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A STUDY ON THE PRESENT STATUS OF SEED PADDY PRODUCTION IN SRI LANKA

J.G.D.T. SENEVIRATHNA, K.A. METTANANDA and S. BOGAHAWATTA
Seed Certification Service, Gannoruwa, Peradeniya

ABSTRACT

Seed quality is one of the major factors that determine the final rice yield. Estimated seed paddy requirement for Sri Lanka is 90,000 mt of which only about 12-15% is presently supplied as quality certified/assured seed. According to the calculations, at least 20-25% of this requirement should be supplied as quality certified/assured seed in order to obtain a significant increase in rice productivity. During the past few years there has been a declining trend in the extent registered for certified seed paddy production and expected seed yield has been rejected due to various reasons in the seed certification process. This study was performed to quantify rejections using data of eight consecutive seasons from 2004 – 2007, covering 18 regional units of the Seed Certification Service, Department of Agriculture. According to the statistical analysis, there was a significant reduction (p = 0. 05) of expected quantity in each step during seed certification process especially in major seed producing regions. About 20% of the extent registered for certified seed paddy production is rejected at the field level. Only 46% of total expected quantity were sampled for the laboratory testing due to the farmers selling before sampling (34%) and 15 % was rejected in laboratory testing. Rejection due to high percentage of weed seeds has increased during last four years. An average of 31% of the expected seed quantity was certified and another 24% has been considered as quality assured. Therefore, only around 55% of the expected seed quantity could be considered as quality certified/assured.

KEYWORDS: Seed Certification, Seed paddy, Weed seed, Seed quality.

INTRODUCTION

Rice, the staple food in Sri Lanka, is the most important agriculture sub sector in the country where 30% of total labour force is employed. In 2004, agriculture accounted for 17.9% of the Gross Domestic Production (GDP) of the island in which 2.6% was contributed by rice. However, in 2007, the total share of rice has reduced to 1.6% of the GDP. This emphasizes the need of upgrading the rice sector in Sri Lanka to increase yields by appropriate technology.

Seed quality is one of the major factors that determine the rice yield. There are formal and informal seed supply systems in Sri Lanka. Majority of farmers use informal systems such as saved seed from their previous crop or borrowed from neighboring farmers for their seed requirement. The others depend on the formal seed supply system that assures the genetic and physical purities including germination standards of seed materials. According to the national seed policy, both public and private sectors are involved in formal seed supply activities in which the role of the public sector is played by the Seed and Planting Materials Development Centre of the Department of Agriculture. Contract growers, seed producing

companies, farmer organizations, co-operative societies and individual farmers who are registered with the Department of Agriculture (DOA) for registered and certified seed production are the key stake holders in the seed production sector.

According to the statistics, average national seed requirement of rice seed is 90,000 mt (Weerasena and Madawanarachchi, 2000), of which around 15% is supplied through a formal seed supply system and another 35% by private seed producers, who purchase basic seed from DOA. Balance 50% is supplied via informal ways such as farmer saved seeds and self seed programmes organized by extension officers. Although the targeted amount of seeds produced by DOA is around 25% of the national seed requirement, only 15% is being supplied at present. The failure to reach the production targets has been accounted, mainly, due to the quantitative rejections of seeds during the seed certification process. In the seed certification process, intended producers should make a request to Seed Certification Service (SCS) to register their fields for certified seed production, within two weeks of crop establishment. They should produce the certification labels/tags of basic seeds that they used at the time of registration. In case of failure to do this, their field will not be registered by SCS. Seed certification officers make field inspections during the cropping period and provide written instructions regarding the crop management. Fields that are not up to the required standard will be rejected at the final inspection before harvesting. Seed samples will be taken from seed lots of accepted fields at the final inspections for laboratory testing. Seed lots that do not meet the required quality standards get rejected at the laboratory testing. However, some farmers sell their seeds before sampling mainly due to the economic reasons.

The objective of the present study was to quantify rejections of rice seed production field/seed lots at different stages of the seed certification process in order to make recommendations to minimize these rejections.

