



Integrated Nutrient Management in Potato-baby Corn Cropping Sequence and Its Impact on Soil Quality and Yield

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The present study aimed to evaluate the integrated nutrient management in potato-baby corn cropping sequence and its impact on soil quality and yield. A field experiment was conducted during the rabi and summer seasons of 2016–17 and 2017–18 at the Instructional-cum-Research Farm of Assam Agricultural University, Jorhat. The experiment included sixteen treatments incorporating various nutrient combinations, such as 100% of the recommended dose (RD) of nitrogen (N) and different proportions of RD N supplemented with organic sources like farmyard manure (FYM), poultry manure, vermicompost, and enriched compost. Implemented in a

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randomized block design with three replications, the soil at the experimental site had a sandy loam texture, an acidic pH of 5.57, medium organic carbon content (0.75%), and moderate availability of N (292 kg/ha), P₂O₅ (25.80 kg/ha), and K₂O (272.18 kg/ha). The total rainfall recorded during the cropping sequence was 2336.40 mm in 2016–17 and 2107.10 mm in 2017–18, with temperatures ranging from 8.0°C to 35.1°C during both years. The results revealed that the treatment T₆ (50% RD N + 25% N through FYM + 25% N through vermicompost) achieved the highest growth and yield attributes for both potato and baby corn. In the case of potato, this treatment recorded the highest tuber yield over two years (27.77 t/ha). Similarly, for baby corn, T₆ resulted in the highest cob yield with husk (23.09 t/ha in 2016–17 and 24.83 t/ha in 2017–18). The integrated nutrient management (INM) practices implemented in the study significantly enhanced the soil quality of the experimental site. Among the treatments, T₆ (50% RD N + 25% N through FYM + 25% N through vermicompost) proved most effective in improving both the physico-chemical and biological properties of the soil. Post-cropping, this treatment recorded higher organic carbon content (0.98% in 2016–17 and 1.02% in 2017–18), indicating improved soil organic matter and enhanced microbial activity. Moreover, the availability of essential nutrients—nitrogen (391.33 and 423.33 kg/ha), phosphorus (28.88 and 29.50 kg/ha), and potassium (336.55 and 347.90 kg/ha)—increased noticeably under T₆, suggesting better nutrient retention and soil fertility. The improvement in soil microbial biomass carbon further highlights the positive impact of INM on biological soil health, ultimately contributing to the sustainability and productivity of the potato-baby corn cropping sequence. Economically, T₆ emerged as the most profitable practice, generating a net return of Rs 6,38,200.00 per hectare and a benefit-cost ratio (B:C) of 4.82 in the potato-baby corn cropping sequence. These findings establish the superiority of the 50% RD N + 25% N through FYM + 25% N through vermicompost (T₆) treatment in enhancing crop growth, soil health, economic yield, and overall system productivity in this cropping sequence.

Keywords: *Babycorn; enriched compost; integrated nutrient management; potato; vermicompost.*

1. INTRODUCTION

“The potato, often hailed as the “King of Vegetables,” is the third most important food crop globally, following rice and wheat” (Khurana and Naik, 2003). Its popularity in China and India, which together contribute 38% of global production, has driven its expansion (Kumar et al., 2017). In India, potato production increased from 34.7 million metric tons (MT) in 2008 to 50.19 million MT in 2019, a 45% rise over a decade, with a projected annual growth rate of 3% until 2050 (AICRP, 2019). Potatoes are rich in starch, vitamins B and C, and essential amino acids, making them nutritionally significant. However, Assam lags behind the national average in productivity (7.5 t/ha) due to a lack of quality tubers, pest issues, and rainfed cultivation (Kumar et al., 2024).

Similarly, maize, known as the “Queen of Cereals,” is the third most cultivated cereal and plays a crucial role in food, feed, and industry (Navarre et al., 2019; Islam et al., 2013; FAO, 2020). The introduction of baby corn, harvested young for vegetable use, offers high economic potential due to its short growth cycle (60–70 days) and high fodder yield. India’s low labour

costs provide an advantage in manual harvesting, a practice common in top baby corn-exporting nations like Thailand, China, and Sri Lanka. Its increasing demand in Asia, Africa, and South America highlights its economic importance and potential for higher returns. (Dass et al., 2004; Ghosh, 2014).

