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PRESENT STATUS AND FUTURE PROSPECTS OF ONION PRODUCTION IN SRI LANKA

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FOREWORD

The Diversified Agriculture Research Project has recently assisted with the preparation of several studies on key agricultural commodities that could play an important role in crop diversification in Sri Lanka. Each study, while presenting the current position of the commodity, provides an in-depth analysis of demand and supply, marketing, future trends and policy options available for adoption in future development of the commodity.

This draft publication is the third in the series, with the focus on Onion. It has been presented to the Division of Agricultural Economics and Planning (DAEP) of the Department of Agriculture. It will be distributed more widely after appropriate review and revisions have been completed.

The authors hope this information will be useful to researchers, extensionists, administrators, investors in agri-business and policy makers in identifying the technical and economic issues involved in the development of this crop, in familiarizing themselves with the relevant policy options and in appreciating their implications.

EXECUTIVE SUMMARY

Although consumers use Red and Big Onion in somewhat different ways, the two seem to be nearly perfect substitutes in the market place. Since Red Onion is more pungent, it may be more economical and therefore preferred by the consumer with lower income. Per capita consumption of all onion has risen gradually over time with rising incomes. Big Onion consumption has risen even more dramatically, but this is partly because of the shortage in Red Onion supplies due to the disturbances in the north and east. When onion is in short supply Big Onion in imported to make up the difference.

Onion consumption is elastic with respect to income, increasing 1.4 percent for each 1 percent rise in real per capita GNP. Consumption is inelastic with respect to price, increasing only 0.2 percent with each 1 percent drop in price.

Demand for all onion is projected to increase from its current level (1991) of 134 thousand mt to about 190 mt by year 2000. Demand for Red Onion would still be somewhat greater than that of Big Onion--97 versus 92 thousand mt.

Supplies of redonion from the north and east have been erratic since 1984, providing an opportunity for other areas of the country to move into production. In 1990, other areas accounted for 66 percent of Red Onion produced locally. Red Onion is becoming more of a Maha crop in other parts of the country. Reason for this shift might be the introduction of Big Onion into paddy fields during Yala season, depressing prices during September and October.

This study revealed that overall availability of onion and onion prices are governed by Red Onion supply. However, projections of Red Onion production depend largely on the situation in the north and east. Therefore, local production may be anywhere from 109 to 157 thousand mt by year 2000. With 14-20 percent being required for planting material, only 93 to 133 thousand mt would be available to the consumer.

Sri Lanka began to promote Big Onion production very recently through the Department of Agriculture programme around Dambulla and Kalawewa (Matale and Anuradhapura Districts). Local production accounted for 30 to 40 percent of the Big Onion availability in the past few years.

As Big Onion is a Yala crop in the dry zone, production comes to the market around the last week of September and first week of October. Providing facilities to store onion for 2-3 months are necessary to avoid serious market gluts at that time.

Big Onion production is projected to fully meet local demand during the four-month period from August to November by the year 2000. This implies a production level of 36 thousand mt. If the storage period were extended to include December, local production could cover the market for five months and increase to perhaps 47 thousand mt.

If the above projections are roughly on target, demand by the year 2000 will be around 190 thousand metric tonnes, and local supply might be 93 to 133 for Red Onion and

36 thousand metric tonnes of Big Onion. The deficit of 21 to 61 thousand metric tonnes would need to be imported.

There are ways to increase local production. Sri Lanka is a very efficient producer of Big Onion, though only at one point during the year. Also Red Onion can be produced in several places in the country, and much of it can be produced in Maha season. Red Onion can also be stored with fewer losses than Big Onion. Therefore, the most likely means of increasing local supply would be to:

1. Encourage storage of Big Onion to extend local supply by one or two more months (November and December).

2. Encourage storage of Red Onion produced in Yala so that it too can be held back from the market during September and October, and marketed later when gluts clear.

3. Encourage production of Red Onion for harvest from January through July. This might be possible under the expanding agro-wells programmes in North Central and North Western provinces.

4. Encourage off-season production of Big Onion to harvest at any time except September-October. Research should be carried out in low country dry zone and in up country areas.

5. Continue extension support to help farmers increase Red Onion yields in places like Kalpitiya and Ratnapura.

One of the most important points to emerge from this study is the need to allow the free market to operate with fewer restrictions. Sri Lanka is an efficient producer of onion and does not require import or other restrictions to protect local farmers. Such restrictions failed to stimulate local production in the past. This does not imply inaction on the part of the government. DOA programmes in support of farmers have been very effective in promoting cultivation of both Red and Big Onion in recent years.

1. INTRODUCTION

1.1 BACKGROUND

Diversification of field crop production beyond paddy cultivation has received a great deal of emphasis in recent years as a means of providing alternative income earning possibilities for small farmers while improving the diet of the general population. Other food crops (OFCs) were defined in different ways, but usually included grain legumes such as cowpea, greengram (mung bean), and soybean; grains such as maize and sorghum; oilseeds such as gingelly (sesame) and groundnuts; and others such as potato, chillie, and onion. The emphasis on producing some of these crops is to replace imports, either of the same commodity or close substitutes.

Since 1984, extent and production of greengram has risen sharply with the help of price support policies, replacing imported lentil dhal. Maize extent and yields have risen, with modest price support. Despite recent achievements, future possibilities for expanding output of many field crops are not clear, resulting in different and sometimes conflicting approaches being adopted by different organizations. For instance, new technologies are being developed that extension and other organizations may never offer to the farmer. In other cases, a policy to support farmer prices may be frustrated by import policies.

This third report focuses on onion. The previous titles were:

Maize: Meeting Future Demand in Sri Lanka

Soybean: Need for Coordinated Action

"Onions (*Allium cepa*) and shallots (*A. cepa* var. *ascalonium*) are popular vegetables with most of the world's population. They are valued for their distinctive pungent or mild flavours and form essential ingredients of the cuisine of many regions." "Among vegetables on a world scale, they rank second only to tomatoes in the quantities produced." (Overseas Development Administration, 1990) China was the world's leading producer in 1987 according to FAO (1990), with India second. India was the largest exporter that same year, followed by Mexico and Turkey. Several countries in South Asia import significant amounts of onion, including Malaysia, Singapore, and Sri Lanka.

Production of Big Onion in Sri Lanka is becoming one of the success stories of the Department of Agriculture (DOA), with production increasing to satisfy nearly half of the fast growing market in the country.

1.2 PURPOSE

The purposes of this study are to:

1. Suggest specific activities, programmes, and services that should be provided in the future by the DOA and other organizations to promote local production of onion.

2. Identify policies that would lead to sustained or increased production and increased benefits to farmers.

The study was supported by the Diversified Agriculture Research Project of the Department of Agriculture (DOA) and the United States Agency for International Development (USAID). Technical assistance is provided by Development Alternatives, Inc. (DAI).

1.3 APPROACH

Published literature on onion production and consumption, data from the Department of Agriculture, Central Wholesale Establishment and Statistics Department of the Central Bank, resource persons who are engaged in promoting onion production in Sri Lanka and onion growers were some of the sources of information used for this study. Cost information about true seed production and storage of Big Onion were investigated further through interviews held with the officers of the DOA and onion growers.

Using data on onion consumption, prices, and income levels, demand for a composite commodity "onions" was estimated. Then, the ratio of demand for Big Onion to red onion was estimated. Given the quantities demanded of all onion and then the proportion of big over red onion in demand, the amounts of each kind could be determined. Using these functions, demand for red and Big Onion was forecasted up to year 2000.

Prospects for producing the projected requirements of onions in Sri Lanka were explored. Appropriate policy measures to stimulate local production and balance supply with demand were identified.

2. OVERVIEW OF ONION IN SRI LANKA

2.1 KINDS OF ONION AND THEIR PROPAGATION

Two general kinds of onion have traditionally been known to Sri Lankan consumers, locally called Red Onion and Big Onion. They are distinguished primarily by their size, rather than colour. Red Onions produce small bulbs, whereas Big Onion is the normal bulb onion. Red Onions can also be distinguished from normal bulb onions by their habit of multiplying vegetatively by lateral bud growth. After the bulb is planted, several leafy shoots grow out from it. Each shoot then produces a small bulb. Red Onions, often referred to as tropical shallots, are widely popular only in Sri Lanka and Indonesia (ODA, 1990).

Both Red Onion and Big Onion can be propagated either with true seed or bulbs. The following figure summarizes different forms of planting material available for the propagation of onion.

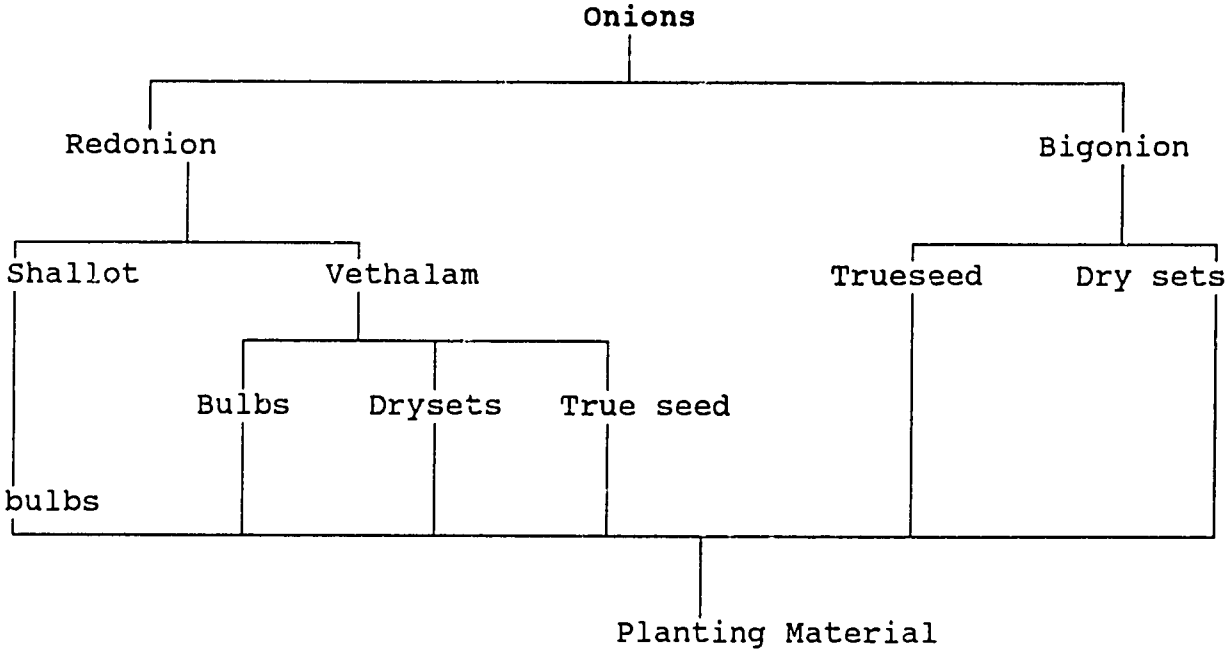

Figure 1. Diagrammatic Scheme Showing Different Planting Materials Used in Propagation of Onion

Despite the various alternatives technically available, Red Onion is commonly planted from bulbs, while Big Onion is planted from true seed. Therefore the vegetative cycle for Big Onion requires planting seed to obtain bulbs, then planting bulbs to produce seed.

