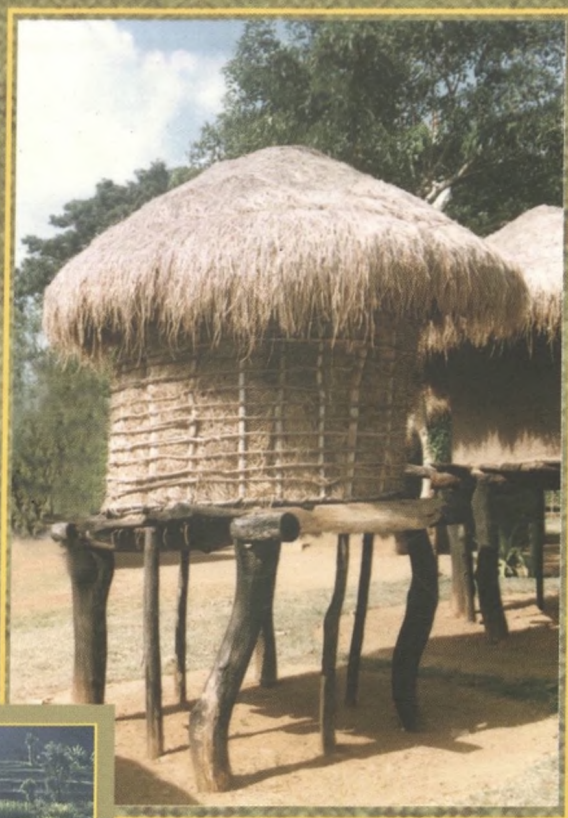


AN UNCERTAIN FUTURE:

Traditional Plant Varieties and their Crop Wild Relatives in Sri Lanka



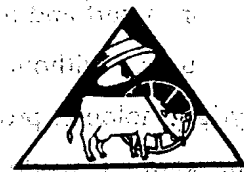
SOUTH ASIA WATCH ON TRADE, ECONOMICS AND ENVIRONMENT

**South Asia Watch on Trade,
Economics & Environment (SAWTEE)
Kathmandu**



**Law & Society
Trust (LST)
Colombo**

AN UNCERTAIN FUTURE:
Traditional Plant Varieties and their
Crop Wild Relatives in Sri Lanka



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AN UNCERTAIN FUTURE: Traditional Plant Varieties and their Crop Wild Relatives in Sri Lanka

The opinions expressed in this research report represent the opinions of the individual contributors and are not necessarily the views of the Law and Society Trust (LST) and South Asia Watch on Trade, Economics and Environment (SAWTEE). Any errors of fact or interpretation are the responsibility of the authors. The publication of this report would not have been possible without the efforts of LST staff members particularly Ms. Chamali Wickramaratne, Ms. Thiranthie Udukumbura and Ms. Thiagi Piyadasa.

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Preface

This research report on *Traditional Plant Varieties and their Crop Wild Relatives in Sri Lanka* is an outcome of Phase II of the Farmers' Rights to Livelihood project in partnership with South Asia Watch on Trade, Economics and Environment (SAWTEE) and supported by the Ford Foundation (New Delhi) and Novib (The Hague). This project is concerned with farmers' rights relating to genetic resources in the context of globalisation and the World Trade Organisation.

Chapter I contributed by Dr. Gamini Hitinayake documents traditional and crop wild varieties in Sri Lanka, their geographical distribution and usages. It also surveys farmers' perceptions as to the advantages and disadvantages of using such varieties. Chapters II and III written by Mr. Jagath Gunawardena identifies threats to the protection of crop genetic resources such as bio-theft and bio-piracy. It goes on to critique the UN Food and Agriculture Organisation's International Treaty on Plant Genetic Resources in Food and Agriculture (ITPGRFA) as well as the World Trade Organisation's Trade-Related Intellectual Property Rights (TRIPS) Agreement.

One finding common to both researchers is that awareness of traditional crop varieties and wild relatives, and of their uses, is in decline even within farming communities. Another observation in common is that state authorities have been slow to take action to arrest threats to biodiversity conservation through appropriate legal reforms and practical measures.

The 1992 United Nations Convention on Biological Diversity (CBD) promised that states would retain sovereign rights over access to their biological resources and that benefits arising from the use of those resources would be fairly shared (Access and Benefit Sharing – ABS). Stakeholders, particularly local communities, were also assured that they would receive information about and be consulted on any proposed initiative and its likely impacts and enabled to meaningfully participate in the process (Prior Informed Consent – PIC), before research and utilisation of genetic resources is authorised.

However subsequent international instruments such as the TRIPS agreement and the ITPGRFA seriously erode principles of Access and Benefit Sharing and Prior Informed Consent contained in the Convention on Biological Diversity.

The LST hopes that this research report and other activities of the project will contribute towards engendering a favourable policy environment that supports farmers' rights to plant genetic resources; and that policymakers will recognise the importance of farmers' participation in decision making processes that affect them.

CHAPTER 1

TRADITIONAL VARIETIES AND WILD RELATIVES OF CROP PLANTS IN SRI LANKA

Dr Gamini Hitinayake

1.0 INTRODUCTION

Crop wild relatives are important both for increasing agricultural production and for maintaining sustainable agroecosystems. The wise conservation and use of crop wild relatives are essential elements for increasing food security, eliminating poverty and maintaining the environment. The genes that come from crop wild relatives make a direct contribution to increase production, food quality and human wellbeing through poverty alleviation.

A number of cultivated food plants have their wild relatives. Wild relatives of crop plants include the progenitors of crops as well as species more or less closely related to them.

Crop wild relative species have already made substantial contributions to improving food production through the useful genes they contribute to new crop varieties. Genes that provide resistance to pests and diseases have been obtained from crop wild relatives and used in a wide range of crops, including rice (e.g. virus resistance from *oryza nivara*), potato (e.g. potato blight), wheat (e.g. powdery mildew and rusts) and tomato (e.g. *fusarium* and nematodes). Genes from crop relatives have been used to improve protein content in wheat and vitamin C content in tomato. Broccoli varieties producing high levels of anti-cancer compounds have been developed using genes obtained from wild Italian *brassica oleracea*. Crop wild relatives have also been a source for genes for abiotic stress tolerance in many crops.

The natural populations of many species of crop wild relatives are increasingly at risk. They are threatened by habitat loss and by increasing destruction of natural environments. Destruction of forests is leading to the loss of many populations of important wild relatives of fruit, nut and industrial crops such as mango and rubber.

Many cereal crop wild relatives, including wild wheat and millet species, occur in arid or semi-arid lands and are severely affected by over-grazing and desertification. Mountain areas, which may possess wild relatives of potato, tomato and fruit crops, are particularly vulnerable to the loss of wild relatives, as these fragile ecosystems are easily eroded as population pressure increases. Crop wild relatives are also traditionally found as natural inhabitants of agroecosystems, in and around farms; the increasing industrialisation of agriculture is reducing their occurrence.

Many species of important crop wild relatives are found in centres of plant diversity and crop diversity in developing countries, which often lack resources to invest in the necessary conservation activities. Additional resources are urgently needed in such areas of high diversity to identify species that should have conservation priority, determine the necessary conservation activities, monitor key species' status, improve the use of these valuable resources in supporting production systems less dependent on external inputs such as pesticides, and ensure that communities in these areas obtain full benefits from the use of these resources.

2.0 ACCESSIONS OF TRADITIONAL CROP PLANTS AND WILD RELATIVES AT PLANT GENETIC RESOURCES CENTRE

Table 1
Summary of crops accessions at the Plant Genetic Resource Centre (PGRC), Gannoruwa, Peradeniya

Crops species	Number of accessions
Rice	
<i>Oryza sativa</i> (traditional & cultivars)	3 194
<i>Wild relatives</i>	17
Coarse Grains	
<i>Eleusine coracana</i>	195
<i>Panicum miliaceum</i>	28
<i>Setaria italica</i>	71
<i>Paspalum scrobiculatum</i>	5
<i>Zea mays</i>	223

<i>Sorghum bicolour</i>	52
Grain Legumes	
<i>Vigna unguiculata</i>	165
<i>Vigna radiate</i>	64
<i>Vigna mungo</i>	28
<i>Vigna umbellate</i>	18
<i>Macrotyloma uniflorum</i>	30
<i>Psophocarpus tetragonolobus</i>	395
<i>Canavalia ensiformis</i>	15
<i>Phaseolus lunatus</i>	31
<i>Lablab niger</i>	19
<i>Pisum sativum</i>	13
<i>Glycine max</i>	204
<i>Mucuna pruriens</i>	4
<i>Pachyrrhizus spp.</i>	1
Vegetables	
<i>Momordica charantia</i>	72
<i>Momordica dioica</i>	4
<i>Trichosanthes cucumerina</i>	28
<i>Luffa acutangula</i>	58
<i>Luffa aegyptica</i>	18
<i>Cucurbita spp.</i>	120
<i>Benincasa hispida</i>	22
<i>Cucumis spp.</i>	129

The status of collection and maintenance of different germplasm (including wild varieties, traditional and new) is shown in Table 2.

Table 2
Germplasm collection status by crop plants at the Plant Genetic Resource Centre (PGRC), Gannoruwa, Peradeniya

Crop Group	Number of		Percentage Collection
	Species	Accessions	
Rice	2	3 809	34.0
Other cereals	9	785	7.0
Grain legumes	14	1 907	17.0
Vegetables	52	2 927	26.1
Spices and condiments	9	500	4.5
Fruits	16	363	3.2
Root and tubers	7	309	2.8
Oil seeds	3	180	1.6
Medicinal plants	12	21	0.2
Wild relatives of crop	26	308	2.7
Species			
Other	-	96	0.9
Total	180	11 205	100

Source: Ministry of Forestry and Environment (1998), Biodiversity Conservation in Sri Lanka – A Framework for Action

3.0 OBJECTIVES

The present study was conducted to identify

- Traditional Crop Varieties and their Wild Relatives; and
- Uses, Perceptions and Protection of Traditional Varieties of Crop Plants and their Wild Relatives

3.1 METHODOLOGY

A list of genetic material of traditional crop plants and their wild relatives was compiled based on the catalogue of the germplasm accessions maintained by the Plant Genetic Resources Centre (PGRC), Gannoruwa in Peradeniya. PGRC has the largest and most comprehensive collection of accessions of traditional crop plants in Sri Lanka.

Also another list of traditional crop plants and Crop Wild Relatives was compiled using the information given in the Flora of Ceylon (Fosberg, *et al*, 1994). This is given in Appendix 2. The list consists of 55 plant species used as vegetables, wild fruits, spices and in making herbal teas/porridges.

A survey was conducted with farmers in three locations in order to understand their perceptions about the traditional crop varieties and their wild relatives and their conservation. The three locations were Kurunegala (Ibbagamuwa, Galgamuwa, Kumbukwewa), Hanguranketha and Kandy (Kundasale). Conservation of traditional varieties by farmers was also investigated at three other locations namely, Polonnaruwa, Mahiyanganaya and Moneragala in addition to above locations. The questionnaire used for the survey is reproduced as Appendix 1.

4.0 FINDINGS OF THE STUDY

4.1 IDENTIFICATION OF TRADITIONAL PLANT VARIETIES AND CROP WILD RELATIVES

Traditional crop accessions maintained at the PGRC, Gannoruwa in Peradeniya are given in Table 3. As said before PGRC is the national institute which has the mandate for collection and maintenance of Plant Genetic Resources of Sri Lanka. It has the largest and most comprehensive collection of traditional and wild relatives of crop plants in Sri Lanka.

Plant Name	Scientific Name	Accession Name	Origin	Number of types
01. Rice	<i>Oryza sativa</i>	Traditional & cultivated	Sri Lanka	2469
02. Wild Rice	<i>Oryza nivara</i>	-	Anuradhapura	
		-	Anuradhapura	
		-	Anuradhapura	
		-	Anuradhapura	
		Uru Wee	Puttalam	
		V 15	Sri Lanka	
	<i>Oryza rufipogon</i>	Uru Wee	Gampaha	
		V 27	Sri Lanka	
	<i>Oryza eichingeri</i>	V 6	Sri Lanka	
	<i>Oryza sp.</i>	-	Puttalam	
03. Maize	<i>Zea mays L.</i>	Baby corn	Thailand	2

		Bada iringu	Anuradhapura	20
			Badulla	15
			Hambantota	17
			Kandy	10
			Kegalle	2
			Kurunagala	7
			Matale	10
			Matara	1
			Mexico	1
			Monaragala	6
			Nuwara Eliya	17
			Polonnaruwa	6
			Ratnapura	6
			Thailand	1
		Rathu	Matale	1
			Unknown	2
		Bala iringu		
		Hane iringu	Kandy	1
		Haramas bada iringu	Anuradhapura	1
			Monaragala	1
		Heenati bada iringu	Polonnaruwa	1
		Iringu	Badulla	1
			Kandy	1
		Kiramana iringu	Badulla	1
		Kiri bada iringu	Anuradhapura	3
		Maha bada iringu	Ratnapura	1
		Maha iringu	Ratnapura	1
		Mannaram bada iringu	Kurunagala	1
		Mukala iringu	Kandy	1
			Monaragala	1

			Ratnapura	1
		Mukla iringu	Kandy	1
		Pabalu iringu	Badulla	1
		Ratu bada iringu	Monaragala	1
		Siwru bada iringu	Kurunagala	1
		Siwuru bada iringu	Anuradhapura	1
		Sudu bada iringu	Kandy	1
		Sudu iringu	Kandy	1
		Tunmas iringu	Monaragala	
04. Sorghum	<i>Sorghum bicolor (L.)</i>	Bath iringu	Hambantota	
		Edal iringu	Badulla	1
			Kandy	1
			Kurunagala	3
			Matale	1
			Monaragala	2
			Nuwara Eliya	1
		Edal iringu	Hambantota	1
		Edal iringu	Matale	1
		Idal iringu	Anuradhapura	1
			Badulla	1
			Kegalle	1
			Matale	1
			Monaragala	3
			Nuwara Eliya	1
		Karal iringu	Kurunagala	
			Matale	
			Monaragala	
		Karal iringu	Hambantota	
		Karal iringu	Kandy	
		Karalliya	Galle	

