VEGETABLE PRODUCTION IN SRI LANKA

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ABSTRACT

Sri Lanka is bestowed with a climate that varies from tropical to sub-tropical. This allows for the successful cultivation of both temperate and tropical vegetables. At present the production amounts to about 600 thousand metric tons annually and no imports are being made to fulfil the country's requirements of vegetables.

While most temperate vegetables are raised from imported seeds, indigenous ones are grown from locally produced seeds. The yield and quality of the local varieties have to be improved mainly by breeding. The Department of Agriculture is promoting a vegetable improvement program and on-farming systems but needs assistance to upgrade the training of its personnel and develop other resources.

A large amount of the crop produced is wasted due to improper handling and transport as well as other post-harvest losses. Farm organizations have to be improved to prevent exploitation of growers as well as consumers.

Introduction

A wide variety of vegetables ranging from temperate to tropical are grown in Sri Lanka throughout the year. It is known that nearly 35 kinds can be grown (Klaus, 1976) and the most common types are listed in Table 1.

A significant feature of the country's dietary habit is the consumption of potato, root and tuber crops and yams in the vegetable form as well as the use of many kinds of dry

Table 1 Vegetable types commonly grown in Sri Lanka

Leafy vegetables	Fruit vegetables
Cabbage	Tomato
Lettuce	Capsicum
Leeks	Brinjal
Spring onion	Beans
Ceylon spinach* (*Basella sp.*)	Vegetable cowpea
Gotukola*(*Centella asiatica*)	Cucumber
Kankung*(*Ipomea aquatica*)	Okra
Mukunuwenna*(*Alternanthera sessilis*)	Pumpkin
Thampala*(*Amaranthus* sp.)	Bitter gourd
Sarana*(*Trianthema decandra*)	Snake gourd
Kathurumurunga*(*Sesbania grandiflora*)	Bottle gourd
Kohila*(*Lasia spinosa*)	Luffa
	Winged bean
Root vegetables	Drumstick (*Moringa olicifera*)
Carrot	Ash plantain
Beet root	
Radish	Flower vegetables
Knolkhol	
Kohila yam*	Cauliflower

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pulses (lentils, mungbean and cowpea) and tropical fruits (*Artocarpus heterophyllus, Artocarpus altilis*) cooked as curries.

Climate

Sri Lanka is an island located between 6° and 10° North of equator, at the southern tip of the Indian Sub-Continent. It has a total area of 6.6 million hectares and is divided into three climatic zones namely ; wet zone, dry zone and intermediate zone, based on annual rainfall. The three climatic zones are sub-divided into seven major agro-ecological zones (Fig. 1 and Table 2) by altitude, temperature and land form. Both the wet and intermediate zones range from the low country, mid-country, to the up-country. The dry zone is in the low country. Land form in the country varies from flat to undulating, rolling, hilly steeply dissected to mountainous. These seven zones are sub-divided into 24 well-defined agro-ecological regions, each with its unique combinations of rainfall pattern, elevation, land form, temperature range and soil types.

The distribution of rainfall is determined by the Northeast and Southwest monsoons, depressions and convections. It follows a distinctive bimodal pattern. Consequently, there are two cultivation seasons : the Maha season from October to January which is influenced by the Northeast Monsoon and the Yala season from May to September during the Southwest Monsoon.

Rainfall in the wet zone is adequate for year round cultivation of vegetables while in the intermediate and dry zone the rainfall is adequate only during the Maha season.

Sri Lanka's wide variation in precipitation, topography and soil makes it possible to grow a wide range of vegetables.

Size of land-holding and cropping systems with vegetables

In Sri Lanka, farm size under vegetable cultivation is generally small and the average land area under different vegetables shows a wide variation in different localities and in different seasons. In many instances the average area cultivated with vegetables varied from 0.09 hectares to 0.37 hectares in the dry zone and 0.57 to 1.46 hectares in major vegetable growing areas such as Welimada and Badulla districts (Gunawardena *et al.*, 1980). The exceptions are found in "Chena" lands where shifting cultivation is practiced.

Vegetable cropping systems in Sri Lanka vary from monocropping to different degrees of mixed cropping.