Shallots have become popular in the tropics because they can be maintained vegetatively, avoiding the need to produce true seed. Bulbs from one harvest are planted the following season to produce new bulbs. Shallots usually tend to flower less readily, making seed production difficult and costly. The most popular variety in Sri Lanka is called Vethalam.

Big Onion in Sri Lanka is usually also reddish in colour, nearly all local varieties being derived from India. It is also called B'Onion. Until recently, most Big Onion consumed in the country was imported.

2.2 USES OF ONION BY CONSUMERS

Big Onion is preferred for preparations such as salads. When other vegetables are priced high compared to onion, Big Onion is sometimes made into a curry dish. Red Onion is sometimes used as an ingredient in Ayurvedic medicine. Premature Red Onion with green tops is used as a fresh vegetable. Onion is also said to prevent heart disease and contains substances with antibiotic properties.

Both onions are substitutes for each other. Leeks are also used in place of onion, although this substitution is marginal. Leeks are widely produced and marketed in Sri Lanka, and are known to consumers. However they do not produce the dry bulb, and are probably not considered an attractive alternative to onion if the latter is available. Consumption of leeks might be more popular in the main areas of production and urban market centres where it is easily available to consumers at competitive prices.

Another substitute--chives (*Allium schoenoprasum*)--is a perennial having an onion-like flavour. It is popular in home gardens in Colombo district. It is popular for tempering dried fish, cutlets, rolls, fried rice, noodles, pickles "seenisambol", and "polsambol." (Azmey, 1990). This plant contains chemicals that are said to help reduce rheumatism and high blood pressure.

2.3 ONION PRODUCTION AND IMPORTS

Until recently, onion production in Sri Lanka was limited primarily to Red Onion, the bulk of which was concentrated in the northern Districts, principally Jaffna. In 1971, Jaffna accounted for nearly two thirds of the total Red Onion extent cultivated in the country, and produced nearly three fourths of the total output. Other districts of importance included Vavunia, Mullaitivu, Trincomalee, also in the north and east, and Puttalam in the northwest. (Mullaitivu is a new district carved out of Vavunia in 1979.)

Red Onion was produced throughout the year in Jaffna. Similarly Red Onion can be grown throughout the year in the Kalpitiya area of Puttalum District. Red Onion in most other areas of the North and East is primarily a Yala crop.

As a result of the civil disturbances existing in the north and east, areas such as Kalpitiya, Matale, Anuradhapura, Polonnaruwa, Mahaweli Systems H, B, and C,

Badulla, Monaragala, Nuwara-Eliya and Ratnapura have begun producing Red Onion. Table 1 below indicates that in 1991, production from these districts outside of the Northeast region have overtaken the supply from the traditional Red Onion producing areas.

Big Onion has been supplied primarily through importation, which was interrupted for several years in the 1970's due to a ban on imports. Once the ban was lifted in 1978, importations resumed. However in recent years, production of Big Onion in Sri Lanka has risen dramatically. The principal areas of production include Matale, Anuradhapura, and Polonnaruwa Districts. Kalawewa or Mahaweli System H is an important area located in Matale and Anuradhapura Districts. Local production is concentrated heavily in the Yala season, supplying the local market from September through November. Importation of Big Onion also continues to rise in order to provide a steady flow of this commodity during the rest of the year.

Table 1. Onion Availability From Different Sources, Selected Years From 1971-1991

	1971	1976	1981	1986	1991
		(Metric Tonnes)			
Onion Production in North East Sri Lanka					
Red Onion	36,518	59,342	72,085	63,140	35,654
Big Onion	205	586	677	1,932	331
Subtotal	36,763	59,928	72,762	65,072	35,985
Onion Production in the Rest of the Country					
Red Onion	7,426	17,309	20,097	13,484	41,271
Big Onion	1,002	1,124	201	3,654	21,288
Subtotal	8,428	18,433	20,298	17,138	62,559

	1971	1976	1981	1986	1991
		(Metric Tonnes)			
Onion Imports					
Red Onion	0	0	0	0	0
Big Onion	9,899	0	5,250	51,254	48,688
Subtotal	9,899	0	5,250	51,254	48,688
Total Availability of Onion in Sri Lanka					
Red Onion	43,944	76,651	92,182	76,624	76,925
Big Onion	11,106	1,710	6,128	56,840	70,307
Total	55,050	78,361	98,310	133,464	147,232

Table 2 provides a useful summary of onion production and imports over the past 20 years, by converting the figures from Table 1 into percentages of total annual availability of onion (combined total of Red Onion and Big Onion). In 1971, over 65 percent of onion was produced in the northeast, and about 15 percent was produced in the rest of the island. The remainder was imported. By 1976, the ban on imports was in effect. Onion production rose in the northeast and the rest of the country. The trend of increasing production continued to 1981, and importations had also resumed.

Interestingly, the general picture regarding local production in 1986 resembles that of 1971 once again in percentage terms (although the volumes of production are twice as large as before). About 50 percent of all onion was produced in the northeast, 13 percent in other areas, and the rest was imported.

However by 1991, the situation had changed dramatically. While production in the northeast was down, in the remainder of the country Red Onion production was up by three times and Big Onion was up by five times compared to 1986 (again, as a percent of total onion available). Imports had diminished as a percentage of total quantity supplied. Much of this dramatic change was due to the very large increases in Big Onion production.

In Yala 1983, DOA had begun to strengthen it's campaign to push Big Onion production. The district agricultural extension staff of Matale conducted demonstrations in farmers' fields and trained farmers as well as DOA officers. Many farmers achieved very high earnings and efforts to expand production met with gradual success. Later, Big Onion production was expanded into other parts of the country as well. It's cultivation is most popular among medium-scale farmers, since it requires superior management and use of technology, and is very capital intensive.

It appears that the policy of limiting imports might have initially helped to stimulate Red Onion production up to 1978. However, the decreased external competition would have been mitigated by local price controls. The end result was that imports grew to much higher levels as a proportion of total onion availability once the ban was lifted. However with free market forces prevailing during the following decade, and local production being actively encouraged, local production increased dramatically and the proportion imported declined.

Table 2. Percentages of Onion Coming from Different Sources, 1971-1991

	1971		1976		1981		1986	1991
			(Percent of Total Available Onion)					
Onion Production in North East Sri Lanka								
Red Onion	66.3		75.7		73.3		47.3	24.2
Big Onion	0.4		0.7	0.7	1.4	0.2		
Subtotal	66.7	76.5	74.0	48.8	24.4			

	1971	1976	1981	1986	1991
	(Percent of Total Available Onion)				
Onion Production in the Rest of the Country					
Red Onion	13.5	22.1	20.4	10.1	28.0
Big Onion	1.8	1.4	0.2	2.7	14.5
Subtotal	15.3	23.5	20.6	12.8	42.5
Onion Imports					
Red Onion	0.0	0.0	0.0	0.0	0.0
Big Onion	18.0	0.0	5.3	38.4	33.1
Subtotal	18.0	0.0	5.3	38.4	33.1
Total Availability of Onion in Sri Lanka					
Red Onion	79.8	97.8	93.8	57.4	52.2
Big Onion	20.2	2.2	6.2	42.6	47.8
Total	100.0	100.0	100.0	100.0	100.0

Table 2 also suggests that the demand for Big Onion as a percentage to total onion consumed seems to be increasing over time. Whereas Big Onion accounted for about 20 percent of onion available to the market in 1971, it was up to over 42 percent in 1986, and nearly 48 percent by 1991.

3. LOCAL DEMAND FOR ONION

Per capita demand for onion in most countries has been found to be constant and relatively inelastic. (ODA, 1990) The present study analyses the market situation after 1977 because there was an import restriction on onion before 1978 and retail prices were also controlled. Demand estimation for onion is useful for policy makers to plan local production as well as to properly schedule imports in a way to protect the local farmer and consumer. Previous estimates of demand in Sri Lanka done by Ratnayake (1990) indicate how monthly demand peaks in April and December coinciding with local holiday periods.

3.1 HISTORICAL TRENDS IN ONION CONSUMPTION

Red Onion and Big Onion are used by the consumer in a similar fashion, and are therefore close substitutes. Red Onion is usually more pungent, and comes in a smaller "package". It is thought that the less affluent population might prefer Red Onion because of the possibility of using smaller amounts and still achieving the desired flavour. Big Onion might be more desirable to a more affluent population, since it is more convenient to prepare.

Because it was imported, Big Onion may have been more readily available to urban consumers in the past, whereas Red Onion would generally be available to rural consumers closer to areas of production. Therefore, urban consumers may have become accustomed to Big Onion, as well as finding it less time consuming to prepare.

Total quantities of both Red Onion and Big Onion available in Sri Lanka have followed an increasing time trend (Table 3.) This trend is much more marked in the case of Big Onion, which has increased by about 4,000 metric tonnes per year over this 14-year period.

To estimate the quantities consumed, an adjustment needs to be made in the case of Red Onion. Whereas Big Onion is planted from seed, Red Onion is planted using bulbs held back from the previous season's harvest. About 1.75 metric tonnes per hectare are required for planting. Therefore, net Red Onion availability to the consumer has been derived by subtracting the extent of land planted in each year's Yala season plus the extent in the follow year's Maha season times 1.75 The net amounts available per capita are shown in Table 4.

It should be noted that the above figures represent gross availability at the port of entry or farm gate. Actual consumption would be lower after accounting for drying and storage losses, which may be around 13 percent.

Big Onion percapita availability to consumers has risen sharply from the late 1970's to the early 1990's, while Red Onion percapita availability has remained about constant. Recent stagnation of Red Onion consumption is largely a function of availability. Supplies from the northern districts have been severely interrupted because of the conflict in that area.

Real prices of onions have not changed significantly over this period. Average retail price of Big Onion over the 14-year period was slightly higher than that of Red Onion--33.42 for Big Onion and 30.92 for Red Onion--stated in 1991 Rupees per kilogram, according to the Food Commodities Bulletin of ARTI.

Table 3. Local Production, Imports, and Total Availability of Big Onion and Red Onion in Sri Lanka, 1978 - 1991

Year	Big Onion			Red Onion		
	Imports	Local Production	Total Availability	Imports	Local Production	Total Availability
		(Metric Tonnes)				
1978	21,138	2,278	23,416	0	72,300	72,300
1979	16,393	1,009	17,402	0	62,500	62,500
1980	16,459	360	16,819	2,150	79,900	82,050
1981	5,250	862	6,112	0	92,100	92,100
1982	7,390	2,035	9,425	949	96,200	97,149
1983	8,180	2,527	10,707	100	139,900	140,000
1984	44,736	3,029	47,765	4,578	39,600	44,178
1985	58,690	2,394	61,084	3,087	52,600	55,687
1986	51,254	5,631	56,885	0	76,500	76,500
1987	33,928	4,778	38,706	0	112,900	112,900
1988	34,642	6,715	41,357	0	113,600	113,600
1989	22,950	11,099	34,049	0	107,700	107,700
1990	31,447	20,006	51,453	80	97,000	97,080
1991	48,688	21,619	70,307	0	77,000	77,000

Sources: Production estimates from Department of Agriculture; importation figures from CWE and Department of Customs.

