Indian Journal of Hill Farming 27(1):149-152 Available online at www.kiran.nic.in

Soil Test-Based Nutrient Management on Garden Pea (var. Arkel) under Paddy-Pea Cropping Sequence at Wokha District in Nagaland

S. K. RAY

Received - 2.6.14, Revised 30.6.14. Accepted 30.6.14

ABSTRACT

A frontline demonstration on soil test based nutrient management (STBNM) on garden pea was carried out during the post kharif season in 2013 at six villages in Wokha District in Nagaland. The average green pod yield of nutrient management plots for pea were 3.95 to 5.53 t ha^{-1} and yield increased by 49.11 to 63.65% as compared with farmers practice/control plots. The nutrient management plots also gave higher gross returns (Rs/- 47,436.00 to Rs/- 66,396.00) and net returns (Rs/-21,836.00 to 40,496.00) compared to the farmers practice plots which gave Rs/-24,120.00 and Rs/-9,120.00, respectively.

Key words: Frontline demonstration, Net returns, Soil test, Yield attributes

INTRODUCTION

Soil acidity and poor nutrient management are the major constraints of optimum pea production in Wokha district of Nagaland. Nutrients application trend in this district is very poor and farmers are generally inclined in favour of nitrogenous fertilizers, particularly urea, as because of its visible influence on crop growth, with rare or no use of other primary, secondary and micronutrients. Legume crops such as pea are sensitive to soil acidity and liming is the only option for increasing yield in such soil conditions (Gupta et al. 2000). Garden pea also respond positively to application of primary nutrients take up N, P_2O_5 and K_2O in the ratio 1.00:0.23:0.53 to produce one ton green pod (Verma, 2005). Keeping this in mind it is assumed that the balance nutrients supplement through soil test based nutrient management might be the only possible way to improve soil fertility status and productivity of pea. Hence the present study was undertaken to assess the effect of soil test based nutrient management on yield, yield attributes and net returns for garden pea.

MATERIALS AND METHODS

A frontline demonstration on garden pea was conducted at six villages under rice-pea cropping sequence at Wokha district in Nagaland during the post kharif season in the year, 2013 (Table 1). The demonstrated area falls under sub tropical hill zone, having annual rainfall ranging from 170 to 210 cm, spreading through 107 to115 numbers of rainy days, mean daily sunshine hour 4.18 during monsoon and to 8.25 hour during winter, relative humidity 30.58 to 96.26 percent and day-night temperature were 14.97 to 26.70^{0}C and 14.14 to 24.31^{0}C respectively. The demonstrations were carried out with three replications for each village and the sowing was done during the month of September, 2013. Nutrients were applied according to the initial soil test results and interpretation (low, medium, high) and the doses of primary (NPK) nutrients were calculated by using fertilizer recommendation guide, 2005 (FRG 2005). The full doses of N, P and K were applied at the time of sowing and lime in recommended dose was applied 15 days ahead of sowing. Green pod was harvested at 98 days after

ICAR Research Complex for NEH Region, Nagaland Centre, Post Box no-137, KVK, Wokha, Nagaland, 797111,
*Corresponding author's E-mail: dr.sanjakumarray@yahoo.in

sowing. Yield and yield attribute data were taken from five randomly selected plots located at six different sites of the demonstrated area. The surface soil samples (0-15 cm) were collected from the plots before sowing and the composite soil samples were used for initial soil nutrient status. pH and electrical conductivity of the soil was measured in water using soil: water ratio of 1:2.5. Soil texture, available nitrogen, phosphorus and potassium were determined following standard procedures (Page et al. 1982). Lime requirement was determined by New Woodruff's method (Brown and Cisco 1984). The statistical analysis of the demonstration data were carried out by the Indostat (Version - 13).

RESULTS AND DISCUSSION

Soil properties

The textural classes of the soil samples of the demonstrated area under study were sandy loam, loam, sandy clay loam, clay loam and sandy clay (Table 1). All the soil samples of six different villages were acidic in nature, with pH ranging from 3.46 to 5.18. Electrical conductivity of the soils ranged from 0.11 to 0.23 dSm^{-1}. The organic carbon content ranged from 1.95 to 3.562 %. The available nitrogen, phosphorus and potassium content ranged from 141.12 to 400.12, 9.51 to 25.22 and 175.53 to 434.11 kg ha^{-1} respectively (Table 2).

