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*Review article*

# A CRITICAL REVIEW ON THE INFLUENCE OF PHOSPHORUS ON AVAILABLE NUTRIENT STATUS OF SOIL IN SUNFLOWER-GROUNDNUT CROP SEQUENCE

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The fertilizer need of a crop in a given cropping system is mainly a function of preceding crop characteristics and kind and quantities of manure and fertilizers applied. For example, inclusion of legumes in a cropping system helps in improving soil fertility resulting in higher yield of the succeeding crop (s) compared to preceding exhaustive cereal or other non-legume crops [1]. Since fertilizers do have residual and cumulative effects, its recommendation for individual crops will also have some effect on the succeeding crop grown in a sequential cropping system. Though the sequential cropping system is an old and established agronomic practice, the interest for working out fertilizer recommendations on cropping system basis was generated only during last decade. Though the subject is still in its infancy, some of the important recommendations regarding fertilizer use on cropping system basis are being highlighted hereunder. Phosphorus application unlike nitrogen known to benefit the growth and productivity of more than one crop in rotation. In quantitative terms, this residual effect of P depends on the rate and frequency of P application, type of soil, type of P carrier, intensity and productivity of the cropping system (hence P removal). Estimation of residual effect and crop yields it can support, are the corner stone's of P-management on cropping system basis. In double cropping on an average, the rotational response to a single P application is made up of about 60% direct and 40% residual. Residual P contributes more to crop nutrition when the crop feeding on the P residues is taken in the warm, wet *kharif* season as compared to the cooler *rabi* season [2]. In wheat-groundnut, maize-groundnut and mustard-groundnut cropping system, the groundnut crop was observed to thrive on residual effect [3]. Sunflower based cropping system studies conducted at Hyderabad, India revealed that groundnut and castor are efficient in utilizing the residual fertility from preceding sunflower crop [4, 5]. Likewise, if sesame or sunflower succeeds potato crop, there was no need to apply fertilizer to these crops [15]. Among the various sunflower based cropping systems, sunflower-groundnut sequence was found to be most productive and remunerative besides being efficient in utilizing the residual fertility from preceding sunflower field. This system was shown to impart greater sustainability on a long term basis, even meeting the fodder needs and improving the soil fertility with optimum utilization of resources under alfisols of semi arid tropics [4]. Field experiments were conducted by Rai and Sinha [7] to study phosphorus fertilization to base crops, wheat and pea, and its residual effect on unfertilized cowpea, groundnut, green gram and maize. The results revealed that wheat and pea showed marked response to phosphorus ranging from 0 to 90 Kg $P_2O_5$ $ha^{-1}$. The residual effect of phosphorus was more prominent on cowpea, groundnut, green gram than maize after pea compared to that after wheat. Application of nutrients in excess results in their reduced use efficiency [8, 9]. This is more accountable in sequential cropping systems.

## Monetary Returns

Evaluation of intensive cropping system is multidimensional and preponderantly is directed by cost investment and returns besides optimum utilization of land, labour and capital. It is not only the production that has to be considered but the concept of agri-business has to be applied for evaluating different cropping systems for the farmers to make the choice. Gross returns, net returns and net returns per rupee invested of different cropping systems were compared at Tirupati, India [10]. Sunflower-groundnut-rice system gave the maximum gross and net returns, whereas finger millet-maize-groundnut recorded least returns.

The highest return in sunflower-groundnut-rice system was due to tow oilseed crops (high market price) in *kharif* and *rabi* and rice crop in summer season. Among the various summer sunflower based cropping systems tried at Hyderabad, India, sunflower-groundnut system was found most productive as well as remunerative in terms of net monetary returns (Rs. 23,391). Sorghum, pigeonpea and sunflower as succeeding crops could not yield high at the higher residual fertility from sunflower [10].