Mixed cropping system with very high cropping intensity is practiced in the cooler hilly areas of the country. These areas are found predominantly in Nuwara-Eliya and Badulla districts where the climate is favourable throughout the year and an ample supply of water is available. Many kinds of exotic vegetables such as cabbage, beet root, knolkhol, leeks, radish, carrot and lettuce are grown with high management practices. However, the available land area under vegetable cultivation in these regions is limited due to the competition from potato and tea crops.

Chena type of vegetable cultivation is another common practice found in the highland areas of the dry zone. In this system a large extent of land, 2~20 hectares is cleared and burned. Minimum tillage practices are followed wiht the onset of Maha rains and various kinds of indigenous vegetables together with a number of cereals, millets, legumes and root and tuber crops are grown. The common varieties found in Chena cultivation are capsicum, chillies, brinjal, cucumber, ash pumpkin, red pumpkin, okra, cowpea (vegetable and seed), luffa, snakegourd, bittergourd, maize, sorghum, kurakkan, meneri, green gram, black gram, soya bean and manioc. It is very rare to find a pure monocrop under "Chena" system of farming. The crop intensity under this system is very low and the use of inputs such as good quality seeds, fertilizer and agrochemicals is minimal.

In the rice-based cropping system vegetables are grown as a form of crop rotation,

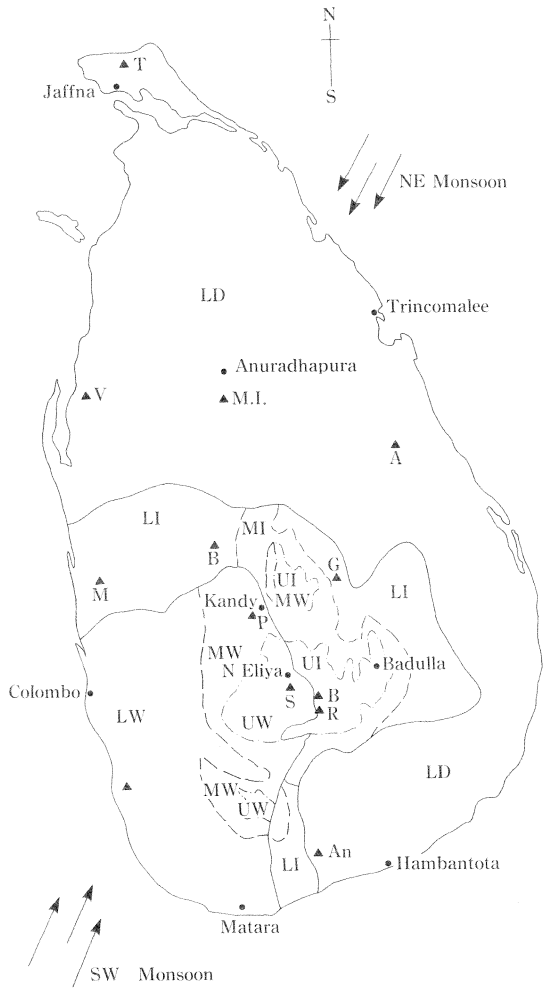

Fig. 1 Agro-climatic regions in Sri Lanka

Table 2 Agro-climatic zones and their characteristics in Sri Lanka

	Zone	Elevation(m)	Average temperature(°C)	Rainfall (mm)
1	Up-country wet	1000−2000	10−15	2500−5000
2	Mid-country wet	500−1000	20−25	2000−3000
3	Low-country wet	<300	±25	2000−5000
4	Up-country intermediate	1000−1500	15−22	1500−2250
5	Mid-country intermediate	350−500	24−26	1500−2000
6	Low country intermediate	<300	25−29	2000−2200
7	Low country dry	<300	±28	900−1000

namely paddy during the Maha season and vegetables in the Yala season. This system is practiced mostly in the dry and intermediate zones and in certain areas of the mid-country. In the dry zone where the major irrigation schemes are located, green chillis, capsicum, tomato, pumpkins and onion are frequently grown. In the mid-country, different kinds of gourds, tomato, knolkhol, okra, capsicum, brinjal, cabbage and beet root are found. In these instances, a certain degree of monoculture is practiced and some inputs like agrochemicals and quality seeds are used.