2. METHODS AND MATERIALS

2.1 Experimental Design and Layout

The experiment was conducted at the AICRP (Potato) field, ICR Farm using a Randomized Block Design (RBD) with three replications and sixteen treatments, resulting in 48 plots. The total experimental area was 432 m² (24m × 18m), with individual plots measuring 3m × 3m. The tested varieties were Kufri Pukhraj (potato) and G 5414 (baby corn).

2.2 Rainfall

The total rainfall received during the cropping sequence of 2016-17 was 2336.40 mm in 129 rainy days. In 2017-18 cropping sequence the total rainfall received was recorded 2107.10 mm in 127rainy day (Government of India 2019).

2.3 Treatment Details

The experiment included combinations of organic and inorganic fertilizers:

- T₁: 100% RD of N
- T₂-T₅: 75% RD of N + 25% N from FYM, poultry manure, vermicompost, or enriched compost
- T₆-T₈: 50% RD of N + 25% N from one organic source + 25% from another
- T₉-T₁₂: 50% RD of N + 50% N from a single organic source
- T₁₃-T₁₆: 50% RD of N + 25% N from a single organic source

2.4 Crop Management

Potato (Kufri Pukhraj):

- Tuber traits: Early bulking, ovoid yellow tubers with medium deep eyes
- Resistance: Early blight (resistant), late blight (moderately resistant)
- Duration: 70–90 days
- Yield: 250–400 q/ha (Grewal et al., 1991).

Baby Corn (G 5414):

- Harvest: First harvest at 49–55 days, 2–3 cobs per plant

2.5 Fertilizer and Biofertilizer Application

- Organic Manures (FYM, poultry manure, vermicompost, enriched compost): Applied at planting/sowing.
- Biofertilizers: Tubers coated before planting.

2.6 Planting and Spacing

- Potato: 22.5 q/ha, 50 cm × 20 cm spacing, manually planted (26th & 29th Nov), irrigated thrice.
- Baby Corn: 25 kg/ha, 60 cm × 20 cm spacing, sown on 12th April & 28th March.

2.7 Chemical parameters

Soil pH: Soil pH was determined before planting and at harvest by glass electrode method (Jackson, 1973). For the purpose, soil water suspension was prepared at the ratio of 1: 2.5 and the pH of the suspension was determined with pH meters with glass electrode.

Organic Carbon: Organic Carbon in the soil (0.2g) was oxidized with a mixture of 1N

K₂Cr₂O₇ (Potassium dichromate), conc. H₂SO₄ (sulphuric acid) and conc. H₃PO₄ (Ortho phosphoric acid) for reduction of K₂Cr₂O₇ by organic compounds as per the method described by Walkley (1947). The unused K₂Cr₂O₇ was back titrated with ferrous ammonium sulphate (FAS) [(NH₄)₂ SO₄ FeSO₄ 6H₂O] (0.5M) using diphenylamine indicator till the colour changed from violet blue to green. Blank contained no soil but all reagents treated similarly for calculation.

Available Nitrogen: Available N of the soil sample was estimated by modified Kjeldahl's method as described by Jackson (1973) and expressed as kg ha⁻¹.

Available Phosphorous: Available P in soil sample was extracted by Bray's method as outlined by Jackson (1973). The phosphorous content was determined with the help of Spectrophotometer and expressed as available P₂O₅ (kg ha⁻¹).

Available Potassium: Available K content of the soil sample was extracted with neutral normal ammonium acetate as outlined by Jackson (1973). The potassium content was determined with the help of Flame Photometer and expressed as available K₂O (kg ha⁻¹) (Khalak & Kumaraswamy, 1992).

2.8 Data Collection and Analysis

- The harvested tubers were sorted out into four different grades viz., <25g, 25-50g, 50-75g and >75g. The weight of each grade of tubers per plot was recorded in kilogram and later converted into t/ha. Similarly the total tuber yield per plot was recorded in kilogram and later converted into t/ha.
- The uptake of nutrients was calculated by multiplying the concentration of the nutrients in the tuber and haulm samples with the corresponding yields of tuber and haulm of the potato.