Yield of pea

The green pod yield of garden pea showed that the yield of pea (var. Arkel) increased significantly after application of lime and nutrients through soil test for all the demonstrated villages, as compared to the control plots (Fig. 1) but the highest green pod yield (5.53 t ha^{-1}) was obtained from wokha village follow by humtso village (5.05 t ha^{-1}), new wokha village (4.93 t ha^{-1}), Longsachung village (4.52 t ha^{-1}) Chukitong village (4.21 t ha^{-1}) and Koio village (3.95 t ha^{-1}) of the district. Similar results on green pod yield advantage on lime application were reported by Uwah et al. (2010). An increase in yield pattern was observed due to soil test based nutrient management over the farmers practice/ control plots. The highest yield increase (63.65%) was obtained at Wokha village and the lowest yield increase (49.11%) was observed at Koio village (Fig 2) as compared to control plots at different villages.

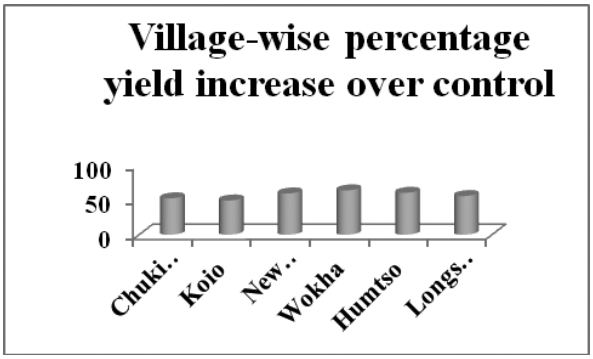

Table 1: Location and soil textural class of the demonstrated area under study

Village name	Location of demonstration			Percentage (%)			Textural class
	Latitude	Longitude	Elevation (m)	Sand	Silt	Clay	
Chukitong	26°07,022'N	094°19,452' E	1122	55.30	17.00	27.70	Sandy clay loam
Koio	26°07,531'N	094°18,390' E	1181	53.30	16.00	30.70	Sandy clay
New Wokha	26°07,216'N	094°17,312' E	1239	42.53	36.00	21.47	Clay Loam
Wokha	26°06,649'N	094°15,543' E	1450	66.68	26.00	13.32	Sandy loam
Humtso	26°06,599'N	094°12,755' E	667	30.88	40.00	29.12	Clay loam
Longsachung	26°01,589'N	094°15,428' E	1298	42.00	38.54	19.46	Loamy

Table 2: Soil properties and initial soil status of the demonstrated area under study

Village name	Soil properties and initial nutrients status					
	pH	EC (dSm^{-1})	OC (%)	Available N(kg ha^{-1})	Available P_2O_5 (kg ha^{-1})	Available K_2O (kg ha^{-1})
Chukitong	3.56	0.154	2.001	141.12	19.88	282.24
Koio	4.30	0.229	2.119	153.42	9.51	175.53
New Wokha	5.01	0.230	2.100	178.25	16.50	180.10
Wokha	3.46	0.138	3.562	400.12	25.22	309.12
Humtso	4.22	0.110	1.950	178.75	24.01	434.11
Longsa-chung	5.18	0.195	2.463	194.43	17.45	286.27

Relationship between yield and yield attributes of pea

A positive significant relationship was obtained between dry matter accumulations and yield (Fig. 2a) and also between plant height and yield (Fig. 2b) which showed that the yield of garden pea was dependent on dry matter and plant height. Number of pods per plant (Fig. 2c), pod length (Fig. 2d), number of grains per pod (Fig. 2e) and thousand green grains weight (Fig. 2f) had significant positive correlation with yield which also indicates that high value of yield attributes for garden pea are richer in higher pod yield.

