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Effect of organic and inorganic nutrition in cashew

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Abstract

A study was conducted to find the effect of integration of different nutrient sources *viz*., organic, inorganic and biofertilizers on cashew yield and soil. The cashew yield in different nutrition treatments to meet 100% N requirement of cashew were on par (1.1 to 1.2 tonnes/ha/year) and was lowest (0.88 t/ha/year) in control without manure. An increase in yield over the years was observed in treatments T_9 (50% N through recommended dose of fertilizer (RDF) and remaining through poultry manure) followed by T_4 (biofertilizer *Azetobacter* with 100% N through organically recyclable biomass compost (ORBC)) and T_8 (25% N through RDF and remaining through poultry manure) respectively. The higher nut weight of 10.12 g was observed in treatment T_8 and was low in control (8.9 g). After manure application, the N content (296.8 kg/ha) of the soil was more in treatment T_5 with 25% N through RDF and remaining through ORBC. The available P_2O_5 content was more in treatment T_8 (59.0 kg/ha) and available K_2O content was on par in many treatments. The nutrient content of the soil was less in control treatment (N – 98.3 kg/ha, P_2O_5 – 33.9 kg/ha and K_2O – 85.7 kg/ha). The net profit was worked out and the yield trend over the years showed that treatments T_9 with 50% N through RDF and remaining through poultry manure is more suitable for cashew garden. The study also revealed that sustainable yield and profit can be achieved by the application of different fertilizers and manures or their combinations to meet 100% N requirement of cashew.

Keywords: Biofertilizers, cashew, inorganic fertilizers, organic manures

Introduction

It is estimated that about 28 Mt of primary plant nutrients (NPK) are removed annually by crops in India, while 18 Mt or even less are applied as fertilizer, leaving a net negative balance of about 10 Mt of primary plant nutrients (NAAS, 2006). The data available from centres under the Project Directorate of Cropping Systems Research (PDCSR), Modipuram indicate that inadequate and imbalanced fertilization is a major causative factor for low and declining crop response to fertilizers. Furthermore, the soils are getting continuously depleted of secondary plant nutrients and micronutrients. Thus, there is a need for integrated nutrient management including the use of organic sources such as farmyard manure, rural and urban compost, vermi-compost, green manures, inclusion of legumes in the crop rotations, bio-fertilizers *etc*. for meeting a part of the plant nutrient needs of crops (NAAS, 2006).

Cashew (*Anacardium occidentale* L.), an important foreign exchange earning horticultural crop in India is generally grown as a neglected crop along the West Coast region of India. The average productivity of cashew in India is as low as 0.695 tonnes/ha against the target of 1.0 tonne/ha (DCCD, 2010). Though cashew is hardy and drought tolerant, it responds well to water and nutrients (Sawke, *et al*., 1979; Veeraraghavan, *et al*., 1985; Richards, 1993; Kumar *et al.*, 1993; Yadukumar and Mandal, 1994; Kumar *et al*., 1995; Patrick *et al*., 2002; Yadukumar, 2001; Yadukumar and Rejani, 2004; Yadukumar, *et al*., 2009b; Rejani and Yadukumar, 2010). Therefore, the productivity of cashew can be increased significantly through the application of fertilizers/ manures (Yadukumar *et al.*, 2003).

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Richards (1993) studied the cashew yield, growth and macronutrient status as influenced by fertilizer applications. Kumar *et al.* (1993) observed positive effect of nitrogen, phosphorus and potassium on growth and yield of cashew in coastal soils of Karnataka. Yadukumar (2007) reported that nutritional trials with organic, inorganic fertilizers and combination of both and found that recommended dose of fertilizers with 10 kg poultry manure per tree resulted in better cashew nut production. In India, although studies on fertilizer application was done, so far no study was conducted on integration of organic manures, inorganic fertilizers and biofertilizers for increased cashew yield by maintaining soil fertility. Hence, the present study was taken up with the objective of developing a suitable combination of organic, inorganic fertilizers and biofertilizers for increased cashew yield by ensuring the sustained maintenance of soil fertility.