Nutrients Uptake (Kg/ ha) =

$$\frac{\text{Dry matter Yield (tuber/haulm) Kg/ ha} \times \% \text{ nutrient conc.}}{100}$$

- Microbial Biomass Carbon (MBC): Assessed via chloroform fumigation-extraction, using $\text{MBC} (\mu\text{g g}^{-1}) = \text{Ec}/\text{K}_{\text{EC}}$.

Microbial biomass carbon was determined by chloroform fumigation- extraction technique following the method of Vance et al. (1987). 5g soils in 50ml glass beaker are placed in a desiccator and a vial of soda lime. A beaker containing 50 ml ethanol free CHCl_3 (chloroform) and the desiccators evacuated until the CHCl_3 has boiled vigorously for 2 minutes. The desiccator was then incubated in dark at 25°C for 24 hours. After fumigation, CHCl_3 was removed by repeated evacuation, the soils were then extracted with 25ml 0.05M K_2SO_4 (5:1) for 30 minutes by oscillating shaking at 200 rpm and then filtered through a Whatman No. 42 filter paper. Controls were prepared by extracting soils without fumigation. Organic carbon content in the extracts was measured with dichromate (66.7mM) digestion method. To 8ml of extract in a 250ml conical flask, 2ml of $\text{K}_2\text{Cr}_2\text{O}_7$ (66.7mM) and 15ml of the digestion mixture (2:1 conc. H_2SO_4 : H_3PO_4 (v/v)) was added. The mixture was gently refluxed for 30 minutes, allowed to cool and diluted with 20 ml distilled water. The excess $\text{K}_2\text{Cr}_2\text{O}_7$ was measured by back titration with FAS (40.0mM) using 1.10-phenanthroline-ferrous sulphate complex (25mM) solution as an indicator. MBC was calculated from the differences in extractable organic carbon between the fumigated and non fumigated soil and expressed as $\mu\text{g g}^{-1}$ on dry weight basis as follows:

$$\text{MBC } (\mu\text{g g}^{-1}) = \text{Ec}/\text{K}_{\text{EC}}$$

Where, $\text{Ec} = [(\text{OC extracted from fumigated soil}) - (\text{OC extracted from non fumigated soil})] \text{K}_{\text{EC}} = 0.38$ (Vance et al., 1987)

3. RESULTS AND DISCUSSION

The results indicated that different INM treatments significantly influenced grade-wise tuber yield (Table 1). The highest tuber yield across all grades was recorded in T_6 (50% RD of N + 25% N through FYM + 25% N through vermicompost), followed by T_8 . The increased yield can be attributed to improved soil mineralization, enhanced nutrient availability, and the synergistic effect of biofertilizers with organic sources, supporting findings by Singh et al. (2005) and Sharma & Sharma (1990). Total tuber yield (Table 2) followed a similar trend, with T_6 recording the highest yield of 30.31 t/ha and 25.23 t/ha during both years, followed by T_8 (23.04 t/ha). The maximum increase in tuber yield at T_6 could be due to the balance supply of

nitrogen through INM and its uptake by the plants might have stimulated the rate of various physiological processes in plant and lead to increased growth and tuber yield. Similar findings of Islam et al. (2013) also support “the effect of organic manure and chemical fertilizers in combination on soil properties and enhancement of tuber yield. These results could also be attributed to balanced nutrition of the crop particularly in respect to N, P, and K owing to integrated use of organic and inorganic fertilizer. The key role of nitrogen, phosphorous and potassium on tuber initiation, growth and development were established by several researchers” (De, 1960; Sharma & Sharma, 1990; Grewal et al., 1991; Lal & Arora, 1994). Nutrient uptake by both the haulm and tuber was significantly affected by INM (Tables 3–8). T_6 consistently recorded the highest N, P, and K uptake, followed by T_8 . The increased uptake in T_6 is likely due to improved vegetative growth, root development, and better nutrient assimilation. Similarly, in the case of baby corn, the highest cob yield was recorded in T_6 (23.09 t/ha with husk, 9.39 t/ha without husk), followed by T_8 , reflecting the beneficial impact of integrated nutrient management on crop productivity (Tables 9 & 10).