The cultivation of indigenous leafy vegetables "Keera" is being done in the form of mixed cropping system. The crops belonging to this group are listed in Table 1. They are easy to grow, require low inputs and have a relatively short growth period. Crop intensity is high and the cultivation is done throughout the year. Planting materials such as seeds and vegetative parts are produced by the farmers. Fertilizers and agrochemicals are used. The cultivation of this group of vegetables on a commercial scale has been done in and around Colombo city (wet zone). The survey conducted in 1976 revealed that the area under leafy vegetable cultivation is about 400 hectares. However, the area under "Keera" cultivation in Colombo district is declining due to the expansion of the city, while it is expanding in the surrounding districts.

The other very common and oldest form of vegetable cultivation is the home gardening. Almost every backyard of houses has several varieties of vegetables in which the production is mainly for domestic consumption.

Trend in area and production of vegetables

The area under cultivation and the production of sixteen of popular vegetables are presented in Table 3. The area and the production of individual vegetables over the last decade have not shown a significant trend in any direction. The government policy is to keep the area as stable as possible but to increase production through higher productivity. However, it is noted that the national average yields for most of the vegetables are very low when compared to the yields obtained in most countries in the region. This is due to a variety of reasons.

1) The bulk of vegetable production is carried out during the Maha season under rainfed conditions. During this period the rainfall is unpredictable and subject to extreme fluctuations. Thus significant differences in yield from place to place and year to year can be observed. This situation particularly applies to indigenous vegetables that are grown in highland areas of the dry zone and intermediate zone of the country.
2) Generally,the indigenous vegetables are grown from the seeds produced by the farmers. These are local land races which had been grown during many years and their genetic productivity is generally low due to poor maintenance of seeds. Most of these vegetables are therefore low-yielding.
3) A large area of indigenous vegetables is utilized in the form of Chena cultivation in which inputs such as implements, fertilizers and agrochemicals are used to a minimal level. Weeding is almost non-existent in this method of cultivation.
4) Lack of availability of material inputs such as seeds, fertilizers, agrochemicals and equipment at the correct time causes severe fluctuations in production. Although many cultivators produce themselves seeds from many indigenous vegetable varieties, some depend on the seeds produced by the government. In the case of exotic vegetables farmers have to purchase the entire seed requirement from outside.
5) Deficiencies in extension staff
   At the village level an extension worker is expected to handle about 800 farm families and is supposed to supply information on crops such as rice, vegetables and fruits. In many instances, the extension officer is unable to give proper instructions to the farmers as he is not very conversant with all the aspects of vegetable cultivation.

Table 3 Area and production of popular vegetables

Crop		79/80	80/81	81/82	82/83	83/84	84/85	85/86	86/87
Cucumber	Ext. (ha)	2605	2387	2129	2148	2475	2061	2316	2154
	prod. (tons)	25046	22309	199270	21689	27035	23684	23353	21168
Ash pumpkin	Ext. (ha)	1321	—	1168	1294	1281	1358	1184	1100
	prod. (tons)	38447	—	8188	10490	13388	13977	13372	10721
Red pumpkin	Ext. (ha)	6731	—	7266	7564	8848	7617	7646	7116
	prod. (tons)	46683	—	37638	80348	121638	96120	96461	97008
Bitter gourd	Ext. (ha)	2966	3004	3129	3249	3343	3354	3247	3541
	prod. (tons)	5486	13328	13755	22439	22514	20059	21263	19266
Snake gourd	Ext. (ha)	3403	3224	3381	3392	3338	3178	3001	3046
	prod. (tons)	25264	20621	18589	23289	23466	28188	28715	25996
Okra	Ext. (ha)	3948	3864	3716	3813	5524	6760	4338	5680
	prod. (tons)	17454	16041	14794	17320	17719	33065	—	34721
Brinjal	Ext. (ha)	5223	5128	4742	5386	6704	5953	2866	6333
	prod. (tons)	61037	53273	44989	47449	48856	84256	42920	66838
Bushitao	Ext. (ha)	1931	2898	2436	2411	2875	2277	1596	2669
	prod. (tons)	11260	12348	7593	9182	7251	11616	9037	17508
Capsicum	Ext. (ha)	1877	1863	1621	1633	2200	1702	1476	1677
	prod. (tons)	6736	9441	5068	6316	6479	6201	5342	—
Tomato	Ext. (ha)	2800	2282	1439	2584	3130	2693	2272	3112
	prod. (tons)	18499	24642	12149	28668	32455	32406	13218	34216
Cabbage	Ext. (ha)	1587	1789	1306	2381	3125	2974	2642	2821
	prod. (tons)	33738	35504	25352	45764	41198	61113	43406	64974
Carrot	Ext. (ha)	690	408	401	688	1437	1409	1222	654
	prod. (tons)	9137	4146	4898	7896	4660	13192	10482	7576
Beet root	Ext. (ha)	1002	1030	1298	2109	1630	1704	1637	1648
	prod. (tons)	15423	6485	734	21913	5459	13548	55966	23475
Knolkhol	Ext. (ha)	901	889	825	1049	2685	1746	1100	1191
	prod. (tons)	7344	9037	5802	5964	10018	14678	9076	12331
Radish	Ext. (ha)	2325	1954	2127	1420	4535	2481	1830	1591
	prod. (tons)	8252	26802	25371	10119	12872	47551	19170	13241
Beans	Ext. (ha)	4776	6201	4139	6697	7242	8747	5391	7762
	prod. (tons)	25803	31613	16567	27881	23536	48716	33882	41137