Materials and Methods

The experiments were conducted during 2000 to 2006 as a part of National Agricultural Technology Project (NATP) on developing integrated production packages for enhancing productivity of cashew. The study area is characterized by seasonally wet, hot humid with dry season (January to May) during the fruiting period of cashew. The average annual rainfall is 3500 mm distributed from May to November every year. The soil is laterite and it is characterized by low water holding capacity (23% at field capacity) and texturally the soil is sandy clay loam (0-60 cm depth). The soil is acidic with a pH of 5.2 to 5.5, EC of 0.04 to 0.07 dS/m, organic carbon content low to medium (0.45 to 0.70 %), low to medium in N content (150- 250 kg/ha) and low in P_2O_5 (2 to 10 kg/ha) and low K_2O (40 to 80 kg/ha) contents.

The study was initiated in a four year old cashew garden with NRCC selection 2 variety (1996 planting) under normal planting density (7 m x 7 m). The cashew leaf litter, cashew apple waste and weed biomass (organically recyclable biomass) obtained from a matured cashew garden (>6 year old) under normal planting density (200 plants/ha) is around 4 to 5 tonnes/ha/year (Mini *et al.*, 2005). When the biomass is decomposed, the recovery is 65%. The decomposed biomass (40 kg reduced to 26 kg) contains 0.65% N, 0.41% P, 0.45% K, 0.22% Ca, 0.19% Mg, 369 ppm Fe, 14.6 ppm Cu, 16.5 ppm Zn and 283 ppm Mn (Yadukumar and Nandan, 2005). The recommended dose of fertilizer (RDF) for the normal planting density in cashew (200 trees/ha) is 500 g N, 125 g P_2O_5, 125 g K_2O/plant/year. The experiment was laid out in a randomized block design with 9 nutrient treatments comprising of different combinations of organic, inorganic and biofertilizers and a control plot with three replications. The treatments are as follows:

T_1 - No fertilizer application (control).

T_2 - 100% N through recommended fertilizer dose (RDF).

T_3 - Biofertilizer *Azospirillum* with 100% N through organically recyclable biomass compost (ORBC)

T_4 - Biofertilizer *Azotobacter* with 100% N through ORBC.

T_5 - 25% N through RDF and remaining through ORBC.

T_6 - 50% N through RDF and remaining through ORBC.

T_7 - 75% N through RDF and remaining through ORBC.

T_8 - 25% N through RDF and remaining through poultry manure.

T_9 - 50% N through RDF and remaining through poultry manure.

T_{10} - 75% N through RDF and remaining through poultry manure.

The nutrient treatments were imposed at the end of rainy season (September) when sufficient moisture was available in the soil. The soil and leaf were collected before (May) and after fertilizer and manure application (November) and analyzed for nutrients. For the supply of 100% N through organically recyclable biomass compost (ORBC), approximately 33 kg of compost equivalent to 500 g N, 250 g P_2O_5 and 200 g K_2O/plant/year is required (Yadukumar *et al*., 2009a). The yield data was recorded for a period of four years (2002-2006) and the economics was worked out.

Nut yield

Cashew nut yield was recorded year wise from eight trees in each treatment (Table 1). The collected nuts were counted and weighed. Fresh and dry weights of a sub sample of 100 nuts from each tree were determined. The dry weight was recorded after sun drying the nuts for six days. The weight per nut including shell was determined at 14 per cent moisture as per the industrial standard (Kuppelwieser, 1989). The nut yield/tree was calculated as follows:

Nut yield = Mean nut weight x total number of nuts/ tree.

Shelling percent

The nuts of each tree were roasted, shelled and peeled as per the standard procedure (Kuppelwieser, 1989). Fresh and dry weight of the kernels were determined gravimetrically and the kernel yield was calculated on the basis of three per cent moisture. The shelling percent (kernel recovery rate) was calculated as the kernel weight in percentage of the weight of raw nuts (Kuppelwieser, 1989).

Nutrient analysis of soil and leaf

Nutrient content of the soil and leaf before fertilizer and manure application (May) and after fertilizer and manure application (November) were determined. The root activity of cashew was found to be high (72%) within 2 m radius around the plant and in the top soil (0-15cm). The soil samples at three different depths (0 to 30, 31-60 and 61-90 cm depth) within 2 m radius of the plant were collected and were analyzed using standard procedure. The fourth or fifth index leaves from cashew plants were collected, oven dried at 70° C and powdered. Nitrogen was determined using Kjeltek Auto-Analyzer, phosphorus was estimated calorimetrically by vanado molybdo phosphate method (Singh et *al.*, 1999). K was estimated using flame photometer and Ca, Mg Fe, Zn, Mn and Cu were determined using atomic absorption spectrophotometer (AAS) by wet digest method with HNO_3 and $HClO_4$ in 10:4 ratio. The data were subjected to statistical analysis using AGRISTAT package.