		Poth eringu		
		Rata kurakkan		
		Rathu thiringu		
		Red sorghum		
		Rice sorghum		
05. Green gram	<i>Vigna radiata</i>	Ali mung	Monaragala	
		Anju mung		
		Boowa mung	Hambantota	
		Gaja mung	Monaragala	1
			Ratnapura	1
		Kaha mung	Anuradapura	2
			Hambantota	1
			Kandy	1
			Kurunegala	4
			Matale	2
			Monaragala	3
		Kalu karal mung eta	Matale	2
		Kalu mung	Anuradapura	1
		Kola mung	Kurunegala	1
		Maha mung	Hambantota	1
		Mung	Anuradapura	4
			Hambantota	1
			Kegalle	1
			Monaragala	1
			Kurunegala	1
			Polonnaruwa	1
		Mung eta	Hambantota	2
			Ampara	1
			Anuradapura	3
			Monaragala	2
		Pinna mung	Hambantota	8

			Ratnapura	2
		Pinna mung kaha	Ratnapura	1
		Pinna mung kola	Ratnapura	1
		Pisna mung	Hambantota	2
		Thel mung	Monaragala	1
		Tissa mung	Hambantota	1
		Thissa mung	Kurunegala	1
		Weda mung	Monaragala	6
		Yellow gram		
		Heen mung	Kegalle	
06. Black gram	<i>Vigna mungo</i>	Gas undu	Anuradapura	1
			Badulla	1
			Kurunegala	1
			Monaragala	1
		Undu	Anuradapura	2
			Badulla	1
			Kurunegala	1
			Monaragala	3
			Kandy	5
			Matale	7
			Nuwara Eliya	4
			Polonnaruwa	1
			Ratnapura	1
		Wel undu	Matale	2
			Monaragala	1
07. Soya Bean	<i>Glycine max</i>	Maturata soya	Nuwara Eliya	1
		Soya	Nuwara Eliya	1
		Soya bonchi	Nuwara Eliya	3
			Badulla	1

08. Common Bean	<i>Phaseolus vulgaris</i>	Bonchi	Nuwara Eliya	1
		Bonchi (Butter)	Badulla	1
		Butter bonchi	Badulla	2
			Nuwara Eliya	3
			Ratnapura	1
		Dampata bonchi	Badulla	1
		Gas bonchi	Badulla	2
			Nuwara Eliya	1
		Gus bonchi	Badulla	1
		Kaha murunga bonchi	Nuwara Eliya	1
		Kaha roii	Badulla	1
		Kalu bonchi	Badulla	1
		Kalci roll	Badulla	1
		Kalu murunga bonchi	Badulla	2
		Kalu wel bonchi	Badulla	1
		Katugastota bonchi	Badulla	4
		Keti murunga	Kandy	1
		Keti murunga bonchi	Kandy	1
			Nuwara Eliya	1
		Kollu bonchi	Badulla	4
			Nuwara Eliya	1
		Kotrole bonchi	Badulla	1
		Me karal	Kandy	1
		Murunga bonchi	Badulla	9
			Ratnapura	1
			Nuwara Eliya	3
		Nari bonchi	Kandy	5
			Nuwara Eliya	1

		Nil bonchi	Nuwara Eliya	1	
			Badulla	1	
		Panduru bonchi	Badulla	3	
		Peas butter	Badulla	1	
			Badulla	1	
		Peas butter bonchi	Badulla	2	
			Nuwara Eliya	1	
		Pole bean	Badulla	1	
		Pothu bonchi	Nuwara Eliya	1	
		Rila bonchi	Nuwara Eliya	1	
		Role bonchi	Badulla	1	
		Setti murunga	Kandy	1	
		Short murunga bonchi	Nuwara Eliya	1	
		Sinhala bonchi	Nuwara Eliya	1	
		Sitti murunga	Kandy	1	
			Nuwara Eliya	3	
		Sudu bonchi	Badulla	2	
			Nuwara Eliya	1	
		Sudu murunga bonchi	Badulla	1	
		Sudu paturu bonchi	Badulla	1	
		Wairan murunga	Nuwara Eliya	1	
		Wel bonchi	Nuwara Eliya	2	
		Wel murunga bonchi	Kandy	2	
09.	Yard-long Bean	<i>Vigna unguiculata</i>	Bamba me	Anuradapura	1
			Batic me	Puttalam	1
			Bim me	Kalutara	2
			Bim polon me	Kalutara	1

		Bin me	Kalutara	1
		Bonchi ma	Badulla	1
		Bonchi me	Hambantota	1
			Ratnapura	1
		Boo me	Matale	1
		Bushita	Anuradapura	1
			Puttalam	1
		Bushitawo	Hambantota	1
		Butter me	Puttalam	1
		Cowpea	Hambantota	4
			Kandy	1
			Moaragala	1
			Nuwara Eliya	1
		Digapolon me	Kalutara	1
		Dumburu me	Kandy	1
		Gan bushita	Gampaha	1
		Hane mae	Matale	1
		Hawai me	Nuwara Eliya	1
		Hawari me	Anuradapura	2
			Gampaha	1
			Kandy	2
			Puttalam	1
		Hean lee me	Nuwara Eliya	1
		Hean me	Nuwara Eliya	2
		Hen me	Matale	3
		Hene me	Nuwara Eliya	1
			Matale	1
		Hene mekaral	Matale	1
		Kalu me	Kandy	1
		Kola mae	Nuwara Eliya	1
		Kola me	Nuwara Eliya	3
		Konda me	Nuwara Eliya	1

		Kotu me	Anuradapura	1
		Kotu me	Kalutara	3
			Kurunegala	1
			Matale	2
			Ratnapura	1
		Lee me	Badulla	1
		Lee mekaral	Nuwara Eliya	1
		Me	Hambantota	1
			Monaragala	2
		Me	Kandy	5
			Kurunegala	2
			Matara	1
			Ratnapura	1
		Maha lee me	Hambantota	1
		Ma karal	Monaragala	3
		Mas leme	Galle	1
		Mas me	Matale	2
		Mas mekaral	Kandy	1
		Me	Galle	1
			Kalutara	3
			Kandy	4
			Kurunegala	6
			Nuwara Eliya	2
			Ratnapura	1
		Me karal	Nuwara Eliya	3
		Me	Kurunegala	1
		Mekaral	Anuradapura	5
			Badulla	6
			Galle	7
			Hambantota	4
			Kalutara	3
			Kandy	14

			Kurunegala	9
			Matale	12
			Nuwara Eliya	5
			Polonnaruwa	1
			Puttalam	5
			Ratnapura	3
		Mekaral (Red)	Matale	1
		Mishita me	Anuradapura	1
		Murunga me	Galle	1
			Hambantota	1
			Kalutara	2
		Nari paithea	Puttalam	1
		Nil me	Kalutara	1
		Palu me	Ratnapura	2
		Panduru ma	Gampaha	1
		Patha me	Puttalam	1
		Pathuru me	Ratnapura	1
		Patta me	Kalutara	1
		Pokuru me	Ratnapura	1
		Polon leme	Galle	1
		Polon ma	Kegalle	1
		Polon mae	Anuradapura	2
			Kalutara	1
			Kurunegala	1
			Monaragala	2
			Polonnaruwa	1
		Polon me	Anuradapura	1
			Kalutara	2
			Hambantota	1
			Kandy	1
			Polonnaruwa	1
			Matale	4

			Nuwara Eliya	1
			Puttalam	1
			Ratnapura	1
		Pothu me	Kurunegala	1
		Rath me	Kalutara	1
		Rathu me	Gampaha	1
		Rathu me	Anuradapura	1
			Colombo	2
			Kurunegala	1
			Ratnapura	1
			Polonnaruwa	1
		Rathu me	Anuradapura	1
			Kalutara	2
			Kurunegala	1
			Puttalam	2
			Matale	1
		Ratu diga me	Kurunegala	1
		Ratu kota me	Anuradapura	1
		Ratu me	Anuradapura	3
		Ratumada	Gampaha	1
		Seelakara me	Puttaam	1
		Sudu me	Anuradapura	2
			Kurunegala	1
			Polonnaruwa	1
		Sudu mekaral	Kurunegala	2
		Thattu me	Puttalam	1
		Wathu me	Nuwara Eliya	1
		Wel me	Nuwara Eliya	1
10. Cowpea	<i>Vigna unguiculata</i>	Alinga cowpea	Anuradapura	1
		Boo me	Matale	1

		Bushita cowpea	Anuradapura	1
		Cowpea	Anuradapura	8
			Badulla	6
			Hambantota	8
			Kalutara	1
			Kandy	15
			Kegalle	1
			Kurunegala	1
			Matale	17
			Monaragala	7
			Nuwara Eliya	26
			Ratnapura	1
		Dekathi cowpea	Monaragala	1
		Guru cowpea	Anuradapura	1
		Hane me	Kandy	1
		Hean me	Kandy	2
			Matale	3
		Kadala cowpea	Anuradapura	7
			Hambantota	1
			Kandy	1
			Monaragala	2
		Kadala me	Ratnapura	1
		Kalu cowpea	Anuradapura	5
			Hambantota	1
			Kurunegala	1
			Matale	1
			Nuwara Eliya	1
			Ratnapura	3
		Kiri cowpea	Hambantota	1
		Kiri lee me	Mpnaragala	1
		Kole me	Kandy	1
		Konda cowpea	Anuradapura	1

		Konda kadala	Anuradapura	1
		Kos dambala	Badulla	1
		Kotu me	Matale	1
		Lanka kadala	Kandy	1
		Lanka parippu	Anuradapura	1
			Ratnapura	1
		Lee me	Monaragala	4
		Lee me	Badulla	3
		Loku cowpea	Nuwara Eliya	1
		Mathurata mung cowpea	Nuwara Eliya	1
		Me	Badulla	1
			Kandy	1
		Multessa	Puttalam	1
		Mung cowpea	Monaragala	1
			Polonnaruwa	1
		Pathakada lee me	Monaragala	1
		Rata me	Matale	1
		Rathu cowpea	Anuradapura	3
			Hambantota	1
			Matale	2
			Monaragala	1
			Nuwara Eliya	1
		Red cowpea	Hambantota	1
			Nuwara Eliya	1
		Sampath cowpea	Hambantota	1
		Sudu cowpea	Anuradapura	5
			Kandy	1
			Kurunagala	1
			Polonnaruwa	1
			Puttalam	1
			Monaragala	2

		Sudu mung	Puttalam	1
		Thiripehe cowpea	Nuwara Eliya	1
		Thora	Kurunagala	1
		Uda kambu	Monaragala	1
		Udaha cowpea	Gampaha	1
		Walawaya cowpea	Monaragala	1
		Wasana cowpea	Hambantota	1
			Monaragala	4
11. Groundnut	<i>Arachis hypogaea</i>	Game ratakadju	Kurunagala	1
		Hambegamuwa	Monaragala	1
		Hambegamuwa (yellow)	Monaragala	1
		Hambegamuwa (pink)	Monaragala	1
		Kivla local	-	
		Rata kadju	Hambantota	4
			Rathnapura	1
			Monaragala	2
		Rata kadju(pink)	Hambantota	1
		Rata kadju(red)	Hambantota	1
		Rata kadju(yellow)	Hambantota	1
		South china	Hambantota	1
		Sudu kadju	Monaragala	1
		Undu	Anuradapura	1
12. Winged Bean	<i>Psophocarpus tetragonolobus</i>	Daluk dambala	Badulla	3
			Kalutara	1
			Kandy	1
			Kegalle	1

			Kurunegala	2
			Matale	3
			Nuwara Eliya	8
		Dambala	Anuradapura	3
			Badulla	1
			Colombo	1
			Gampaha	2
			Kalutara	5
			Kandy	4
			Kegalle	1
			Kurunegala	2
			Matale	4
			Nuwara Eliya	4
			Matara	1
			Puttalam	1
		Dara dambala	Galle	2
			Matale	1
			Nuwara Eliya	1
		Deshiya dambala	Gampaha	1
		Diga dambala	Kandy	1
		Dubai dambala	Kandy	1
		Winged bean	Gampaha	1
13. Sword bean	<i>Canavalia gladiata</i>	Awara	Badulla	1
			Gampaha	1
			Hambantota	1
			Kalutara	1
			Kegalle	1
			Kurunegala	1
			Matale	1
			Nuwara Eliya	4

		Wal awara	Matale	1
		Wel awara	Kegalle	1
			Puttalam	1
14. Hyacinth bean	<i>Lablab purpureus</i>	Dambala	Badulla	1
		Halmassan dambala	Kandy	1
			Matale	1
			Puttalam	1
			Nuwara Eliya	2
		Halmehi dambala	Matale	1
			Nuwara Eliya	1
		Halmessan dambala	Badulla	3
			Kandy	2
			Nuwara Eliya	2
			Anuradapura	1
			Puttalam	1
		Kiri dambala	Kurunegala	1
		Pini bonchi	Puttalam	2
		Pothu dambala	Kandy	2
		Soya dambala	Kandy	1
15. Brinjal	<i>Solanum melongena</i>	Batu	Anuradapura	1
			Colombo	1
			Gampaha	2
			Hambantota	1
			Kurunegala	3
			Kegalle	1
			Matale	3
			Monaragala	1
			Nuwara Eliya	1

			Puttalam	1
		Diya leneiri wam batu	Gampaha	1
		Elabatu	Colombo	1
			Kurunegala	1
		Eri batu	Hambantota	1
		Eth batu	Matale	1
		Eth dath wambatu	Ratnapura	1
		Gam wam butu	Gampaha	1
		Halawatha batu	Anuradapura	1
		Hene batu	Kandy	1
		Hene wam batu	Matale	1
		Kaththirikka batu	Hambantota	2
			Kurunegala	3
			Monaragala	1
		Katunethi batu	Anuradapura	1
		Kola batu	Gampaha	1
		Kuliyapitiya wambatu	Kurunegala	1
		Lane iri batu	Nuwara Eliya	2
		Lean iri batu	Nuwara Eliya	1
		Lean iri wambatu	Badulla	1
			Kalutara	1
		Len iri batu	Galle	2
			Hambantota	1
			Matale	1
			Puttalam	1
			Ratnapura	1
		Len iri podi wambatu	Kalutara	1
		Len iri wambatu	Kalutara	1
		Lena eri	Nuwara Eliya	1

		Lena eri batu	Nuwara Eliya	1
		Lena iri	Hambantota	2
		Local batu	Puttalam	1
		Ni batu	Galle	1
		Plastic batu	Anuradapura	1
		Sudu batu	Puttalam	1
			Kurunegala	1
		Thibbatu	Matale	1
		Wambatu	Kandy	1
			Kurunegala	1
			Matale	1
		Wambatu	Anuradapura	10
			Badulla	1
			Colombo	2
			Galle	1
			Hambantota	1
			Kalutara	2
			Kandy	2
			Kurunegala	9
			Matale	2
			Monaragala	2
			Nuwara Eliya	3
			Puttalam	1
			Ratnapura	1
		Yapane batu	Anuradapura	1
16. Ela-batu	<i>Solanum melongena</i>	Batu	Matale	1
		Ela batu	Badulla	1
			Gampaha	1
		Elabatu	Anuradapura	5
			Badulla	1