“Soil health parameters were also positively influenced by INM treatments. T_6 exhibited the highest organic carbon content (0.98–1.02%) and microbial biomass carbon, indicating improved soil fertility and microbial activity. Increased soil biomass carbon in INM treated plots might be due to effect of application of organic manures along with bio-fertilizer and inorganic fertilizers in the soil. The application of organic manures which contains crop residues, animal faeces and their compost etc. in soil usually increases the soil biomass and activities” (Subhani et al., 2001). Furthermore, T_6 provided the highest net return of Rs. 6,38,200/ha and a benefit-cost ratio (B:C) of 4.82, making it the most economically viable treatment.

Overall, T_6 (50% RD of N + 25% N through FYM + 25% N through vermicompost) emerged as the best INM practice, leading to higher crop productivity, enhanced nutrient uptake, improved soil fertility, and better economic returns. These findings highlight the potential of integrated nutrient management as a sustainable approach for maintaining soil health and boosting agricultural productivity (Lal & Arora, 1994).

Table 1. Influence of different INM practices on grade wise tuber yield of potato

Treatments	Grade wise tuber yield (t/ha)							
	<25g		25-50g		50-75g		>75g	
	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18
T ₁ : 100% RD of N	3.96	3.25	5.28	4.62	6.15	5.18	5.53	3.57
T ₂ : 75% RD of N + 25% N through FYM	4.14	3.23	5.72	4.27	6.35	6.87	6.05	3.95
T ₃ : 75% RD of N + 25% N through poultry manure	4.11	3.24	5.12	4.45	6.27	6.87	5.52	4.06
T ₄ : 75% RD of N +25% N through vermicompost	3.60	2.18	4.43	4.05	6.95	6.59	5.76	4.06
T ₅ : 75% RD of N + 25% N through enriched compost	3.21	2.27	5.24	5.24	7.43	5.60	6.24	3.72
T ₆ : 50% RD of N + 25% N through FYM +25% N through vermicompost	5.51	4.54	6.94	6.98	9.82	8.60	8.04	5.14
T ₇ : 50% RD of N + 25% N through poultry manure + 25% N through enriched compost	3.35	3.08	5.04	5.19	7.65	6.81	6.31	3.90
T ₈ : 50% RD of N + 25% N through FYM + 25% N through poultry manure	4.57	3.33	5.99	5.78	7.68	7.08	7.39	4.25
T ₉ : 50% RD of N + 50% N through FYM	2.63	3.05	5.72	5.49	5.48	5.70	5.06	4.18
T ₁₀ : 50% RD of N + 50% N through poultry manure	4.53	3.23	4.17	5.19	6.47	6.40	6.41	4.05
T ₁₁ : 50% RD of N + 25% N through poultry manure	3.77	3.02	5.09	4.88	4.87	5.60	6.34	3.65
T ₁₂ : 50% RD of N + 50% N through vermicompost	3.93	2.18	4.96	5.96	5.96	6.15	5.72	3.80
T ₁₃ : 50% RD of N + 25% N through FYM	3.21	1.96	5.15	4.95	5.28	5.60	5.44	4.16
T ₁₄ : 50% RD of N + 25% N through poultry manure	2.81	3.37	4.95	4.17	5.19	5.43	5.61	3.82
T ₁₅ : 50% RD of N + 25% N through vermicompost	4.01	1.93	4.29	4.29	4.29	5.65	5.18	3.77
T ₁₆ : 50% RD of N + 25% N through enriched compost	4.37	2.96	5.50	5.48	7.35	6.29	4.76	3.49
S.Em(±)	0.29	0.37	0.57	0.56	0.70	0.49	0.59	0.27
CD(p=0.05)	0.85	1.07	NS	NS	2.02	1.41	1.72	NS