Source : Seed Division, Department of Agriculture.

Consequently farmers are unware of the improved technology.

Due to these drawbacks the full potential of land, labour and capital is not utilized in the case of indigenous vegetables. However, in the case of exotic vegetables the situation is slightly different. These are mostly grown in the higher mountainous areas where a cool climate prevails. The entire seed requirement is met by the import of seeds recommended by the Department of Agriculture and preferred by the cultivators. The free import policy implemented since 1984, has improved the supply of seeds.

Per capita requirement, per capita availability and consumption

The optimum daily requirements of vegetables for different categories of persons have been worked out by the nutrionists at the Medical Research Institute of Sri Lanka. According to their findings, the average optimum daily requirement of a person is 156.60 g with 47.44 g of leafy vegetables and 109.25 g of fruit vegetables and root and tubers. Compared with the figures of the daily per capita availability given in the food balance sheet prepared by the Census and Statistics, it is evident that there was a considerable gap between the per capita requirement and the per capita availability during the early half of the last decade (Table 4). With the absence of reliable statistics on per capita availability from 1983, possibly due to the prevailing civil disturbances, it is difficult to make any comparison for the last few years. However, it is estimated that the current annual vegetable production is about 600,000 metric tons. If this amount is made available without any waste, it could be assumed that the present per capita availability of 109 g per day is still far below the daily per capita requirement.

The total quantities of each individual vegetable consumed for a period of time are difficult to estimate in the Sri Lankan context. Considering "vegetables" as a single commodity, it is reported that the people of Sri Lanka consume about 60% of their optimum daily requirement of vegetables i.e. about 93 g per day. Therefore, the annual current consumption of vegetables could be estimates at about 555 thousand metric tons.

Increase in the consumption of vegetables per family is determined on the one hand by the availability and price and on the other by income levels and standard of living. Within the limits set by current income levels it may not be possible to expect more than a 20% increase in consumption even if production and marketing problems were solved. It would appear, therefore, that a total annual production of about 667 thousand metric tons of a properly balanced supply of different types of vegetables spread evenly throughout the year would satisfy the current demand of vegetables. However, the recently introduced state programs such as poverty alleviation and school nutritional programs are bound to increase the demand for vegetables. The main thrust to achieve this goal would come from the diversification program under the Mahaweli River Development

Table 4 Comparison between optimum daily per capita requirements and daily availability for per capita consumption

Year	(a) Per capita requirement g/day Assumed to be constant	(b) Per capita net availability g/day
1979	156.69	87.75
1980	156.69	87.84
1981	156.69	87.91
1982	156.69	87.97

Source : (a) Medical Research Institute, Sri Lanka.
(b) Department of Census and Statistics, Sri Lanka.

Project. The Mahaweli areas are also being earmarked for production of certain vegetables such as gherkins for export.