			Colombo	2
			Gampaha	1
			Hambantota	7
			Kalutara	1
			Kegalle	1
			Kurunegala	6
			Matale	7
			Monaragala	2
			Nuwara Eliya	4
			Polonnaruwa	1
			Puttalam	2
		Elabatu (Big)	Gampaha	1
		Elabatu (Small)	Gampaha	1
		Hene ela batu	Monaragala	1
		Japan batu	Anuradapura	1
			Polonnaruwa	1
		Kaththirikka batu	Hambantota	1
		Kaththirikka batu	Kegalle	1
		Katu ela batu	Nuwara Eliya	1
		Sudu ela batu	Kalutara	1
		Thalana batu	Hambantota	2
		Thalum batu	Kalutara	2
		Talana batu	Monaragala	1
17. Ahas-batu	<i>Solanum macrocarpon</i>	Ahas batu	Kalutara	2
			Kandy	2
		Kolakana batu	Kalutara	1
18. Gona-batu	<i>Solanum torvum</i>	Rata thibbatu	Nuwara Eliya	1
		Thibbatu	Kegalle	1

19. Thibbatu	<i>Solanum violaceum</i>	Thibbatu	Kalutara	1
		Thiththa thibbatu	Kandy	1
			Matale	1
		Thitta thibathu	Matale	1
		Tibbatu	Kalutara	1
		Tiththa thibbatu	Monaragala	1
		Titta tibbatu	Badulla	1
20. Del batu	<i>Solanum capsicoides</i>	Del batu	Ampara	1
			Badulla	2
			Kandy	3
		Del batu/ Nari batu	Ratnapura	1
		Nari batu	Kandy	1
21. Capsicum	<i>Capsicum annum</i>	Amu miris	Matale	1
		Ath Honda malu miris	Puttalam	1
		Athdath malumiris	Kurunegala	1
		Batalu Ang miris	Galle	2
		Hen miris	Kurunegala	3
		Kalu malu miris	Badulla	1
			Ratnapura	1
		Malu miris	Anuradapura	1
			Badulla	1
			Gampaha	1
			Hambantota	1
			Kandy	1
			Kurunegala	9
			Puttalam	9

			Ratnapura	1
		Miris	Anuradapura	1
			Galle	2
			Hambantota	9
			Kandy	1
			Kurunegala	1
			Matara	1
			Nuwara Eliya	3
		Navakadu miris	Puttalam	1
		Sudu miris	Matale	1
		Sudu nawakadu miris	Puttalam	1
		Uda miris	Anuradapura	2
		Wanni miris 1	Monaragala	1
		Wanni miris 2	Monaragala	1
		Waraniya miris	Ratnapura	1
22. Capsicum	<i>Capsicum frutescens</i>	Bola kochchi	Gampaha	2
			Kalutara	1
		Chillies	Kalutara	2
		Dampata kochchi	Kurunegala	1
		Heen kochchi	Galle	1
			Gampaha	1
			Kegalle	3
			Nuwara Eliya	1
		Ho miris	Ratnapura	1
		Ka pari kochchi	Kalutara	1
		Kawum miris	Kandy	2
			Nuwara Eliya	1
		Kochchi	Colombo	1
			Galle	4

			Gampaha	3
			Hambantota	1
			Kalutara	7
			Kegalle	6
			Kurunegala	6
			Monaragala	1
			Nuwara Eliya	2
			Polonnaruwa	1
			Ratnapura	2
		Kochchi miris	Kegalle	1
			Nuwara Eliya	1
		Kola kochchi	Gampaha	1
		Nai miris	Kandy	1
		Nay kochchi	Kurunegala	1
		Nie kochchi	Puttalam	1
		Nil kochchi	Kalutara	1
		Rata kochchi	Nuwara Eliya	1
		Sudu kochchi	Anuradapura	1
			Kalutara	1
			Kandy	1
			Kurunegala	5
			Matale	1
			Monaragala	2
			Ratnapura	1
		Thakkali kochchi	Kalutara	1
		Visha kochchi	Galle	1
		Wanni kochchi	Puttalam	1
23. Tomato	<i>Lycopersicon esculentum</i>	Bala takkali	Hambantota	1
		Batu thakkali	Ratnapura	1
		Batu takkali	Anuradapura	1

			Monaragala	1
		Bilinda thakkali	Anuradapura	1
		Bola takkali	Kandy	1
		Geta thakkali	Nuwara Eliya	1
		Goraka takkali	Kandy	1
			Ratnapura	1
		Goraka thakkali	Kandy	3
			Kegalle	1
			Puttalam	1
		Kaha takkali	Hambantota	1
		Local	Ratnapura	2
		Mass thakkali	Hambantota	1
			Matale	1
		Rata batu	Monaragala	1
		Rata batu takkali	Monaragala	1
		Takkali	Kurunegala	1
		Thakkali	Hambantota	5
			Kandy	3
			Matale	1
			Monaragala	1
			Nuwara Eliya	1
			Kurunegala	1
		Tomato	Kandy	1
		Wel thakkali	Badulla	1
24. Pumpkin	<i>Cucurbita maxima</i>	Bala wattakka	Hambantota	1
		Bola wattakka	Ratnapura	1
		Desha puhul	Hambantota	1
		Gal kuru wattakka	Kurunegala	1
		Handun wattakka	Hambantota	1
		Labu	Gampaha	1

		Maha-oya wattakka	Monaragala	1
		Petti wattakka	Kurunegala	1
		Rata wattakka	Matale	2
		Wattakka	Anuradapura	2
			Kurunegala	2
			Hambantota	3
			Matale	2
			Monaragala	1
			Nuwara Eliya	3
			Polonnaruwa	1
			Puttalam	4
		Wattakka	Matale	2
			Anuradapura	3
			Badulla	7
			Nuwara Eliya	2
			Ratnapura	1
25. Snake gourd	<i>Trichosanthes cucumerina</i>	Sudu pathola	Kandy	1
			Nuwara Eliya	1
		Tirunelveli white	Jaffna	2
		Uru pathola	Puttalam	1
26. Luffa	<i>Luffa sp.</i>	Bim wetakolu	Kalutara	1
		Bola wetakolu	Kalutara	1
		Diya wetakolu	Kegalle	1
		Hen wetakolu	Kurunegala	2
		Keti wetakolu	Gampaha	1
27. Angled luffa	<i>Luffa acutangula</i>	Diya wetakolu	Nuwara Eliya	1
		Hean wetakolu	Kurunegala	1

		Hen wetakolu	Kurunegala	1
		Kotta wetakolu	Kurunegala	1
		Math wetakolu	Galle	1
		Mehi wetakolu	Monaragala	1
		Ran weta kolu	Ratnapura	1
		Ran wetakolu	Polonnaruwa	1
		Wanni wetakolu	Kalutara	1
		Wetakolu	Anuradapura	9
			Kalutara	1
			Hambantota	2
			Monaragala	1
			Galle	14
			Gampaha	2
			Kandy	3
			Kurunegala	5
			Matale	8
			Nuwara Eliya	5
			Puttalam	4
28. Ash Pumpkin	<i>Benincasa hispida</i>	Alu puhul	Anuradapura	2
			Hambantota	1
			Kalutara	1
			Kandy	1
			Kurunegala	1
			Nuwara Eliya	1
			Puttalam	1
		Ash pumpkin	Badulla	1
			Nuwara Eliya	1
			Kalutara	1
			Matale	1
			Gampaha	1

			Kegalle	1
		Puhul	Kurunegala	2
			Matale	3
			Puttalam	1
29. Bitter gourd	<i>Momordica charantia</i>	Batu karawila	Kurunegala	3
			Matale	3
		Bitter gourd	Kalutara	1
		Dara karawila	Hambantota	1
		Gam karawila	Kurunegala	1
		Gan karawila	Kegalle	1
		Gata karawila	Hambantota	1
		Geta karawila	Kandy	1
			Kurunegala	1
			Matale	1
			Monaragala	1
		Kalu karawila	Galle	1
			Hambantota	1
			Ratanapura	1
		Karawila	Anuradapura	7
			Colombo	2
			Galle	6
			Hambantota	6
			Kalutara	4
			Kandy	3
			Kegalle	1
			Matale	6
			Nuwara Eliya	7
			Puttalam	3
			Ratnapura	5
		Katu karawila	Kandy	1

		Keti murunga bonchi	Kandy	1
		Mugati karawila	Matale	1
		Polos karawila	Colombo	1
		Sitti murunga	Kandy	1
		Sudu karawila	Hambantota	2
			Kurunegala	1
			Nuwara Eliya	2
			Polonnaruwa	1
		Thei karawila	Nuwara Eliya	1
		Thiththa karawila	Kalutara	1
30. Bottle gourd	<i>Lagenaria siceraria</i>	Diya labu	Badulla	1
			Galle	1
			Kalutara	1
			Kandy	1
			Nuwara Eliya	1
		Kota labu	Kurunegala	1
		Labu	Anuradapura	1
			Galle	1
			Hambantota	1
			Kandy	3
			Kegalle	1
			Kurunegala	3
			Matale	1
			Nuwara Eliya	1
			Polonnaruwa	1
			Puttalam	4
31. Smooth luffa	<i>Luffa aegyptica</i>	China wetakolu	Galle	1

		Diya wetakolu	Hambantota	1
			Kalutara	1
		Niyan wetakolu	Gampaha	1
			Kandy	2
			Kegalle	3
			Kurunegala	2
			Matale	1
			Nuwara Eliya	3
			Ratnapura	1
		Wali wetakolu	Moneragala	1
32. Coccinia sp	<i>Coccinia cordifolia</i>	Kowakka	Anuradapura	1
			Colombo	1
			Kurunegala	1
		Mei Mini Kowakka	Anuradapura	1
33. Momordika sp.	<i>Momordika dioica</i>	Thumba karawila	Galle	1
			Hambantota	1
			Kurunegala	1
			Moneragala	1
34. Kekiri	<i>Cucumis melo</i>	Amu kekiri	Hambantota	1
		Atu kekiri	Hambantota	1
		Batu kekiri	Anuradapura	1
			Kurunegala	2
		Gal kekiri	Ratnapura	1
		Geta kekiri	Matale	1
		Gon kekiri	Anuradapura	2
			Kurunegala	1
			Matale	1

		Gona kekiri	Kurunegala	1
			Anuradapura	1
			Matale	1
		Hen kekiri	Kurunegala	1
		Honda kekiri	Kandy	1
		Kekiri	Anuradapura	10
			Badulla	1
			Colombo	1
			Gampaha	3
			Hambantota	1
			Kalutara	1
			Kandy	4
			Kegalle	1
			Kurunegala	7
			Matale	5
		Kiri Kurakkan	Hambantota	1
		Loku Kekiri	Anuradapura	1
		Mala Wetu Kekiri	Puttalam	1
		Pittu Kekiri	Puttalam	3
			Kurunegala	1
		Podi Kekiri	Anuradapura	1
			Puttalam	1
		Punchi Kekiri	Monaragala	1
		Seeni Kakiri	Hambantota	1
		Seeni Kekiri	Anuradapura	1
			Hambantota	5
			Nuwara Eliya	1
			Plonnaruwa	1
		Thiththa Kekiri	Kurunegala	1
		Wanni Kekiri	Kurunegala	1
35. Kowkka	<i>Coccinia grandis</i>	Kowakka	Anuradapura	1

			Hambantota	1
			Ratnapura	1
36. Okra	<i>Abelmoschus esculentus</i>	Ath Dala Bandakka	Kalutara	1
			Kurunegala	1
			Ratnapura	1
		Bala Bandakka	Polonnaruwa	1
		Bandakka	Anuradapura	19
			Colombo	1
			Galle	14
			Gampaha	4
			Hambantota	10
			Kalutara	8
			Kandy	18
			Kegalle	2
			Kurunegala	15
			Matale	24
			Moneragala	5
			Nuwara Eliya	20
			Polonnaruwa	2
			Puttalam	2
			Ratnapura	3
		Bim Bandakka	Kalutara	1
		Demas Bandakka	Monaragala	1
		Diya Bandakka	Polonnaruwa	1
		Eddala Bandakka	Hambantota	1
		Ethdala Bandakka	Kurunegala	1
		Hane Bandakka	Kandy	1
		Harmas Bandakka	Monaragala	1
		Hen Bandakka	Kurunegala	1

		Hene Bandakka	Matale	1
		Itipandam bandakka	Kurunegala	1
			Puttalam	1
		Katu bandakka	Kurunegala	1
		Kota bandakka	Hambantota	1
		Kotta bandakka	Anuradapura	2
		Local	Ratnapura	1
		Local bandakka	Gampaha	1
		Nona bandakka	Anuradapura	1
		Rata bandakka	Matale	1
		Rathu bandakka	Matale	1
			Kurunegala	1
			Polonnaruwa	2
		Ratu bandakka	Anuradapura	1
			Hambantota	1
		Thel bandakka	Matale	1
37. Amaranthus	<i>Amaranthus hybridus</i>	Heenkuru Thampala	Kalutara	
		Lansi Thampala	Kalutara	1
			Kurunegala	1
		Lokukuru Thampala	Kalutara	1
		Rath Thampala	Kurunegala	1
		Rathu Thampala	Kalutara	1
			Kandy	1
		Ratu Thampala	Polonnaruwa	1
		Thampala	Anuradapura	1
			Kurunegala	1
			Nuwara Eliya	1
Amaranthus	<i>Amaranthus dubius</i>	Koora Thampala	Kalutara	1

		Podi Koora Thampala	Kalutara	1
		Thampala	Kalutara	1
Amaranthus	<i>Amaranthus hybridus</i>	Landesi Thampala	Anuradapura	1
		Lansi Thampala	Kurunegala	1
		Rath Thampala	Nuwara Eliya	1
		Thampala	Baduula	1
			Nuwara Eliya	1
Amaranthus	<i>Amaranthus lividus</i>	Katu Kura	Kandy	1
Amaranthus	<i>Amaranthus tricolor</i>	Hamaspala	Anuradapura	1
		Lansi thampala	Kalutara	1
		Rat thampala	Polonnaruwa	1
		Rathu koora thampala	Kalutara	1
		Rathu thampala	Ratnapura	1
		Thampala	Galle	1
			Hambantota	1
			Kalutara	3
			Matale	2
38. Ceylon spinach	<i>Basella alba</i>	Nivithi	Badulla	1
			Galle	1
			Gampaha	1
			Kalutara	1
			Kandy	2
			Puttalam	2
		Niwithi	Badulla	1