METHODOLOGY

The present status of the formal rice seed supply system in Sri Lanka was evaluated using seed certification data of eight consecutive seasons from 2004 to 2007. Data was collected in three stages of the seed certification programme, namely, field registration, final inspection, and lab testing in both *yala* and *maha* seasons in 18 regional units (Fig.1) of the SCS. The data from field registration, final field inspection and seed testing laboratory reports of Seed Certification Service was used for this study. Comparisons were done between registered extent, final inspection, sampled quantity, accepted quantity and rejected quantity in each season / year. Analysis of data was done using Mini-Tab (Version 13-1): considering the data of each year as replications.

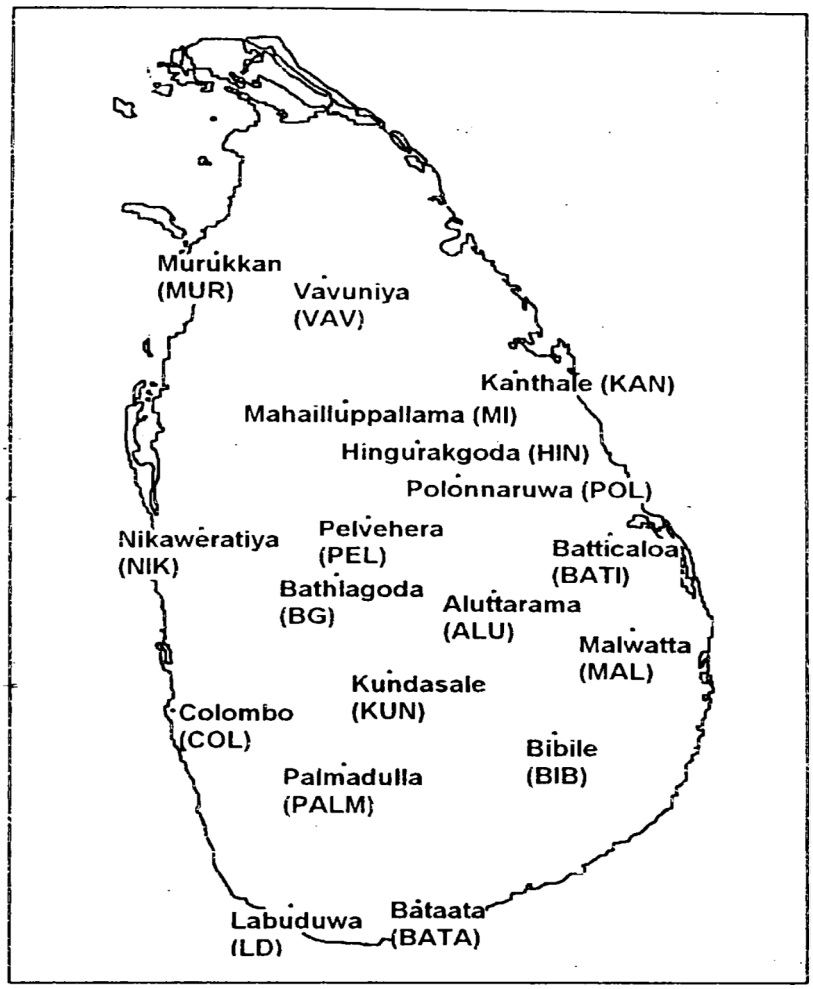


Figure 1. Location of eighteen regional SCS units in Sri Lanka.

RESULTS AND DISCUSSION

Mean registered extent, accepted extent for sampling and reasons for rejection under each region of SCS from 2004-2007 are given in Table 1.

Registered extent

Registered extents across the regional units showed a wide variation, ranging from 6 to 901 ha (Table 1). For convenience of interpreting the results, based upon the magnitude of registered extents, regions could be broadly categorized into three groups as major, moderate and minor seed producing regions. Regions where the registered extent exceed 300 ha were considered as major, where as the extent between 100 – 300 ha as moderate while the extent less than 100 ha as minor seed producing regions. Around 70% of the total registered extent was distributed among five major seed producing regions, while 22% of it was contributed from moderate seed producing regions, and only 8% of the extent from minor seed producing regions. Major and moderate seed producing regions, represented the dry zone where rice is widely cultivated.

Accepted extent for sampling

Only about 80% of the total extent registered across all the regions was accepted for sampling while 14% was rejected due to the failure in fulfilling the basic requirements and 6% due to poor management practices (Table 1). The same trend is shown in the major seed producing regions.

Table 1. Average registered extent (ha), accepted extent for sampling and reasons for rejection during 2004-2007.

