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ENHANCING FOOD SECURITY THROUGH RESILIENT BANANA CROP MANAGEMENT STRATEGIES: INSIGHTS FROM FARM PRACTICES IN NANJANGUD TALUK MYSORE DISTRICT KARNATAKA INDIA

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ABSTRACT

Bananas (*Musa* spp.) are a vital staple and cash crop, contributing significantly to food security and rural livelihoods in tropical regions. However, climate variability, pest pressures, and resource constraints challenge sustainable production, necessitating resilient crop management strategies. This study investigates farm management practices for banana cultivation across multiple villages in Nanjangud, Karnataka, India, through a comprehensive field survey. Data were collected from smallholder farmers on agronomic practices, including soil management, irrigation techniques, pest and disease control, and intercropping systems, to assess their efficacy in enhancing yield and resilience. Preliminary findings reveal a diversity of strategies, with notable variations in adoption of organic and inorganic inputs, water conservation methods, and integrated pest management across villages. High-performing practices, such as drip irrigation and biofertilizer use, correlate with improved crop productivity and reduced environmental stress, while traditional methods persist in areas with limited access to resources. These insights underscore the potential of localized, adaptive crop management to bolster agricultural resilience. By aligning these strategies, this study contributes to the discourse on sustainable agriculture in the face of global challenges. Recommendations include scaling successful practices through farmer education and policy support, offering a pathway toward resilient banana production systems in India.
Keywords **:** Banana cultivation, crop management, resilient agriculture, food security, smallholder farmers.

Introduction

Since the beginning of time, India has primarily been an agrarian economy, with agriculture providing a livelihood for more than half of its population; key fruit crops include mangoes, bananas, citrus fruits, and grapes, with total horticulture production in 2021-22 estimated at 341.63 million tonnes, reflecting an increase of about 7.03 million tonnes (a 2.10% rise) over 2020-21 (DES, 2021-22). Bananas (Musa spp.) serve as a vital staple and cash crop, significantly contributing to food security and rural livelihoods in tropical regions, ranking as the second most leading fruit crop in India after mango and accounting for 31.74% of global fruit production; however, climate variability, disease pressures such as Panama Wilt, and resource constraints in tropical regions like Karnataka often lead to decreased banana production. Asia accounts for 54% of the global banana market, with China and India contributing over 40% of production in the past decade, making India the world's largest producer, where leading states include Tamil Nadu, Maharashtra, Gujarat, and Karnataka; banana cultivation occupies 20% of the total crop area in India, and after Chamarajanagar, Mysore district holds the second-highest area and production of bananas in Karnataka, with Nanjangud and H.D. Kote taluks boasting the highest area under banana production, where the total banana area in Nanjangud taluk is 5.57 thousand hectares, contributing 167.364 thousand metric tons in 2023-24(Department of horticulture, Government of Karnataka) and the major varieties grown in this region are Yelakki, Nendran, Cavendish, and the unique GI-tagged Nanjangud Rasabale. Limited studies exist on localized, resilient management practices for banana cultivation in this region, and the present study investigates farm practices, assesses their efficacy, and proposes scalable strategies to enhance resilience and ensure food security

Materials and Methods

Study Area

Nanjangud taluk lies on south-western parts of Mysore district and forms almost a plain boundary except for a few isolated hillocks to the south and west. These hills rise 600 to 700 feet above the general level of the boundary, which is at an elevation of 2400 feet above MSL. The highest peak lying on the south-western corner of the taluk is 3108 above MSL. The hills are bare and stand out prominently in this flat stretch of the boundary. The general slope is from south to north and there is a small but gradual and wide depression seen on the northern parts of the taluk following the Kabini river basin and another small and narrow depression is seen on the western parts of the taluk through which Nugu river flows. Similarly, another wide depression is seen in the central portion of the taluk where Gundal river flows sluggishly; the northern parts of the taluk are drained by Kabini river, a major tributary of the river Cauvery.The Nanjangud taluk is lies between north latitude 11°5’ 30” to12°12’30” and east longitude 76°22’30” to 76°56’30”. Total extent of area is 981.60 sq. km covering 184 villages in 5 hoblis.As per the crop survey data (Department of Horticulture, 2023), the areas cultivating more than 50 hectares of banana lies in hullalhalli and doddakowlande hoblis of nanjangud taluk will be selected. In the selected hoblis, three villages of hullahalli and one village in doddakowlande has highest area under banana cultivation, and the details are given below.,