			Kalutara	1
			Nuwara Eliya	1
		Panduru niwithi	Kalutara	1
39. Gas niviti	<i>Talinum triangulare</i>	Gas nivithi	Polonnaruwa	1
		Gas niwithi	Galle	1
		Nivithi	Gampaha	1
			Kalutara	1
			Kegalle	1
40. Kiri henda	<i>Cellosia argentea</i>	Katu kura	Monaragala	1
		Kiri handa	kalutara	1
			Matale	1
		Kiri handa thampala	Kalutara	1
		Kiri henda	Kalutara	2
			Matale	2
			Monaragala	1
			Polonnaruwa	1
		Kiri henda thampala	Kalutara	1
41. Yam	<i>Dioscorea alata</i>	Katu ala	Anuradapura	1
			Kandy	1
Yam	<i>Dioscorea bulbifera</i>	Panu ala	Kandy	1
42. Butsarana	<i>Canna indica</i>	But sarana	Kegalle	1
43. Mustard	<i>Brassica juncea</i>	Aba	Anuradapura	8

			Badulla	10
			Kandy	9
			Kurunegala	2
			Matale	11
			Nuwara Eliya	8
			Polonnaruwa	4
44. Sesame	<i>Sesamum indicum</i>	Godakawela	Ratnapura	1
		Hambagamuwa black	Monaragala	1
		Hambagamuwa white	Monaragala	1
		Hambagamuwa Kalutala	Hambantota	1
		Hambagamuwa mixed	Hambantota	1
		Haramas tala	Anuradapura	1
		Haramas thala	Anuradapura	1
		Kahata Thala	Hambantota	1
		Kalu tala	Polonnaruwa	1
		Kalu thala	Badulla	1
			Hambantota	2
			Monaragala	1
			Polonnaruwa	1
			Ratnapura	1
		Mas thala	Hambantota	1
			Kurunegala	2
		Pokuru thala	Anuradapura	1
			Monaragala	1
		Sesami (local)	Anuradapura	1
		Sudu tala	Hambantota	1
		Sudu thala	Badulla	1

			Hambantota	5
			Kandy	2
			Matale	1
			Ratnapura	1
		Suduthala	Anuradapura	1
		Thala	Anuradapura	3
			Badulla	3
			Hambantota	5
			Kandy	1
			Matale	4
			Kurunegala	5
			Ratnapura	3
			Monaragala	2
			Puttalam	1
		Tissa	Hambantota	1
		Tummas tala	Anuradapura	1
		Wal thala	Kandy	1
		Yala thala	Kurunegala	2
			Ratnapura	1
45. Watermelon	<i>Citrullus lanatus</i>	Karapusi	Hambantota	1
		Komadu	Hambantota	2
			Kalutara	1
		Pani komadu	Hambantota	2
			Puttalam	1
		Pattakka	Kandy	1
		Peni komadu	Matale	1
			Puttalam	1
		Peni puhul	Matale	1
			Monaragala	1
		Poto pattakka	Hambantota	1

46. Banana	<i>Musa sp.</i>	Ambon	Kegalle	1
		Emban	Matale	2
		Embul	Badulla	1
			Galle	1
		Gal kesel	Kegalle	2
		Kalu kehel	Ratnapura	1
		Kolikuttu	Monaragala	2
		Marathamana	Kandy	1
		Muwanethi kehel	Ratnapura	1
		Nethrampalam	Kalutara	1
			Ratnapura	1
		Puwalu	Kalutara	1
		Rata hondarawalu	Ratnapura	1
		Rata kolikuttu	Kegalle	1
		Rathkehel	Ratnapura	1
		Sapuanamalu	Ratnapura	1
		Seeni kehel	Galle	1
		Seeni kesel	Kandy	1
		Sudu kochchi	Ratnapura	1
		Sudu puwalu	Kandy	2
		Suwandel	Galle	1
			Kalutara	1
		Wal suwandel	Kegalle	1
		Wathabanga	Ratnapura	1
47. Plantain	<i>Musa sp.</i>	Hamban puwalu	Kalutara	1
		Kithala	Galle	1
		Eti kehel	Ratnapura	2
		Eti kesel	Ratnapura	1
48. Naran	<i>Citrus reticulata</i>	Geta naran	Kandy	1

		Jama naran	Kandy	1
		Konda naran	Kandy	1
		Pini naran	Kandy	1
49. Sweet orange	<i>Citrus sinensis</i>	Penidodam	Kandy	1
50. Jak	<i>Artocarpus heterophyllus</i>	Kurukos	Kegalle	1
51. Cotton	<i>Gossypium sp.</i>	Kapu	Kandy	1
			Matale	1
		Kapupulun	Matale	1
52. Asamodagam	<i>Trachyspermum roxburghianum</i>	Asamodagam	Matale	1
			Nuwara Eliya	1
			Polnnaruwa	1
53. Katu wel batu	<i>Solanum virginianum</i>	Katuwel batu	Puttalam	1
54. Amukkara	<i>Withania somnifera</i>	Amukkara	Badulla	1
55. Indi	<i>Phoenix zeylanica</i>	Indi	Anuradapura	1

4.2 USES, PERCEPTIONS AND PROTECTION BY PEOPLE

4.2.1 HOW PEOPLE PERCEIVE TRADITIONAL PLANT VARIETIES

Peoples' perceptions about the advantages and disadvantages of traditional varieties are given in Table 4. According to them traditional varieties produce low yields but require fewer inputs for their production when compared to new varieties. They also perceive traditional varieties as having special nutritional characteristics.

However the biggest constraint for using traditional varieties is that they do not fetch high prices to compensate the low yield they produce. This seems to be the underlying factor that has motivated farmers to use new improved varieties and hybrid seeds when planting the crops.

Table 4			
Advantages and disadvantages of traditional crop varieties as perceived by the farmers in the Kurunegala, Kandy and Hanguranketha			
Characters of wild types	Percentage (%)		
	Kurunegala	Kandy	Hanguranketha
(a) Advantages			
Low cost of production	60%		
Low labour cost in planting	20%		
More tasty than new varieties	20%		
More nutritious than new varieties	40%	22%	100%
High resistance to diseases	20%	33%	
Crop management is relatively easy	20%		
Can compete with weeds	20%		
Require no inorganic chemicals and fertilisers		22%	
Produce high yield under low input conditions		67%	20%
Produce more healthy food		33%	

Traditional varieties have high medicinal value		33%	100%
Produce high flavoured food			20%
They can be sold at a higher price			20%
(b) Disadvantages			
Longer duration taken for maturity	20%		
Low yield potential	40%		20%
Some varieties are suseptible to diseases if grown without chemicals	20%		

4.2.2 USE OF TRADITIONAL VARIETIES DURING CULTIVATION OF CROPS

During the survey, it was found that none of the farmers surveyed (at locations in Kandy, Kurunegala, Hanguranketha, Moneragala, Polonnaruwa, Hambantota and Mahiyanganaya) were found using traditional varieties for cultivation of rice or upland crops.

It was observed that traditional varieties have been replaced by the hybrids (local and imported). It seems that these varieties have completely disappeared from the landscape and also from the small stocks of seed maintained by the local farmers.

Among the traditional rice varieties *Kalu Heenati* and *Pachchaperumal* is rarely found. These were the two main varieties that were used to develop the old improved rice varieties/hybrids.

4.2.3 TRADITIONAL CROP VARIETIES KNOWN BY FARMERS

Table 5 and 6 shows the traditional rice and other crop varieties cited by the farmers during the discussions held at three locations. However, the knowledge held by the farmers about these traditional crop varieties is rather poor. They have not used these varieties in the recent past. Only some older farmers had some experience of using the traditional varieties.

Wild type	Percentage (%)		
	Kurunegala	Kandy	Hanguranketha
Ma we	40%	-	-
Muthu samba	60%	-	-
Suthuru samba	40%	-	-
Hatapanduru we	40%	-	-
Heenati	20%	22%	40%
Hatada we	20%	-	-
Heenati we	20%	-	-
Kalu heenati	20%	33%	-
Hatial	20%	11%	-
Goda we/Kalu hatial	20%	-	-
Suwadel	20%	-	-
Hangimuththan we	-	22%	-
Hodara walu	-	11%	-
Sudu we	-	22%	60%
Bala we	-	11%	40%
Raththunda	-	-	20%
Kalu we	-	-	40%
Kottiaran	-	-	20%
Bala Raththunda	-	-	20%

Kalu Kottiaran	-	-	20%
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Crop	Wild type	Percentage (%)		
		Kurunegala	Kandy	Hanguranketha
Ginger	Sinhala	20%		
Banana	Ati kesel	20%		
Beans	Waduru me	20%		
	Nil bonchi			20%
	Askoda me			20%
Cassava	Wal maiyokka	20%		
Bitter gourd	Batu karawila	20%		20%
	Thumba karawila		11%	40%
	Katu karawila			40%
	Thel karawila			40%
Yam / tubers	Kidaran ala		44%	
	Wal ala		44%	
	Buthsarana		11%	
	Desi ala		11%	
Tomato	Goraka takkali		22%	
Brinjal	Thiththa thibbatu		11%	

Mukunuwanna	Wel mukunuwanna		11%	
Gotukola	Weda gotukola		11%	
Finger millet	Thanahal			40%
	Kollu			20%
Thampala	Thampala			20%
Indian mustard	Indian mustard			20%
Chilli	Batu miris			20%
Okra	Thel bandakka			20%
	Buwa bandakka			20%

4.2.4 EFFORTS TO CONSERVE TRADITIONAL CROP VARIETIES

It was also found that no mechanism exists with farmers to store and protect the traditional varieties. Also there are no organised efforts from the state agencies (other than PGRC) or private sector to conserve the traditional crop varieties. Only some NGOs who promote organic and sustainable agricultural practices have taken initiatives to protect the traditional varieties of crop plants.

5.0 CONCLUSION

As mentioned earlier it is important to conserve the traditional varieties and wild relatives of crop plants. After considering the current status following actions/measures can be recommended in order to conserve the traditional varieties and wild relatives of crop plants:

- Exploration of habitats of such plants in order to identify the genetic material for taking measures for *in-situ* and *ex-situ* conservation
- Creating awareness about the (nutritional and agronomic) importance of traditional crop varieties
- Promoting organic farming and other sustainable agriculture practices
- Conservation of natural habitats

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APPENDIX 1

Questionnaire – Survey on perception of people on crop wild relatives of traditional plant varieties

Section 1: Background information

1.1 Farmers' name :-----

1.2 Address :-----

1.3 Agrarian service centre -----

1.4 Climatic zone :-----

1.5 Level of Education of the Farmer -----

Up to O/L Higher

Up to A/L Other

Section 2: Farming information

2.1 Farming experience in years -----

2.2 Extent of land held (acres)-----

2.3 Crops cultivated during last year-----

Section 3: Crop Wild Relatives

3.1 What are the crop varieties you cultivate? -----

3.2 What are the traditional crop varieties you cultivate?-----

3.3 Do you know about the crop wild relatives? Yes/No

If yes

3.3.1 What are the crop wild relatives you know?

Crop	Wild relatives	Yes	No

3.3.2 Can you differentiate crop wild relatives from weed plants?

Yes

No

3.3.3 What is the importance/use of those crop wild relatives?

Section 4: Any other information / comments about Crop Wild Relatives

APPENDIX 2

Wild Fruits, Traditional Varieties and Wild Relatives of some Crop Plants

01. Crop	Rice
Botanical Name	<i>Oriza sativa</i> (L.)
Family	Poaceae
Common Name	Uruwi, wi
Growing Region	Low elevations, in standing water or in areas only seasonally wet
Growing Form	Annual or perennial 60-80 cm tall
Uses	Staple food in Sri Lankans
Varieties	
Traditional varieties/Wild Relatives	<p>Ma we group</p> <p>Kohu</p> <p>Kuru</p> <p>Kalu kan</p> <p>Sudu</p> <p>Maha</p> <p>Goda</p> <p>Rathkunda</p> <p>Samba group</p> <p>Podi</p> <p>Kuruluthudu</p> <p>Muthumanikkan</p> <p>Molagu</p> <p>Puluk</p> <p>Sura</p> <p>Bala we group</p> <p>Sudu</p> <p>Bala kera</p>

	<p>Danahala group</p> <p>Heenati Heenati wi Podi heenati Sudu heenati Seenaddi</p> <p>Illankalian group</p> <p>Illankalian</p> <p>Murunkan group</p> <p>Sinna murungan Murungan</p>
02. Crop	Finger millet
Botanical Name	<i>Eleusine coracana</i> (L.)
Family	Poaceae
Common Name	Kurakkan
Growing Region	Mainly dry zone, also in wet zone wet elevations up to 2000m Anuradhapura, Badulla
Growing Form	Annual/perennial herb, erect, 30-100cm high
Uses	As a serial, other edible purposes are little or no, no value as fodder
Varieties	
Wild Relatives	<i>E. indica</i>
Wild Relatives	<i>Vigna trilobata</i> (Bin-me) <i>Vigna vexillata</i>
03. Crop	Black gram
Botanical Name	<i>Vigna mungo</i> (L.)
Family	Fabaceae

Common Name	Bu-me, Mun, Ulundu
Growing Region	Dry zone(mainly Badulla, Trincomalee districts)
Growing Form	Sub erect cultivar with many branches
Uses	Use as flour
Varieties	
Wild Relatives	
04. Crop	Egg plant
Botanical Name	<i>Solanum melongena</i>
Family	Solanaceae
Common Name	Ela-batu
Growing Region	Dry zone (Mannar, Vaunia, Trincomalee, Hanbantota)
Growing Form	Herb 40-60cm high much branched
Uses	Fruits eaten with curry, medicinal useful for liver complaint
Varieties	
Wild Relatives	Var. insanum <i>S.pseudocapsocum</i> <i>S.pubescens</i> <i>S.torvum</i> (Gona-batu) <i>S.trilobatum</i> (Wel-tibbatu) <i>S.ciliatum</i> Lam(Nai batu) <i>S.lasiocarpum</i> Dunal (Mala batu) <i>S.violaceum</i> Ortega (Titta batu) <i>S.viginianum</i> L (Karabatu)
05. Crop	Snake gourd
Botanical Name	<i>Tricosanthus anguina</i> (L.)
Family	Cucurbitaceae
Common Name	Pathola
Growing Region	Dry zone and Intermediate zone
Growing Form	Climbing wine
Uses	Tender pods as vegetable
Varieties	