Results and Discussion

Effect of manure on yield and nut characteristics of cashew

The cashew nut yield for four years (2002 to 2006), nut weight and shelling percent of cashew kernels from all the ten treatments are presented in Table 1. The higher cashew nut yields of 1.22, 1.17, 1.15 and 1.13 t/ha/year were obtained in four treatments with different levels of integration of the nutrient sources such as T_3 (biofertilizer *Azospirillum* with ORBC to meet 100% of N requirement), T_9 (50% N through RDF and remaining through poultry manure), T_6 (50% N through RDF and remaining through ORBC) and T_4 (biofertilizer *Azotobacter* with ORBC to meet 100% of N requirement) respectively. The lowest yield of 0.88 t/ha/year was obtained in control (T_1) plot receiving no manure.

Table. 1. Yield and nut characteristics of cashew in different treatments

Treatment	Yield (t/ha/y)					Nut wt. (g)	Shelling %
	2002-03	2003-04	2004-05	2005-06	Mean		
T_1	0.669	0.89 (+33)	0.79 (+18)	1.17 (+75)	0.88	8.9	29.84
T_2	0.951	1.01 (+6)	0.90 (-5)	1.51 (+59)	1.09	9.43	29.33
T_3	1.052	1.30 (+23)	0.87 (-17)	1.67 (+59)	1.22	10.04	27.39
T_4	0.830	1.12 (+35)	0.91 (+9)	1.67 (+101)	1.13	9.33	27.68
T_5	0.942	0.85 (-10)	0.92 (-2)	1.65 (+75)	1.09	9.44	27.8
T_6	1.024	0.99 (-3)	1.00 (-2)	1.59 (+55)	1.15	9.88	28.79
T_7	1.030	0.92 (-11)	0.97 (-6)	1.54 (+50)	1.12	9.08	28.63
T_8	0.798	0.97 (+21)	0.87 (+9)	1.57 (+97)	1.05	10.12	28.92
T_9	0.718	1.13 (+57)	1.07 (+49)	1.77 (+146)	1.17	9.22	28.73
T_{10}	0.990	1.01 (+2)	0.81 (-18)	1.58 (+60)	1.10	9.32	30.05
SED	0.0511	0.1151	0.0635	0.0903	0.0445	0.412	0.692
CD (p=0.05)	0.1073	0.2418	0.1333	0.1896	0.0935	0.865	1.450

(Note: Values in parenthesis indicate the increase/decrease in yield w.r.t 6^{th} year of planting or 2002-03)

An increase in yield over the years was observed in treatments T_9 (50% N through RDF and remaining through poultry manure), followed by T_4 (biofertilizer *Azotobacter* with ORBC to meet 100% of N requirement) and T_8 (25% N through RDF and remaining through poultry manure) respectively. There was a build up of nutrients due to the cashew biomass deposit and a general increase in yield over the years was noted in the control plot also. Compared to 6th year, the cashew yield during 9th year was 146% more in treatment T_9 followed by 101% and 97% in treatments T_4 and T_8 respectively. The nut weight was higher in treatments T_8 and T_3 (10.12 and 10.04 g) and was low in control (8.9 g). No significant difference in shelling percent was observed among treatments. The yield trend over the years shows that treatment T_9 with 50% N through RDF and remaining through poultry manure is more suitable for cashew garden.

Yadukumar (2007) conducted nutritional trials with organic, inorganic fertilizers and combination of both and found that recommended dose of fertilizers with 10 kg poultry manure per tree resulted in cashew nut production of 1.2 t/ha compared to 0.56 t/ha in control treatment without any manure. Increased nut weight, nut yield and shelling percentage due to application of higher levels of NPK was reported by Ghosh and Bose (1986), Harishu Kumar and Sreedharan (1986), Ghosh (1990) and Kumar *et al*. (1995). Kamalakshi Amma *et al*. (2001) have recommended that integrated and balanced nutrient management is essential for the growth and productivity of coconut palms. Sharma *et al*., 2002 reported significant increase in yield of tea garden due to the positive Nitrogen x FYM and FYM x *Azotobactor* interactions.