Hobli	Village	Area (Hectares)
Hullahalli	Huskuru	97.14
	Kaninuru	59.61
	Karya	51.01
Doddakowlande	Halepura	83.72

Methodology

A comprehensive field survey was conducted in the selected villages from March 2024 to March 2025 to collect data on farmer demographics, agronomic practices, pest and disease management, and yield and productivity metrics, utilizing pre-prepared questionnaires and farm observations, with a sample size of approximately 120 smallholder farmers.

Statistical analysis was conducted using R, a free and open-source statistical programming language, for data analysis and visualization, employing R version 4.2.3 along with packages such as tidyverse for data manipulation, and functions like dataframe and rbind for data structuring and combination.

Results and Discussion

Diversity of Farm Practices across the four villages: Table1.shows the diversified farm practices followed in the same village by different farmer. Likewise, the other three villages which show the highest area under banana cultivation were selected and represented through tabular form in Table2, Table3 and Table4.The four villages-Halepura, Huskuru, Kaninuru, and Karya-represent diverse banana farming systems in a region characterized by the use of drip and flood irrigation techniques, tissue culture, and sucker planting methods, with varying intercropping practices such as Mangalur cucumber and beans. Halepura and Huskuru predominantly employ compost and NPK fertilizers, while Kaninuru and Karya rely heavily on manure and NPK, reflecting differences in soil management and input availability. The planting seasons span November to April, influenced by local climatic conditions, and the prevalence of pests and diseases like Panama wilt, rhizome weevil, and bacterial soft rot underscores the challenges faced by these farming communities. This study analyzed yield (tons per acre) and disease loss (% of plants affected) across 30 farmers per village, totaling 120 observations**.**Halepura recorded the highest mean yield at 18.27 tons/acre, followed by Huskuru (16.47 tons/acre), Kaninuru (16.07 tons/acre), and Karya (15.93 tons/acre). Disease loss was highest in Halepura (18.30%), compared to Huskuru (12.40%), Kaninuru (11.23%), and Karya (14.47%). Income followed a similar trend, with Halepura averaging Rs 925,000/acre, Huskuru Rs 841,667/acre, and both Kaninuru and Karya at Rs 800,833/acre as shown in Table 5.

Irrigation Techniques

Halepura and Kaninuru used 100% drip irrigation. Huskuru had 77% drip and 23% flood irrigation, while

Karya had 87% drip and 13% flood irrigation as shown in Table 6.

Banana Varieties

Halepura showed the most variety, with Cavendish (7/30), Yelakki (9/30), Nendran (10/30), and Rasbale (3/30). Huskuru was dominated by Nendran (28/30), with only 2 Cavendish farmers. Kaninuru had mostly Nendran (16/30) and Yelakki (12/30), while Karya had Nendran (16/30), Cavendish (7/30), and Yelakki (6/30).

Intercropping

Kaninuru had the highest intercropping rate (67%), with 20/30 farmers growing Mangalur cucumber, beans, or chilli alongside bananas. Huskuru had 40% intercropping, Karya 33%, and Halepura the lowest at 17% (5/30 farmers).

