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Optimizing Peanut Intercropping Density in Young Coconut Plantations: A Case Study from Phu Quoc, An Giang, Vietnam

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ABSTRACT

Background: Coconut (*Cocos nucifera* L.) and peanut (*Arachis hypogaea* L.) are widely cultivated in tropical and subtropical regions. Intercropping peanuts in young coconut gardens can enhance soil fertility through biological nitrogen fixation while supporting local food production. This study evaluated the optimal intercropping density of VD 01-1 peanut in Dua Dua coconut gardens (an aromatic variety) during the establishment phase in Phu Quoc, An Giang Province, Vietnam.

Methods: A field experiment was conducted in Phu Quoc, An Giang Province (10°14′40.7″N; 104°01′22.4″E) from 2024 to 2025 to compare three intercropping densities (15, 20, 25 peanut rows) with a non-intercropped control. The study assessed VD 01-1 peanut growth, yield and pod quality, as well as changes in soil properties and nutrient availability.

Result: VD 01-1 peanut grew well under Phu Quoc conditions. Intercropping 20 rows in Dua Dua gardens resulted in higher yield and better pod quality than 15- or 25-row treatments, without affecting coconut growth. This density also enhanced soil fertility and nitrogen-fixing microbial activity, with the most favorable soil and microbial conditions observed at 20 rows. Nutrient availability supported coconut growth, with highest nitrogen and phosphorus at 20 rows and potassium at 25 rows. Overall, intercropping 20 rows (covering 60% of the intercroppable area) is optimal, improving productivity, soil health and economic returns while maintaining coconut development.

Key words: Aromatic coconut, Intercropping, Peanut, Soil fertility.

INTRODUCTION

The coconut (*Cocos nucifera* L.) is widely cultivated on more than 30,000 islands across tropical and subtropical regions worldwide (Nayar, 2018). According to Niral and Jerar (2018), the number of coconut roots during the bearing stage ranges from 4,000 to 7,000, with about 75% concentrated within a radius of no more than 2 m. With the common planting distance of 7.5 m × 7.5 m, corresponding to a surface area of 56.25 m^2 and an active root zone area of 12.57 m^2 (a circular area around the trunk with a radius of 2 m), the land use efficiency of coconut is about 22.24%, indicating that nearly 75% of the area remains underutilized by coconut roots (Thomas *et al.*, 2018). Moreover, the coconut canopy occupies an average of 30% of space and intercepts about 45-50% of solar radiation, leaving gaps between the canopy and the ground, as well as sufficient sunlight that can be utilized by intercrops in coconut gardens (Samitha *et al.*, 2024). Bhat *et al.* (2024) reported that during the early growth stage, from planting up to 8 years, most sunlight reaches the ground due to the undeveloped canopy, making light availability medium to high and suitable for intercropping with food crops, fruit trees and vegetables.

Peanut (*Arachis hypogaea* L.), an important oilseed and food crop, is cultivated widely in tropical and subtropical regions (Basuchaudhuri, 2022; Trinh *et al.*, 2023). Peanuts can be cultivated on diverse soils, including sandy and coastal sandy soils (Minh *et al.*, 2021; Hama-Ba *et al.*, 2022; Trinh *et al.*, 2023) and are a preferred legume for intercropping in various farming systems (Chaudhari *et al.*, 2017; Anithakumari *et al.*, 2022; Sudhalakshmi *et al.*, 2022; Liu *et al.*, 2024). Previous studies have shown that intercropping peanuts in coconut gardens enhances soil fertility through biological nitrogen fixation and contributes to increasing food availability for local communities (Anithakumari *et al.*, 2022). Therefore, integrating peanuts into intercropping systems helps reduce nitrogen fertilizer input and strengthens the soil nitrogen cycle (Erhunmwunse *et al.*, 2023). Intercropping peanuts in coconut plantations promoted biological nitrogen fixation, improved soil moisture and increased leaf structural diversity in agricultural ecosystems, thereby enhancing the interaction of solar radiation with various crops (Viégas *et al.*, 2021; Fernandes *et al.*, 2025). However, in coconut-growing areas

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on sandy soils with limited irrigation, it is necessary to study the selection of suitable peanut varieties and determine optimal planting densities to balance environmental conditions, enhance biomass, yield and nitrogen fixation capacity (Magalhães *et al.*, 2024).