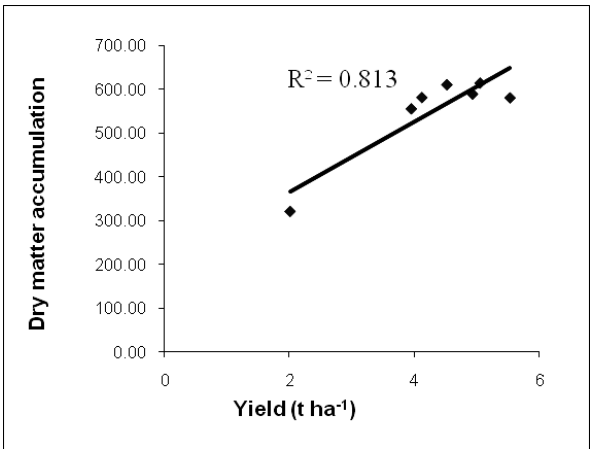

Fig. 2a: Dry matter accumulation influencing yield of pea

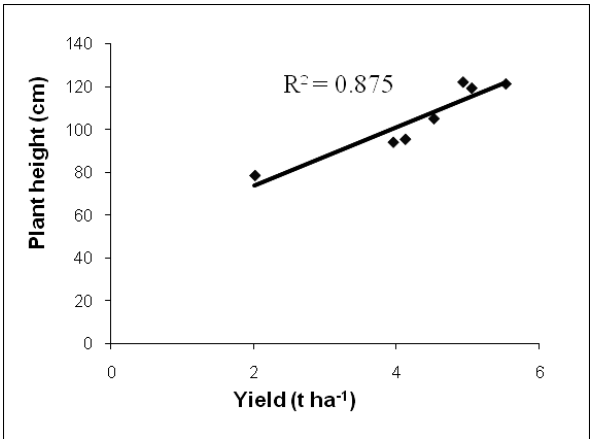

Fig. 2b: Plant height influencing yield of pea

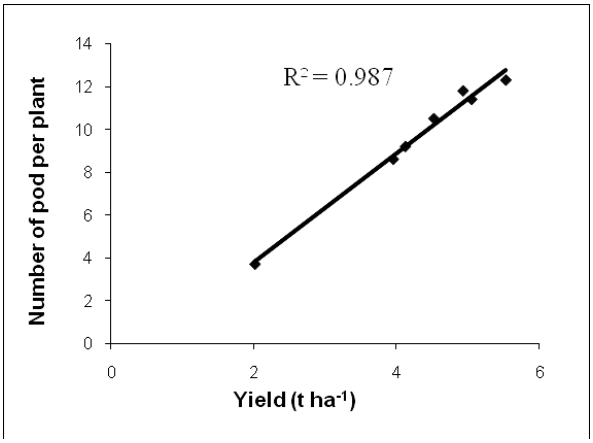

Fig. 2c: Number of pods per plant influencing yield of pea

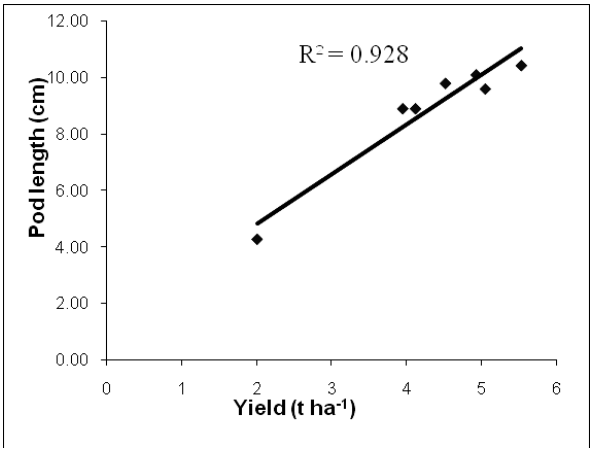

Fig. 2d: Pod length influencing yield of garden pea

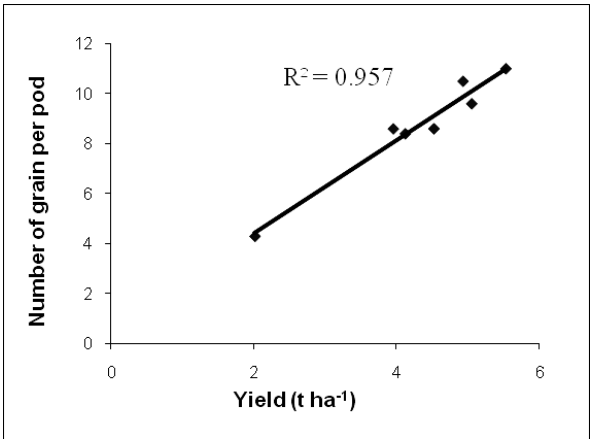

Fig. 2e: Number of grain per pod influencing yield of pea

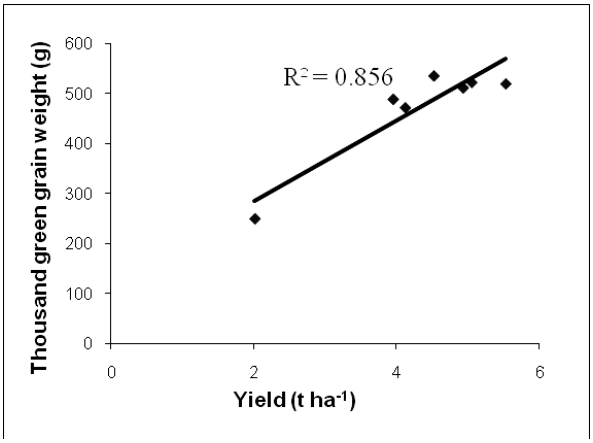

Fig. 2f: Thousand green grains weight influencing yield of pea

Cost of cultivation, gross return and net return from garden pea

The economics of garden pea production revealed that gross returns and net returns followed a similar trend. The cost of cultivation includes cost on seeds, lime and fertilizers (Table 3). The lime and fertilizers was applied at demonstrated area through soil test based and the input requirement differed from one village to another village due to the differences in initial nutrients status and, which finally varied the cost of cultivation for different villages. Cost of cultivation at the demonstrated area varied from Rs. 15,000/- (control) to Rs. 26,200/- (Chukitong village). The gross returns at the demonstration area was highest at Wokha village (Rs. 66,396/-) and lowest at control plots (Rs. 24,120/-). The net returns for the demonstrated area were also maximum at Wokha village (Rs. 40,496/-) and lowest at Koio (Rs. 21,836/-) village. The net returns for farmers practice area was Rs. 9,120/-.

Table 3: Productivity, gross return, cost of cultivation and net return from garden pea