Region		*Registered extent (ha)*	*Accepted extent (ha)*	*Reasons for rejection*	
				No basic requirement (ha)	*Poor management (ha)*
Major	POL	901	793	54	54
	MI	898	700	135	63
	MAL	785	683	79	23
	ALU	780	570	194	16
	BATA	400	252	84	64
Sub total		3764 (70%***)	2998 (80%*)	546 (14%*)	220 (6%*)
Moderate	HIN	296	246	20	30
	NIK	294	267	21	6
	KAN	178	169	5	4
	BG	162	120	31	11
	PEL	147	132	12	3
	VAV	135	103	24	8
Sub total		1212 (22%***)	1037 (85%*)	113 (9%*)	62 (5%*)
Minor	BIB	88	79	7	2
	MUR	86	74	7	5
	BATI	77	45	14	18
	KUN	75	44	28	3
	LD	70	44	17	9
	PALM	42	33	3	6
	COL	6	5.6	0.2	0.2
Sub total		444 (8%***)	325 (73%*)	76 (17%*)	43.2 (10%*)
Grand total		5420	4360 (80%**)	735 (14%**)	324.5 (6%**)

*Percentages of each sub total from each registered extent
**Percentages from total registered extent
***Percentage contribution to the total registered extent

Quantity sampled and quantity sold before sampling

Expected quantity is the potential yield relevant to the registered extent. Accepted quantity for sampling is the expected potential yield of the extent accepted in final inspection. There was a significant reduction (Table 2) in accepted quantity for the sampling from expected quantity in major regions while it was not evident in moderate and minor regions. Percentage quantity of seed sampled compared to the total expected seed yield across the eighteen regional units was 46% (Table 3). Quantity sampled in major and moderate seed producing regions were 48% and 45% of the expected quantity respectively. In minor seed producing areas, the sampled quantity was only 33% of the expected. Sampled quantity from final accepted

quantity has significantly reduced at p= 0.05 in all the three regional categories (Table 2). Out of 11837mt of the total accepted quantity from major regions, only 7277mt (61%) of seed paddy has been sampled. Therefore, it was important to identify reasons for not allowing for sampling in major regions, since even 1% reduction would significantly affect seed paddy production in these regions.

Out of the total accepted quantity for sampling, only a certain percentage was reached for laboratory testing due to selling by farmers, before samples drawn for testing by SCS officers. Data revealed that, about 34% of the total expected quantity across all regional units has been sold before sampling. Economic and technical reasons such as early money requirement for settling loans, inability to process the seed as required were identified as some of the important reasons for selling the seeds by farmers before sampling.

Table 2. Mean comparison in each step of seed certification programme.

	Major regions	*Moderate regions*	*Minor regions*
Expected quantity (mt)	3049[a]	819[a]	256[a]
Accepted quantity for sampling (mt)	2067[b]	705[a]	195[a]
Sampled quantity (mt)	1455[c]	370[b]	86[b]
Certified quantity (mt)	993[d]	262[b]	41[b]
$LSD_{0.05}$	182	132	71

Means followed by the same letter in each column are not significantly different at p= 0.05. Data were not analysed among three regional categories

Laboratory testing of sampled quantity

At laboratory testing seed samples were examined for percentage seed germination, weed seeds, moisture, Other Distinguishable Varieties (ODV), pest and other factors. Those that did not meet the acceptable seed quality standards were rejected at laboratory testing. Certified quantity from sampled quantity was significantly reduced in major regions but it was not significant in moderate and minor regions (Table 2). Out of the total expected quantity, 31% was accepted in laboratory testing (Table 3). The lowest level (15%) of laboratory acceptance from expected quantity was recorded in minor regions compared to that of major and moderate regions. The data shows that, about 70% of the sampled quantity was accepted in laboratory testing.

Laboratory rejections in major seed producing regions remained around 15% while it varied from 13% - 19% in moderate and minor regions. About 3.9% of the laboratory rejections were due to high weed seed contaminations, 3.5% each for high moisture and higher percentage of ODV, 1.5% due to pest damage and 2.6% due to other factors (Table 4). The data showed that a higher percentage of sampled quantity was rejected in minor regions due to all the reasons compared to that of major and moderate regions by reflecting their unsuitability for seed paddy production.

Table 3. Average regional data on expected quantity, accepted quantity for sampling, quantity sampled, quantity sold before sampling and quantities accepted and rejected from lab testing during 2004-2007.