Institutional framework

The Department of Agriculture plays an important role in the development of production of vegetables in the island. Divisions such as Research, Extension, Farms and Seed Certification Service which operate under the Department of Agriculture extend their services in solving the problems related to the vegetable cultivation.

1 Vegetable research

Technical research into vegetable production has been mainly undertaken by the research division. The research division has nine Regional Research Cenrters and many Agricultural Experimental Stations located in different agro-ecological regions. Each center works on specific problems related to the region when devoting its efforts in breeding and testing of improved cultivars, developing improved cultural and fertilizer practices and better techniques of pest, disease and weed control.

2 Seed production and supply

Sri Lanka is lacking the chilling requirements necessary to induce flowering and fruit setting of the temperate vegetables. Therefore, the seeds of improved varieties that have proved their superiority under local conditions have to be imported annually (Table 5). In the case of bean, capsicum and radish small quantities of seeds are imported but in bean and radish, Sri Lanka will soon be self-sufficient.

Foundation and Certified Seeds of indigenous vegetables are produced in the government farms while the Breeders' Seed production is confined to the research stations. There are 24 such farms all over the island which are expected to produce 10-12% of the total requirement for the country (Table 6). However, as government farms have a limited area for production and contract, growing of seeds of some vegetable varieties is not presently feasible, the demand for certain local varieties cannot be met (Table 7). To overcome this situation, bufferstocks are being maintained from crops grown in paddy fields in the dry zone during the Yala season.

Locally produced seed is certified by the Seed Certification Services and in the case of exotic vegetables the test for trueness to lable test is carried out.

3 Vegetable marketing

Marketing systems for vegetables can be categorized into three groups, namely ; Private, Government and Cooperative. Government institution engaged in vegetable

Table 5 Vegetable seed imports (kg) to the country

Crop	1981	1982	1983	1984	1985	1986	1987
Beet	14707	6071	8244	—	22770	18120	8850
Cabbage	1446	2120	3445	—	4065	2217	1057
Carrot	7715	6148	8574	—	13009	14687	9960
Cauliflower	54	22	58	—	175	150	210
Leeks	4340	1365	1031	—	8350	7217	4425
Tomato	266	236	1049	locally produced			
Kholrabi	2217	4827	3523	—	5425	2550	5900
Radish	1144	9674	4993	locally produced			
Beans	120700	105200	37000	25000	locally produced		
Capsicum	2543	1992	2853	—	6680	8627	2400
Lettuce	400	366	98	—	137	201	50

Source : Seed Division, Department of Agriculture.

Table 6 Approximate annual requirements (kg) of local vegetable seed

Crop	1985	1986	1987	1988
Beans	100,000	120,000	140,000	150,000
Capsicum CA-8	1,000	1,250	1,500	1,500
Capsicum H.Y.W.	3,500	4,000	4,500	4,500
Tomato	750	850	900	1,000
Cowpea-Pole	3,000	3,500	4,000	4,500
Cowpea-Bush	15,000	17,500	20,000	20,000
Okra	5,000	5,250	5,600	6,000
Snake gourd	1,500	1,700	1,900	2,000
Bitter gourd	1,500	1,700	1,900	2,900
Luffa	1,500	1,700	1,900	2,000
Cucumber	750	850	950	1,000
Eggplant	1,500	1,650	1,850	2,000

Source : Seed Division, Department of Agriculture.

marketing is the Marketing Department. Cooperative societies are grouped as Cooperative Marketing Federation (MARKFED) and the Producers' Unions. These three systems operate at all three levels, primary (farm), wholesale and retail in the marketing chain but not in every locality. However, at all levels private sources are cosidered to handle about 80% of the vegetable trade in Sri Lanka (Indraratne, 1975).