Wild Relatives	<i>Tricosanthus cucumerina</i> L. (Dum-mella) <i>T.nervifolia</i> L.(Titta-hondala)
06. Crop	Bitter gourd
Botanical Name	<i>Momordica charantia</i> (L.)
Family	Cucurbitaceae
Common Name	Batukaravila, Karavila
Growing Region	Lowland rainy and riverine forests, areas up to 1200m
Growing Form	
Uses	Fruits- curries and pickles, vegetables
Varieties	
Wild Relatives	<i>Momordica charantia</i> (Batu karavila) <i>Momordica dioica</i> Roxb.ex(Tumba karavila)
07. Crop	Cucumber
Botanical Name	<i>Cucumis sativus</i> (L.)
Family	Cucurbitaceae
Common Name	Pipinha, rata kekiri
Growing Region	Dry zone and intermediate zone
Growing Form	Annual, climbing hispid
Uses	Fruit- salad, curry
Varieties	
Wild Relatives	<i>Cucumis melo</i> L. (Kekiri) <i>Cucumis trigonus</i> Roxb
08. Crop	Kekiri
Botanical Name	<i>Cucumis melo</i>
Family	Cucurbitaceae
Common Name	Kekiri
Growing Region	Mannar, Hambantota, Kandy
Growing Form	Stem climbing
Uses	Fruit- curry
Varieties	
Wild Relatives	
09. Crop	Bottle gourd

Botanical Name	<i>Lagenaria siceraria</i>
Family	Cucurbitaceae
Common Name	Diyalabu
Growing Region	Mainly dry zone
Growing Form	Wine, climbing stem
Uses	
Varieties	
Wild Relatives	<i>Lagenaria vulgaris</i> (Diya labu)
10. Crop	Ridge gourd
Botanical Name	<i>Luffa acutangula</i>
Family	Cucurbitaceae
Common Name	Vetakolu, Dara vetakolu
Growing Region	Mainly dry zone (Low country)
Growing Form	Wine, climbing stem
Uses	Tender pods- vegetable
Varieties	
Wild Relatives	<i>Luffa cylindrica</i> <i>Luffa aegyptica</i> Miller (Niyana wetakolu)
11. Crop	Okra / Ladies fingers
Botanical Name	<i>Hibiscus esculentus</i> (L.)
Family	Malvaceae
Common Name	Bandakka
Growing Region	Mainly, Anuradhapura, Monaragala, Kandy districts
Growing Form	Annual herb; erect up to 0.5-2m
Uses	Tender pods- vegetable
Varieties	
Wild Relatives	<i>Hibiscus abelmoschus</i> L. (Kapukinissa) <i>A. angulosus</i> <i>A. ficulneus</i>
12. Crop	Tampala
Botanical Name	<i>Amaranthus dubius</i>
Family	Amaranthaceae

Common Name	thampala
Growing Region	Roadsides and waste places Kandy, Nuwara –Eliya, Ratnapura, Colombo, Badulla
Growing Form	Annual herb, erect mostly up to 90cm
Uses	Green vegetable, as a source of bird weed
Varieties	
Wild Relatives	A.spinosus (Kotuthampala) A.hybridus A.caudatus A.tricolor A.lividus A.viridis (Kura thampala) A.graecizans A.gangeticus(Sudu thampala)
13. Crop	Ceylon spinach
Botanical Name	<i>Brasella alba</i>
Family	Brasellaceae
Common Name	Nivithi
Growing Region	In forests and shady places in dry regions
Growing Form	Fleshy, twining perennial herb
Uses	As a vegetable
Varieties	
Wild Relatives	
14. Crop	Gotukola
Botanical Name	<i>Centella asiatica</i>
Family	Apiaceae
Common Name	Gotukola, Heen gotukola
Growing Region	From sea level to highest elevations all over the island Anuradhapura, Kandy, kegalle, Nuwara-eliya,
Growing Form	Herbaceous perennial, stem-creeping, glabrous at maturity
Uses	Fresh form- as salad, Dry leaves- medicinal purposes
Varieties	

Wild Relatives	<i>Hydrocotyle asiatica</i> (Heen gotukola)
15. Crop	Mukunuwenna
Botanical Name	<i>Alternanthera sessilis</i>
Family	Amaranthaceae
Common Name	Mukunuwenna
Growing Region	Very common in many habitats, in wet paddy ditches to dry roadside banks All over the island
Growing Form	Annual/perennial herb
Uses	As vegetable, medicinal purposes
Varieties	
Wild Relatives	<i>A. pungens</i> <i>A. paronychioides</i> <i>A. betzickiana</i> <i>A. triandra</i> Lam
16. Crop	Pol-pala
Botanical Name	<i>Aerva javanica</i>
Family	Amaranthaceae
Common Name	Pol-pala, Pol-kudu-pala
Growing Region	Sandy places near the sea level on the west side of the island, rare Jaffna, Puttalam, districts, Kalpitiya
Growing Form	Perennial herb, erect .3-1.5m
Uses	Medicinal use
Varieties	
Wild Relatives	<i>A. lanata</i>
17. Crop	Drumstick
Botanical Name	<i>Moringa oleifera</i> Lam
Family	Moringaceae
Common Name	Murunga
Growing Region	Widely in dry zone chena
Growing Form	Tree 3-12m tall
Uses	Tender pods, leaves and flowers as vegetables

Varieties	
Wild Relatives	<i>Moringa pterygosperma</i> Gaerth
18. Crop	Kathurumurunga
Botanical Name	<i>Sesbaniya grandiflora</i> (L.)
Family	Fabacea
Common Name	Kathurumurunga
Growing Region	Mainly dry zone and intermediate zone
Growing Form	Tree to about 10m tall
Uses	Leaves and flowers as vegetable, For medicinal purposes
Varieties	
Wild Relatives	<i>Sesbaniya asculanta</i> <i>Sesbaniya macrantha</i> <i>Sesbaniya sericea</i>
19. Crop	Kiri ala
Botanical Name	<i>Sonaratia alba</i> (L.)
Family	Sonneratiaceae
Common Name	Kiri ala
Growing Region	Mangrove swamps- common from Chilaw to Puttalam
Growing Form	A bush or small tree
Uses	Vegetable (Food crop)
Varieties	
Wild Relatives	
20. Crop	Innala
Botanical Name	<i>Plectranthus rotundifolius</i>
Family	Lamiaceae
Common Name	Innala
Growing Region	Wet mid lands and lowlands
Growing Form	Herb (Lateral)
Uses	Food crop
Varieties	
Wild Relatives	
21. Crop	Sweet potato

Botanical Name	<i>Ipomea batatas</i>
Family	Convolvulaceae
Common Name	Batala
Growing Region	Most common in tropics Matale, Kandy, Nuwara-Eliya, Badulla, Kegalle, Ratnapura, Galle districts
Growing Form	Vine
Uses	Vegetable
Varieties	Kaha batala, sudu batala, bola batala, ratu batala
Wild Relatives	I.alba I.asarifolia I.cairica I.carnea I.coptica I.deccana I.eriocarpa I.hederifolia I.harsfalliae I.indica
22. Crop	Cassava
Botanical Name	<i>Manihot esculanta</i>
Family	Euphorbiaceae
Common Name	Maiokka
Growing Region	
Growing Form	Herb, shrub or tree
Uses	Vegetable
Varieties	
Wild Relatives	M.glaziovii (Gas manyokka)
23. Crop	Turmeric
Botanical Name	<i>Curcuma longa</i>
Family	Zingiberaceae
Common Name	Ath-kaha, bim kaha, kaha, rata kaha
Growing Region	Mainly Colombo district

Growing Form	Rhizome Orange, Leaf tuft to 1m
Uses	Spice
Varieties	
Wild Relatives	
24. Crop	Ginger
Botanical Name	<i>Zingiber cylindricum</i>
Family	Zingiberaceae
Common Name	Inguru
Growing Region	Endermic, Common in shady situations up to 1500m
Growing Form	Leaf shoots up to 2m
Uses	Medicinal properties of the rhizome
Varieties	
Wild Relatives	
25. Crop	Cardamom
Botanical Name	<i>Elettaria cardamomum</i> (L.)
Family	Zingiberaceae
Common Name	Cardamungu, ensal, rata ensal
Growing Region	Southern India and Sri Lanka Kandy, Badulla, Matale, ratnapura, Galle districts
Growing Form	Leafy shoot up to 4m high
Uses	Seeds- provide the cardamom of commerce(spice)
Varieties	
Wild Relatives	Amomum cardamomum Amomum repens Alponia cardamomum
26. Crop	Clove
Botanical Name	<i>Syzygium aromaticum</i>
Family	Myrtaceae
Common Name	Karabuneti
Growing Region	In the intermediate zone north of Kandy
Growing Form	A medium sized tree with smooth pale brown bark

Uses	Major spice
Varieties	
Wild Relatives	
27. Crop	Black pepper
Botanical Name	<i>Peperomia nigrum</i> (L.)
Family	Piperaceae
Common Name	Gam miris wel, miris
Growing Region	Locally naturalized in secondary and disturbed forests of wet zone from sea level up to about 800m
Growing Form	A tall glabrous climber with the stems thickened at the nodes, producing ground runners
Uses	Dry fruits to make pepper powder
Varieties	
Wild Relatives	
28. Crop	Cinnamon
Botanical Name	<i>Cinnamomum verum</i>
Family	Lauraceae
Common Name	Kurundu
Growing Region	Endemic, moist low country to about 700m
Growing Form	Moderate sized tree up to 18m tall
Uses	Aromatic bark is the cinnamon of commerce Oil- distilled from both the bark and the leaves Roots – afford a camphor
Varieties	
Wild Relatives	
29. Crop	Goraka
Botanical Name	<i>Garcinia quaesita</i>
Family	Clusiaceae
Common Name	Goraka, rata goraka
Growing Region	Endemic, low lands to 1000m altitude, wet and intermediate zone Kandy, Badulla, kegalle, Galle districts
Growing Form	Tree up to 20m tall

Uses	Dried fruits- used for making fish curries(spice), brine for fish preparation, Medicinal purposes
Varieties	
Wild Relatives	G.zeylanica G.morella (kana-goraka) G.hermonii
30. Crop	Indian mustard
Botanical Name	<i>Brassica juncea</i> (L.)
Family	Brassicaceae
Common Name	Aba
Growing Region	Cultivated areas up to 2000m Puttalam, Trincomalee, Matale, Kandy, Nuwara-Eliya, Badulla, Hambantota
Growing Form	Annual herb erect to 1 m or more
Uses	Ingredient for cooking curries (spice), Medicinal properties
Varieties	
Wild Relatives	<i>B. oleracea</i>
31. Crop	Betel
Botanical Name	<i>Pier betel</i> (L.)
Family	Piperaceae
Common Name	Bulat, bulat-wel
Growing Region	Colombo district, N'Eliya and Kandy districts (Not known as a wild plant)
Growing Form	A climber up to 20 m tall
Uses	Leaves – a universal masticatory stimulant and carminative Whole plant has a peculiar and characteristic odour and taste Oil – strong antiseptic properties
Varieties	
Wild Relatives	
32. Crop	Areca nut
Botanical Name	<i>Areca concinna</i>
Family	Arecaceae
Common Name	Lenteri puwak

Growing Region	Endemic, endangered, Southwest lowlands from Kalutara to Galle
Growing Form	Tree, slender stem, clustering, 2-5 m high
Uses	As a substitute for Areca for masticating with betel
Varieties	
Wild Relatives	
Uses	Leaves – a universal masticatory stimulant and carminative Whole plant has a peculiar and characteristic odour and taste Oil- strong antiseptic properties
Varieties	
Wild Relatives	
33. Crop	Curry leaf
Botanical Name	<i>Murraya koenigii</i>
Family	Rutaceae
Common Name	Karapincha
Growing Region	Low country specially in the dry zone but widespread in cultivations
Growing Form	Shrub or small tree to 5m tall
Uses	Leaves – essential ingredient in cooking curries, medicinal properties
Varieties	
Wild Relatives	<i>M.glenoei</i> <i>M.foetidissima</i> <i>M. minutum</i> <i>Var ceylanicum</i> (Wal karapincha)
34. Crop	Dehi
Botanical Name	<i>Citrus aurantifolia</i>
Family	Rutaceae
Common Name	Dehi, Hin-dehi
Growing Region	Kandy, Monaragala districts
Growing Form	Small tree
Uses	Fruit edible, medicinal properties
Varieties	

Wild Relatives	C.hystrix C.medica C.macroptera
35. Crop	Banana
Botanical Name	<i>Musa acuiunata</i> (L.)
Family	Musaceae
Common Name	Gal- kehel, unel
Growing Region	On rocky ground near streams in open forests that allow light to penetrate – 1000 m
Growing Form	Plants erect, sparsely stooling usually 3-5m high
Uses	Young male bud – eaten as vegetable Ripen fruits – edible
Varieties	
Wild Relatives	
36. Crop	Asparagus
Botanical Name	<i>Asparagus officinalis</i> (L.)
Family	Asparagaceae
Common Name	Hathawariya
Growing Region	Dry low and mid country and montane zone
Growing Form	Rambling and scan dent, much branched shrub with long stems
Uses	Young shoots and tubers – eaten, medicine
Varieties	
Wild Relatives	<i>Asparagus racemosus</i>
37. Crop	Jackfruit
Botanical Name	<i>Artocarpus heterophyllus</i>
Family	Moraceae
Common Name	Kos
Growing Region	Common in Sri lanka
Growing Form	Evergreen tree
Uses	Fruit, vegetable, timber
Varieties	
Wild Relatives	

38. Crop	Breadfruit
Botanical Name	<i>Artocarpus incisus</i>
Family	Moraceae
Common Name	Rata-del
Growing Region	Planted in parks and gardens Kandy district
Growing Form	Evergreen tree
Uses	Vegetable
Varieties	
Wild Relatives	<i>A. nobilis</i> (bedi-del)
39. Crop	Mango
Botanical Name	<i>Mangifera indica</i> (L.)
Family	Anacardiaceae
Common Name	Amba
Growing Region	Village gardens in the lower wet and montane zone up to about 600m altitude
Growing Form	Medium or large size tree 8-30 m high
Uses	Timber, fruits – edible
Varieties	
Wild Relatives	
40. Crop	Weralu
Botanical Name	<i>Elaeocarpus subvillosus</i>
Family	Elaeagnaceae
Common Name	Gal weralu
Growing Region	Moist lowland forests extending in the montane zone to c. 1200m
Growing Form	A tree 7-12 m high
Uses	Fruits – edible
Varieties	
Wild Relatives	
41. Crop	Etamba
Botanical Name	<i>Mangifera zeylanica</i>