INM-Integrated nutrient management, NS – Non-significant

Table 2. Influence of different INM practices on tuber yield of potato

Treatments	Total tuber yield (t/ha)		
	2016-17	2017-18	Pooled
T ₁ : 100% RD of N	20.92	16.62	18.77
T ₂ : 75% RD of N + 25% N through FYM	22.26	18.32	20.29
T ₃ : 75% RD of N + 25% N through poultry manure	21.02	18.62	19.83
T ₄ : 75% RD of N +25% N through vermicompost	20.74	16.88	18.80
T ₅ : 75% RD of N + 25% N through enriched compost	22.12	16.83	19.47
T ₆ : 50% RD of N + 25% N through FYM +25% N through vermicompost	30.31	25.23	27.77
T ₇ : 50% RD of N + 25% N through poultry manure + 25% N through enriched compost	22.35	18.98	20.66
T ₈ : 50% RD of N + 25% N through FYM + 25% N through poultry manure	25.64	20.44	23.04
T ₉ : 50% RD of N + 50% N through FYM	18.89	18.42	18.64
T ₁₀ : 50% RD of N + 50% N through poultry manure	21.58	18.87	20.22
T ₁₁ : 50% RD of N + 25% N through poultry manure	20.08	17.15	18.61
T ₁₂ : 50% RD of N + 50% N through vermicompost	20.57	18.09	19.33
T ₁₃ : 50% RD of N + 25% N through FYM	19.08	16.67	17.87
T ₁₄ : 50% RD of N + 25% N through poultry manure	18.56	16.79	17.67
T ₁₅ : 50% RD of N + 25% N through vermicompost	17.78	15.64	16.71
T ₁₆ : 50% RD of N + 25% N through enriched compost	21.98	18.22	20.10
S.Em(±)	0.53	0.86	0.83
CD(P=0.05)	1.53	2.48	1.68

INM- Integrated nutrient management

Table 3. Influence of different INM practices on nitrogen uptake by haulm of potato

Treatments	N (kg/ha)	
	2016-17	2017-18
T ₁ : 100% RD of N	18.86	16.40
T ₂ : 75% RD of N + 25% N through FYM	16.09	15.79
T ₃ : 75% RD of N + 25% N through poultry manure	15.48	15.51
T ₄ : 75% RD of N +25% N through vermicompost	15.90	15.67
T ₅ : 75% RD of N + 25% N through enriched compost	16.52	16.67
T ₆ : 50% RD of N + 25% N through FYM +25% N through vermicompost	23.88	24.05
T ₇ : 50% RD of N + 25% N through poultry manure + 25% N through enriched compost	16.84	17.50
T ₈ : 50% RD of N + 25% N through FYM + 25% N through poultry manure	20.60	20.82
T ₉ : 50% RD of N + 50% N through FYM	14.90	15.01
T ₁₀ : 50% RD of N + 50% N through poultry manure	17.46	16.37
T ₁₁ : 50% RD of N + 25% N through poultry manure	16.89	17.47
T ₁₂ : 50% RD of N + 50% N through vermicompost	17.67	17.73
T ₁₃ : 50% RD of N + 25% N through FYM	16.53	16.76
T ₁₄ : 50% RD of N + 25% N through poultry manure	15.93	16.68
T ₁₅ : 50% RD of N + 25% N through vermicompost	16.48	16.58
T ₁₆ : 50% RD of N + 25% N through enriched compost	16.77	17.12
S.Em(±)	0.92	0.66
CD(P=0.05)	2.67	1.91

INM-Integrated nutrient management

Table 4. Influence of different INM practices on phosphorous uptake by haulm of potato

Treatments	P (kg/ha)	
	2016-17	2017-18
T ₁ : 100% RD of N	4.82	4.23
T ₂ : 75% RD of N + 25% N through FYM	4.29	3.99
T ₃ : 75% RD of N + 25% N through poultry manure	4.19	4.10
T ₄ : 75% RD of N +25% N through vermicompost	4.28	4.03
T ₅ : 75% RD of N + 25% N through enriched compost	4.45	3.97
T ₆ : 50% RD of N + 25% N through FYM +25% N through vermicompost	6.55	6.59
T ₇ : 50% RD of N + 25% N through poultry manure + 25% N through enriched compost	4.32	4.15
T ₈ : 50% RD of N + 25% N through FYM + 25% N through poultry manure	4.87	4.52
T ₉ : 50% RD of N + 50% N through FYM	4.65	3.83
T ₁₀ : 50% RD of N + 50% N through poultry manure	4.25	4.08
T ₁₁ : 50% RD of N + 25% N through poultry manure	4.59	4.49
T ₁₂ : 50% RD of N + 50% N through vermicompost	4.47	4.44
T ₁₃ : 50% RD of N + 25% N through FYM	4.57	4.38
T ₁₄ : 50% RD of N + 25% N through poultry manure	4.30	4.27
T ₁₅ : 50% RD of N + 25% N through vermicompost	4.28	4.20
T ₁₆ : 50% RD of N + 25% N through enriched compost	4.40	4.34
S.Em(±)	0.29	0.20
CD(P=0.05)	0.85	0.59