Phu Quoc is the largest island in Vietnam, located in An Giang province (previously known as Kien Giang province) in the southwest of the country. The island has a tropical monsoon climate, with average temperatures ranging from 22.7°C to 32.9°C and a total of 2304.7 sunshine hours per year. The annual average rainfall is 2545.4 mm, annual evaporation reaches 1576.9 mm, the average number of rainy days is 14.8 days (mostly May-October) and the average relative humidity is 81.2% (Le *et al.*, 2016). Most of the soil in Phu Quoc belongs to the group of loam and sandy loam. According to Lacerda *et al*. (2024), coconut trees grow well under humid tropical conditions with an annual average temperature of 27.0-29.0°C, annual rainfall of 1100-2300 mm, more than 2.000 sunshine hours per year and relative humidity of 80-90%. Peanuts thrive at temperatures of 25.0-32.0°C, more than 200 sunshine hours per month, a total water requirement during the growing period of 450-700 mm and humidity of 70-80% (Basuchaudhuri, 2022). Therefore, the ecological conditions on Phu Quoc are suitable for the growth and development of both coconut and peanut plants. The aim of this study was to determine the appropriate intercropping density of peanuts in young coconut gardens of Dua Dua variety (an aromatic coconut) during the establishment phase on Phu Quoc, An Giang province, Vietnam.

MATERIALS AND METHODS

The field experiment was conducted in Phu Quoc, An Giang Province (10°14′40.7″N; 104°01′22.4″E) from November 2024 to March 2025. The experiment was carried out in a two-year-old Dua Dua plantation, planted at a spacing of 6.5 m × 6.5 m with a density of 237 trees/ha. Each tree has an average leaf length of 120 cm and a ground projection of 80 cm, giving an effective growth radius of 0.8 m. The available distance between two coconut rows for intercropping was therefore 4.9 m. The base plot consisted of 6 coconut trees arranged in 2 rows (3 trees per row), with a total area of 84.5 m^2. Based on the available spacing, the intercroppable area within the coconut garden was calculated as S = 4.9 × 13 = 63.7 m^2. Intercropping treatments were implemented within this usable area. The experimental soil belonged to the sandy loam group, with properties presented in Table 1. The intercrop peanut variety was VD 01-1, sown at 20 cm between rows and 15 cm between plants, resulting in a planting density of 33 plants/m^2.

The experiment was conducted using a randomized complete block design (RCBD) with four treatments: (i) sole coconut (0% of the intercroppable area); (ii) intercropping 15 peanut rows (45% of the intercroppable are); (iii) intercropping 20 peanut rows (60% of the intercroppable area); and (iv) intercropping 25 peanut rows (75% of the intercroppable area). Each treatment was replicated four times.

The fertilizer rate per hectare included 10 tons of well-decomposed manure, 60 kg N, 120 kg P_2O_5, 90 kg K_2O and 500 kg lime. Basal fertilization consisted of 10 tons of manure, 20 kg N, 120 kg P_2O_5 and 45 kg K_2O. Top dressing was applied twice: the first with 20 kg N at 15 days after peanut sowing and the second with 20 kg N and 45 kg K_2O at 30 days after sowing. Lime was applied twice: 250 kg before land preparation for peanut sowing and 250 kg at the end of the flowering stage.

For each plot, 10 peanut plants were randomly selected to record growth and yield parameters, including plant height (cm), number of primary branches per plant, number of harvested plants per plot, fresh biomass (g/m^2), dry biomass (g/m^2), fresh-to-dry biomass ratio (%), number of pods per plant, number of filled pods per plant, fresh pod weight (g/m^2), dry pod weight (g/m^2), fresh-to-dry pod weight ratio (%), dry pod yield per plot (kg), dry pod yield per hectare (kg/ha), kernel ratio (%), percentage of filled seeds (%) and 100-seed weight (g).

In each plot, six coconut trees were planted in two rows with three trees per row. One tree from the middle of each row was selected (one tree per row), resulting in two monitored coconut trees per plot. The recorded parameters included trunk girth (cm), number of fronds, number of newly emerged leaves, length of the petiole-bearing section of functional leaves (cm), number of leaflets, leaflet length (cm) and leaflet width (cm).

Soil samples were collected from each plot at a depth of 0-30 cm before and after the experiment. Soil analysis was conducted at the Research Institute of Biotechnology and Environment, Nong Lam University, Ho Chi Minh City.

Statistical analysis

One-way analysis of variance (ANOVA) was performed, followed by Duncan's multiple range test at the 0.01 significance level (for data with $F \geq F_{0.01}$) and at the 0.05 significance level (for data with $F \geq F_{0.05}$), using the *agricolae* package (Felipe de Mendiburu, 2023) in R software version 4.5.0.