Table 4. Net Availability of Big Onion and Red Onion Per Capita, 1978 - 1991

Year	Net Per Capita Availability		
	Big Onion	Red Onion	All Onion
	(kilograms percapita)		
1978	1.650	4.291	5.941
1979	1.203	3.568	4.771
1980	1.141	4.495	5.636
1981	0.408	5.296	5.704
1982	0.621	5.087	5.707
1983	0.695	7.874	8.568
1984	3.062	2.262	5.324
1985	3.857	2.675	6.532
1986	3.530	3.589	7.119
1987	2.366	5.752	8.118
1988	2.493	5.802	8.296
1989	2.026	5.181	7.207
1990	3.028	5.113	8.141
1991	4.076	3.684	7.761

3.2 EFFECT OF INCOME LEVELS ON ONION CONSUMPTION

A factor that has caused much of the change in consumption patterns from Red Onion to Big Onion is percapita income and its distribution. Monthly percapita consumption

of Red Onion, Big Onion and leeks by different income groups of the society were investigated using the Consumer Finance Surveys for 1981/82 and 1986/87. Seven income groups that lie between Rs.0-1000 and over Rs. 10,000 per month were used. Note that these groups are defined in terms of current Rupees of each of the two years, not adjusted for inflation. Therefore the corresponding groups are not directly comparable for the two years. Still, general trends in percapita consumption of onion and leeks can be seen.

Table 5. Quantities Consumed per Capita per Month by Income Groups, 1981/2 and 1986/7

		Income Group of Spending Unit							
FOOD ITEM	YEAR	0 1000	1001 1500	1501 2000	2001 3000	3001 5000	5001 10000	> 10000	OVERALL AVERAGE
		(Grams per Month per person)							
RED ONION	81/2	182.0	224.4	256.1	294.5	349.8	372.7	380.5	235.6
	86/7	243.7	244.4	265.6	290.8	317.5	335.7	386.0	280.0
Big Onion	81/2	5.1	7.0	12.6	21.0	35.8	71.6	157.0	13.6
	86/7	59.6	73.4	89.6	125.5	189.8	279.5	357.3	126.3
LEEKS	81/2	42.4	54.8	69.0	100.8	110.4	136.6	173.0	64.9
	86/7	32.4	44.3	53.0	67.4	90.1	107.2	128.8	63.1
TOTALS	81/2	229.5	286.2	337.7	416.3	496.0	580.9	710.5	314.0
	86/7	335.7	362.1	408.2	483.7	597.4	722.4	872.1	469.4

Table 5. (Continued) PORTION OF EACH ITEM AS A PERCENTAGE OF TOTAL BY INCOME GROUP

		Income Group of Spending Unit							
FOOD ITEM	YEAR	0 1000	1001 1500	1501 2000	2001 3000	3001 5000	5001 10000	> 10000	OVERALL AVERAGE
		(Percent)							
RED ONION	81/2	79.3%	78.4%	75.8%	70.7%	70.5%	64.2%	53.6%	75.0%
	86/7	72.6%	67.5%	65.1%	60.1%	53.1%	46.5%	44.3%	59.6%
BIG ONION	81/2	2.2%	2.4%	3.7%	5.0%	7.2%	12.3%	22.1%	4.3%
	86/7	17.8%	20.3%	22.0%	25.9%	31.6%	38.7%	41.0%	26.9%
LEEKS	81/2	18.5%	19.1%	20.4%	24.2%	22.3%	23.5%	24.3%	20.7%
	86/7	9.7%	12.2%	13.0%	13.9%	15.1%	14.8%	14.8%	13.4%
TOTALS	81/2	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	86/7	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 5. (Continued) NUMBER OF PERSONS SURVEYED IN EACH INCOME GROUP

Number of persons in each group	81/2	15,061	11,083	5,861	5,437	2,667	1,002	340	41,451
	86/7	5,480	7,133	6,368	7,582	5,925	2,668	857	36,013

Source: Report on Consumer Finances and Socio Economic Survey, 1981/2 and 1986/7. Central Bank of Sri Lanka. Published in 1985 and 1990, respectively.

Notes: Spending Units are defined as decision making units within families. In the 1986/7 survey there were an average 1.09 spending units per family.

Income groups are in current Rupees in the year of each survey.

Percapita consumption of red onion rises with income in both years of the surveys, roughly doubling from the lowest to the highest income group. But over time, Red Onion's monthly percapita consumption appears to have dropped in higher income groups. (Again, the income groups are not completely comparable between the two years because they are defined in terms of current, not real, Rupee levels. Note the number of people in each income group for both surveys, shown at the very bottom of Table 5.) Overall consumption of Red Onion increased by approximately 19 percent from 1981/2 to 1986/7--from 235.6 to 280.0 grams percapita per month.

Big Onion consumption increased manyfold from the lowest to the highest income groups in both surveys, and increased nearly 10 times over the five years between the surveys--from only 13.6 to 126.3 grams percapita per month. Big Onion consumption increased significantly over time in every income group, from the lowest to the highest, the rate of increase being greater in the lower income groups.

Table 6. Pattern of Changing Consumption of Big Onion in Different Income Groups: 1981/2 to 1986/7

Income Group	Increase in Big Onion Consumption Percapita from 1981/2 to 1986/7
Rupees	
0-1000	11.7 times
1001-1500	10.5
1501-2000	7.1
2001-3000	6.0
3001-5000	5.3
5001-10000	3.9
>10000	2.3

The recorded change in monthly percapita consumption of Big Onion is entirely due to increased disposable income, but also to higher availability of Big Onion in rural markets close to areas of production.

Leeks consumption also responds to rising incomes, but overall average percapita consumption did not change over the period between the surveys. It should be remembered that the surveys cover only consumption of items purchased by the family, not that which is home-grown. Consumption of leeks actually dropped in all income groups during the period from 1981/82 to 1986/87, but this is balanced out by the larger proportion of people distributed into the higher income categories.

Percapita consumption of all three commodities as a whole increased from 314 to 469 grams per month over the five-year period. Grams of Red Onion, Big Onion, and leeks are divided by the total amount consumed of all three commodities as a whole to obtain the percentages shown in the second portion of Table 5. As incomes rise, Red Onion accounts for a smaller percentage of the total onion/leeks group. Leeks stay about the same. Big Onion, however, increases as a percentage of the entire group. Over time, Big Onion has become more important, accounting for nearly 27 percent of onion/leeks consumption in 1986/7.

These differences in consumption seen among income groups and over time might be associated with availability of these three commodities as well as their relative prices. Less affluent consumers prefer Red Onion as it can be obtained and used more easily in smaller quantities, and is therefore more economical. Also while Red Onion is produced in Sri Lanka, it is more readily available to the rural population, perhaps at lower prices compared to those in urban markets. Meanwhile, Big Onion is largely imported, and would be more easily available to the urban consumer on a regular basis.

3.3 ESTIMATION OF DEMAND FOR BIG ONION AND RED ONION

Four regression equations were used to estimate demand for onion. Leeks is not included in the models. As seen above, leeks consumption is less significant than that of onion, accounting for only 13 percent of the total onion/leeks volume in 1986/7. It accounted for less that 7 percent in 1991.

The four models are as follows:

Percapita Big Onion Consumption = Function of (Percapita Income, Real Price of Big Onion, Real Price of Red Onion)

Percapita Red Onion Consumption = Function of (Percapita Income, Real Price of Red Onion, Real Price of Big Onion)

Ratio of Big Onion Consumption over Red Onion Consumption = Function of (Percapita Income, Ratio of Real Big Onion Price over Real Red Onion Price)

Percapita Onion Consumption = Function of (Percapita Income, Composite Price of Onion)

Real percapita income (RPCGNP) is estimated by dividing Gross National Product by population. This is adjusted for inflation using the Consumer Price Index, and is stated in 1991 Rupees. It stood at Rs.19,235 in 1991. Prices are also stated in 1991 Rupees.

Percapita consumption of Big Onion averaged 2.15 kilograms per year between 1978 and 1991. It climbed from levels of around 1 kilogram in the earlier years to levels of 3 to 4 kilograms recently.

Results of the first regression resulted in the following:

Table 7. Coefficients of Demand Equation Estimated for Big Onion

Dependent Variable: Percapita Big Onion Consumption
Adjusted R Square .80581

Variable	B	SE B	T	Sig T
RPCGNP	.0003136	.0001094	2.865	.0168
RBOPRICE	-.08817	.02415	-3.650	.0045
RROPRICE	.07757	.02033	3.816	.0034
Constant	-2.74260	2.04514	-1.341	.2096

An increase of 1,000 Rupees in RPCGNP causes big onion consumption to increase by .314 kilogram per year. A one Rupee increase in real Big Onion price (RBOPRICE) causes its own consumption to decrease by .088 kilogram. Likewise, a one Rupee increase in Red Onion price (RROPRICE) causes a cross price effect, and Big Onion consumption rises by .078 kilogram per capita per year. These three variables explain about 81 percent of the variability in Big Onion consumption.

Results for the second equation show that percapita Red Onion consumption (PCRO) averaged 4.619 kilograms over the 14-year period from 1978 through 1991.

Table 8. Coefficients of Demand Equation Estimated for Red Onion

Dependent Variable: Percapita Red Onion Consumption
Adjusted R Square .55817

Variable	B	SE B	Beta	T	Sig T
RPCGNP	.000377	.000192	.42492	1.964	.0779
RROPRICE	-.14918	.03566	-.91659	-4.184	.0019
RBOPRICE	.11909	.04237	.57107	2.811	.0185
Constant	-1.29737	3.58749		-.362	.7251

Consumption would increase by .377 kilogram with a Rs. 1,000 increase in percapita Gross National Product. Red Onion consumption is more affected by changes in its own price--decreasing .149 kilogram with a one Rupee increase. It is also more sensitive to cross price effects of Big Onion prices--rising .119 kilogram with a one-Rupee increase in Big Onion price. Increased sensitivity to prices would be expected of a commodity consumed by the lower income groups of the population.

Red Onion consumption increases faster with each Rs. 1,000 rise in per capita income than Big Onion--377 grams percapita compared to 314 grams--on an absolute basis. On a relative basis, however, the income elasticity of red and Big Onion are about the same. A one percent rise in RPCGNP causes about a 1.4 percent increase in onion consumption overall.

Given the validity of the above regressions, it comes as little surprise that the same factors account for most of the variation in the proportion of Big Onion versus Red Onion consumed. The average proportion of Big Onion/Red Onion was 0.569 during the period. (When this factor comes up to 1.0, demand for Big Onion is equal to that of Red Onion. A ratio of .569 means that Big Onion accounted for an average of 36 percent of all onion between 1978 and 1991.) The average ratio of prices (BOPRROPR) was 1.139--Big Onion prices usually being slightly higher. The results of the regression show that income and price ratios explain over 78 percent of the variation in the ratio of Big Onion/Red Onion consumption.