Economics

Economics was worked out for a period of four years (2002-2006). The highest net profit of Rs.34446/ha/year was obtained from plots treated with biofertilizer *Azospirillum* with ORBC to meet 100% of N (T_3) requirement followed by Rs. 33074 and Rs. 32554/ha/year from plots treated with 50% N through RDF and remaining through ORBC (T_6) and 50% N through RDF and remaining through poultry manure (T_9) respectively (Table 2). The lowest profit of Rs. 27246/ha/year was from control treatment. The B:C ratio was highest in absolute control due to fact that the cost of cultivation was relatively less since no manure application costs are involved. Depending on the availability of fertilizer and manures, one can apply fertilizers (RDF) or manures or their combinations to meet the 100% N requirement in cashew since the yield and net profits in different treatments were on par. Kumar *et al.* (1993) reported that increased levels of NPK increased the nut yield, shelling percentage and net returns. The application of 500:125:125 g NPK/ plant/year produced higher nut yield of 6.23 to 7.8 kg/tree, highest shelling percentage of 33.07 and a net return of Rs. 21740/plant/year.

Table. 2. Economics of growing cashew under different treatments (mean of four years from 2002-2006)

Labour cost	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}
Jungle clearance and weeding twice a year (Rs./ha/year)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Manuring (Rs./ha/year)		800	800	800	800	800	800	800	800	800
Plant protection measures (Rs./ha/year)	510	510	510	510	510	510	510	510	510	510
*Picking nuts (Rs./ha/year)	540	540	540	540	540	540	540	540	540	540
Total (Rs./ha/year)	2650	3450	3450	3450	3450	3450	3450	3450	3450	3450
Cost of materials										
Fertilizers and organic manures (Rs./ha/year)	-	2344	4000	4000	3180	2922	2632	5040	4142	3242
Plant protection Chemicals (Rs./ha/year)	804	804	804	804	804	804	804	804	804	804
Total cost of cultivation (Rs./ha/year)	3554	6598	8254	8254	7434	7176	6886	9294	8396	7496
Nut yield (kg/ha/year)	880	1090	1220	1130	1090	1150	1120	1050	1170	1100
**Income (Rs./ha/year)	30800	38150	42700	39550	38150	40250	39200	36750	40950	38500
Net profit (Rs./ha/year)	27246	31552	34446	31296	30716	33074	32314	27456	32554	31004
Benefit cost ratio	7.7	4.8	4.2	3.8	4.1	4.6	4.7	3.0	3.9	4.1

*Cost of picking nuts is @Rs.1.5/kg; **The rate of produce is @Rs.35/kg.

Effect of manures on nutrient content of soil and leaf

The nutrient content of the soil and leaf were determined before and after fertilizer and manure application and are presented in Table 3 to 6. Before manure application (pretreatment), the nutrient content of the soil is presented in Table 3. After manure application, the nutrient content of the soil increased significantly in all the treatments receiving 100% RDF either in the form of biofertilizer or organic manure or inorganic fertilizer or a combination of these compared to control treatment (Table 4). The N content of the soil was higher in treatments T_5, T_2 and T_4 (296.8, 229 and 194.7 kg/ha), P_2O_5 was higher in T_8 and T_4 (59.0 and 54.4 kg/ha) and K_2O was higher in T_6, T_2, T_3 and T_4 (105.6, 104.8, 104.2 and 101.2 kg/ha) respectively and low in control (N – 98.3 kg/ha, P_2O_5 – 33.9 kg/ha and K_2O – 85.7 kg/ha). It was observed that the mean values of NPK in soil and leaf during pre and post treatments were on par in control plot receiving no manure at all. This may be due to replenishment of nutrients in the soil due to organic recycling of cashew biomass waste (cashew leaf litter, waste apple etc.) Increase in cashew yield due to N application was reported by Veeraraghavan *et al.* (1985) and Ghosh (1988). Positive effect of phosphorous on cashew yield was reported by