Village	Productivity (q ha^{-1})	Gross return ha^{-1}(Rs/-)	Cost of cultivation ha^{-1} (Rs/-)	Net return ha^{-1} (Rs/-)
Chukitong	42.12	50,544.00	26,200.00	24,344.00
Koio	39.53	47,436.00	25,600.00	21,836.00
New Wokha	49.26	59,112.00	23,700.00	35,412.00
Wokha	55.33	66,396.00	25,900.00	40,496.00
Humtso	50.50	60,600.00	24,500.00	36,100.00
Longsachung	45.21	54,252.00	23,100.00	31,152.00
Control	20.10	24,120.00	15,000.00	9,120.00

CONCLUSION

It was apparent that soil test based nutrient management on garden pea under rice-pea cropping sequence was found economically profitable and agronomically viable in terms of yield, yield attributes and returns for wokha district in Nagaland.

ACKNOWLEDGEMENT

Author would like to express his special thanks to the Joint Director, ICAR Research Complex NEH Region, Nagaland Centre, Jharnapani, Medziphema, Nagaland-797106, for providing the soil laboratory facility to carry out this research work.

REFERENCES

Brown JR, Cisco JR(1984). An improved Woodruff buffer for estimation of lime requirement. Soil Sci Soc America J 48: 587-592.

Gupta CR, Sengar SS, Singh J (2000). Growth and yield of table pea (*Pisum sativum* L.) as influenced by levels of phosphorus and lime in acidic soil. Vegetable Sci 27(1): 101-102.

Page AL, Miller RA, Keenay DR (1982). 'Methods of soil analysis. Part 2: Chemical and Microbiological properties' (Soil Science Society of America Inc., Madison, USA).

Uwah DF, Nwagwa FA Lwo GA (2010). Response of okra (*Abelmoschus esculutus* L) moench) to different rates of nitrogen and lime on an acid soil. Int J Agril Sci 2 (2): 14-20.

Verma ML (2005). Effect of water conservation practices on root growth, yield, nutrient removal and quality of pea and tomato. J Indian Soc Soil Sci 53(4): 602-607.