Region		*Expected Quantity (mt)*	*Accepted quantity for sampling (mt)*	*Quantity Sampled (mt)*	*Sold before Sampling (mt)*	*Accepted quantity from laboratory testing(mt)*	*Quantity rejected from laboratory testing(mt)*
Major	POL	3652	3208	1797	1412	1278	519
	MI	3640	2823	1337	1486	914	423
	MAL	3180	2768	1884	884	1327	557
	ALU	3158	2154	1628	526	1015	613
	BATA	1617	884	631	253	403	228
Sub total		15247	11837(78%*)	7277(48%*)	4561(30%*)	4937(32%*)	2340(15%*)
Moderate	HIN	1199	1000	599	401	470.8	128.2
	NIK	1189	1068	434	634	272	161.8
	KAN	723	693	531	162	463	68
	BG	656	492	205	286	132.3	73.3
	PEL	596	536	213	323	129	84
	VAV	548	439	241	198	102.4	138.6
Sub total		4911	4228(86%*)	2223(45%*)	2004(41%*)	1569(32%*)	653.9(13%*)
Minor	BIB	357	319	197	122	119.2	77.8
	MUR	350	295	101.3	193.7	46.3	55
	BATI	311	206	152	54	43.6	108.4
	KUN	297	198	79.7	118.3	47	32.7
	LD	285	176	50.5	125.5	13.9	36.6
	PALM	167	144	45	99	17.1	27.9
	COL	14	24	4.2	19.8	0.8	3.4
Sub total		1781	1362(76%*)	629.7(35%*)	732.3(41%*)	287.9(15%*)	341.8(19%*)
Grand total		21939	17427	10130	7298	6794	3335.8
			80%**	46%**	34%**	31%**	15%**

*Percentages of each sub total from each expected quantity

**Percentages of total expected quantity

Table 4. Average regional data on quantitative rejections from lab testing under different reasons during 2004-2007.

Region		*Quantity rejected from laboratory testing (mt)*	*Reasons for rejection*				
			Quantity for Weeds (mt)	*Quantity for Moisture (mt)*	*Quantity for ODV (mt)*	*Quantity for Pest (mt)*	*Quantity for Other (mt)*
Major	POL	519	133	102	110	75	99
	MI	423	129	37	120	12	125
	MAL	557	167	160.6	54.6	93	82
	ALU	613	192	136	214.6	25	45.4
	BATA	228	29	66	75	15	42
Sub total		2340(15.3%*)	650(4.5%**)	501.6(3.2%**)	574.2(3.7%**)	220(1.4%**)	393.4(2.4%**)
Moderate	HIN	128.2	31	42	27	12.7	14.8
	NIK	161.8	32	46.2	34	20.4	29.1
	KAN	68	4.6	39.8	16.8	0.7	6.1
	BG	73.3	13	35.4	5.4	8.7	10.7
	PEL	84	23	16	14.4	12.5	18.3
	VAV	138.6	14.5	14	40	30.5	38.6
Sub total		653.9(13%*)	118(3.1%**)	193.4(4%**)	137.6(2.8%**)	85.5(1.7%**)	117.6(2.4%**)
Minor	BIB	77.8	6.6	11.5	23	8.5	28.5
	MUR	55	18.2	4.6	3.4	12.9	15.9
	BATI	108.4	48.5	6.3	24.6	10	18.8
	KUN	32.7	13.5	15.5	1.3	0.9	1.5
	LD	36.6	5.5	8	14.5	0	8.6
	PALM	27.9	7	17	3	0.5	0.5
	COL	3.4	0.9	0.6	1.9	0	0
Sub total		341.8(18.3%*)	100.2(5.4%**)	63.5(3.5%**)	71.7(4%**)	32.8(1.8%**)	73.8(4%**)
Grand total		3335.7	868.2	758.5	783.5	338	584
		15%***	3.9%***	3.5%***	3.5%***	1.5%***	2.6%***

*Percentage rejection of each expected quantity

**Percentage rejection of each regional sub unit from each expected quantity

***Percentage rejection from total expected quantity

Table 5. Yearly variation of registered extent, expected quantity, accepted quantity for sampling, quantity sampled, quantity accepted and rejected in laboratory testing under each reason.