INM-Integrated nutrient management

Table 5. Influence of different INM practices on potassium uptake by haulm of potato

Treatment	K (kg/ha)	
	2016-17	2017-18
T ₁ : 100% RD of N	9.93	9.21
T ₂ : 75% RD of N + 25% N through FYM	9.33	9.02
T ₃ : 75% RD of N + 25% N through poultry manure	9.00	8.96
T ₄ : 75% RD of N +25% N through vermicompost	9.58	9.32
T ₅ : 75% RD of N + 25% N through enriched compost	9.88	9.94
T ₆ : 50% RD of N + 25% N through FYM +25% N through vermicompost	13.98	14.05
T ₇ : 50% RD of N + 25% N through poultry manure + 25% N through enriched compost	9.54	9.45
T ₈ : 50% RD of N + 25% N through FYM + 25% N through poultry manure	11.35	10.73
T ₉ : 50% RD of N + 50% N through FYM	8.21	8.19
T ₁₀ : 50% RD of N + 50% N through poultry manure	9.45	8.92
T ₁₁ : 50% RD of N + 25% N through poultry manure	9.75	9.63
T ₁₂ : 50% RD of N + 50% N through vermicompost	10.00	9.97
T ₁₃ : 50% RD of N + 25% N through FYM	9.65	9.64
T ₁₄ : 50% RD of N + 25% N through poultry manure	9.04	9.00
T ₁₅ : 50% RD of N + 25% N through vermicompost	9.15	8.69
T ₁₆ : 50% RD of N + 25% N through enriched compost	9.12	9.03
S.Em(±)	0.56	0.28
CD(P=0.05)	1.61	0.82

INM-Integrated nutrient management

Table 6. Influence of different INM practices on nitrogen uptake by tuber of potato

Treatments	N (kg/ha)	
	2016-17	2017-18
T ₁ : 100% RD of N	55.02	52.77
T ₂ : 75% RD of N + 25% N through FYM	44.61	41.53
T ₃ : 75% RD of N + 25% N through poultry manure	42.43	40.10
T ₄ : 75% RD of N +25% N through vermicompost	52.66	50.52
T ₅ : 75% RD of N + 25% N through enriched compost	42.03	41.54
T ₆ : 50% RD of N + 25% N through FYM +25% N through vermicompost	76.88	72.33
T ₇ : 50% RD of N + 25% N through poultry manure + 25% N through enriched compost	44.64	43.33
T ₈ : 50% RD of N + 25% N through FYM + 25% N through poultry manure	60.84	58.71
T ₉ : 50% RD of N + 50% N through FYM	50.43	46.55
T ₁₀ : 50% RD of N + 50% N through poultry manure	53.61	41.57
T ₁₁ : 50% RD of N + 25% N through poultry manure	47.41	43.51
T ₁₂ : 50% RD of N + 50% N through vermicompost	46.57	44.38
T ₁₃ : 50% RD of N + 25% N through FYM	48.66	41.51
T ₁₄ : 50% RD of N + 25% N through poultry manure	43.53	42.83
T ₁₅ : 50% RD of N + 25% N through vermicompost	47.46	41.47
T ₁₆ : 50% RD of N + 25% N through enriched compost	51.10	43.23
S.Em(±)	3.71	3.54
CD(P=0.05)	10.72	10.21

INM-Integrated nutrient management

Table 7. Influence of different INM practices on phosphorous uptake by tuber of potato

