

# IMPROVING POTATO YIELDS IN THE UPPER UVA REGION POST-RICE ENVIRONMENTS

S.K. THARMARAJAH<sup>1</sup>, R.J.K.N. KULARATNE<sup>1</sup>  
and K.K.S. FERNANDO<sup>2</sup>

Regional Agricultural Research and Development Centre  
Bandarawela

Potato (*Solanum tuberosum* L.) is a high-value crop grown during *yala* season in the upper Uva region (Bandarawela, Welimada and Uva Paranagama Divisional Secretariat areas) post-rice environments. This crop fits well into the existing rice-based cropping systems of the region. The average tuber yield range under normal conditions in the post-rice fields during *yala* season is 12-14t/ha. However, low tuber yields were reported ranging from 4 to 6 t/ha during *yala* 1994. Several reasons were attributed to the yield decline. These included unfavourable weather conditions (Table 1), moisture stress, improper crop management, poor seed quality, unexpected pest/disease outbreak, etc., On-farm testing was conducted in the target areas to ascertain yield decline causes and to demonstrate strategies for improving potato yields during *yala* season.

## MATERIALS AND METHODS

On-farm testing was carried out in 12 farmer fields in six AI - ranges of the upper Uva region post-rice environments (Table 2) during *yala* 1996. The sites were selected with the concurrence of Uva provincial extension staff. Soil samples were collected from each test site to determine pH. The pH was adjusted using lime at the rate of 2 t/ha before the commencement of the testing where pH was less than 5.4. The treatments consisted of Farmer management (check) and Department of Agriculture (DOA) management packages as described in Table 3. Two plots were established at each location, one for testing DOA management and other for Farmer management packages. The plot size was 6m x 2m. The treatments were replicated over sites. The crop was planted in July 1996 and harvested in September 1996. The number of stems per hill and plant height were recorded at 6 weeks after planting (6WAP). Whole plots were harvested and per ha yield was estimated.

1 Reaserch Officer  
2 Deputy Director (Research)

## RESULTS AND DISCUSSION

The weather data of *yala* 1994 and *yala* 1996 for Bandarawela and Rahangala are presented in Table 1. The rainfall during the cropping months of June, July and August of 1994 was less than that during the corresponding months of 1996 at both Bandarawela and Rahangala. The soil temperatures at 30 cm depth during the months of May, June, July, August and September in 1994 at Bandarawela and during July, August and September in 1994 at Rahangala were higher than that during the corresponding months of 1996 at Bandarawela and Rahangala, respectively. Hence, low rainfall and high soil temperatures during *Yala* 1994 compared with that during *yala* 1996 among other factors, may have contributed to potato yield decline during *yala* 1994 in the upper Uva region. The weather conditions throughout the cropping season during *yala* 1996 were fairly favourable in the upper Uva region.

The plant height and number of stems per hill at 6 weeks after planting and tuber yield per hectare under DOA management are significantly higher than that under Farmer management system (Table 4). Approximately 30% tuber yield increase was obtained under DOA management system compared to Farmer management system. The

yield increase could be attributed to better crop growth and higher number of stems per hill (Table 4) under DOA management system. Further, even with lower amounts of fertilizer application under DOA management (0.95 kg/12m<sup>2</sup>) compared with that under Farmer management (5kg/12m<sup>2</sup>), higher yields were recorded under DOA management. It is therefore, uneconomical for the farmer to apply higher dose of fertilizer than that is recommended by the DOA.

The net returns under DOA management and farmer management systems were Rs. 202,500/= and Rs. 60,300/=, respectively, indicating an approximate 3-fold increase of net returns under DOA management (Table 5).

## CONCLUSION

It appears that one of the reasons for potato tuber yield decline in the upper Uva region post-rice environments during *yala* 1994 was unfavourable weather conditions that prevailed during the season. The yield levels were restored during *yala* 1996 with weather improvement. However, the yield during *yala* 1996 was further enhanced approximately by 30% under DOA management compared with that under Farmer management system. It was also possible to reduce production cost and increase net return under DOA management systems.

Table 1: Weather data for upper Uva region *yala* 1994 and *yala* 1996.

a. *Bandarawela*

Month	Air temperature (°C)				Rainfall (mm)	Soil temperature at 30 cm depth (°C)		
	Maximum		Minimum			1994	1996	1994
	1994	1996	1994	1996	1994	1996	1994	
1996								
May	27.3	28.2	16.9	16.3	121.8	26.0	24.5	24.4
June	27.4	26.1	16.1	17.8	5.5	88.4	24.2	23.4
July	26.5	25.5	16.8	17.2	39.6	59.1	24.1	23.0
August	26.6	26.5	15.5	15.6	43.3	86.1	23.8	23.5
Sept.	25.8	25.8	16.0	16.2	354.5	119.0	23.5	23.1