Year	*Registered extent(ha)*	*Expected quantity (mt)*	*Accepted quantity for sampling (mt)/%*	*Quantity sampled (mt)/%*	*Accepted quantity from laboratory testing (mt)*	*Reasons for rejection (mt)/%*				
						Weeds	*Moisture*	*ODV*	*Pest*	*Other*
2004	5099	20651	16818. (81%)	9967 (48%)	5865 (28%)	563 (2.7%)	1062 (5.2%)	750 (3.6%)	513 (2.5%)	1214 (5.9%)
2005	7003	28362	22733 (80%)	13185 (46%)	9230 (33%)	803 (2.8%)	821 (2.9%)	1293 (4.6%)	505 (1.8%)	532 (1.8%)
2006	5388	21821	17046 (78%)	11080 (51%)	7645 (35%)	1092 (5%)	587 (2.7%)	672 (3.1%)	241 (1.1%)	843 (3.9%)
2007	4252	17221	13864 (37%)	6375 (37%)	4472 (26%)	1022 (5.9%)	89 (0.5%)	396 (2.3%)	96.3 (0.5%)	300 (2.4%)

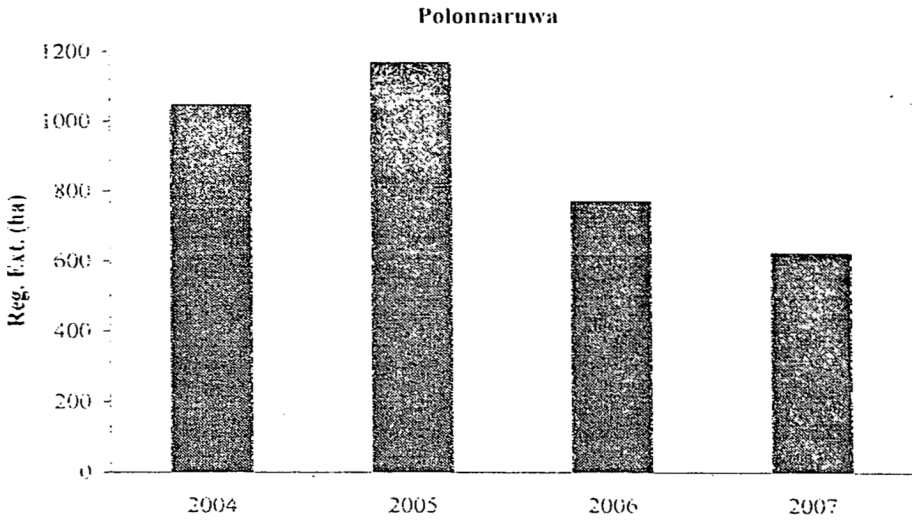
In most of the regions a higher proportion of sampled quantities have been rejected due to weed seeds where as higher percentage of rejection due to ODV was recorded from Aluttarama, Batata, Bibile, Labuduwa, Vavuniya and Colombo. Highest percentage rejection for pest damages was recorded in Vavuniya, Murunkan and Batticaloa.

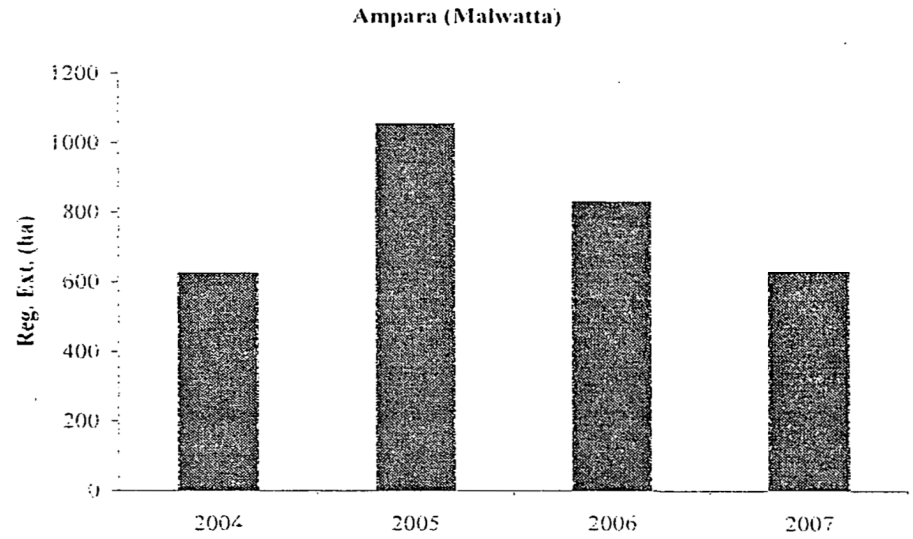
According to the calculations, only about 31% of the total expected quantity of seed paddy was certified. Twenty percent (20%) was rejected at field level and about 34% is sold by farmers before sampling. Fifteen percent was rejected at laboratory testing. However, 34% of the expected quantity that was sold before sampling is also mostly used for seeds and similar to sampled quantity 70% of that quantity will also be suitable for seed if they were tested in the laboratory. Therefore, on an average 31% of the expected quantity gets certified and another 24% (34%x 0.7) will be quality assured seeds.