Family	Anacardiaceae
Common Name	Etamba
Growing Region	Lowlands in moist and dry regions up to 3000 tt
Growing Form	Large tree
Uses	Timber (tea boxes) Fruit – edible though unpalatable
Varieties	
Wild Relatives	
42. Crop	Gal siyambala
Botanical Name	<i>Dialium ovoideum</i>
Family	Fabaceae
Common Name	Gal siyambala
Growing Region	Native to Ceylon but has been introduced into South-East Asia (Anuradhapura, Polonnaruwa, Kurunagala, Matale, Ampara, Moneragala)
Growing Form	Large unarmed tree
Uses	Fruit – edible use in preparation of chutneys Tree – timber for furniture making
Varieties	
Wild Relatives	<i>Dialium guineense</i>
43. Crop	Ugurassa
Botanical Name	<i>Flacourtia indica</i>
Family	Flacourtiaceae
Common Name	Ugurassa
Growing Region	Scrub, jungle, steep grassy roadsides and submontane forests; 260-810 (-1200 cult) m
Growing Form	Shrub or tree, spiny 2-10 (-15) m tall
Uses	Fruit – edible (acidic in taste) Ornamental young foliage (undesirable weed) Tough and durable timber for posts
Varieties	
Wild Relatives	
44. Crop	Himbutu

Botanical Name	<i>Salacia reticulata</i>
Family	Hippocrateaceae
Common Name	Himbutu
Growing Region	Moist zone in wet secondary forests, up to 1500 m, rather common
Growing Form	Woody climber or scandent shrub
Uses	Fruit – edible
Varieties	
Wild Relatives	-
45. Crop	Amberalla
Botanical Name	<i>Spondias dulcis</i>
Family	Anacardiaceae
Common Name	Amberalla
Growing Region	Kandy, Kegalle, Ratnapura
Growing Form	Tree
Uses	Fruit – edible
Varieties	
Wild Relatives	<i>Spondias mangifera</i> <i>S.pinnata</i> <i>S.mombin</i>
46. Crop	Laulu
Botanical Name	<i>Chrysopyllum roxburghii</i>
Family	Sapotaceae
Common Name	Laulu
Growing Region	Primary and secondary wet evergreen forest often by river banks; 30-750 m
Growing Form	Slender tree 6-20 m tall
Uses	Fruit - edible (sweetish, rather unpalatable sticky latex)
Varieties	
Wild Relatives	-
47. Crop	Heen damba
Botanical Name	<i>Syzygium umbrosum</i>

Family	Myrtaceae
Common Name	Hin damba
Growing Region	Endemic, common between 1000 and 2000m in the wet zone hills from Rakwana to Knuckles and including Namunukula
Growing Form	Medium sized tree
Uses	Fruit – edible
Varieties	
Wild Relatives	-
48. Crop	Madan
Botanical Name	<i>Syzygium cumini</i>
Family	Myrtaceae
Common Name	Madan
Growing Region	Dry zone in all forms of forests but specially along the margins of streams and tanks
Growing Form	Large shrub to large canopy tree – 25 m tall
Uses	Timber- constructions, bridges
Varieties	
Wild Relatives	-
49. Crop	Mora
Botanical Name	<i>Dimocarpus longan</i>
Family	Sapindaceae
Common Name	Mora
Growing Region	In forests of dry and wet regions to 700m
Growing Form	Medium sized to large trees, 20-30m
Uses	Fruit – edible
Varieties	
Wild Relatives	-
50. Crop	Nelli
Botanical Name	<i>Phyllanthus emblica</i>
Family	Euphorbiaceae
Common Name	Nelli
Growing Region	Monsoon forests, not native in Ceylon

Growing Form	Tree to 15m high
Uses	Fruit – edible, medicinal uses
Varieties	
Wild Relatives	-
51. Crop	Pineapple
Botanical Name	<i>Ananas comosus</i>
Family	Bromeliaceae
Common Name	Annasi
Growing Region	Kegalle district
Growing Form	Medium sized terrestrial herb
Uses	Fruit – edible
Varieties	
Wild Relatives	Bromelia ananas B.comosa
52. Crop	Diwul
Botanical Name	<i>Limonia acidissima</i>
Family	Rutaceae
Common Name	Diwul
Growing Region	Limited to dry zone Monaragala, Polonnaruwa, Mannar, Hambantota, Batticaloa districts
Growing Form	Small tree
Uses	Fruit – edible
Varieties	
Wild Relatives	Sehinus limonia Anisifolium limonia Feronia limonia
53. Crop	Papaya
Botanical Name	<i>Carica papaya</i>
Family	Caricaceae
Common Name	Gas-labu, Papol
Growing Region	Cultivated in all parts of the country
Growing Form	Small tree, 5-7 m height

Uses	Vegetable (raw) Fruit (ripe)
Varieties	
Wild Relatives	C.pubescens

** Source : Fosberg, F. R., Dassanayake M. D. and Clayton W. D. (1994) A Revised Handbook to the Flora of Ceylon Vol. 8*

CHAPTER II

TRADITIONAL CROP VARIETIES AND CROP WILD RELATIVES

Mr. Jagath Gunawadana

Traditional crop varieties that have been cultivated in Sri Lanka are facing two types of threats at present. One is the threat of extinction and the other is that they are being subjected to bio-theft and bio-piracy because of the genetic wealth they contain. Traditional crop varieties remain largely neglected by both farmers and the authorities.

It was these crop varieties, once the backbone of our agriculture, that have contributed to the development of new high-yielding varieties. These varieties had unique characteristics (traits) that made them useful and important. These traits range from adaptations that made some to be grown in various conditions such as floods and droughts, and resistant to pests and diseases. There were others with special characteristics such as aroma, tastes and medicinal uses.

For example, the traditional rice varieties known as *pokkali* and the traditional capsicum variety known as *eth-honde* (meaning 'elephant trunk' in Sinhala) are able to withstand salinity of soil. Another rice variety known as *devaradderi* can remain alive when submerged and was cultivated in paddy fields that are at risk of being flooded during heavy monsoonal rains. There are also rice varieties that mature in a short period and can withstand dryness, such as *suduru samba* (70 days) and *heete de wee* (60 days) that were grown in the dry zone during the Yala season.¹

These are other traditional crop varieties that have special qualities making them appealing to consumers. The rice variety known as *suwandel* is known for the pleasing aroma when it is cooked. Varieties of rice such as *suduru samba* and *puwak mal samba* are also known as *heen kekiri* and noted for their pure, white short grain of high quality and taste. A number of red rice varieties known as *heenati* were known for the medicinal properties;

1. Personal Observation.

while the variety of orange known as *Bibile dodang* is known for the juicy, sweet, tasting fruits.²

The distribution of traditional varieties shows that some are widely dispersed while others show regional or limited spread. For example, rice varieties such as the salt-tolerant *pokkali* and flood-tolerant *devareddari* have wide distribution in areas where such problems exist. However the salt-tolerant capsicum *eth-honde* is grown only in the Kalpitiya area in the Puttalam District in the North Western Province. It is also seen that different varieties with the same type of traits are sometimes known by the same name. For example, the name *heenati* is given to about 10 different rice varieties and the name *lane-iri* is given to several brinjal varieties that have white and purple stripes.³

Although traditional crop varieties have a wide range of traits that made them appealing to both farmers and consumers, some have drawbacks as well. A common drawback is the low-yield in comparison to some of the new high-yielding varieties. Another is the susceptibility to some pests and diseases, and low sensitivity to fertiliser. Therefore when new high-yielding varieties were introduced, many farmers abandoned traditional varieties. In some areas, the spread of pests or disease made them adopt new resistant varieties. There were other instances when new varieties were made with traditional varieties. These new varieties were improved versions of traditional varieties and had replaced the latter because of their improved characteristics.

The introduction of new, high-yielding varieties has been happening for the past five decades and most of the traditional varieties have been replaced by new varieties. Knowledge on traditional varieties is also disappearing from farmers, making them less likely to revert to growing these varieties or growing both traditional and new varieties. The best practice to conserve and protect traditional varieties is their *in-situ* conservation: that is, to continue to grow them in the areas where they were traditionally grown and evolved. The other option is their cultivation in a selected locality or keeping samples in gene banks or both.

2. Personal Observation.
3. Personal Observation.

There is no conscious effort on the part of the authorities (that is, the Department of Agriculture and the ministry in charge of the subject) to develop and implement the programme to encourage and adopt practices for the *in-situ* conservation of traditional crop varieties. Collections of some varieties are maintained in crop research stations. A large *ex-situ* collection (germplasm collection) is maintained at the plant genetic resources centre (PGRC) at Gannoruwa, Peradeniya.⁴

There are no co-ordinated efforts on the part of the non-governmental organisational sector in preserving traditional varieties such as Heirloom Varieties Protection in USA. There, a loose coalition of non-governmental groups helps maintain traditional varieties through planned and co-ordinates efforts such as seed exchange, sales, special preparations, and through leaflet and newsletters. Traditional varieties are described as heirlooms because they consider that they have inherited them and should pass them on to their descendants as part of their heritage.

Several non-governmental groups in Sri Lanka have been collecting and growing some varieties of several crops, most notably the traditional rice varieties that have appealing traits that confer added value to the rice. There is an emerging market for organically grown traditional rice varieties that possess special traits (such as aroma, colour and taste) not found in new high-yielding varieties. Some of them can fetch higher prices that compensate for the comparatively lower yields. To take advantage of the higher demand, some of these efforts should be co-ordinated and strengthened. The creation of niche markets and the popularising of some varieties with special and unique taste will also encourage farmers to both retain their traditional varieties and also to take up growing some promising varieties that could give them a good income even if the harvest is lower due to higher prices and fewer inputs^{5 6}.

A number of naturally growing relations of crop plants are found in Sri Lanka and these are collectively known as *Crop Wild Relatives*. Most are quite similar to a crop and share some characteristics with them while others are not easily associated with a crop by looking

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4. See chapter by Dr. Hitinayake in this publication.
 5. Interview with Mr. Podinilame, Human Development Centre, Tolangamuwa.
 6. Interview with Mr. Seneviruwan, Saruketha Movement, Matugama.

at them. These grow in a wide variety of habitats, from the wet zone forests to wetland and grasslands. There are some Crop Wild Relatives that are the ancestors of cultivated crops. Modern bio-technology has made it possible to isolate genes that confer specific traits and transfer them to other crops. The wild relatives of crops are a potentially rich source of genetic material, both to be used in the improvement of the related crops and for use in other unrelated crops.⁷

There is a wide diversity of crop wild relatives in Sri Lanka. For example, cinnamon (*cinnemomum verum*) the only endemic spice in the country has eight species of wild relatives, all of which are endemic to Sri Lanka.⁸ The nutmeg has three wild relatives, one of which is endemic to Sri Lanka.⁹ The mango has endemic wild relatives and so have the durian and breadfruit.¹⁰

Some of these wild relatives have utility values of their own and hence are unknown to the people. For instance, two of the wild relatives of cinnamon are also used as spices in some parts of the country.¹¹ Wild relatives of the mango and rambutan produce small but edible fruits and valued timber. The wild relatives of breadfruit have an edible seed and are valued as a fruit. A number of wild relatives are used in traditional medicine and are known as medicinal plants rather than crop wild varieties.

The identities and the importance of crop wild relatives as a group is still largely known; and their potential value is neither acknowledged nor recognised. Hence they remain mostly neglected and therefore unprotected. Most are destroyed when their habitats are degraded and this is the most prevalent threat facing them. Some species, such as the wild relatives of the mango and rambutan have been extensively felled for timber and are now quite rare

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7. Wijesundara, Cyril (2005) Presentation made at Workshop of 31.03.2005 of the Crop Wild Relatives Conservation Project.
 8. Wijesundara, Cyril (2005) Presentation made at the Workshop of 31.03.2005 of the Crop Wild Relatives Conservation Project.
 9. Wijesundara, Cyril (2005) Presentation made at the Workshop of 31.03.2005 of the Crop Wild Relatives Conservation Project.
 10. Wijesundara, Cyril (2005) Presentation made at the Workshop of 31.03.2005 of the Crop Wild Relatives Conservation Project.
 11. Personal Observation.

in some areas having disappeared altogether from other localities.¹²

A number of crop wild relatives are found in protected areas as declared under the Fauna and Flora Protection Ordinance,¹³ Forest Ordinance,¹⁴ and National Heritage Wilderness Areas Act.¹⁵ Since it is an offence to disturb the habitats, damage, or collect any plants or parts within these areas, they offer protection to any crop wild relatives found within. This has, at times contributed greatly to the protection of some species. A case in point is *cinnemomum sinharajense*, discovered in 1978,¹⁶ which is a wild relative of cinnamon. It is found only in the Sinharaja forest, declared as a National Heritage Wilderness Area in 1988, and thereby enjoys full protection. The Fauna and Flora Protection Ordinance can also afford full protection to a species, which makes it an offence to uproot, destroy or damage such plants. However, it is seen that only a few species of crop wild relatives such as three species of plants related to cinnamon and relatives of nutmeg have been protected so far.¹⁷

The main reason for such little attention to conservation of crop wild relatives is the lack of knowledge on the part of some authorities and the public. There is no material available to the general public that gives them the ability to identify these plants and to learn about their importance. If there is any value, people tend to take an interest and protect them. An example is two species of *horsfieldia*, which are relatives of the Nutmeg. Both of these have separate male and female trees. The male tree produces clusters of scented flowers while the female tree produces fruits. The flowers are valued as they are offered at temples, but there is no use for the fruits. Hence people let that the male trees remain but cut the

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12. Personal Observation and also articles on "Crop Wild Relatives: a vital but neglected resource, *The Island* 08.05.2002, and "Crop Wild Relatives and legal protection", *The Island* 15.05.2002.
 13. Fauna and Flora Protection Ordinance, No 02 of 1937 as amended.
 14. Forest Ordinance.
 15. National Heritage Wilderness Areas Act.
 16. Dassanayaka M.B, Fosberg F.R, Clayron W.D (1995) A Revised Handbook to the Flora of Ceylon Volume IX.
 17. Schedule V, under s. 42, Fauna and Flora Protection Ordinance.

female trees. When shown that it is essential to keep the female trees too, they often refrain from harming them.¹⁸

Other problems facing traditional crop varieties and crop wild relatives, is the theft of the plant material and the application of intellectual property rights over varieties and their genetic wealth. The first issue is known as *bio-theft* while the second is known as *bio-piracy*. Bio-theft is the export of plant genetic material without proper authorisation. It involves physical matter such as plants, seeds or tissues, and is an offence because the export is carried out in violation of the law and in a surreptitious manner just as in other types of theft.