RESULTS AND DISCUSSION

Research by Ngo *et al.* (2010) on the VD 01-01 peanut variety cultivated in the Winter-spring season on sandy soils in several provinces of the South Central Coast showed an average growth period of 94 days after sowing. This indicates that the harvesting time of the VD 01-01 peanut variety on Phu Quoc does not differ significantly compared to studies on sandy soils. Table 1 shows that plant height at harvest varied significantly among intercropping treatments ($p<0.01$), with height increasing as the number of intercropped peanut rows in coconut gardens increased. The tallest plants were observed in the 25-row intercropping treatment (74.5 cm) and the shortest in the 15-row treatment (54.5 cm). This indicates that the VD 01-1

peanut plants on Phu Quoc grew significantly taller than those grown on gray soil in Cu Chi, Ho Chi Minh City, where the average height was 32.0 cm (Ngo *et al*., 2005).

Table 1 shows that the number of primary branches per plant did not differ significantly among treatments, ranging from 4.5 to 4.8 branches. These results are consistent with Le *et al*. (2025), who reported 4-5 primary branches per VD 01-1 peanut plant grown on gray soils in Trang Bang, Tβy Ninh province. The number of harvested plants per plot increased proportionally with the number of intercropped rows, with the 25-row treatment yielding the highest (1,755 plants/plot) and the 15-row treatment the lowest (1137.8 plants/plot). Fresh and dry peanut biomass did not differ significantly across treatments, with fresh biomass ranging from 3748.3 to 3884.0 g/m^2 and dry biomass from 910.8 to 1057.8 g/m^2. The fresh-to-dry biomass ratio varied between 24.0% and 27.2%, with no significant differences among treatments.

Table 2 shows that the number of pods per plant and the number of filled pods differed significantly ($p<0.01$). The 20- and 15-row intercropping treatments had 15.6 and 13.1 pods per plant, significantly higher than the 25-row treatment (9.4 pods). The highest number of filled pods was in the 20-row treatment (12.3 pods), exceeding the 15-row treatment by 2.4 pods (9.9 pods) and the 25-row treatment by 5.7 pods (6.6 pods). On gray soil in Trang Bang, Tay Ninh province, VD 01-1 peanuts produced 12-18 pods per plant and 10-14 filled pods per plant (Le *et al.*, 2025). This indicates that the 25-row intercropping treatment produced fewer pods per plant and the 15- and 25-row treatments had lower filled pod numbers than reported by Le *et al.* (2025). Fresh pod weight did not differ significantly ($p>0.05$), ranging from 653.3 to 705.0 g/m^2. Dry pod weight was highest in the 20-row treatment (342.6 g/m^2), significantly higher than the 25-row treatment (273.6 g/m^2) but not significantly different from the 15-row treatment (307.1 g/m^2). The ratio of fresh to dry pod biomass varied between 40.9% and 48.5% without significant differences (Table 2).

Table 3 shows that dry pod yield per plot was highest in the 20- and 25-row treatments (17.1 and 17.2 kg) and lowest in the 15-row treatment (11.7 kg). Dry pod yield per

Table 1: Effect of the number of intercropped peanut rows on peanut growth.

No. of inter-cropped rows	Plant height (cm)	No. of primary branches/plant	Actual plants/plot	Fresh biomass (g/m^2)	Dry biomass (g/m^2)	Fresh/dry biomass ratio (%)
15	54.5^{b}	4.5	1137.8^{b}	3748.3	961.0	25.6
20	61.3^{ab}	4.5	1418.3^{ab}	3884.0	1057.8	27.2
25	74.5^{a}	4.8	1755.0^{a}	3807.3	910.8	24.0
CV (%)	9.57	4.16	10.00	7.13	8.73	3.47
F-calculated	11.23	3.05^{ns}	18.51	0.25^{ns}	3.07^{ns}	3.90^{ns}
Prob	0.0094	0.1222	0.0027	0.7861	0.1206	0.0821

Within the same column, values sharing the same letter are not significantly different at $p<0.01$.

Table 2: Effect of the number of intercropped peanut grows on peanut pod development.