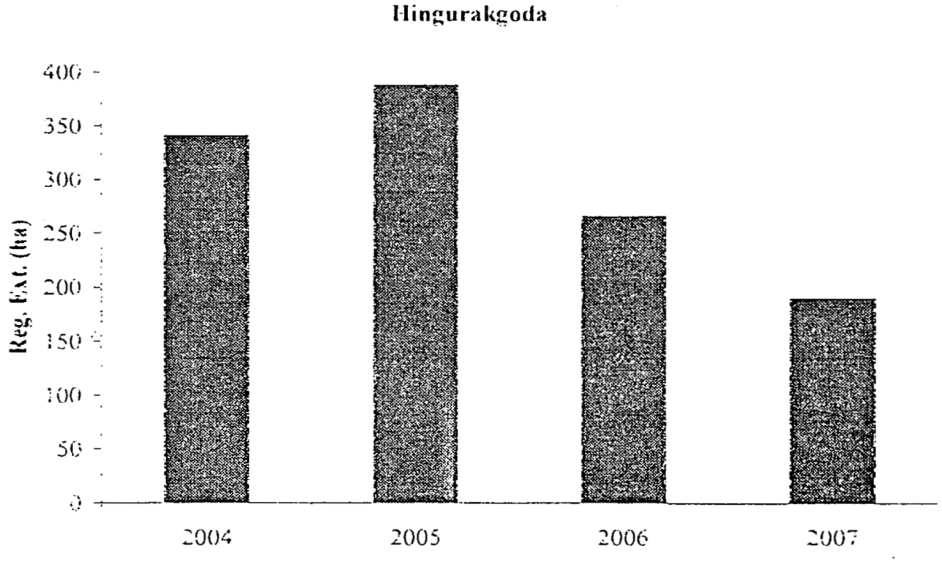
Extent registered for certified seed production and accepted quantities have declined from 2005 – 2007 (Table 5). Highest field registration and certified quantity were reported in 2005. Accepted percentage in field level from expected quantity has remained around 80% in all the years irrespective of the registered extent. Percentage sampled from expected quantity ranged from 37 – 51% whereas percentage acceptance in laboratory testing remained around 30% during 2005-2007. As shown by the data the percentage contribution of different reasons to the total rejection varied highly between years. Rejections due to weed seeds increased from 2.7% in 2004 to 5.9% in 2007. The percentage rejection for moisture and pest damage decreased sharply over the same period. Rejections due to ODV in 4 years showed no specific pattern, but it has remained below 5%.

Variations in registered extent in major seed paddy producing areas from 2004 -2007 are given in Figure 2.

In all the seed paddy producing areas, registered extents have increased from 2004 -2005, followed by a declining trend (Table 5). There was about 40% reduction in the registered extent of Polonnaruwa and Malwatta (Ampara) regions in 2007 compared to that of the year 2005 (Fig.2). Those regions are in high potential areas for seed paddy production and therefore, such reduction in the extents may drastically reduce the seed paddy production in the country. Therefore, it is important to pay special attention to identify the reasons for the reduction in extent of those regions.


