louisiana during the summer. The hard fleshed, tough-skinned Australian Brown stores well in California, South Africa and Australia. Other cultivars that are reported to store well are 'Pukekohe' Longkeeper (in New Zealand), Mako (produced in Hungary), Southport Globe types, and many Denvers (Thompson, 1982). Giza No. 6 was developed by the Egyptian Ministry of Agriculture to carry over the hot, dry summer and to stand rough handling and long distance shipment. In the Sudan, cultivar Wad Ramli can be stored for several months under ambient conditions (Musa et al., 1973). Indian cultivars Pusa Red, N-241, Arka Niketan, and Agrifound Light Red possess good storing qualities combined with good yield potential and could be prospective varieties for Sri Lanka. These varieties must be evaluated under local conditions.

Fertilizer Management

It is well established that proper fertilizer management can affect the storability of onions. Increased nitrogen results in larger bulbs which do not store well and are likely to sprout early. It has also been observed that excessive application of nitrogen, particularly late in the growing season, produces bulbs with thick necks which do not shrink on drying, thus reducing storability.

Pest and Disease Management

Regardless of the cultivar, bulbs should carry no pathogens and mature normally if they are to store well. Severe thrip attacks, downy mildew, purple blotch etc. can cause premature death of foliage and when plants produce new foliage, bulbs with thick necks result and storability is adversely affected.

Water Management

Water management influences the storability of onions. For most of the varieties grown locally irrigation water should be cut off 2 weeks before harvest to enable mature bulbs to harden.

Harvesting Time

Time of harvest depends on the purpose for which the crop is raised, i.e. for green onions or mature bulbs. Time of harvest is a very important factor influencing the keeping quality of bulbs. Premature harvesting enhances early sprouting and rapid deterioration during storage; delayed harvesting causes the formation of secondary roots during storage. Variety, rate of growth, and prevailing weather conditions influence date of harvest of dry bulbs. Indicators of maturity are bulb size, color and pungency; yellowing of foliage; softening of neck tissues; and drooping of tops. Varieties presently grown in Sri Lanka can be harvested for dry bulbs about 90 days after field planting.

Handling

Bulbs intended for storage must be free from cuts and bruises and must be handled and transported carefully. They should not be dropped on hard surfaces or piled up to the extent that there is a lot of pressure on bulbs at the bottom. Bruises and cuts increase weight loss and may accelerate infection by pathogens.

Drying and Curing

Drying is a process which removes excess moisture from surface tissues of the bulb and neck. This prevents shrinkage during storage and minimizes the establishment of micro-organisms which cause rotting. Drying is primarily a post-harvest field operation. Curing, during which further drying occurs, is a process to improve skin color and texture. Curing usually takes place in the shade. A well-cured onion bulb should have a tight neck, appealing skin color and loose outer scales which are dry enough to rustle.

Grading

Bulb size is an important determinant of storability. Over-sized bulbs sprout more quickly than smaller ones, which loose weight more rapidly than larger bulbs. Therefore, medium sized and uniform bulbs are most desirable for storage.

Storage Temperature and Humidity

Temperature and humidity are critical factors in onion storage. In a study by Wright et al. (1935), sprouting increased with each increase in temperature but very little with humidity while rooting increased with humidity but was influenced very little by temperature. Sprouting occurred in the second month when stored at 9°C, 11°C, and 20°C. Storage

tests by Karmakar and Joshi (1941) recorded a gradual loss in weight at all temperatures: the loss at 32°C-35°C was roughly twice that at 0°C. Storage time is increased if bulbs are in a dormant state.

SHORT-TERM STORAGE

The high temperatures and humidities common in traditional onion growing areas in Sri Lanka during the months following harvest are conducive to spoilage if onions are stored for long periods. However, short-term storage (1-3 months) in production areas would be profitable for producers and middlemen. A simple, low cost storage structure which can be made from available raw material is being introduced to growers but it needs further improvement.

LONG-TERM STORAGE

It has been established that bulbs can be stored for long periods under ideal cold storage conditions. Such storage facilities require high capital investment and are costly to maintain under local conditions. Alternatively, studies should be conducted on storage at higher elevations where ambient conditions are more favorable. Storage of surplus produce for 4-5 months would be profitable.

GOVERNMENT COMMITMENT

Storage is profitable only if the price expected after storage is higher than the cost of the additional care, investment and risks. State commitment to an assured market, introduction of a sliding scale floor price, and incentives to invest in improved storage structures will encourage off-season production and storage of onion.

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