The term bio-piracy has been widely used since being coined in 1993.¹⁹ Initially defined as “the use of intellectual property laws (patents and plant breeders’ rights) to gain exclusive monopoly control over genetic resources that are based on the knowledge and innovation of farmers and indigenous people”,²⁰ it has now been broadened to include the acquisition of intellectual property rights over any living being, any compound, genetic material or other part of a living being found in one country by a person or organisation of another country. In bio-piracy, what is lost is not physical material but rights covering the material. These rights are held as monopoly rights by the assignee of the patents or plant breeders’ rights and even the country of origin cannot engage in any activity that transgresses those rights.

Patents were initially meant to be defensive tools that gave an inventor of a new invention a fair chance without competition for a limited period of time to profit by the invention in return for its disclosure. It allowed the inventor to reap profit for the time, effort, and resources spent. In return, the disclosure made it possible for anyone to use it freely after the expiration of the patent. It is not possible to get patents on genetic materials in a number of developed countries.

18. Personal Observation in the Kalutara District.

19. RAFI Communique of 30.11.1993, “Bio-piracy: the story of coloured cottons of the Americas”.

20. RAFI Communique.

However patents are increasingly being used to undermine competitors by preventing them from entering a market or excluding them from the market. This is achieved by obstructing and preventing research, preventing the introduction of similar products, denying access to research materials, and to exhaust smaller opponents by lengthy legal actions. It is seen that many of the patents on genetic materials have not been exploited commercially and only serve to stifle activities of others.

The other type of monopolies on plants is through taking Plant Breeders' Rights. Although these are available only to new varieties, the scope and availability of a Plant Breeders' Right (PBR) is decided by how each law interpret key terms such as varieties, novelty and distinctness. In some countries plants that differ from the other by one trait are considered as distinct and thus qualify as a new variety. This is the situation in countries which have Plant Breeders Rights Acts based on the UPOV (1991) convention.²¹

In countries such as Sri Lanka which have a large diversity of traditional crop varieties, it is difficult, if not impossible, to document all the traits of different traditional crop varieties. It leaves room for others to manipulate these inadequacies gaining a PBR on an already existing variety by pointing out one or more existing traits as new traits. The authority that grants PBR would not be able to verify the claim as they may not have the necessary reference material. The same situation may prevent other parties from challenging such a PBR effectively. However the assignee of the PBR would therefore make a claim on the traditional variety. More than 100 such PBRs granted in Australia have been identified by the Heritage Seed Curators of Australia (HSCA) and the Rural Advancement Foundation International (RAFI).²² Thus a variety that had been cultivated for generations runs the risk of becoming intellectual property of an individual or company in a far off country.

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21. The Sri Lankan authorities drafted a Plant Breeders Rights Act in 2001 based on UPOV (1991). It was not brought before parliament due to public protest from environmental groups. A new Bill is presently being drafted.
 22. RAFI News Release 16.09.1998 "Plant Breeders Wrongs". A full list of the PBR and pending applications is contained in the annex to the document titled 'Plant Breeders Rights and Wrongs, the result of investigation by RAFI and HSCA'. Hankin, Bill (1998) "Australia bungles Plant Breeders Rights", *The Curator*, Journal of HSCA, Harvest 1998.

A PBR can only grant a monopoly over a variety as defined by the law of the country that grants these rights. Thus, they do not give monopoly control over the traits, nor to the genes that are responsible for the particular traits. A PBR does not extend coverage to progeny, unless they are substantially similar to the patent that is given protection. Hence inventive breeders can use such varieties to confer a particularly useful trait to an already existing variety or a new variety that would not be substantially similar to the variety covered by the PBR. Hence some breeders always try to get a patent to cover plants in countries where this is lawful.²³ An example is the patenting of Basmati rice in USA. Rice Tec made an application for a patent in July 1994 and patent US 5,663,484 was granted in September 1997. They also applied for a PBR in November 1995, and were awarded PBR certificate PVP 9600077 in 1996. They abandoned the PBR after obtaining the patent.

There is no legal requirement to make a disclosure about the origin of any genetic material that is intended to be covered by the patent. Even TRIPS and the Convention on Biological Diversity are silent on this issue. There is no way to obtain such provision in a national law unless a state voluntarily takes such a decision which is highly unlikely. This deficiency in the patent law is what helps bio-theft to become bio-piracy by making it possible to get patents on material stolen from other countries. However it is seen that some patents do mention the country of origin in their description.²⁴ This is done in order to help them prove an infringement and not as a grateful acknowledgement; and the country of origin cannot take any action even when such facts are mentioned.

It has been suggested that a system should be introduced to make it mandatory to disclose the source of any genetic or other biological material that is intended to be covered by a patent. One such suggestion is to introduce Certificates of Origin to protect the rights of owners of genetic resources and traditional knowledge.²⁵ This term was originally introduced to certify in the patent application procedure that *Prior Informed Consent* (PIC) had been obtained for use of genetic material. Certificates of Origin can also be used to track

23. The scope of a patent and PBR has been compared and discussed in the decision of Pioneer Hi-Bred International vs. J.E.M. Supply Inc., H.S. Patents Quarterly Edition vol.53, p.1440 (Fed. Cir.2000).

24. For example US 4,293,546 and US 4,385,122 both state that the new micro-organism *streptosporangium fragile* was discovered in Jaffna, Sri Lanka. U S 5,541,181 states that the new strain of *micromonospora* spp.M990-6 was found in Sri Lanka.

25. Tobin. B (1994), "Alternative Mechanism for Protection for Indigenous Rights", Paper presented at "Indigenous People, Biodiversity and Intellectual Property in Bolivia Conference", September 1994.

the flow of genetic material and to document the right to use genetic resources. However their use for this purpose has yet to be incorporated into access regimes and is still under consideration.²⁶

Box 1

Patenting rice varieties: an unknown instance

The Patenting of Basmati Rice lines and grains by Rice Tec Incorporation of Texas, U.S.A and the subsequent successful challenges by the Indian government are well known. But there are other instances where traditional rice varieties have been subjected to patents in other countries.

The Japanese patent JP 11169003 of 29.06.1999 assigned to New Aque Gijustu Kenkyusho is one such example that has gone unnoticed to all. It covers an indica rice variety known as Black Lily that is a traditional rice variety grown in China, known for its excellent flavours and health properties.

The 'invention' that has been made is to cultivate the original variety in paddy fields in Japan, select the larger seed and continue the process every session for a period of eight years.

Thus, the 'invention' that they claim is just the end of a continuous process of selective cultivation which has resulted in a larger seed.

26. The Sixth Conference of the Parties (COP-6) of the CBD, held in The Hague in 2002 tasked the Secretariat to undertake an analysis of the feasibility of an International Certificate of Origin. COP-7 in 2004 has decided to examine this further.

Box 2**Rice genes: a hot intellectual property**

A large number of genes from the rice plant (*oryza sativa*) have been patented by companies, research institutes and universities. The past few years saw a marked increase in numbers, especially by Syngenta which stated that they have described the genome of rice. A list of some are provided below.

Number/date	Assignee	Title
WO 03/048319 (12.06.2003)	Syngenta	Nuclear molecules from rice encoding proteins for biotic stress tolerance, enhanced yields, disease resistance and altered nutritional quality and uses thereof
WO 03/007699 (03.01.2005)	Syngenta	Transcription factors of cereals
WO 2005/030968 (07.04.2005)	Monsanto	Acting regulatory elements for use in plants
WO 2004/005515 (15.01.2004)	Japan Tobacco Inc. Syngenta	Sterility recovery genes to rice BT type male sterile cytoplasm
WO 2005/017167 (24.02.2005)	Monsanto	Promoter molecules for use in plants

Box 3**Patenting of Nutmeg genes**

Nutmeg (*Myristica Fragrance*) is a spice originating in Asia and is known for the fragrance and taste caused by substances known as myristates.

Two patents covering two genes that code for the enzymes creating the metabolic pathways for the production of myristates in plant cells have been obtained by a US company. The patents are numbered HS 5,654,495 of 05.08.1997 and US 5,850,022 of 15.12.1998 and are titled, "Production of myristates in plant cells" with the same abstract, assignees, description and summaries.

The patent claims that these genes can be introduced successfully to oil-producing plants and myristates produced in these modified plants. They have identified crops such as Canola, Sunflower, Safflower, Cotton, Soybean, Peanut, Corn, Oil Palm and Coconut.

CHAPTER III

TRADITIONAL CROP VARIETIES, INTELLECTUAL PROPERTY RIGHTS AND INTERNATIONAL CONVENTIONS

Mr Jagath Gunawardena

The increasing importance of traditional crop varieties and their wild relatives has led to different parties trying to acquire such patents and their genetic materials and to take monopolies over the genetic material and their use. The search for biochemical genetic materials with potential economic values is known as *bio-prospecting*. The ability to search for, find, take and use these bio-chemical compounds and genetic materials is known as *access*.

Though the terminology seems to be novel, this is only a continuation of a process that has been ongoing for more than five centuries. This continuous process has resulted in an anomalous situation at present. That is bio-diversity poor developed countries have accumulated 70% of the world's genetic material, 75% of which originated in bio-diversity rich developing countries.¹

The biological and genetic materials found in different animals, plants and micro organisms were initially considered the common heritage of human kind and were freely provided and exchanged between nations – although the laws of countries such as Sri Lanka have asserted and acknowledged sovereign rights over them.²

The situation started to change due to several interconnected reasons. First and foremost was the realisation by the provider countries that they do not receive their due benefits from the donation of important material to others. The second was increasing intellectual property claims over donated material that gave stronger monopolies to users, often to the

1. RAFI Communique.

2. Articles 27 and 28 of the Constitution of the Democratic Socialist Republic of Sri Lanka.

detriment of the providers. The third was the failure of such users to share any of the benefits with providers.

The increasing reluctance and refusal by the provider countries to bio-prospecting efforts by developed countries has placed them in an awkward situation. Although developed countries have resources (both monetary and technological) they are short of suitable biological material to create wealth. Therefore different approaches have been mooted to induce the provider countries to part with their biological material by getting their consent either directly through monetary benefits or indirectly through non-monetary benefits, and through “common systems” and “common regimes” in granting access that provide a regime for sharing benefits with providers.

International legal instruments that deal with access to genetic resources and the sharing of benefits are the Convention on Biological Diversity (CBD) and the International Treaty on Plant Genetic Resources in Food and Agriculture (ITPGR). Sri Lanka has signed and ratified the CBD but has not signed the ITPGR.

The introduction of intellectual property rights (IPR) over genetic resources has become an important and controversial issue in discussions on access and sharing of benefits as they sometimes interfere with both these issues and causes problems. The international legal instrument that deals with IPR issues is the Trade Related Aspect of Intellectual Property Rights Agreement (TRIPS) under the World Trade Organization (WTO). The TRIPS agreement also deals with patents on living beings and similar IPR on plant varieties. Hence, it is important to enlarge the present discussion to include the relevant provisions of TRIPS as well.

CONVENTION ON BIOLOGICAL DIVERSITY (CBD)

The objectives of the Convention are the conservation of biological diversity, sustainable use of genetic resources and the fair and equitable sharing of benefits from the use of genetic resources.³ It is important to note that although the CBD deals with the conservation of biological diversity, the scope of access and benefit sharing is narrowed down to genetic resources. This Convention defines genetic resources as genetic material with actual or potential economic value;⁴ a definition that is based not on science but on commercial value.

The CBD does not call for any direct action from members. Rather it provides a set of policies and objectives and members can take necessary action within the context provided. It therefore acts as a framework convention. In this regard the CBD provides a set of responsibilities for the conservation of biological diversity and sustainable use, access and benefit sharing as well as a set of corresponding rights.

Although the scope of the CBD is to cover all types of genetic resources, there is an important exception that serves as an exclusive clause. This is article 15.3 which says that the provisions of articles 15, 16 and 19 apply only to those genetic resources “acquired in accordance with the convention.” This, in other words, excludes all the ex-situ collection that have been acquired before the ratification of the Convention⁵ which accounts for the majority of the ex-situ collections held in almost all the gene banks in the world. This is a great disadvantage to a country like Sri Lanka which has readily and freely donated crop germplasm to others for more than four decades.

The articles of the CBD make clear that it sets out a bilateral approach in providing access

3. Article 1 (Objectives) of the CBD.
4. Article 2 (Use of Terms) of the CBD.
5. CBD was ratified on 29.12.1993.

to genetic resources and the sharing of benefits that has to be on “mutually agreed terms”.⁶ This is nothing new and amounts to the usual approach in bilateral agreements. It also authorises national governments to determine access to genetic resources, subject to national legislation and to create conditions to facilitate access. Thus, a country can decide on how to set about negotiating a bilateral agreement. It does not call for any new legislation or even for an amendment of any existing legislation but only to create a system. Even though there are moves to make a new access law in Sri Lanka this is not a requirement under the CBD. These moves are afoot although Sri Lanka has provided and still continues to provide crop genetic resources through bilateral agreements.

The need for *Prior Informed Consent* (PIC) has been established as crucial when requesting access. This means that the potential recipient must inform the providing party about the intended use and related issues prior to the agreement. Implicit in this are the fact that recipient should tell the truth and the information needs to be sufficient for the provider to get a clear idea of the issues involved. The Convention does not say, either explicitly or implicitly that the provider has to get the PIC of the actual holders of a genetic resource such as a community, family or even an individual.

The issues of PIC have to be dealt with on several levels. The first is the country level and then comes regional, community, family group and then individual levels. For example, if a particular variety of paddy is available in the hands of several communities. Can some or any one community give PIC and material thereby excluding others from sharing? This is of essential importance from the point of view of sharing the benefits. The Draft Access and Benefit Sharing Act of 2000⁷ restricted PIC to the government, a move that was criticised for its inadequacy and the possibility of it leading to malpractices such as the government being under no obligation to share benefits derived with the holders of traditional knowledge from whom the source material and information on its uses had been obtained in the first place. Fortunately this scenario has been averted when the authorities abandoned the 2000 Bill.