Polonnaruwa
Reg. Ext. (ha)
1200
1000
800
600
400
200
0
2004
2005
2006
2007


Ampara (Malwatta)
Reg. Ext. (ha)
1200
1000
800
600
400
200
0
2004
2005
2006
2007


Hingurakgoda
Reg. Ext. (ha)
400
350
300
250
200
150
100
50
0
2004
2005
2006
2007

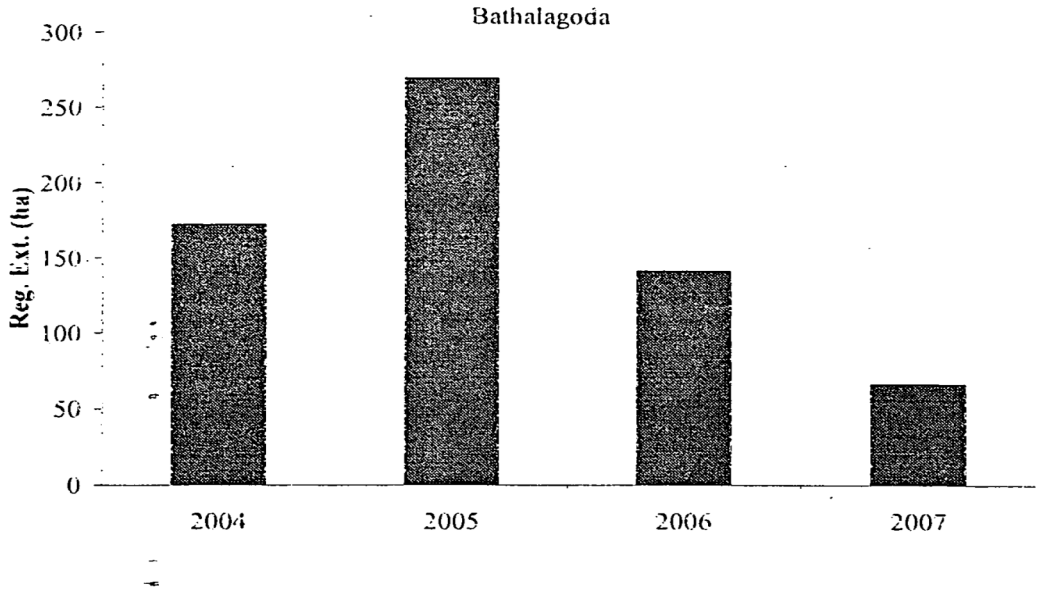


Figure 2. Regional data on registered extent (ha) during 2004-2007.

Rejections due to weeds in major seed paddy producing regions have progressively increased from year 2004-2007(Fig. 3).

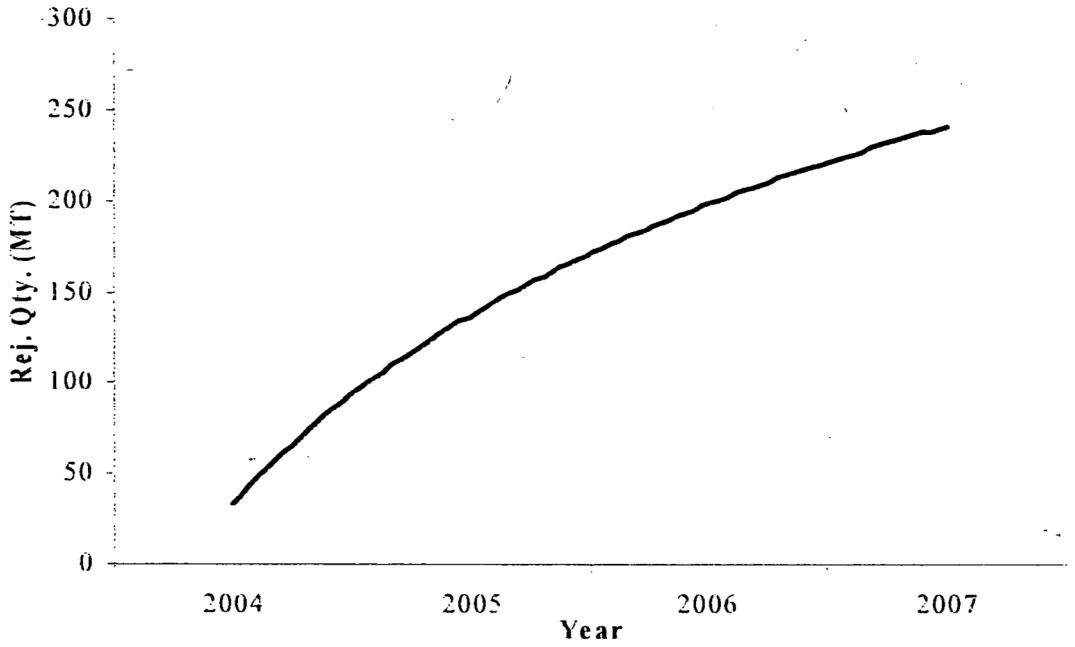


Figure 3. Change in rejection quantities for weeds in major seed paddy producing regions in Sri Lanka from 2004 – 2007 (LSD $_{0.05}$ = 84 between years).