Table. 3. Pretreatment nutrient contents in three different depths of soil

Treatments	Available N (kg/ha)				Available P_2O_5 (kg/ha)				Available K_2O (kg/ha)			
	Depth (cm)				Depth (cm)				Depth (cm)			
	0-30	31-60	61-90	Mean	0-30	31-60	61-90	Mean	0-30	31-60	61-90	Mean
T_1	180.8	74.1	40.4	98.4	43.0	37.6	17.9	32.8	111.1	92.9	63.2	89.1
T_2	144.8	131.3	64.0	113.3	62.1	25.0	16.7	34.6	133.8	114.1	99.9	155.9
T_3	117.9	101.0	47.1	88.7	51.9	21.5	11.3	28.2	134.4	116.2	94.5	115.0
T_4	218.9	198.7	114.5	177.4	64.5	53.1	34.6	50.7	134.4	100.9	97.4	110.9
T_5	330.1	205.5	141.5	225.7	32.7	31.7	23.8	29.4	122.4	92.9	80.1	98.5
T_6	117.9	101.0	53.9	90.9	41.8	25.0	19.7	28.8	134.9	116.2	99.9	117.0
T_7	266.1	151.6	80.8	166.1	64.5	39.4	26.8	43.6	115.9	93.1	65.6	91.5
T_8	232.3	107.8	48.2	129.4	78.2	61.5	27.4	55.7	100.9	81.4	63.2	81.8
T_9	131.3	114.5	81.9	109.2	53.7	52.7	31.6	46.0	116.0	98.8	69.1	94.6
T_{10}	232.4	158.3	87.6	159.4	60.3	31.6	22.6	38.2	81.4	69.1	62.9	71.1
CD T				14.11				4.09				9.99
(p=0.05) D				7.73				2.24				5.47
T x D				24.45				7.09				17.30

(T - Treatment and D - Depth of soil)

Table. 4. Post treatment nutrient contents in three different depths of soil

Treatments	Available N (kg/ha)				Available P_2O_5 (kg/ha)				Available K_2O (kg/ha)			
	Depth (cm)				Depth (cm)				Depth (cm)			
	0-30	31-60	61-90	Mean	0-30	31-60	61-90	Mean	0-30	31-60	61-90	Mean
T_1	133.4	84.2	68.5	98.26	48.5	39.2	14.0	33.9	101.4	88.5	67.3	85.73
T_2	274.0	240.3	172.9	229.0	67.5	28.8	18.4	38.23	117.6	103.5	93.4	104.83
T_3	215.6	170.7	62.8	149.7	62.9	28.0	14.2	35.03	118.0	105.1	89.6	104.23
T_4	247.0	223.5	113.4	194.7	68.8	55.1	38.3	54.4	118.0	94.2	91.6	101.26
T_5	408.7	296.4	185.3	296.8	38.4	31.7	23.8	31.3	109.5	88.5	79.3	92.43
T_6	185.3	123.5	73.0	127.26	52.3	28.8	24.0	35.03	118.4	105.1	93.4	105.63
T_7	297.6	147.1	83.1	175.9	74.9	43.1	29.3	49.1	104.8	88.6	68.9	87.43
T_8	262.7	187.5	102.1	184.1	85.8	62.8	28.4	59.00	94.2	80.2	67.3	80.56
T_9	184.1	163.9	99.9	149.3	64.6	56.1	35.3	52.0	104.9	92.6	71.5	89.66
T_{10}	270.6	183.0	95.4	183.0	71.6	35.3	23.2	43.36	80.2	71.5	67.0	72.9
CD T				18.24				4.52				10.34
(p=0.05) D				9.99				2.47				5.66
T x D				31.60				7.84				17.91

(T - treatment and D - depth of soil)

Sawke *et al.* (1985). Significant positive effect of potassium on yield of cashew tree was reported by Ghosh (1988) and Ghosh (1990).

The pre and post treatment nutrient concentration of leaf samples in different treatments with integration of nutrients were presented in Table 5 and 6. After treatment, N ranged from 1.45 to 2.15%, P ranged from 0.13 to 0.18%, K ranged from 0.26 to 0.38%, Ca ranged from 0.20 to 0.48%, Mg ranged from 0.17 to 0.30%, Cu ranged from 6.25 to 13.89 ppm, Zn ranged from 3.48 to 8.96 ppm, Mn ranged from 16.38 to 43.44 ppm and Fe ranged from 34.85 to 110.23 ppm. The leaf nutrient content was also low in control plot (N – 1.37%, P – 0.13%, K – 0.22%, Ca – 0.15%, Mg – 0.15%, Cu – 7.52 ppm, Zn – 3.56 ppm, Mn – 15.63 ppm and Fe – 28.63 ppm) (Table 6). The results of the study indicated the possibility of complete substitution of inorganic fertilizers with organic manures and biofertilizers meeting the NPK requirement of the crop.