No. of inter-cropped rows	Number of pods/plant	Number of filled pods/plant	Fresh pod weight (g/m^2)	Dry pod weight (g/m^2)	Fresh/dry pod biomass ratio (%)
15	13.1^{a}	9.9^{b}	653.3	307.1^{ab}	47.0
20	15.6^{a}	12.3^{a}	705.0	342.6^{a}	48.5
25	9.3^{b}	6.6c	676.8	273.4^{b}	40.9
CV (%)	10.34	7.20	6.99	5.51	8.68
F-calculated	23.44	69.82	1.19^{ns}	16.64	4.16^{ns}
Prob	0.0015	0.0001	0.3662	0.0036	0.0735

Within the same column, values sharing at the same letter are not significantly different at $p<0.01$.

Table 3: Effect of the number of intercropped peanut rows on peanut yield.

No. of inter-cropped rows	Dry pod yield/plot (kg)	Dry pod yield (kg/ha)	Kernel rate (%)	Filled seed rate (%)	100-seed weight (g)
15	11.7^{b}	3071.0^{ab}	75.4^{a}	79.3^{b}	42.8
20	17.1^{a}	3425.5^{a}	75.7^{a}	86.0^{a}	43.5
25	17.2^{a}	2733.5^{b}	72.0^{b}	76.2^{b}	40.8
CV (%)	5.58	5.51	0.54	1.35	3.92
F-calculated	54.82	16.64	24.00	19.87	2.94^{ns}
Prob	0.0001	0.0036	0.0014	0.0023	0.1289

Within the same column, values sharing at the same letter are not significantly different at $p<0.01$.

hectare differed significantly ($p<0.01$), with the 20-row treatment achieving the highest yield (3,425.5 kg/ha), 1.12 times higher than the 15-row treatment (3,071.0 kg/ha) and 1.25 times higher than the 25-row treatment (2,733.5 kg/ha). Previous studies in the south central coast region of Vietnam indicated yields of 3,770 kg/ha for VD 01-1 in winter-spring, while in the southeast region, yield was 3,480.0 kg/ha (Ngo *et al.*, 2010; Thai *et al.*, 2010). In the summer-autumn on gray soil in Tay Ninh province, the average harvested yield of VD 01-1 was 3,500 kg/ha (Le *et al.*, 2025). These results show that the VD 01-1 yield on Phu Quoc in winter-spring was lower and increasing the number of intercropped rows did not enhance yield. The 20-row treatment produced 3,425.5 kg/ha, comparable to yields in the summer-autumn in Tay Ninh province and winter-spring season in the southeast region. Additionally, this yield was higher than the black peanut variety in Thanh Hoa province, which produced 2,940.0 kg/ha in autumn-winter and 3,070.0 kg/ha in winter-spring (Nguyen *et al.*, 2019).

The kernel rate was highest in the 15- and 20-row treatments (75.4% and 75.7%) and lowest in the 25-row treatment (72.0%). The filled kernel rate differed significantly ($p<0.01$), highest in the 20-row treatment (86.0%), while the 15- and 25-row treatments had 79.3% and 76.2%, respectively. Hundred-seed weight did not differ significantly, averaging 40.8-43.5 g. Ngo *et al.* (2010) reported kernel and filled rates of 74.6% and 87.7% for VD 01-1 in the south central coast region, while on gray soil in Cu Chi, Ho Chi Minh City, rates were 73.5% and 90.1% (Thai *et al.*, 2010). In the summer season on gray soil, kernel and filled rates were 87.0% and 89.2% (Le *et al.*, 2025). VD 01-1 on Phu Quoc showed similar or slightly lower rates, with the 20-row treatment tending to have higher kernel and filled rates than the 15- and 25-row treatments, comparable to some southeast and south central coast regions.

Before the experiment, growth indicators of Dua Dua did not differ significantly across treatments, with base circumference of 50.0-51.3 cm, 11.0-11.6 fronds, leaf-bearing part length of 113.8-118.0 cm, 47.3-48.3 leaflets, leaflet length of 61.5-64.3 cm and width of 4.2-4.3 cm (Table 4). After three months, growth differences due to peanut intercropping were not significant (Table 5). Base circumference increased slightly (54.8-57.0 cm), fronds ranged 12.3-12.8, new fronds 3.5-3.8, leaf-bearing part 125.0-133.3 cm, leaflets 51.3-54.5, leaflet length 68.8-71.3 cm and width 4.6-4.8 cm. Peanut intercropping did not significantly affect coconut growth. Studies on 2-year-old Dua Dua on gray soils in Tay Ninh province reported average base circumference of 67.8 cm, 8.5 fronds, leaf-bearing length of 173.2 cm and 60.3 leaflets (Nguyen *et al.*, 2005). Other surveys on Phu Quoc indicated base circumference of 45.9-69.2 cm and 9.7-12.6 fronds at 2-3 years (Thai *et al.*, 2020). Growth on sandy loam at 2-3 years showed base circumference 40.4-63.1 cm, 7.1-9.9 fronds, leaf-bearing length 100.5-145.9 cm and 36.6-50.2 leaflets (Nguyen *et al.*, 2024). These results indicate that coconut growth on Phú Quoc was not significantly different from Tay Ninh or Ba Ria-Vung Tau provinces and intercropping with peanuts did not affect growth, suggesting minimal nutrient competition.