Improvement of vegetable production technology

1 Cultivar improvement

1) Selections from introductions

During the period of 1971-1975, an extensive program to evaluate new introductions was implemented with the assistance of the Federal Republic of Germany. Nearly 1,600 accessions of 35 kinds were introduced from all over the world and tested at six locations which represent the climatic conditions of the major producing areas. This program gave very useful information on new varieties which have high yield, better adaptability and resistance to pests and diseases. As a result most of the temperate vegetable crops which were confined to cooler regions were distributed to warmer areas. During this period few varieties of exotic vegetables were identified which can be made to produce viable seed under local climatic conditions. The program ended in 1976 and was unable to develop at the pace it was continued at the time the project was initiated. However, the testing of introductions has continued with the assistance of the private sector and Asian Vegetable Research and Development Center (AVRDC), Taiwan. A large number of accessions were tested and some promising varieties of cabbage, beans, tomato, vegetable cowpea, okra were identified (Table 8). Also an exception to the non-flowering carrot variety was discovered when an Indonesian variety, Renita set seeds in some locations. In addition some tomato varieties from AVRDC were used as parents to produce new hybrids such as T 244 and T 245.

2) Selections from land races

Selection of indigenous vegetables has been done. Promising selections were made in brinjal, vegetable cowpea, capsicum, green chilli, bush type Gotukola and these are under the final stage of varietal testing in farmer field trials. These selections give higher yields over the existing cultivars, show tolerance to some diseases and pests and are better adapted to local conditions. These will undoubtedly help to increase the production in the future.

2 Cropping systems

Scientifically planned intercropping systems have been identified instead of the

Table 7 Vegetable seed production on government farms and by growers and release (kg), 1983-1988

Variety	1983		1984		1985		1986		1987		1988	
	Prod.	Release	Prod.	Release	Prod.	Release	Prod.	Release	Prod.	Release	Prod.	Release
Okra	2544	3687	3701	3027	3952	2318	7527	4012	5700	4968	7800	4918
Cowpea	9543	8749	19566	7406	1808	6314	55000	5665	8468	4548	7824	4274
(Bushitao)												
Cowpea(Pole)	1251	3892	18320	2538	1572	2201	2859	1427	1168	1387	1645	1251
Snake gourd	1073	939	719	799	1359	1197	1923	923	1620	993	2670	580
Luffa	56	805	422	751	599	775	780	797	1545	814	867	849
Bitter gourd	768	983	1224	887	1081	637	2354	1047	1167	1219	1862	1173
Cucumber	250	293	257	402	825	658	442	517	337	534	1014	581
Capsicum	198	212	433	290	861	669	752	703	606	626	1089	597
Tomato	1170	649	831	945	2061	1553	731	618	113	978	1865	862
Brinjal	35	811	20	814	451	690	1077	572	1048	666	1345	630
Radish	—	3725	304	3402	2715	1744	3164	871	143	821	117	493
Beans	161778	100367	85909	103895	142225	116674	33146	111369	25471	105266	1645	1251
Amaranthus	—	67	—	59	—	54	—	—	110	71	—	—
Spinach	26	68	13	47	52	31	—	—	—	—	—	—

Source : Seed Division, Department at Agriculture.

Table 8 Varieties selected and improved in the program

Crop	Before 1979	After 1979
Cabbage	K. Y. cross S. D. cross A. S. cross K. K. cross Hercules Atlas Leo 80 Big cropper Gloria Early Yehsen	Exotic Talix Hultan
Beans	Wade Top crop Cherokeewax Tender green	Provider Contender Tuf
Tomato	K. W. R. Marglobe Roma Bianz T_{146}(C 32d-0-1-2-0)	T_{245}(KWR x C32d-0-1-7-0) T_{244}(KWR x T_{146}) Caribe
Okra	MI 5 MI 7 VT	Keystone spineless (AV x 6607)
Vegetable cowpea	Bushitao 'Hawari me' 'Polon me'	BS 1 BS 3

traditional method of mixed cropping (Dissanayake *et al.*, 1986). Crop combinations which have given high yield and net returns are as follows :

(a) Tomato with two rows of bush bean
(b) Tomato with three rows of radish
(c) Okra with two rows of bush beans
(d) Okra with three rows of radish
(e) Double row of cassava with cucumber
(f) Double row of cassava with tomato

3 Disease and pest control measures

Seedling diseases such as damping off caused by soil pathogens are serious problems in vegetable nurseries. "Solar heating" has been identified as an effective and cheap method in controlling these diseases (Sivakadadcham, 1983). In this method the soil is kept moist and covered with thin transparent polyethylene 25-30 μm in gauge for about four weeks prior to sowing.