## Available nutrient status of the soil

Continuous cropping of cereal resulted in decrease of soil nitrogen [11]. On the other hand, there was build up of N and $P_2O_5$ with the inclusion of legumes in cropping system. The superiority in building up of soil available nitrogen and phosphorus was in the order of cropping patterns having all legumes > legumes+cereals > all cereals [12]. The cropping systems having all the pulse crops (blackgram - lentil - greengram) recorded maximum soil available N and P. On the other hand, cropping systems having all the cereal crops (maize-wheat-pearlmillet) resulted in the lowest soil available N and P and cropping systems with legume crops also recorded higher soil available N and P in that order as compared to cropping systems with cereals only. On sandy loam soils of Andhra Pradesh the crop sequences maize-groundnut, maize-green gram and maize-pigeon pea improved the nutrient status of the soil after crop harvesting, whereas crop sequences maize-maize, maize-sunflower, maize-Indian mustard showed depletion of nutrients in the soil [13] Contrary to this, [14] reported no influence of different cropping systems on available phosphorus, potash in the soil.

At Ludhiana, India, the available P and K was maximum in maize - pearlmillet-potato sequence as compared to the initial status and there was slight increase in P and K in maize - pigeopea, maize - maize + cowpea (fodder) - toria, sequence [15].

## REFERENCES

[1] Singh, R. P. and Venkateswarlu, J. 1985. Role of All India Coordinated Project for Dryland Agricultural Research Development. Fertilizer News. 30: 43-55.

[2] Tandon, H. L. S. 1987. Phosphorus research and agriculture production in India. Fertilizer development and consultation organization. New Delhi pp. 142-154.

[3] Mishra, C.M. and Vyas, M. D. 1992. Response of groundnut-wheat-cropping sequences to fertilizer application. Indian Journal of Agronomy.39 (3): 440-443.

[4] Reddy, B. N. and Babu, S. N. 1996.Production potential, land utilization and economics of fertilizer management in summer sunflower based crop sequences. Indian Journal of Agricultural Sciences.66 (1):16-19.

[5] Pasricha, N. S., Aulakh, M. L., Bahl, G. S. and Buddesha, H. S. 1987. Nutritional requirement of oilseeds and pulse crops in Punjab. Tech.Bull. Punjab Agricultural University, Ludhiana Pp.30.

[6] Sidhu, M. S., Sahota, T. S., Sharma, B. D. and Sawhney, J. S. 1991. Nitrogen and Phosphorus requirements of sunflower as affected by different cropping systems and agronomic practices. Fertilizer News. 26: 35-38.

[7] Rai, R. K. and Sinha, M. N. 1993 Studies on phosphorus management in wheat/pea-cowpea/ groundnut/green gram/maize sequence. Ann.Agric.Res. 14 (1):90-94.

[8] Huggins, D. R., Pan, W. L. and Smith, J. L. 1989. Improving yield, per cent protein and N use efficiency of no-till hard red spring wheat through crop rotation and fall N fertilization (in) Proceeding of Annual far west Regional fertilizer conference, Coeurd'Alene pp.51-61.

[9] Fiez, T. E., Miller, B. C. and Pan, W. L. 1994. Assessment of spatially variable nitrogen fertilizer management in winter wheat .Journal of Production Agriculture. 7: 86-94.

[10] Reddy, P. S. and Soundararajan, M. S. 1994.Evaluation of economic parameters in groundnut based cropping systems. Farming systems. 10(3 &4): 9-19.

[11] Patil, B. P., Jadhav, S. N. and Khade, V. N. 1991. Studies on integrated nitrogen management with Glyricidia maculata green manuring in rice-groundnut sequence on lateritic soil of Konkan. Journal of Indian Society of Coastal Agricultural Research.9 (1):193-196.

[12] Thakur, H.C. and Sharma, N. N. 1990. Dynamics of available soil nitrogen, phosphorus and potassium under different cropping patterns. Journal of Research, Rajendra Agricultural University. 8(1&2):6-12.
[13] Srinivas, A and Raju, M. S. 1996. Rainy season maize-based cropping systems in Andhra Pradesh. Indian Journal of Agronomy 43(4):576-579.
[14] Balyan, J. S. 1997.Production potential and nitrogen uptake by succeeding wheat under different cropping sequences. Indian Journal of Agronomy 42(2):250-252.
[15] Sidhu, M. S., Sahota, T. S., Sharma, B. D. and Sawhney, J. S. 1991. Nitrogen and phosphorus requirements of sunflower as affected by different cropping systems and agronomic practices. Fertilizer News.26:35-38.