The rejected quantity for weed in major regions (ALU, MI, POL) has increased significantly from 2004 – 2007. Therefore, it is clear that the major seed paddy producing areas are under the risk of increased weed seed contamination, affecting the final seed quality. Future research should be focused on this issue.

Rejection due to weed seeds varies from season to season. Percentage rejections due to weed seeds in *yala* and *maha* seasons during the year 2004-2007 are presented in Figure 4.

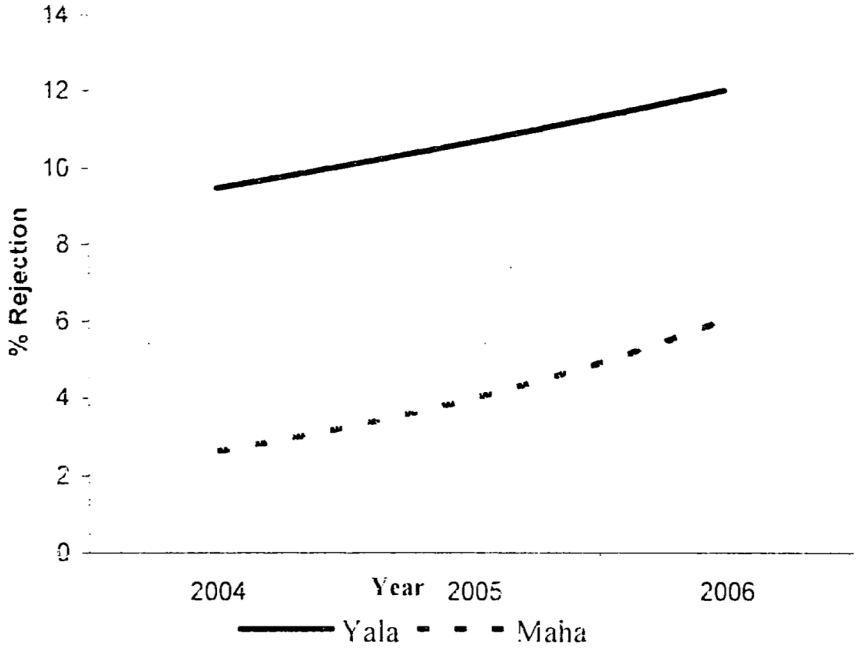


Figure 4. Percentage rejections for weeds from sampled quantity in *yala* and *maha* seasons during 2004-2006 (LSD $_{0.05}$ = 2.1 between years).

A higher percentage of rejections due to weed was recorded in *yala* season compared to that of *maha* season. The reason for this may be due to the water stress that leads to higher weed growth in *yala* season. An increasing trend for rejection due to weeds was observed in both the seasons. However, it was more distinct in *yala* season. This increasing trend in rejection due to weeds during both seasons may be a severe problem in future seed paddy production programmes. Amarasingha *et al.* (1998) showed that weeds could reduce seed yield by about 20-30%. Thus, emphasis should be made to address this situation.

CONCLUSIONS

Fifty four percent of the total expected quantity is available as quality assured seed which is only 12.5% of the total paddy requirement of the country.

There is a great potential to increase the supply of seed paddy without increasing the registered extent by minimizing rejections at different stages of the seed certification programme.

Laboratory rejections could be avoided by adapting recommended crop management practices and also by following instructions given by the seed certification officers. This would be better achieved by motivating relevant extension staff by incentives or by monitoring the progress

of certification programme in their area in the progress evaluation. This also helps to increase certified seed supply by 25 %. Number of farmers who are rejected at the beginning for not fulfilling the basic requirements could be minimized by proper farmer selection. Assistant Director of Agriculture (Seed division) should issue registered seeds for seed production only to those farmers who are recommended by SCS officers and/or extension staff. This will help to increase the quality seed supply further by 20%.

Therefore, at least 25% of the total seed paddy requirement of the country could be produced as quality certified / assured without increasing the extent.

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