The use of chemical insecticides to control cabbage catterpillars is a very common practice. The damage caused by catterpillars is so prevalent that the crop is subjected to heavy spraying at very short intervals. It has been found that Chlorfuazuron, an insect growth regulator is highly effective in controlling this pest and is being recommended.

Beanfly is the most damaging pest during the seedling stage of leguminous vegetables. In some production areas, seedling mortality as high as 80-100% has been recorded where the pest had not been timely controlled (Subasinghe, unpublished). Seed dressing

or seed soaking with carbamates and organophosphate insecticides such as Monocrotopus, Carbosulfan, Thiodicarb, Omithoate was recommended as an economic and effective measure against this pest (Wijesekera and Abeytunge, 1983).

Constraints on vegetable cultivation

1 Lack of improved varieties

Over the last 15 years there has been only very little change in the varieties used by the farmers. Vegetable cultivars recommended in the early 1970s are still being grown and most of the indigenous varieties are producting less than optimum yield. In the case of exotic vegetables this has even created difficulties in obtaining seeds of some cultivars from suppliers abroad. Therefore, effort should be made to improve the local varieties through breeding techniques. Desirable traits such as high-yielding ability, high quality, resistance to drought, pest and diseases should be combined into single cultivars so that losses could be minimized. In the case of testing of exotic vegetable cultivars, a more comprehensive program should be implemented in order to obtain viable results.

2 Lack of knowledge on improved cultural practices

The agronomic requirements of the popular vegetable crops have not been thoroughly investigated. Information on appropriate use of fertilizer, trace element deficiencies, use of organic waste , irrigation requirements, use of various products as mulching materials, new cropping systems and techniques is inadequate.

3 Pest and disease problems

Pests and diseases are major constraints on the cultivation and expansion of certain vegetables. Some of the most common hazardous diseases and pests are :

1) Bacterial wilt in solanaceous vegetables : Bacterial wilt caused by *Pseudomonas solanacearum* is very common in wet zone areas in Sri Lanka and it is a limiting factor for the expansion of these vegetables. Chemical control is not possible. Few resistant varieties of tomato have been identified. In the case of capsicum and egg-plant, the varieties so far introduced to the country were nearly 100% susceptible to the disease while local cultivars of these two crops show a high level of tolerance.
2) Other serious diseases are mosaic virus in okra, virus diseases in capsicum, chillies, tomato, curcurbits and leguminous vegetables. Club root disease in cruciferous, foot rot and collar rot in beans are also prevalent in many parts of the country.
3) Major pests are cowpea pod borer (*Maruca testulalis*), brinjal shoot and pod borer (*Leucinodes orbonalis*), cabbage catterpillars, cucurbit fruit fly (*Dacus curcurbita*) and beanfly (*Melanagromyza phaseoli*).

4 Lack of procedures in grading, packing, processing, transport and storage

Post-harvest losses in vegetables range from 10-40% due to high ambient temperature, poor storage, bad handling, transport and the inherent nature of perishability. At the farm level very little or no cleaning of produce is undertaken befor selling. It is at the retail level that vegetables are cleaned to a greater extent. Present system of packaging is very unsatisfactory. Gunnies are used for beans, cabbage, carrot, beet root, brinjal, capsicum and bitter gourd, wooden boxes for tomatoes and chillies. Snake gourds are wrapped in cadjan while no containers are used for pumpkin and ash plantain. A maximum weight of usually 100-150 lb is packed in a container and maximum number of containers are loaded into a vehicle. These containers receive little or no ventilation for about 1~1 and a half days until they reach the terminal market from the producing areas. Sri Lanka does not have refrigerated transport facilities for private vegetable markets. Therefore, the importance of cleaning, proper packing methods, storage facilities and transport system cannot be over emphasized.

5 Inadequate and unsatisfactory marketing channels

Market imperfections at various levels of the private marketing channel lead to arbitrary price fixing. The collusive behaviour of the middle man in transport assembly, pricing wholesale and retail trade of vegetables has led to a monopoly situation.

6 Lack of trained personnel

Resource personnel such as researchers, instructors technicians are few and mostly untrained.

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