Table 6 shows pre-experiment soil texture: Sand 67.19%, silt 16.48%, clay 16.33%, classifying it as sandy loam (Singh, 2025). Soil bulk density and particle density were 1.82 and 2.48 g/cm³, with porosity 26.5% (Nguyen *et al.*, 2011). Pre-experiment soil pH was 5.74. Post-experiment,

Table 4: Growth parameters of coconut before intercropping with peanuts.

No. of inter-cropped rows	Trunk circum-ference (cm)	Number of leaf clusters	Functional leaf length (cm)	Number of leaf lets	Leaflet length (cm)	Leaflet width (cm)
0	50.0	11.1	113.8	47.8	62.0	4.3
15	51.3	11.0	114.8	47.3	64.3	4.3
20	50.4	11.4	117.0	48.3	63.9	4.3
25	51.3	11.6	118.0	47.5	61.5	4.2
CV (%)	10.41	10.45	8.25	9.68	10.68	8.08
F-calculated	0.06^{ns}	0.22^{ns}	0.17^{ns}	0.03^{ns}	0.16^{ns}	0.07^{ns}
Prob	0.9812	0.8794	0.9149	0.9909	0.9181	0.9742

Table 5: Effect of the number of intercropped peanut rows on coconut growth after intercropping.

No. of inter-cropped rows	Trunk circum-ference (cm)	Number of leaf clusters	Number of new leaves	Functional leaf length (cm)	Number of leaflets	Leaflet length (cm)	Leaflet width (cm)
0	56.0	12.8	3.5	130.1	54.5	68.8	4.6
15	55.8	12.3	3.6	125.0	52.3	69.0	4.8
20	54.8	12.5	3.6	133.3	51.3	71.3	4.7
25	57.0	12.8	3.8	128.8	53.3	69.5	4.8
CV (%)	10.72	9.17	9.20	11.89	7.25	9.00	8.60
F-calculated	0.10^{ns}	0.17^{ns}	0.38^{ns}	0.20^{ns}	0.53^{ns}	0.13^{ns}	0.14^{ns}
Prob	0.9607	0.9121	0.7733	0.8952	0.6749	0.9420	0.9354

pH decreased in non-intercropped and 15-row treatments (5.65, 5.69) but increased in 20- and 25-row treatments (5.89, 5.78), highest in the 20-row treatment. Soil moisture increased in intercropped treatments (12.49-14.44%), highest in 20-row, consistent with Maw *et al.* (2017) regarding legume intercropping reducing evaporation. Electrical conductivity (EC) slightly decreased, with intercropped treatments slightly lower than non-intercropped. Cation exchange capacity (CEC) increased, highest in 20-row (15.92 meq/100 g), improving nutrient availability (Nguyen *et al*., 2021; Farhangi-Abriz and Ghassemi-Golezani, 2023). Organic matter increased, highest in 20-row treatment (3.19%), correlating with higher available P and K (Liu *et al*., 2024) and nitrogen fixation (Cao *et al*., 2021). Total N increased slightly, highest in 20-row (0.16%), while available N peaked in 20-row (7.57 mg/100 g). Available P increased most in 20-row (3.89 mg/100 g) and available K increased with intercropping, highest in 25-row (5.74 mg/100 g). Soil bulk density decreased in intercropped treatments, lowest in 20-row (1.44 g/cm^3), while porosity increased, highest in 20-row (40.7%). Nitrogen-fixing microbes increased to 3.1-5.5 $\times$ 10^6 CFU/g, highest in 20-row.

Dua Dua is a dwarf, early-maturing, high-yield coconut with characteristic aroma (Zhou *et al*., 2024). Coconut requires systematic nutrient supply due to long growth cycles (Mathew *et al*., 2024). Intercropping legumes can fix atmospheric N, enhancing soil fertility and microbial populations (Kebede, 2021). Table 7 shows soil pH (5.89 in 20-row), moisture (highest in 20-row, 14.44%), EC (generally <20 µS/cm), CEC (10.10-15.92 meq/100 g) and organic matter increased post-intercropping. Available N, P and K increased with the number of intercropped rows, meeting coconut nutrient requirements (Malhotra *et al*., 2017;

Table 6: Effect of the number of intercropped peanut rows on soil properties after intercropping.