Table. 5. Pretreatment nutrient concentrations of cashew leaf (%)

Treatments	N	P	K	Ca	Mg
T1	1.16	0.14	0.22	0.13	0.12
T2	1.52	0.15	0.27	0.19	0.15
T3	1.48	0.13	0.33	0.20	0.16
T4	1.27	0.14	0.34	0.20	0.18
T5	1.37	0.11	0.32	0.19	0.20
T6	1.87	0.15	0.20	0.45	0.21
T7	1.44	0.13	0.28	0.26	0.18
T8	1.91	0.14	0.25	0.30	0.24
T9	1.44	0.13	0.19	0.26	0.18
T10	1.67	0.13	0.36	0.30	0.24
CD (p=0.05)	0.068	0.047	0.045	0.047	0.047

Harishu kumar and Nagabushanam (1982) found that leaf nutrient content of cashew is influenced by different methods of fertilizer application. The need for balanced integration of nutrient sources with organic manures as essential component for sustainable yield in different plantation crops have been reported by several authors. Jacob (1999) reported that countries in Asia and Africa would be able to produce organic cashew in view of the growing global demand for organic products. Similarly, the findings of the present study also indicates the need for balanced and integrated nutrient management in cashew by combining the organic manures, organic manures with biofertilizers and inorganic fertilizers for sustainable agriculture with higher productivity of cashew like other perennial crops.

Conclusions

An increase in yield over the years was observed in treatments T_9 (50% N through RDF and remaining through poultry manure), followed by T_4 (biofertilizer *Azotobacter* with ORBC to meet 100% of N requirement) and T_8 (25% N through RDF and remaining through poultry manure) respectively. Compared to 6th year, the cashew yield during 9th year was 146% more in treatment T_9 followed by 101 and 97% in treatments T_4 and T_8 respectively. The nut weight was higher in treatments T_8 and T_3 (10.12 and 10.04 g) and low in control (8.9 g). The highest net profit of Rs. 34446/ha/year was obtained from plots treated with biofertilizer *Azospirillum* with ORBC to meet 100% of N requirement and the second highest profit of Rs.33074/ha/year was

Table. 6. Post treatment nutrient concentration of cashew leaf

Treatments	N	P	K	Ca	Mg	Cu	Zn	Mn	Fe
	%					(ppm)			
T_1	1.37	0.13	0.22	0.15	0.15	7.52	3.56	15.63	28.63
T_2	1.56	0.16	0.28	0.20	0.17	6.25	4.52	16.38	35.63
T_3	1.65	0.13	0.33	0.21	0.18	8.45	4.25	18.63	34.85
T_4	1.45	0.15	0.35	0.22	0.21	9.86	4.86	25.56	52.23
T_5	1.48	0.15	0.34	0.24	0.22	12.60	3.48	24.63	68.45
T_6	2.02	0.17	0.22	0.48	0.24	6.86	5.26	28.00	71.35
T_7	1.60	0.16	0.29	0.35	0.26	10.26	5.98	36.89	69.63
T_8	2.15	0.14	0.26	0.38	0.25	13.45	6.85	45.65	79.63
T_9	1.54	0.14	0.26	0.30	0.25	11.86	6.29	38.67	85.46
T_{10}	1.84	0.18	0.38	0.34	0.30	13.89	8.96	43.44	110.23
CD (p=0.05)	0.062	0.043	0.058	0.032	0.041	0.055	1.166	5.932	8.651

from plots treated with 50% N through RDF and remaining through organically recyclable biomass compost. The lowest profit of Rs. 27246/ha/year was from control treatment. The trend of increase in yield over the years shows that treatments T_9 with 50% N through RDF and remaining through poultry manure is more suitable for cashew garden. The yield, net profit and soil and leaf nutrient content studies indicated that the nutrient requirement in cashew can be met from the biofertilizers with compost of organically recyclable biomass or organic manures or inorganic fertilizers or a combination of these to meet 100% of N requirement in cashew.

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