Treatments	P (kg/ha)	
	2016-17	2017-18
T ₁ : 100% RD of N	14.06	13.34
T ₂ : 75% RD of N + 25% N through FYM	11.29	10.59
T ₃ : 75% RD of N + 25% N through poultry manure	11.27	10.59
T ₄ : 75% RD of N +25% N through vermicompost	13.22	12.93
T ₅ : 75% RD of N + 25% N through enriched compost	10.78	10.60
T ₆ : 50% RD of N + 25% N through FYM +25% N through vermicompost	20.36	19.94
T ₇ : 50% RD of N + 25% N through Poultry manure + 25% N through enriched compost	11.27	11.09
T ₈ : 50% RD of N + 25% N through FYM + 25% N through poultry manure	15.64	15.60
T ₉ : 50% RD of N + 50% N through FYM	12.41	12.05
T ₁₀ : 50% RD of N + 50% N through poultry manure	10.99	10.18
T ₁₁ : 50% RD of N + 25% N through poultry manure	10.74	10.62
T ₁₂ : 50% RD of N + 50% N through vermicompost	11.51	11.49
T ₁₃ : 50% RD of N + 25% N through FYM	10.86	10.48
T ₁₄ : 50% RD of N + 25% N through poultry manure	10.08	10.00
T ₁₅ : 50% RD of N + 25% N through vermicompost	11.64	11.21
T ₁₆ : 50% RD of N + 25% N through enriched compost	12.09	11.61
S.Em(±)	1.15	0.93
CD(P=0.05)	3.33	2.70

INM-Integrated nutrient management

Table 8. Influence of different INM practices on potassium uptake by tuber of potato

Treatments	K (kg/ha)	
	2016-17	2017-18
T ₁ : 100% RD of N	42.25	39.92
T ₂ : 75% RD of N + 25% N through FYM	36.52	34.13
T ₃ : 75% RD of N + 25% N through poultry manure	35.59	33.47
T ₄ : 75% RD of N +25% N through vermicompost	42.23	41.24
T ₅ : 75% RD of N + 25% N through enriched compost	33.83	33.06
T ₆ : 50% RD of N + 25% N through FYM +25% N through vermicompost	60.32	56.72
T ₇ : 50% RD of N + 25% N through poultry manure + 25% N through enriched compost	40.40	37.05
T ₈ : 50% RD of N + 25% N through FYM + 25% N through poultry manure	48.43	47.79
T ₉ : 50% RD of N + 50% N through FYM	40.14	38.09
T ₁₀ : 50% RD of N + 50% N through poultry manure	39.09	34.07
T ₁₁ : 50% RD of N + 25% N through poultry manure	38.62	35.68
T ₁₂ : 50% RD of N + 50% N through vermicompost	38.65	35.75
T ₁₃ : 50% RD of N + 25% N through FYM	37.37	34.03
T ₁₄ : 50% RD of N + 25% N through poultry manure	37.30	32.68
T ₁₅ : 50% RD of N + 25% N through vermicompost	38.03	34.84
T ₁₆ : 50% RD of N + 25% N through enriched compost	40.60	36.05
S.Em(±)	2.55	2.85
CD(P=0.05)	7.35	8.22

INM-Integrated nutrient management

Table 9. Influence of different INM practices on cob yield with husk

Treatments	Cob yield with husk (t/ha)	
	2016-17	2017-18
T ₁ : 100% RD of N	12.67	8.20
T ₂ : 75% RD of N + 25% N through FYM	14.48	9.83
T ₃ : 75% RD of N + 25% N through poultry manure	13.19	17.24
T ₄ : 75% RD of N +25% N through vermicompost	11.64	12.72
T ₅ : 75% RD of N + 25% N through enriched compost	11.70	14.19
T ₆ : 50% RD of N + 25% N through FYM +25% N through vermicompost	23.09	24.83
T ₇ : 50% RD of N + 25% N through poultry manure + 25% N through enriched compost	11.46	19.35
T ₈ : 50% RD of N + 25% N through FYM + 25% N through poultry manure	18.81	21.07
T ₉ : 50% RD of N + 50% N through FYM	13.84	17.45
T ₁₀ : 50% RD of N + 50% N through poultry manure	13.71	12.71
T ₁₁ : 50% RD of N + 25% N through poultry manure	10.95	10.85
T ₁₂ : 50% RD of N + 50% N through vermicompost	16.44	16.02
T ₁₃ : 50% RD of N + 25% N through FYM	13.50	14.72
T ₁₄ : 50% RD of N + 25% N through poultry manure	14.28	16.60
T ₁₅ : 50% RD of N + 25% N through vermicompost	11.70	8.35
T ₁₆ : 50% RD of N + 25% N through enriched compost	15.30	19.23
S.Em(±)	1.17	0.93
CD(P=0.05)	3.38	2.68