6. Article 15 (2) of the CBD.

7. Recommendation on new legislation. Genetic Resources- access and benefit sharing act, draft version of 26.07.2000.

The aims of benefit sharing in the CBD is to channel benefits that are provided to the provider of a genetic resource to be used for the conservation of biological diversity with part of it to be channelled to the owners of the genetic resource. The Convention places two obligations on the provider countries and two on user countries. The two obligations on the providers are for the utilisation of traditional knowledge⁸ practices and innovations and form laws that facilitate the exploitation of genetic resources.⁹ The two obligations placed on user countries are to share the benefits accrued from the use of genetic resources¹⁰ with the provider and also to share the technologies, including bio- technologies, based on the genetic resources of the providers.¹¹

There was widespread hope in the provider countries that the access and benefit sharing regime of the CBD would bring them rapid and substantial monetary rewards as returns for providing genetic resources and that illegal and unethical appropriations of genetic resources and rights would be reduced or stopped (the so-called “granted bargain” predicted by some commentators).

More than ten years after the signing of the CBD, none of these have been realised. Some provider countries have established national laws for the granting of access (that is so-called access laws proposed and actively pursued by several international bodies) but reciprocal measures have not been made by user countries.

The problems in implementing the access and benefit sharing issues has led to the adoption of the Bonn guidelines for access and benefit sharing at the Sixth Conference of Parties in 2002.¹² The Bonn guidelines for access and benefit sharing are intended to assist countries to develop their own access regimes and benefit sharing regimes. They are to help in issues such as PIC and on *mutually agreed terms* (MAT), to provide necessary guide lines for the participation of different groups, their roles and responsibilities. These guide lines do

8. Article 8 (j) of the CBD.

9. Article 15 (2) of the CBD.

10. Article 15 (7) of the CBD.

11. Article 16 of the CBD guide lines were adopted

12. These guide lines were adopted of the sixth COP in April 2002. Decision VI/24.

not elaborate the necessary measures but only point them out in general terms. The more important fact is that those guide lines are, as the name implies, voluntary in nature.

INTERNATIONAL TREATY ON PLANT GENETIC RESOURCES IN FOOD & AGRICULTURE

The objectives of this Convention are the conservation and sustainable use of plant genetic resources in food agriculture and the fair and the equitable sharing of benefits arising from their use, in harmony with the Convention on Biological Diversity for sustainable agriculture and food security.¹³ The scope of this Convention is limited, relating only to *plant genetic resources in food and agriculture* (PGRFA).¹⁴ This term (PGRFA) is defined as any genetic material of plant origin of actual or potential value for food and agriculture.¹⁵

The access regime proposed by the ITPGR is different from the access regime proposed by the CBD. The approach in the ITPGR is a multilateral system to which all the parties are privy to instead of the bilateral agreements proposed by the CBD.¹⁶ The bilateral approach in the CBD is driven by market forces, that is, a party or company enters into a bilateral treaty to gain access only if there is a real or potential value in the genetic resources they request. The term sharing of benefit means that there should be benefits to be shared with the provider. Instead, the ITPGR functions under the assumption that no market driven demand can be created for the most important PGRFA (which are included in Annex D). It is an implicit recognition of monopolies in the crop breeding sector, where

13. Article 1 (Objectives) of ITPGR.

14. Article 3 (Scope).

15. Article 2 (Use of Terms).

16. Part IV of ITPGR. Articles 10 to 13.

those who possess important germplasm could create monopolies over them and refuse to share them with others, especially the poorer parties.

The ITPGR proposes a system of providing open access to PGRFA. This will make it easier for all parties to access needed genetic resources, to keep access costs low and to encourage research and the breeding of new crop varieties that would ultimately lead to global food security.

The ITPGR has proposed a four-pronged approach in benefit sharing.¹⁷ These are:

1. Exchange of Information
2. Access to and Transfer of Technology
3. Capacity-Building
4. Sharing of Benefits of Commercialisation.

The central idea of the Treaty is to establish a multilateral system for all countries that would deal with issues, exchange and benefit sharing for PGRFA. It implies that there is no need to exchange or provide access to genetic material through bilateral agreements, as access will be free of charge. It also proposes a system of standard Material Transfer Agreements (MTA) which could be used by all parties. Although neither the CBD, nor the ITPGR has any explicit exemptions, it is clear that the ITPGR has created a different and alternate system of access to PGRFA and has in effect exempted them from the CBD system.¹⁸

The Treaty also aims at establishing a fund for the ex-situ and in-situ conservation of PGRFA.¹⁹ This fund is intended to be financed through two means:

1. A core contribution made by developed countries;

17. Article 13 (Benefit Sharing in the multilateral system) of ITPGR.

18. Articles 13 (2) together with 12.3 (b) makes this position clear.

19. Article 13 (2) (d) of ITPGR (sharing of monetary and other benefits of commercialisation).

2. A recipient who commercialises a product based on PGRFA obtained from the multilateral system should pay a fair and equitable share of the benefits if the product is covered by IPR in a form that restricts availability for further research and breeding.

In other words this means that a recipient of PGRFA from the multilateral system can obtain a patent or Plant Breeders Right for a variety that uses genetic materials and could commercialise it without sharing the benefits if the product is available for further research and breeding. The ITPGR leaves room for such a person or body to restrict or prevent the use of such product in cultivation even by subsistence farmers and still not contribute to the fund. It could have been fairer if anyone who commercialises a product protecting their interests through IPR were required to make payments to the fund calculated on the availability of material.

TRADE-RELATED ASPECTS OF INTELLECTUAL PROPERTY RIGHTS AGREEMENT

This agreement has made it obligatory for all member countries of the WTO to provide IPR that extend to all products and processes from all fields of technology. The stated objectives of the agreement²⁰ are the promotion of technological innovation and their dissemination to the benefit of both producers and users of technological knowledge. It is intended that the imposition of similar IPR regimes in all member countries of the WTO (the so-called minimum standards) will permit the owners of IPR to gain full benefits by the trade in covered goods and services that would contribute to their growth which will in turn increase trade.

Among the most controversial aspects of TRIPS is the extension of IPR to living beings or life patenting. This is provided in Article 27 (3) (b) which makes it:

20. Article 1 (Objectives) of TRIPS.

1. Discretionary to grant patents to animals
2. Discretionary to grant patents to plants
3. Obligatory to provide patenting of micro-organisms
4. Obligatory to bring a *sui generis* system or a combination of patents and *sui generis* system to provide IPR to plant varieties

An analysis of the real scope of this part shows that only the patenting of animals is still discretionary and all other living beings are covered by the agreement as needing IPR. The little discretion left is the design of a *sui generis* law. Sri Lanka has complied with all of the requirements of TRIPS²¹ except the *sui generis* law, which is still in the draft stage.²²

INTERACTION BETWEEN CBD/ITPGR AND TRIPS

The provisions in TRIPS on granting IPR over plants has a direct relationship with plant genetic resources as provided by CBD, and the PGRFA as covered by the ITPGR, as they can be covered by either patents or by the Plant Breeders Rights or by both. A patent can cover a gene or other genetic material²³ and in some countries even plants.²⁴ A PBR can only cover a variety and does not extend to the genetic level.²⁵ However it is possible to get patents on genes or fragments and also to get PBR on plant varieties that have been bred or made incorporating these genetic materials, leading to the amalgamation of the two IPR systems to get wider and stronger control.

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21. See the Intellectual Property Act (No 36 of 2003) that replaced the Code of Intellectual Property Rights Act (No 52 of 1979).
 22. The draft presented in July 2001 was based on UPOV-1991 Convention. A new draft version is still in preparation.
 23. Thus equating an innovation with discoveries.
 24. In USA there has been a Plant Patent Act since 1930 that provide patents for new, asexually propagated plants with the exception of tube propagated plants. Since 1985 USPTO has been granting utility patents for plants.
 25. A PBR is granted to a new variety of plant that is distinct, uniform and stable.

Both the CBD and ITPGR mention the role of IPR, but stop short of taking an explicit position as regards the extension of IPR to living beings. However both CBD and ITPGR have tacitly approved conferring IPR on genetic material and plants and have no incompatibilities or conflicts with the position set out in TRIPS.

The ITPGR states that recipients of PGRFA shall not claim any IPR or other rights that limit facilitated access in the form received from the multilateral system.²⁶ This in one stroke approves and acknowledges the need for IPR on PGRFA but only provides a proviso that they should not be subjected to the IPR regime in the form received. It has on the other hand given complete and total freedom to claim IPR rights on plant varieties, plasmid constructs and gene constructs that incorporate such genetic material. A basic requirement in both patents and PBR is that what ought to be protected has to be new (or novel) and should not be part of prior art. Thus any genetic material that is in the “form received” constitutes part of prior art and therefore not a novel thing that fulfils this criteria. It can be argued that this provision in ITPGR only gives a meaningless assurance to providers while leaving all options of pursuing IPR to recipients.

The provisions on access and transfer of technologies state that some technologies can only be transferred through genetic material; and that Contracting Parties shall provide and /or facilitate access to such technologies and genetic material. However access to these technologies, improved varieties and genetic material should be provided and/or facilitated while respecting applicable property rights and access laws.²⁷ The applicable property rights in respect of technologies are process patents while those applicable to patent varieties may be either patents or PBR. However applicable to genetic material is life patents on genes or patents covering parts of genetic material such as ‘codes’ (the part of the gene that encodes a protein) or ‘promoters’ (the control region of a gene).

26. Article 12 (3) (d) of ITPGR.

27. Article 13 (2) (b) of ITPGR (access to and transfer of technology).

The TRIPS agreement does not make it mandatory to grant patents on genes but only discretionary.²⁸ However respecting IPR on genes requires amending laws to grant patent cover to these; a position contradictory to the policy maintained by Sri Lanka. It seems that either our IPR regime must be changed to access these technologies, or we hold on the current position, and forego right of access to these technologies. In this respect, it can be said that the ITPGR while complementing TRIPS also extends intellectual property rights to living beings that are not subject to TRIPS.

The provisions on access to and transfer of technologies in the CBD state that the term technologies include bio-technologies.²⁹ It states that technologies covered by patents and other IPR should be provided on terms which recognise and are consistent with adequate and effective protection of IPR,³⁰ and further states that parties should take legislative, policy and administrative steps as appropriate, with the aim of enabling the private sector to gain access to development and transfer of technologies.³¹

The provisions of the CBD on access to and transfer of technologies means that a country that wants access to bio-technologies should provide adequate legal protection to them including legislative and policy measures as appropriate to protect IPR over them. This view is reinforced by the objectives of the CBD,³² which says, among other things, that access to genetic resources and appropriate transfer of relevant technologies should take into account all rights over these resources and technologies.

All the genetic engineering technologies, and often the genes and their parts that are used in these (promoters, codes, gene constructs, plasmid constructs) are covered by the patents. Some patents even cover the resulting plants as well. The provisions of the CBD says that

28. Article 27 (3) (b) of TRIPS.

29. Article 16 (1) of the CBD.

30. Article 16 (2), 16 (3), 16 (4) and 16 (5) of CBD together with Article 19.

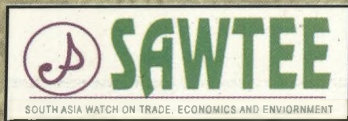
31. Article 16 (4) of CBD.

32. Article 1 of CBD (Objectives).

a country that wants the transfer of technologies has to provide adequate legal protection to them and this means that the IPR laws have to be accommodate patents on genetic material.³³

A country that adopts patents on genetic material has to think of implications as they go well beyond the access of technologies. In this regard, it is needed to look at the articles in TRIPS that makes it mandatory for parties to grant National Treatment³⁴ and Most Favoured Nation Treatment.³⁵ This means that any other party who wants to patent genetic materials has to be accorded the same treatment and any concession provided to it has to be extended to all other parties. It is thus clear that these provisions of the CBD, if implemented will go beyond the requirements of TRIPS in this area.

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33. In Sri Lanka, section 62 (3) of the Intellectual Property Act (No 36 of 2003) excludes patents on plants, animals and their parts.
34. Article 3 of TRIPS (National Treatment).
35. Article 4 of TRIPS (Most Favoured Nation Treatment).



Launched in December 1994 by a consortium of NGOs from South Asia region, South Asia Watch on Trade, Economics and Environment (SAWTEE) is a recognised, registered, non-profit, non-governmental organisation. It currently operates through its headquarters in Kathmandu and 11 network members from five South Asian countries, namely, Bangladesh, India, Nepal, Pakistan and Sri Lanka.

SAWTEE's mission is to build capacity of concerned stakeholders in the context of liberalisation and globalisation in South Asia region. SAWTEE follows a five-prong strategy to achieve its mission.

- ★ **Networking:** Establishing institutional linkage with various national, regional and international institutions that are working in the areas of liberalisation, globalisation and sustainable development.
- ★ **Capacity building:** Conducting capacity building activities at various levels through training workshop, information dissemination and internship programme.
- ★ **Policy research:** Conducting policy research on issues such as WTO rules, regional cooperation, Intellectual property rights, competition policy, environment and development dimension of trade liberalisation.
- ★ **Advocacy:** Organising conferences, seminars, policy dialogues, consultation meetings, talk programmes and interaction programmes. The advocacy at the policy level is also supplemented by publication and distribution of policy briefs on relevant issues in a timely manner.
- ★ **Sensitisation:** Publishing briefing papers, newsletters, discussion papers, monographs and policy briefs on issues related to globalisation, liberalisation, multilateral trading system, regional cooperation, competition policy, environment, intellectual property rights, food security etc.

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Law & Society Trust

The Law & Society Trust is a non-profit making body committed to improving public awareness on civil and political rights and social, economic and cultural rights, and equal access to justice. The Trust is also concerned with the consideration and improvement of professional skills within the legal community. The Trust has taken a leading role in promoting cooperation between government and society within South Asia on questions relating to human rights, democracy and minority protection, and has participated in initiatives to develop a global intellectual and policy agenda for the nineties.

The Law & Society Trust was set up in Colombo in 1982 as a Trust under the Trust Ordinance and was subsequently incorporated in 1992 under the Companies Act No. 17 of 1982.

The Trust designs activities and programmes, and commissions studies and publications, which have attempted to make the law play a more meaningful role within society, and to use the law as a tool for social change. The Trust attempts to use law as a resource in the battle against underdevelopment and poverty, and is involved in the organisation of a series of programmes to improve access to the mechanisms of justice, as well as programmes aimed at members of the legal community. These include publications, workshops, seminars and symposia.

The activities of the Trust are categorised under three Programme Areas namely Socio Economic Rights Civil and Political Rights Programme and Conflict Related Human Rights programme.

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