Table 9. Coefficients of Demand Equation Estimated for the Ratio of Big Onion to Red Onion

Dependent Variable: Ratio of Big Onion/Red Onion Consumption
Adjusted R Square .78308

Variable	B	SE B	Beta	T	Sig T
RPCGNP	.0000712	.0000417	.25013	1.708	.1157
BOPRROPR	-1.09639	.21174	-.75836	-5.178	.0003
Constant	.58311	.86568		.674	.5145

Average per capita income has a large impact on the ratio of Big Onion/Red Onion, causing the ratio to increase by .07 for every Rs. 1,000 increase in real per capita GNP. The price ratio also has a strong influence on the proportion of Big Onion consumed. With a 0.1 increase or decrease in the price ratio, the proportion of

Big Onion would change by .11 in the opposite direction. This verifies again that the two kinds of onion are very close substitutes.

Finally, the two kinds of onion were added together to get the total onion consumption. A composite price was calculated, weighted according to volumes of each type of onion consumed each year. Income and price explain 38 percent of the variation in total onion consumption, as shown in Table 10 below.

Table 10. Coefficients of Demand Equation Estimated for a Composite Commodity "Onion"

Dependent Variable: Percapita Onion Consumption
Adjusted R Square .38442

Variable	B	SE B	Beta	T	Sig T
RPCGNP	.000566	.000179	.72459	3.172	.0089
OPRICE	-.05392	.04523	-.27233	-1.192	.2583
Constant	-1.42943	2.99480		-.477	.6425

As average real percapita income rises by Rs.1,000, onion consumption increases by .566 kilogram. And with a one Rupee increase in prices, consumption might decrease by about .05 kilogram. This latter coefficient is not statistically significant, however. Again, the large effects of income on demand, but the small effects of price changes, are evident.

3.4 DEMAND PROJECTIONS TO YEAR 2000

The above results provide two alternate methods of calculating future demand for onion. One is to project Big Onion and Red Onion demand (equations 1 and 2), then add the two to obtain demand for all onion. The other method is to use equation 4 to project the demand for all onion, and equation 3 to obtain the proportion of Big Onion, which is used to get the breakdown between big and red. The results of both are shown in Table 11. Note that method 1 starts with big and red, ending with all onion. Method 2 starts will all onion, then goes to big, and finally red. The predictions are based on the following assumptions:

1. Per capita GNP will increase by a constant amount each year.
2. Onion prices and therefore the ratio of prices will remain at their overall average of the past 14 years.

The two methods give a very similar results for all onion in the year 2000--203 versus 190 thousand metric tonnes. However the proportion of Big Onion to Red Onion is much different, method 2 projecting higher volumes of Big Onion compared to method 1. The results of both methods are compared in Table 11.

For the discussion that follows, method 2 will be used. There are two reasons why the results of method 2 are more convincing. First, it gives a lower overall projection of onion demand with income. Earlier it was seen that demand increases very fast among lower income groups, but when income reaches a higher level, demand rises more slowly. Second, the demand for these two commodities is highly interrelated.

Therefore, estimating overall consumption levels for both and then the breakdown between them should give more credible results.

Table 11. Projected Demand for Onion Through Year 2000, Two Methods

	Method 1			Method 2		
YEAR	BO	RO	ALL	ALL	BO	RO
		(Thousand Metric Tonnes)				
1992	52	98	150	144	62	82
1993	54	101	156	149	65	84
1994	57	105	162	155	69	86
1995	60	109	169	160	73	88
1996	63	113	175	166	76	90
1997	65	116	182	172	80	92
1998	68	120	189	178	84	93
1999	71	124	196	184	88	95
2000	74	128	203	190	92	97

Historical and predicted values for the 1978-2000 period are shown in Figure 2.

The next step was to change some of the assumptions about prices and income levels in the future to demonstrate the possible effects on demand. Table 12 shows various scenarios that were tried. All are based on method 2 as explained above.

Table 12. Projected Onion Requirements in Year 2000 Under Different Assumptions

	All Onion	Big Onion	Red Onion
	(thousands of metric tonnes)		
Actual levels of 1991, shown for comparison			
	134	70	64
Year 2000, base predictions as shown in the previous table.			
	190	92	97
Year 2000, Price ratio (BO/RO) at different levels.			
0.8	190	108	82
1.139 (base)	190	92	97
1.3	190	83	107
Year 2000, Overall onion prices at different levels. (Rs/kg)			
20	200	98	103
30.22 (base)	190	92	97
40	179	87	92
Year 2000, Per capita GNP at different rates of annual growth.			
4.0%	241	135	105
Linear(base)	190	92	97
No growth	151	63	89

Figure 2.

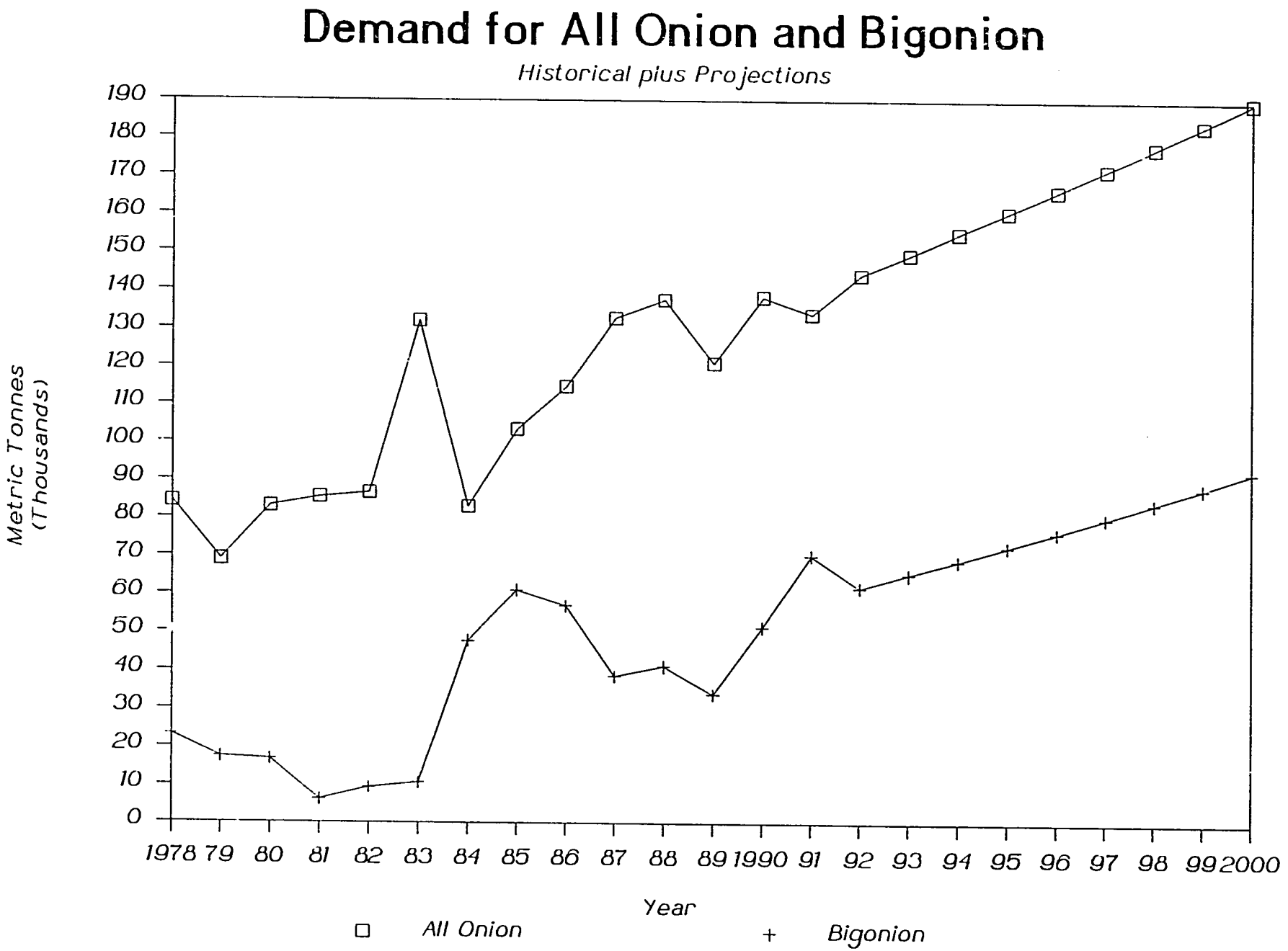
Demand for All Onion and Bigonion
Historical plus Projections
Metric Tonnes (Thousands)
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
1978 79 80 81 82 83 84 85 86 87 88 89 1990 91 92 93 94 95 96 97 98 99 2000
Year
All Onion
Bigonion

Table 12. Projected Onion Requirements in Year 2000 Under Different Assumptions

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30.22 (base)	190	92	97
40	179	87	92
Year 2000, Per capita GNP at different rates of annual growth.			
4.0%	241	135	105
Linear(base)	190	92	97
No growth	151	63	89

The 1991 levels of consumption are shown for general comparison. It should be noted in that year, Red Onion supplies were very low. Therefore the proportion of big/Red Onion consumed was abnormally high.

The first sensitivity analysis deals with the price ratio (BO/RO). As the price ratio varies between big and Red Onion the demand between the two kinds also changes, as was seen earlier. (Overall demand for all onion is identical at 190 thousand metric tonnes in all these scenarios because the absolute level of the composite price remains the same.) If Red Onion supplies are low and its price is high, Big Onion becomes less costly. In fact the price ratio has been around 0.8 recently, and has gone as low as 0.6 in the past. In year 2000, with a price ratio of 0.8 , the demand for Big Onion could be greater than that for Red Onion--108 versus 82 thousand metric tonnes. If the price ratio rises to 1.3, the amounts demanded of each kind of onion would virtually reverse themselves--83,000 mt of Big Onion versus 107,000 mt of Red Onion.

Next the composite price is set at different levels. Here the price ratio is constant at its historical average of 1.139. Interestingly, overall price levels for onion have a very small impact on demand. With a consumer price of Rs.40/kg, overall demand falls from 190,000 to 179,000 mt, and if the price reduces to Rs.20/kg, demand rises to only 200,000 mt. This is consistent with findings from other countries that indicate a low price elasticity of demand for onion. Even when it costs more, people still use onion in their meals, and when it costs less, consumption doesn't increase very much. Note that these conclusions seem to hold for both big and Red Onion.

The final portion of the Table shows three possible scenarios of how income affects demand. Here the impacts are very large. A one percent increase in per capita income results in a 1.4 percent increase in onion demand.