Source - Regional agricultural research & development centre,  
Bandarawela

b. *Rahangala*

Month	Air temperature (°C)				Rainfall (mm)	Soil temperature at 30 cm depth (°C)		
	Maximum		Minimum			1994	1996	1994
	1994	1996	1994	1996	1994	1996	1994	
1996								
May	25.2	25.9	14.7	14.1	53.0	6.0	23.1	25.4
June	25.1	24.2	na	17.1	5.5	91.0	23.6	24.0
July	24.2	23.0	na	17.8	30.5	71.0	25.3	22.4
August	25.0	23.4	na	16.4	30.5	225.5	23.2	22.7
Sept.	24.7	23.1	na	17.4	198.5	55.0	23.5	22.7

na- Data not available

Source- Agricultural research station, Rahangala

Table 2: On-farm testing sites in the upper Uva region post - rice environments

Farmer Name	Location	Soil pH	AI-range
H.P. Wijeratne*	Heennarangolla, Boralanda	5.0	Boralanda
G.D. Ukkupina*	Kirinda, Thannakumbura, Boralanda	5.2	Boralanda
M. Wickramasinghe* Bogahakumbura	Jdubadena, Keppetipola	5.0	
P.B. Ratnayake*	Nugathalawa, Keppetipola	5.2	Keppetipola
E.M. Punchirala	Nugathalawa, Keppetipola	5.4	Keppetipola
M. Samarakoon* Ambagasdowa	'Sanasuma', Madawela, Udukinda	5.2	
N. Premasinghe Ambagasdowa	Wakkumbura, Katagoda, Madawela, Udukinda	5.4	
A.J.M. Kalubanda* Uvaparanagama	Moodanawa, Uvaparanagama	5.2	
V.W.M. Chandrasena	Mahagedera Beheth Shalawa, Kahatathalawa, Welimada	5.7	Welimada
N.P. Piyasena	Puwakahalanth, Bowela, Welimada	5.4	Welimada
W.M. Gunapala Dambawinna	'Priyankara', Annasiwaththa Kotakitulgama, Mirahawatha	5.6	
R.M. Podibanda	Mulatharawa, Dambawinna, Welimada	5.5	Welimada

\* pH adjusted with lime application at the rate of 2 t/ha

**Table 3: Farmer management and DOA management practices**

<b>Package of practices Management</b>	<b>DOA Management</b>	<b>Farmer</b>
1. Soil test	pH tested & corrected using lime at the rate of 2 t/ha	pH not corrected
2. Seed (cv.Desiree)	Certified seed from DOA farm	Farmers seed-Own seed'
3. Planting space	DOA recommendation (60 cm x 25 cm)	Farmer practice (45 cm x 30 cm)
4. Seed rate	2.25 t/ha	2.5 t/ha
5. Farmyard manure	Applied at the rate of 10 t/ha	Not applied
6. Chemical fertilizer	DOA recommendation (straight fertilizer at the rate of 950 g/12 m <sup>2</sup> )	Commercial fertilizer mixture at the rate of 5 kg/12 m <sup>2</sup>
7. Mulch	Mulched with rice straw (5 t/ha)	Unmulched
8. Pest/disease management	DOA recommendation	Farmer management

**Table 4: Number of stems per hill, plant height (6 WAP) and tuber yield under DOA management and Farmer management systems in the upper Uva region post-rice environment during *yala* 1996.**

Farmer name	Farmer management			DOA management		
	No. of stem per hill	Plant height (cm)	Yield (t/ha)	No. of stem per hill	Plant height (cm)	Yield (t/ha)
H.P. Wijerathna	4.4	16	14.7	6.8	38.52	20.79
G.D. Ukkupina	2.2	16.1	na	3.4	30.5	na
M. Wickramasinghe	2.6	22.6	17.96	5.4	42.08	23.7
P.B. Ratnayake	4.4	22.8	13.08	7.4	30.2	22.75
E.M. Punchirala	2.2	14.5	na	4.2	28.5	na
M. Samarakoon	4.8	17.6	11.78	4.0	22.3	10.49
N. Premasinghe	3.4	18.9	13.92	4.6	29.0	19.67
A.J.M. Kalubanda	4.2	30.7	12.92	5.2	53.4	15.75
V.W.M. Chandrasena	4.4	19.4	10.54	5.2	23.5	16.83
N.P. Piyasena	3.4	16.0	11.08	5.2	29.4	12.38
W.M. Gunapala	3.4	21.2	8.75	6.4	36.9	11.17
R.M. Podibanda	2.2	24.3	9.5	3.0	52.6	13.67
Mean	3.47	20	12.42	5.07	34.74	16.12

na - Data not available

Note:-

1. Refer Table 2 for location/site details
2. Tuber yields at two locations were not recorded owing to theft and hence the results of only 10 locations were analysed statistically using the t-test procedure.

Significance Test -  $P=0.05$

a. *Number of stem per hill*

Table t-value (d.f.-11) = 2.201

Calculated t-value (d.f.-11) of 4.94 is greater than 2.201

b. *Plant height*

Table t-value (d.f.-11) = 2.201

Calculated t-value (d.f.-11) of 6.79 is greater than 2.201

c. *Tuber yield*

Table t-value (d.f.-09) = 2.262

Calculated t-value (d.f.-09) of 2.96 is greater than 2.262

**Table 5: Potato production cost and return under DOA and farmer management systems in the upper Uva region post-rice fields**

**A. Production costs (Rs/ha)**

	DOA Management	Farmer Management
Seed tubers	135,000	150,000
	(2.25t/ha - @60 Rs./kg)	(2.5t/ha - @ 60 Rs/kg)
Fertilizer	30,500	41,700
Agro-chemicals	20,000	25,000
Labour (600 man days)	90,000	90,000
Other costs	5,000	5,000
<b>Total cost</b>	<b>280,500</b>	<b>311,700</b>

**B. Net returns (Rs/ha)**

Yield	16.1 t/ha	12.4 t/ha
Price*	Rs. 30/kg	Rs. 30/kg
Gross income (Rs/ha)	483,000	372,000
<b>Net return (Rs/ha)</b>	<b>202,500</b>	<b>60,300</b>

\* Producer price at the harvesting time (September, 1996)