INM-Integrated nutrient management

Table 10. Influence of different INM practices on cob yield without husk

Treatments	Cob yield without husk (t/ha)		
	2016-17	2017-18	Pooled
T ₁ : 100% RD of N	5.81	4.95	5.38
T ₂ : 75% RD of N + 25% N through FYM	7.07	4.83	5.95
T ₃ : 75% RD of N + 25% N through poultry manure	4.99	5.90	5.45
T ₄ : 75% RD of N +25% N through vermicompost	6.02	5.27	5.64
T ₅ : 75% RD of N + 25% N through enriched compost	5.42	5.25	5.33
T ₆ : 50% RD of N + 25% N through FYM +25% N through vermicompost	8.38	9.40	9.39
T ₇ : 50% RD of N + 25% N through poultry manure + 25% N through enriched compost	5.90	5.19	5.55
T ₈ : 50% RD of N + 25% N through FYM + 25% N through poultry manure	7.45	7.65	7.55
T ₉ : 50% RD of N + 50% N through FYM	4.58	5.23	4.91
T ₁₀ : 50% RD of N + 50% N through poultry manure	5.12	5.22	5.17
T ₁₁ : 50% RD of N + 25% N through poultry manure	5.37	5.01	5.19
T ₁₂ : 50% RD of N + 50% N through vermicompost	4.38	5.50	4.94
T ₁₃ : 50% RD of N + 25% N through FYM	4.98	4.82	4.90
T ₁₄ : 50% RD of N + 25% N through poultry manure	4.13	5.04	4.58
T ₁₅ : 50% RD of N + 25% N through vermicompost	5.26	5.90	5.58
T ₁₆ : 50% RD of N + 25% N through enriched compost	5.28	5.13	5.20
S.Em(±)	0.64	0.58	0.61
CD(P=0.05)	1.85	1.69	1.23

INM- Integrated nutrient management

Table 11. Influence of different INM practices on soil microbial biomass carbon

Treatments	MBC ($\mu\text{g g}^{-1}$ soil)	
	2016-17	2017-18
T ₁ : 100% RD of N	243.88	249.11
T ₂ : 75% RD of N + 25% N through FYM	300.53	305.90
T ₃ : 75% RD of N + 25% N through poultry manure	292.29	296.96
T ₄ : 75% RD of N +25% N through vermicompost	328.71	333.35
T ₅ : 75% RD of N + 25% N through enriched compost	298.78	304.02
T ₆ : 50% RD of N + 25% N through FYM +25% N through vermicompost	364.44	372.18
T ₇ : 50% RD of N + 25% N through poultry manure + 25% N through enriched compost	344.93	348.93
T ₈ : 50% RD of N + 25% N through FYM + 25% N through poultry manure	336.27	350.55
T ₉ : 50% RD of N + 50% N through FYM	281.29	288.14
T ₁₀ : 50% RD of N + 50% N through poultry manure	313.82	317.31
T ₁₁ : 50% RD of N + 25% N through poultry manure	301.32	304.39
T ₁₂ : 50% RD of N + 50% N through vermicompost	306.38	309.98
T ₁₃ : 50% RD of N + 25% N through FYM	301.28	306.62
T ₁₄ : 50% RD of N + 25% N through poultry manure	293.96	300.44
T ₁₅ : 50% RD of N + 25% N through vermicompost	306.04	314.15
T ₁₆ : 50% RD of N + 25% N through enriched compost	279.50	287.35
S.Em(\pm)	9.21	7.87
CD(P=0.05)	26.60	20.74

INM-Integrated nutrient management

4. CONCLUSION

Based on results of two years experimentation, the integrated use of inorganic and organic sources of nutrients proved superior to inorganic alone in respect of growth parameters and yield of potato and baby corn in sequence.

Among the different integrated nutrient management practices, application of 50% RD of N + 25% N through FYM + 25% N through vermicompost (T₆) was found to be the best integrated nutrient management practice for overall growth and yield of potato and baby corn crop grown in sequence. It also resulted in better soil health parameters, net returns, benefit cost ratio as a whole.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that generative AI technologies such as Large Language Models, etc. have been used during the writing or editing of manuscripts. This explanation will include the name, version, model, and source of the generative AI technology and as well as all input prompts provided to the generative AI technology

Details of the AI usage are given below:

1. ChatGPT 3.5

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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