Parameter	Unit	Before experiment	After experiment			
			0*	15	20	25
pH H_2O (1:5)	-	5.74	5.65	5.69	5.89	5.78
Soil moisture	%	8.01	8.03	12.49	14.44	13.82
EC (1:5)	µS/cm	19.30	19.60	18.15	18.81	18.40
CEC	meq/100 g	9.70	10.10	12.10	15.92	14.91
Organic matter (OM)	%	1.46	1.64	2.65	3.19	2.87
Total N	%	0.14	0.14	0.15	0.16	0.15
Total P_2O_5	%	0.13	0.13	0.14	0.15	0.14
Total K_2O	%	0.52	0.51	0.63	0.73	0.64
Available N	mg/100 g	3.28	3.26	5.10	7.57	6.80
Available P_2O_5	mg/100 g	2.44	2.40	3.48	3.89	3.57
Available K_2O	mg/100 g	4.40	4.44	5.56	5.59	5.74
Soil density	g/cm^3	2.48	2.47	2.46	2.43	2.45
Bulk density	g/cm^3	1.82	1.73	1.71	1.44	1.53
Porosity	%	26.50	29.90	30.50	40.70	37.60
N-fixing microorganisms	CFU/g	-	1×10^6	3.1×10^6	5.5×10^6	5.1×10^6

*Number of intercropped rows.

Table 7: Effect of intercropped peanut rows on the soil properties of coconut plantations.

Parameter	Unit	0	15	20	25	Reference / Range
pH H_2O (1:5)	-	5.65	5.69	5.89	5.78	5.5 - 7.5 *(Khan and* Krishnakumar, 2018)
Soil moisture	%	8.03	12.49	14.44	13.82	n/a
EC (1:5)	µS/cm	19.60	18.15	18.81	18.40	< 200 (Nair *et al.,* 2018)
CEC	meq/100 g	10.10	12.10	15.92	14.91	20.7 - 43.1 (Irawan *et al.,* 2022)
Organic matter (OM)	%	1.64	2.65	3.19	2.87	0.17 - 2.70 (Srinivasan *et al.,* 2021)
Particle density	g/cm³	2.47	2.46	2.43	2.45	n/a
Bulk density	g/cm³	1.73	1.71	1.44	1.53	1.36 -1.54 (Irawan *et al.,* 2022)
Porosity	%	29.90	30.50	40.70	37.60	31.2 - 41.2 (Irawan *et al.,* 2022)

Table 8: Effect of macronutrients in peanut-intercropped soil on nutrient availability for coconut.

No. of inter-cropped rows	Available N (mg/100 g)	Available P_2O_5 (mg/100 g)	Available K_2O (mg/100 g)
0	3.26	2.40	4.44
15	5.10	3.48	5.56
20	7.57	3.89	5.59
25	6.80	3.57	5.74
Malhotra *et al.* (2017)	7.0-8.0	1.0-2.0	5.0-6.8

Lins *et al*., 2021). Table 8 shows the 20-row treatment had highest available N and P, while K was highest in the 25-row treatment. Intercropping 20-row peanuts in Dua Dua gardens enhances soil fertility, nutrient supply and supports coconut growth.

CONCLUSION

The VD 01-1 peanut variety demonstrated robust growth, development and yield under Phu Quoc conditions. Intercropping 20-row peanuts in Dua Dua gardens produced higher pod numbers, filled pods, dry pod weight, dry pod yield per plot and per hectare, kernel rate and filled kernel rate compared with the 15- and 25-row treatments. Peanut intercropping had no adverse effect on coconut growth, with all growth indicators showing satisfactory increases. Intercropping also improved soil properties, fertility and nitrogen-fixing microbial populations, with the 20-row treatment providing the most favorable soil and microbial conditions. Nutrient availability in intercropped soil supported coconut growth, with the highest available nitrogen and phosphorus in the 20-row treatment and the highest potassium in the 25-row treatment. Overall, intercropping 20-row peanuts (covering 60% of the intercroppable area) during the establishment phase is recommended, enhancing crop diversity, resource use efficiency, economic returns, soil health and supporting coconut growth and development.

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Conflict of interest

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