4. SUPPLY

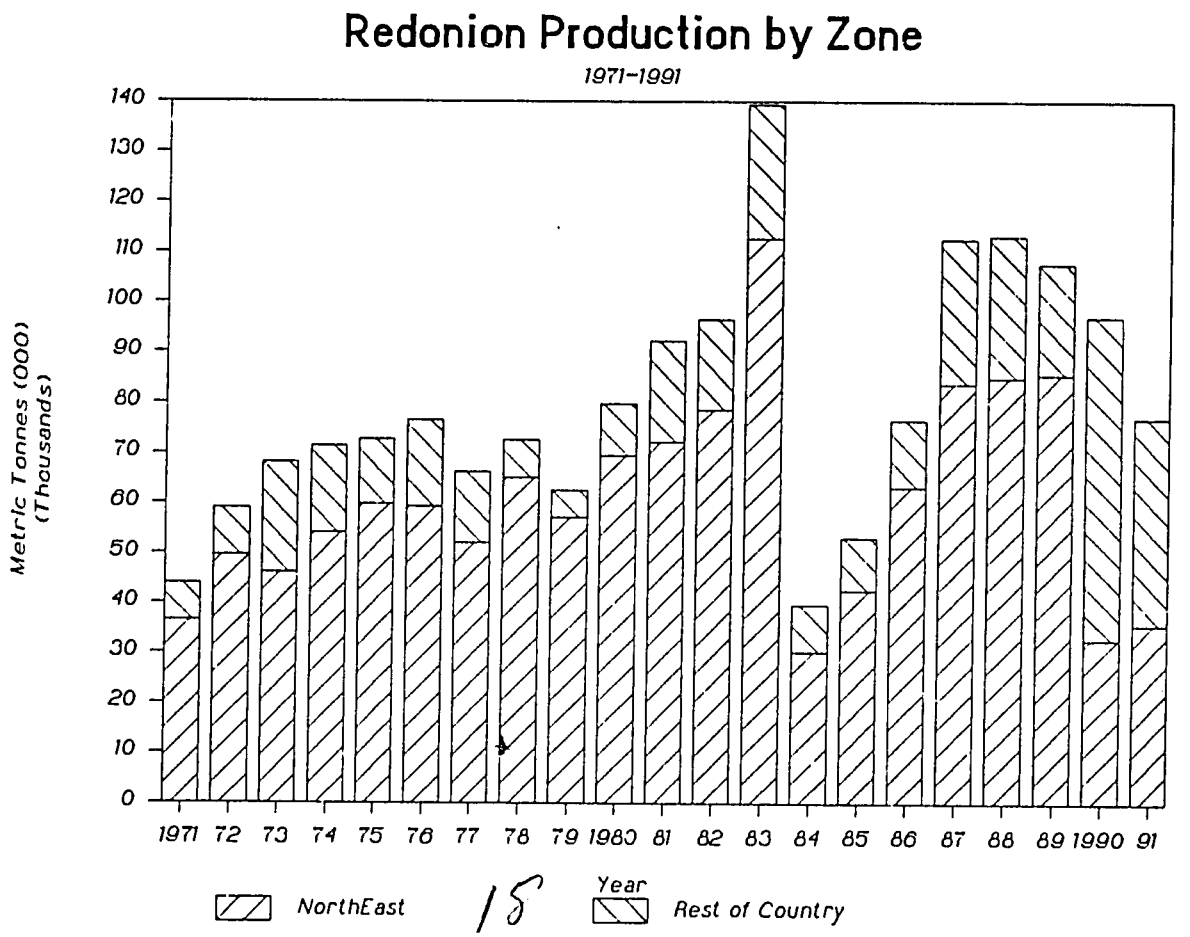
4.1 RED ONION

4.1.1 Regional and Seasonal Trends in Production

Production of Red Onion showed a gradually increasing trend over the 10-year period from 1971 to 1980. Production levels ranged between 60 to 80 thousand metric tonnes per year over most of that period. Then from 1981-83, new production records (for that time) were set each year. An all-time high was recorded in 1983 at nearly 140 thousand metric tonnes.
Most Red Onion comes from the northeastern districts of Jaffna, Vavunia, Mullaitivu, and Trincomalee. With the outbreak of the civil disturbances in the north and east, supply of Red Onion from these areas was drastically curtailed. As a result, national supply of Red Onion in 1984 dropped to under 40 thousand tonnes, less than one-third the previous year's level. (See Figure 3.)

Supplies from the north recovered during the ensuing years. But another important change took place: areas outside the north and east became important producers, accounting for more than 25 percent of Red Onion production in 1987. Again in 1990 and 91 supplies from the north and east were curtailed, but production in other areas soared, accounting for 66 percent in 1990.

Figure 3.

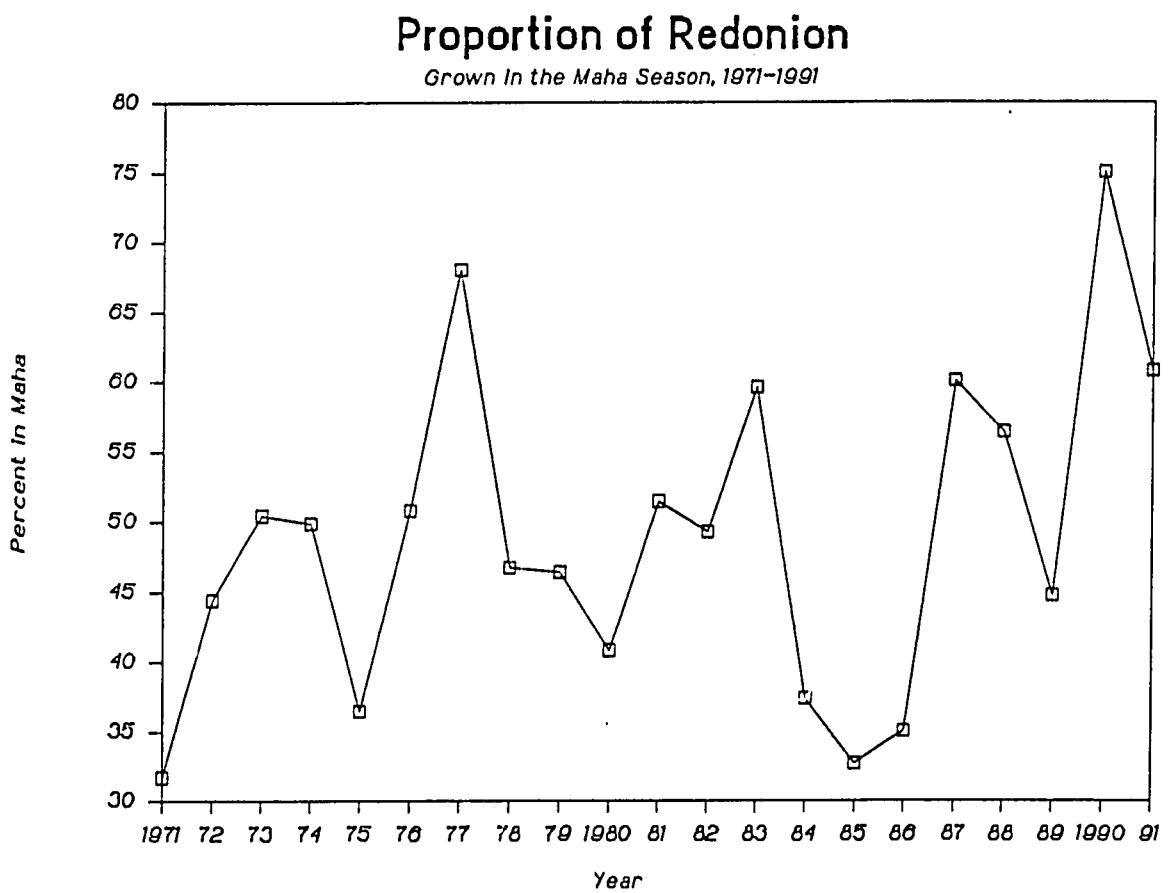


The primary area of production outside the troubled northern provinces is the Kalpitiya region in Puttalum District. Second is the Ratnapura District. Others are Monaragala, Matale, and Kurunegala. The predominant kind of Red Onion grown in Kalpitiya is slightly larger than the shallot grown in Ratnapura and elsewhere.

The proportion of Red Onion grown in Maha season appears to increase with time. (See Figure 4.) However time alone explains little of this variation. Instead, the concentration of production in Maha is related to the increase in production in areas outside the north and east. While in the northeast 44 percent of Red Onion production occurs in Maha, in the rest of the country 64 percent is grown in Maha. Therefore, as supplies from Kalpitiya and Ratnapura increase, Red Onion becomes more accentuated in Maha season.

Undoubtedly production of Big Onion in Yala season accounts for some of this shift of Red Onion to Maha, especially during the past 2 to 3 years. This factor suggests an increasing tendency to shift Red Onion production toward Maha season in the future, even if supplies from the northeast return to normal levels once again.

Figure 4.



4.1.2 Red Onion Yields and Cost of Cultivation

The overall national yield of Red Onion was 10.4 metric tonnes per hectare over the 21-year period analyzed. (After adjusting for 1984 when supplies from the north and east were badly affected by the civil disturbances.) Yields in the north over this period were 11.9 mt/ha, while those in the rest of the country were only 7.3 mt/ha, only 64 percent as much as in the north.

Table 13 shows that for the north, yields are higher in Yala, whereas in the rest of the country, yields are about the same in both seasons.

Table 13. Average Red Onion Yields, 1971-1991

	Annual	Maha	Yala
	(metric tonnes per hectare)		
Sri Lanka	10.4	9.6	11.0
Northeast	11.9	10.0	12.4
Rest of Country	7.3	7.5	7.1

Source: Department of Agriculture

Yields in the northern region rose steadily up to 1983, but have been erratic since that time. In the rest of the country, however, Red Onion yields are rising. While time alone explains only about 20 percent of the variability, Red Onion yields in the rest of the country appear to be increasing at nearly 200 kilograms per hectare per year. The increasing yield is probably related to the capability of farmers to manage the crop. Massive Red Onion production in Kalpitiya, Ratnapura and other places outside the northeast is a new activity. Farmers have little experience with the crop. It is reasonable to expect, then, that as farmers learn more about how to management the crop, yields in the rest of the country will continue to increase.

Production costs per acre are about the same in the north (Jaffna) as in the rest of the country (Kalpitiya), as shown in Table 14. However with higher productivity in Jaffna, cost of production per kilogram was estimated at Rs. 9.49 compared to 11.17 in Kalpitiya.

Table 14. Cost of Production of Red Onion in Jaffna (NE) and Kalpitiya (Rest of the Country), Maha 1990/91

	Jaffna	Kalpitiya
	Rs./Acre	
Total land preparation		
- with buffaloes	2063	
- with 2 wheel tractor		957
Bed preparation	1395	111
Preparation of seed & seedlings	14149	21137
Fertilizer	8090	5458
Weed control	2285	765
Pest control & postharvest handling	2735	3134
Total Cost/Acre	37668	39696
Yield, Kg/Ac	3968	3553
Unit cost, Rs/Kg	9.49	11.17

Technological advances that could reduce costs of production are possible. Red Onion is primarily propagated through seed bulbs, and the requirement to cultivate one hectare of Red Onion (Vethalam) is 1.5 - 2.0 metric tonnes, valued at Rs. 45,000 - 60,000 (DOA, 1990-B). In order to obtain this amount of seed bulbs, it is necessary to cultivate about 0.1 hectare. The agricultural research station at Kalpitiya has successfully produced true seeds from Red Onion variety, Vethalam. This is a great achievement because propagation with true seed would reduce the amount of land required to produce seed material and reduce its cost. However there are difficulties in producing onion seed in the humid tropics. Yields of true seed of Vethalam and costs of production have not yet been determined.

4.2 BIG ONION

4.2.1 Big Onion Importation Policies

Big Onion is a not a traditionally grown crop in Sri Lanka. Most Big Onion consumed in the country is imported, usually from India. The government has handled imports and wholesale distribution directly in most years through the Co-operative Wholesale Establishment (CWE). From 1972-1977, however, government policy was to restrict imports, leading to a total ban on importation of Big Onion. CWE resumed imports in 1978. Volumes imported were adjusted to Red Onion harvests, which hit record levels (for that time) in 1981, 82 and 83. With the beginning of the civil disturbances in the north and east, supply of Red Onion in the country was abruptly curtailed. Red Onion supply hit a record low in 1984 as transport routes to the north and east were cut off. Red Onion price, which had been at low levels from 1981-83, now rose to record highs.

Probably because of the shortages, the government changed its policy of directly controlling imports of Big Onion. Private importers were allowed to participate in the trade. The years 1984 and 1985 saw larger volumes of Big Onion imports. Interestingly Red Onion production also recovered during the same period. Prices had been abnormally high, but naturally came back into line as production and supply rose. In 1986, CWE was again given sole responsibility for importing Big Onion, a mandate which continues up to the present. Volumes of Big Onion imports continued, at similar levels, adjusting always to availability of Red Onion production in the country.

The cost in foreign exchange is important, rising to over Rs.850 million in 1991. The costs of importing in recent years are shown below in Table 15.

Table 15. Big Onion Imports, Value, and Import Prices

	Imports	Value	Average Price (CIF)
	(mt)	(Rs.000)	(Rs./kg)
1987	33,927	379,381	11.18
1988	34,642	359,563	7.49
1989	22,950	277,729	12.10
1990	31,447	412,331	13.11
1991	48,688	856,476	17.59
1992*	35,507	511,229	14.40

* Through September only

Source: CWE Department of Imports

4.2.2 Local Production

Big Onion production in Sri Lanka was typically around 1,000-2,000 metric tonnes per year (plus or minus) from 1971-1985. In 1986, the effects of the DOA research and extension programmes became evident. At the beginning of the campaign Big Onion was cultivated in sunken beds in uplands. Farmers lacked experience in cultivating Big Onion in low paddy lands. Both irrigation and drainage are very critical factors. In time, raised beds were introduced for growing Big Onion in lowlands. Big Onion seed was also a problem in the initial stage of the campaign. Late arrival of seed was a frequent problem. At present, not only DOA but also private sector is dealing with seed imports.

National production topped 5,000 metric tonnes for the first time in 1986, with the Matale/Kalawewa region contributing nearly half this volume. This area had been of little importance in onion production up to that time. In 1989, production rose above 10,000 metric tonnes, again with the Matale and Anuradhapura Districts accounting for about half. In 1990 and 1991, production soared to over 20,000 tonnes. Although several other districts have become important producers--Jaffna,

Polonnaruwa, and Anuradhapura among them--production has become increasingly concentrated in the Dambulla/Kalawewa areas of Matale and Anuradhapura, with 65-75 percent of production.

Average yield of Big Onion has remained almost unchanged over the last several years at about 10.3 mt/ha. Therefore the increases in production are due to larger extents cultivated. Farmers of Kimbissa have harvested 15 metric tonnes of Big Onion from a hectare with the variety Poona Red in Yala 1988. On farm trials conducted by Maithripala and Hittle reported average yield of 15,174 kg of Big Onion per hectare. The highest yield obtained was 17,394 kg/ha. Results of this programme showed that more than five weedings, the first of which to be done 11 days or less after planting, and early planting (May 26 - June 10) give significantly higher yields.

Volumes supplied from imports and local production are shown in Figure 5. Comparing Figures 3 and 5, it is apparent that volumes imported of Big Onion are in reverse proportion to Red Onion production.

Table 16 below shows the recent increase in local production as a proportion of total consumption of Big Onion. This increase has been achieved despite large volumes of Big Onion being imported in the past two years.

Table 16. Local Production as a Percentage of Total Availability of Big Onion

Year	Percent from Local Production
1984	6
1985	4
1986	10
1987	12
1988	16
1989	33
1990	39
1991	31

Big Onion is cultivated mostly in Yala season, and the bulk of local production reaches the market around the last week of September and the first week of October. Local markets have been flooded during this period in the last two years. Until Yala 1987, Big Onion consumption for any given month had exceeded domestic production in that month. Since Yala 1989, the amount harvested in October exceeded total demand for that month. CWE has adjusted imports seasonally in response to the DOA's indications of local availability. Figure 6 shows that for 1989-91, imports in September and October are nearly zero. The values are shown in percentage terms, so that the 87-88 period can be compared with the 89-91 period.

FIGURE 5.

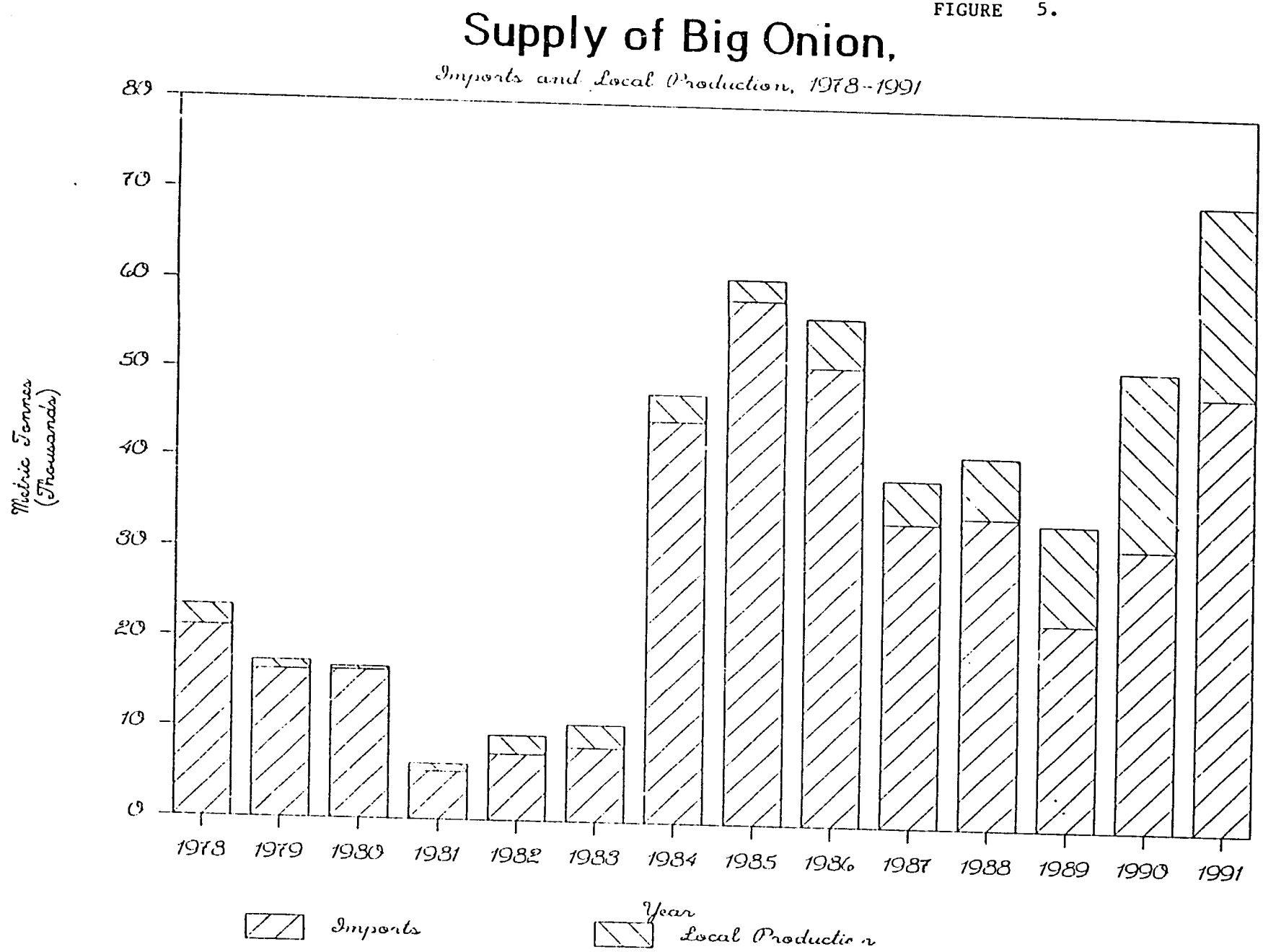


Figure 5.

FIGURE 6.

Bigonion Imports by Month,

1987-88 versus 1989-91

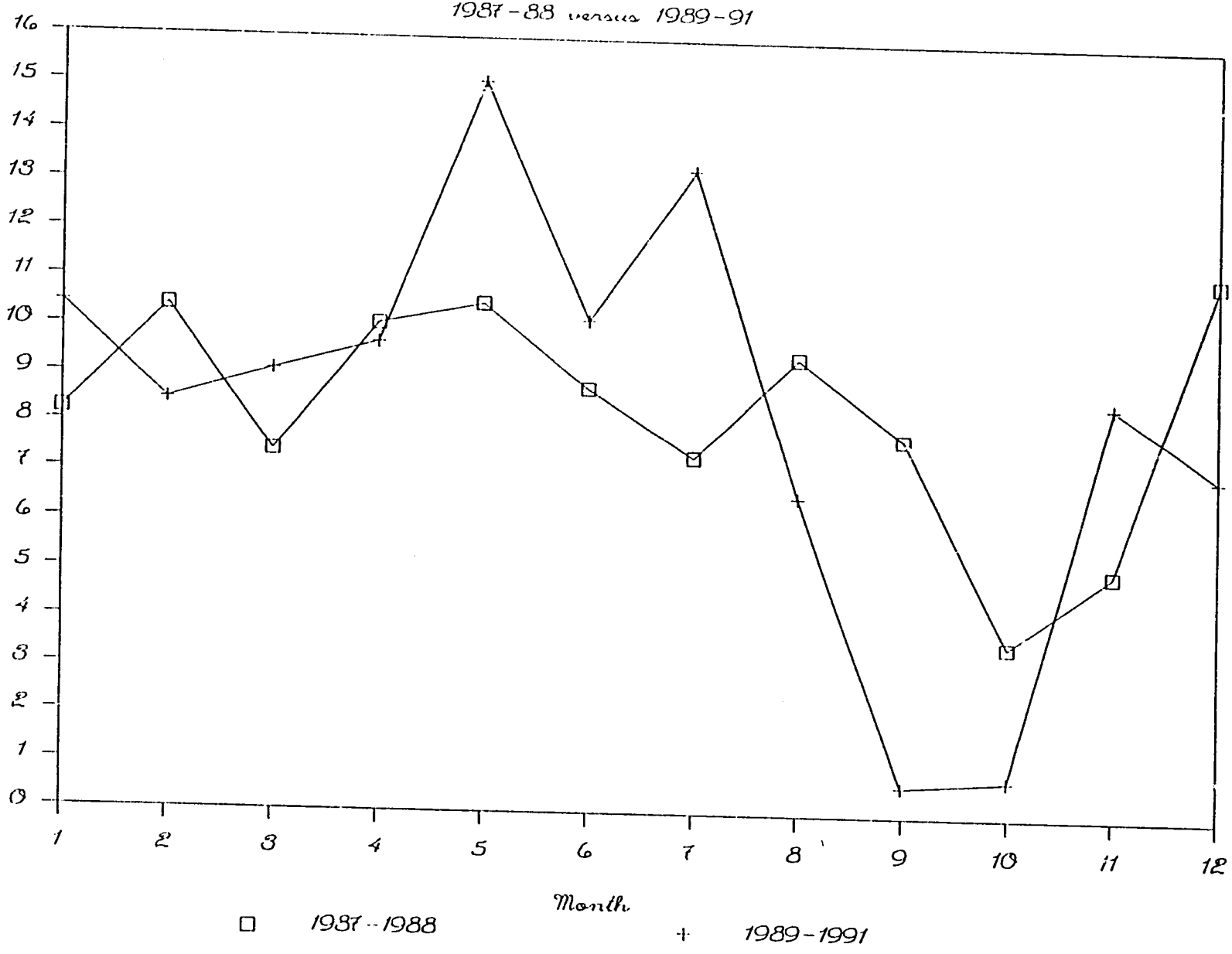


Figure 6.

Potential to expand Big Onion production into other areas and other seasons should be investigated. Present practice is planting nurseries from seed in April-May, transplanting seedlings in May-June and harvesting in September. Ideal time of planting is from April to end of June and with intensive control of pests and diseases, Big Onion can grow even in January. Staggered planting is not possible in the lowlands of the dryzone due to monsoonal rains. Raising nurseries is also a problem when staggered planting is adopted. It would be worthwhile to investigate the possibility of planting Big Onion in February and to introduce hybrids into Nuwara Eliya District (Weeratunga, 1992). Production of drysets is an alternative. If drysets were planted in later part of January it would be possible to harvest bulbs in April.

4.2.3 Onion Storage

Successful storage of an appreciable portion of Big Onion would allow local production to increase even more. Storage of Big Onion beyond harvest period through November and into December has been promoted by the DOA. Among the different factors that may influence onion storage are genetic factors, pre-harvest factors and post-harvest factors. Careful handling and curing are key steps in successful storage. The arrangement of bulbs, provision of natural or forced ventilation and control of humidity and temperature within storage are factors that influence storage life. Excessive nitrogen application and late irrigation contribute to high storage losses. The ideal time of harvesting is when green tops are dried down completely.

Ross and Joel (1990) show total net returns of storing 2000 kg of Big Onion for a period of two months was Rs. 9283 and the net returns per kilogram of onion cured was Rs. 4.64. Storage is profitable until losses exceed 36.4 percent. If the price after storage is only Rs. 15/kg, a storage loss exceeding only 15.2 percent eliminates profits.

Farmers near Matale reported losses in 1991 due to low prices prevailing even one month after harvesting. Such a drop in price occurred due to low quality of local Big Onion, lack of market information to the producer and Big Onion that auctioned at Rs. 10/kg by CWE during harvesting period. It is important to encourage producers to store only selected good quality bulbs that are being harvested at the peak of the season. Estimates made from information provided by Mr. H A Atapattu, Assistant Director of Agriculture in Matale indicate that costs of storing 2,000 kgs for two months include the following:

Table 17. Estimate of Price Margin Required to Justify Onion Storage

	Total Cost (Rs.)
Initial 2,000 kg valued at Rs 19/kg	40,000
Storage Structure (40% of initial value)	2,000
Labour	2,000
Interest (24% per year)	880
Total Cost	44,800

Storage losses: 30 percent
Net Volume sold: 1,400 kg
Minimum sales price to recover costs: Rs.32/kg

Margin required to justify two months' storage: Rs.13/kg

Different parts of the world practice different methods of storage. In Sri Lanka and India farmers hang bunches of onions from rafters of farm huts to dry. Pakistani farmers lie onion on beds of coarse sand on the floor of a shed. Hanging onions on strings, having formed them into bunches, is common in Thailand and Costa Rica (ODA, 1990). Drying causes 3-5% weight loss. This helps to reduce storage losses due to spoilage and shrinkage. Sprout suppressants should be used in long term storage (Thompson, 1982).

4.2.4 Supply of True Seed for Big Onion Production

Sri Lanka imported 12,000 - 14,000 kg of true seed in 1990. Total true seed requirement of the country may be as high as 30,000 kg values at around Rs. 30 million. DOA imported over 95 percent of onion seed before 1990. Since that time, the government permitted private sector to import onion seed (DOA, 1990-A). As importation of true seed costs a large amount of foreign exchange in addition to the problems associated with seed imports, DOA has been interested in true onion seed production. The committee appointed by the DOA to study strategies for true seed production of Big Onion pointed out the problems that Sri Lanka faces with full dependence on imported true seeds. Possible interruption in seed supplies could occur as a result of changing policies of seed exporting countries as well as due to potential damage that could occur to seed in shipments in transit. True seed production in Sri Lanka would minimize such interruptions.

The process of seed production begins with selection of the best bulbs at harvest time. Around 60 percent of bulbs produced can be used for replanting as seed bulbs.

Usually, bulbs must be kept for a period under cold storage conditions--a process called vernalization, which helps enhance flowering. Requirement for seed bulbs is about 4000 kg/ha. True seed production of Big Onion is an operation requiring skill. Big Onion flowers have the possibility of cross-pollinating with other cultivars of big and Red Onion. Onion seed production is particularly subject to weather risks and storage problems. Losses of germination and vigour occur in high temperature and humidity. Fortunately, in Sri Lanka, it is possible to avoid long term seed storage by timing the seed production season. Another common problem with tropical varieties of onion is their tendency to bolt.

Research and Development Farm of Mahaweli Economic Agency in Girandurukotte has carried out seed production with vernalized bulbs of Poona Red. Kalpitiya Research Station of DOA has reported successful seed production with Kalpitiya selection K-1 without vernalization. Vernalized bulbs of Poona Red planted in Matale in Yala 1989 and Maha 1988/89 gave promising results. The K-1 variety has produced true seed in several places under agricultural extension programmes.

Variety K-1 contains many desirable characteristics. But, impact of spacing on yield, twin bulb formation, storability, bulb size, bolting during bulb production and resistance to pests and diseases of this variety should be investigated further.

Kuruppuarachchi (1990) explained that total cost of producing true seeds from a hectare of Big Onion as Rs. 143,180. His calculations show that nursery, bulb crop and seed crop cost 9.9, 33.4 and 56.7 percent respectively of the total cost of producing seed. Further he mentioned that vernalization of mother-bulbs prior to planting would increase flowering by 20 percent and honeybees can increase pollination by 10 percent.

He reported that variety K-1 can produce an average yield of 180 kg of true seed per hectare in farmers' fields. With this level of seed production it would cost around Rs. 794 to produce a kg of true seed. However, research station at Kalpitiya has reported an average seed yield of 400 kg/ha. With that level of production, one kg of seed would cost about Rs. 358. In Yala 1992, marketing imported Big Onion seed at a price around Rs. 500/kg was reported around Dambulla. DOA (1990) mentioned that if the Big Onion variety K-1 could produce around 300 kg/ha of true seed, it would be price competitive to produce locally.

Another tropical experiment gave 110.7 kg/ha of onion seed while U.S. has obtained 800-1000 kg/ha of seed. With optimum cold storage treatment (120 days) a Brazilian variety Big Onion has given over 1000 kg/ha of seed.

4.2.5 Projected Supply of Onion

RED ONION

From the above analysis, it is apparent that overall onion availability and prices are dominated by Red Onion supply, and that the up and down swings in supply from the northeast have especially affected the local market. However, extent and

yields are both expected to increase in other areas of the country. Table 18 presents two scenarios of future Red Onion supply. Under both scenarios, production in the rest of the country continues to rise based on time trend of extent and yields of the recent past. In this period, yields surpass those of the traditional production areas of the north, and production increases to 78,000 mt.

Production in the north and east is projected at two levels. The low level is based on the 1991 extent while the high level is based on average extent for 1987-89. Yields are assumed constant at 11.1 mt/ha throughout the period. These projections are not shown separately. Instead the resulting projections for the entire country are given in the last two columns of Table 18.

Table 18. Projected Red Onion Production, Low & High Levels, from 1992 to 2000

	Rest of Country			Sri Lanka Production	
Year	Extent	Yields	Production	Low Level	High Level
	hectares	mt/ha	mt (000)	mt (000)	mt (000)
1992	4278	10.3	44	75	122
1993	4497	10.6	48	79	126
1994	4717	11.0	52	83	130
1995	4936	11.3	56	87	134
1996	5156	11.6	60	91	138
1997	5375	12.0	64	95	143
1998	5595	12.3	69	100	147
1999	5814	12.7	74	104	152
2000	6034	13.0	78	109	157

Note: Extent in north and east assumed to continue at a level of 2772 hectares for low level projection and 7039 hectares for high level projection. Yields in NE are assumed to continue at an average of 11.1 mt/ha throughout the period.

BIG ONION

Massive Big Onion production in September/October has begun recently, flooding local markets and depressing prices during that period. Preliminary figures for 1992 indicate another record harvest--over 27,000 metric tonnes of Big Onion. Marketing became a major constraint, given that the market currently absorbs an average of only 5,000 to 6,000 mt per month, and farmers called upon the government to support prices at previous levels.

Big Onion production in Sri Lanka during the August through November period is highly competitive with imports. Local production can easily increase to saturate expected volumes required by the local market. Therefore, projections of local production are simply the same as projections of local demand during the August-

November period. Taking the previous projection of 92,000 mt per year and dividing by 12 months gives a monthly consumption of 7,667 mt, or about 31 thousand mt during the season of Yala harvest.

However when the market is saturated with Big Onion, its price will be lower than that of Red Onion, and a larger proportion of Big Onion would be consumed. The ratio of real Big Onion price to Red Onion price was between 1.1 and 1.3 until 1981. When Red Onion production hit record levels, Red Onion became less costly and the price ratio (Big Onion/Red Onion) increased to the 1.4 to 1.8 range. When supply of Red Onion was cut off from 1984-86, Big Onion became less expensive, and the ratio decreased to 0.7. Red Onion supply recovered from 87-90, and the price ratio varied from 1.0 to 1.4. Again Red Onion supply dropped in 1991, and the price ratio dropped to 0.8.

If the price ratio (big over Red Onion) reduces to .8 from August through November, Big Onion consumption during this four-month period could rise to about 9,000 mt/mo or 36 thousand mt in total. If the price ratio during the rest of the year was 1.3 (Big Onion price greater than Red Onion price by 30%), then demand for Big Onion during the 8 months from December through July would lower to 6,900 mt/mo or about 55 thousand mt total. Consumption of Red Onion would adjust in the opposite direction in each period. Expected levels of demand for the two periods of the year are as summarized as follows:

Table 19. Expected Seasonality of Onion Consumption

	Big Onion		Red Onion	
	Monthly	Total	Monthly	Total
	(mt/mo)	mt(000)	(mt/mo)	mt(000)
Eight Months Dec. - July	6.9	55	8.9	71
Four Months Aug. - Nov.	9.0	36	6.8	27
Totals		91		98

Note that total volumes and the proportion between big and Red Onion are virtually the same as projected earlier. (The price ratio over the past years has averaged 1.139, which is roughly equal to .8 for 4 months and 1.3 for 8 months of the year.) The difference lies in the seasonality of consumption of both kinds of onion. By allowing prices to fluctuate according to availability, Big Onion consumption during August-November can increase fro 31 to 36 thousand mt.

If these differences in price levels at different times of the year do indeed take place, Big Onion production should continue to increase to a level of at least 36,000 mt by year 2000.

Red Onion consumption during the August to November period would be lower than normal, and probably lower than production levels during Yala season. It would be necessary to encourage Red Onion production at other times of the year to avoid competition with Big Onion during Yala.

Many persons see price fluctuations as a problem of marketing systems, and propose policies such as price controls or floor price schemes. (See Amarasinghe, 1990) It is important to see, however, that the seasonal adjustments of big and Red Onion consumption depend on these price fluctuations, which provide a means of market regulation.

Until production can be staggered over a longer period and storage capacity increases to spread supply through December and beyond, or until excess production is taken by the food processing industry, larger increases in Big Onion production are unlikely, and probably not desirable.

SUPPLY IN RELATION TO DEMAND

Table 20 compares the two scenarios of supply of all onion against demand for onion. Note that projected availability of Red Onion has been adjusted downward to account for seed bulb requirements (ranging from 14-20 percent of total production). Also in the projection, it is assumed that Big Onion production will increase rapidly to meet the demand during the four-months following Yala season harvest. Further increases in production would depend on spreading the local supply over a longer time period.

For all years under both scenarios, onion (Big Onion) must be imported to satisfy projected demand. Therefore it appears unlikely that Sri Lanka will become self sufficient in onion supply. In the year 2000, imports may vary between 21,000 and 61,000 mt depending primarily on supplies of Red Onion from the north.

Table 20. Projected Supply of Onion to Satisfy Demand

Demand	Production				Imports--Big Onion	
		Big	Red Onion			
Year	All Onion	Onion	Low	High	Low Prod.	High Prod.
1992	144	27	62	102	55	15
1993	149	32	65	105	52	12
1994	155	36	69	109	50	10
1995	160	36	73	113	51	11
1996	166	36	77	117	53	13
1997	172	36	81	121	55	15
1998	178	36	85	125	57	17
1999	184	36	89	129	59	19
2000	190	36	93	133	61	21

If Red Onion production is at low levels, demand for this kind of onion goes unsatisfied, and consumers are obliged to consume more imported Big Onion. If Red Onion production increases to the higher projection, it will reach the levels of demand previously projected (126,000 mt in year 2000).

Further increases in Big Onion production are possible if local onion can be stored and marketed in December. Because of the peak in demand during this month, more than 11,000 mt may be required by the year 2000. Supplying this additional demand from local production would increase Big Onion production from 36 to 47 thousand mt. Even with this addition, however, it is expected that importations will still be required in the future.

5. SUMMARY AND CONCLUSIONS

5.1 DEMAND

Although consumers use red and Big Onion in somewhat different ways, the two seem to be nearly perfect substitutes in the market place. Since Red Onion is more pungent, it may be more economical and therefore preferred by the consumer with lower income. Per capita consumption of all onion has risen gradually over time with rising incomes. Big Onion consumption has risen even more dramatically, but this is partly because of the shortage in Red Onion supplies due to the disturbances in the north and east. When onion is in short supply Big Onion in imported to make up the difference.

Onion consumption is elastic with respect to income, increasing 1.4 percent for each 1 percent rise in real per capita GNP. Consumption is inelastic with respect to price, increasing only 0.2 percent with each 1 percent drop in price.

Demand for all onion is projected to increase from its current level (1991) of 134 thousand mt to about 190 mt by year 2000. Demand for Red Onion would still be somewhat greater than that of Big Onion--97 versus 92 thousand mt.

5.2 RED ONION SUPPLY

Supplies of redonion from the north and east have been erratic since 1984, providing an opportunity for other areas of the country to move into production. In 1990, other areas accounted for 66 percent of Red Onion produced locally. The average yield of Red Onion in Jaffna is higher than that of other parts of the country and production costs per unit output are lower. However, Red Onion yields are increasing along with extent produced in other parts of the country. If trends continue, yields in Kalpetiya of Puttalum District will surpass those of Jaffna with a few years.

Red Onion is becoming more of a Maha crop in other parts of the country. Reason for this shift might be the introduction of Big Onion into paddy fields during Yala season, depressing prices during September and October.

This study revealed that overall availability of onion and onion prices are governed by Red Onion supply. However, projections of Red Onion production depend largely on the situation in the north and east. Therefore, local production may be anywhere from 109 to 157 thousand mt by year 2000. With 14-20 percent being required for planting material, only 93 to 133 thousand mt would be available to the consumer.

5.2 BIG ONION SUPPLY

Sri Lanka began to promote Big Onion production very recently through the Department of Agriculture programme around Dambulla and Kalawewa (Matale and Anuradhapura Districts). Local production accounted for 30 to 40 percent of the Big Onion availability in the past few years. At the initial stage of the programme, farmers faced difficulties due to lack of experience, lack of marketing facilities and problems associated with seed supply. However, yields reported by farmers have been steady at over 10 mt/ha and local production costs are lower than that of imported onion.

As Big Onion is a Yala crop in the dry zone, production comes to the market around the last week of September and first week of October. Providing facilities to store onion for 2-3 months are necessary to avoid serious market gluts at that time. As staggard planting is difficult in the dry zone it is important to look for other areas where Big Onion could be cultivated successfully in order to expand off-season production.

Big Onion production is projected to fully meet local demand during the four-month period from August to November by the year 2000. This implies a production level of 36 thousand mt. If the storage period were extended to include December, local production could cover the market for five months and increase to perhaps 47 thousand mt.

5.3 PROJECTED BALANCE BETWEEN SUPPLY AND DEMAND

If the above projections are roughly on target, demand by the year 2000 will be around 190 thousand metric tonnes, and local supply might be 93 to 133 for Red Onion and 36 thousand metric tonnes of Big Onion. The deficit of 21 to 61 thousand metric tonnes would need to be imported, not far different from the 1991 level.

There are ways to increase local production. Sri Lanka is a very efficient producer of Big Onion, though only at one point during the year. Farmers have stated that a price of Rs. 10 per kg would more than cover their costs during this period, whereas the cost of imported onion is close to Rs. 14 per kg. Also Red Onion can be produced in several places in the country, and much of it can be produced in Maha season. Red Onion can also be stored with fewer losses than Big Onion. Therefore, the most likely means of increasing local supply would be to:

1. Encourage storage of Big Onion to extend local supply by one or two more months (November and December).

2. Encourage storage of Red Onion produced in Yala so that it too can be held back from the market during September and October, and marketed later when gluts clear.

3. Encourage production of Red Onion for harvest from January through July. This might be possible under the expanding agro-wells programmes in North Central and North Western provinces.

4. Encourage off-season production of Big Onion to harvest at any time except September-October. Research should be carried out in low country dry zone and in up country areas.

5. Continue extension support to help farmers increase Red Onion yields in places like Kalpitiya and Ratnapura.

Storage facilities can be expanded with individual farmers or through farmer organizations. At the same time government of Sri Lanka could build storage facilities in production areas and rent them to farmers as well as to traders. Suitable facilities would help reduce post harvest losses and to minimize price fluctuations.

6. POLICY IMPLICATIONS

One of the most important points to emerge from this report is the need to allow the free market to operate with fewer restrictions. Sri Lanka is an efficient producer of onion and does not require import or other restrictions to protect local farmers. Such restrictions failed to stimulate local production in the past. Even in the case of onion seed, continual problems were faced until the free market (especially individual traders and cooperatives) began operating. Instead of restricting imports, the positive support provided by the Department of Agriculture and Provincial Extension programmes has resulted in massive expansion in local production.

Imported Big Onion costs between 14 to 18 Rupees per kilogram (landed, CIF cost), while local production is available during much of the year at only Rs.10-12/kg. Red Onion costs even less, only 9.50 to 11.20 to produce locally. As better varieties are found, and as farmers learn how to manage the crops more effectively, costs of local production may reduce even further. Onion is a clear case where a vigourous programme of import substitution can effectively be pursued.
This does not imply inaction on the part of the government. The authors concur with Atapattu (1991) in placing importance on such factors as coordination between importers and producers, provision of daily price information to farmers, and providing storable varieties.

It is critical to allow prices increase during periods of short supply as a means of stimulating farmers to invest more in production of this crop. Also prices must be allowed to fall during periods of oversupply, as a signal to farmers to avoid producing only during the peak period, and to stagger production and store onions to hit favourable markets. The only incentive to storing is to achieve a differential in price between the low price at harvest time to a higher price later on. Supporting price at harvest time removes the incentive that the farmer or middleman may have to store a commodity.

Encouraging storage, promoting off-seasonal production,and strengthening research and development work on post harvest technology and true seed production are important aspects of onion production to be attended in future as Gunawardena (1990) suggested. For the future, possibilities of onion processing might be worth exploring. Given the low cost production of onion in Sri Lanka, the question of export of processed onion also comes to mind.

Though Amarasinghe (1990) stressed the importance of state intervention in onion market, Hallaham(1988) argued pointed out the benefits of private sector marketing channels that he observed in Matale District. The authors believe that direct state intervention into market is not necessary and that it disrupts the operation of the free market. As onion is a perishable commodity, efficient marketing systems with fewer restrictions are preferred.

The advantages of maintaining a government monopoly over Big Onion importation are not clear. Private sector imported from June 1984 through June 1985 with no

apparent ill effects. Volumes imported rose, however they rose even more the following year under government monopoly. Volumes imported are a function of local availability, not the nature of the importing agency. Again, since local production and low cost, it is unlikely that imports will be able to undercut local producers.

Authors do suggest the need for coordination among different agencies providing production inputs, technology and credit as Fernando and Ginigandara (1987) suggested in order to promote local production. Identification of suitable varieties; development of appropriate management technologies; harvesting; storage and seed production are identified as research objectives by Mettananda and Arulnandy (1990). These statements cast light on a common requirement of improving both technology and institutional support services to promote onion production.

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