Pests and Diseases

In Halepura, 40% of farmers reported Panama Wilt, 30% Rhizome weevil, and 30% Bacterial soft rot. Huskuru had 50% Rhizome weevil, 30% Bacterial soft rot, and 20% Panama Wilt. Kaninuru and Karya reported mostly Rhizome weevil (50% and 60%, respectively) and Bacterial soft rot (43% and 23%) (Mallikarjun *et al*., 2017), with minimal Panama Wilt (3% and 17%) (Pegg *et al*., 2019) as shown in Table 7.

Banana farming is a significant agricultural activity in tropical regions, influenced by factors such as climate, soil fertility, irrigation availability, and farming practices. The four villages under study-Halepura, Huskuru, Kaninuru, and Karya are located in a banana-growing belt characterized by a tropical climate with distinct wet and dry seasons (Ravi and Mustaffa, 2013, Saraswathi *et al*., 2016), which supports the cultivation of varieties like Cavendish, Yelakki, Nendran, and Rasbale. Halepura is known for its fertile alluvial soils and widespread adoption of drip irrigation, which may contribute to higher productivity but also makes it susceptible to soil-borne diseases like Panama wilt. Huskuru, situated in a slightly drier area, relies on a mix of drip and flood irrigation, with many farmers practicing intercropping with crops like Mangalur cucumber and beans to diversify income. Kaninuru benefits from consistent access to water through drip irrigation and is noted for its focus on tissue culture planting, which may reduce disease incidence but can limit yield potential due to smaller farm sizes. Karya, located in a region with variable rainfall, has a mix of irrigation techniques and a higher prevalence of ratoon planting, which may affect both yield and disease susceptibility. These villages also differ in their pest and disease challenges, with Panama wilt, rhizome weevil, and bacterial soft rot being the most common threats. This study examines how these regional and agricultural differences manifest in banana yield and disease loss across the four villages.

This study highlights distinct differences in banana cultivation practices across Halepura, Huskuru, Kaninuru, and Karya, offering insights into resilient strategies for food security in Nanjangud Taluk. Halepura's higher yield (18.27 tons/acre) compared to Kaninuru (16.07 tons/acre) and Karya (15.93 tons/acre) can be attributed to its 100% adoption of drip irrigation (Sharma and Kispotta.2016, Ghosh *et al.*, 2018, Kumar *et al*., 2019) and diverse banana varieties, including high-yielding Cavendish and the GI-tagged Rasbale. Drip irrigation ensures efficient water use, crucial in Nanjangud's monsoon-dependent climate with 850 mm annual rainfall (Shashidhara *et al*., 2007). However, Halepura also faced the highest disease loss (18.30%), driven by Panama Wilt affecting 40% of farmers, particularly Rasbale (35–40% loss) (Ploetz and Pegg.,2000; Ploetz, 2015.) This aligns with historical challenges for Rasbale, where Panama Wilt has reduced cultivation to just 10 acres by 2019 (ICAR-NRCB, 2023, Ordonez *et al*., 2015). Kaninuru and Karya, with lower yields (16.07 and 15.93 tons/acre), focused on Nendran and Yelakki varieties, which may have lower yield potential but showed better disease resistance, with losses at 11.23% and 14.47%, respectively. Kaninuru's high intercropping rate (67%) with Mangalur cucumber, beans, and chilli likely diversified farmer income (Rs 800,833/acre) and reduced risk, supporting resilience (Singh and Sairam, 2016). Huskuru's intermediate yield (16.47 tons/acre) and disease loss (12.40%) reflect a balanced approach, though its 23% use of flood irrigation may contribute to Bacterial soft rot (30% of farmers), as excess water promotes fungal growth. The strong link between yield and income (higher yields in Halepura led to Rs 925,000/acre) underscores the economic benefits of resilient practices, enhancing food security by ensuring stable farmer livelihoods(Staver *et al*., 2015). However, Halepura's disease challenges highlight the need for better pest management, such as integrated pest management (IPM), which could reduce Panama Wilt losses, as seen in Kaninuru's lower disease incidence (Dita *et al*., 2018). Intercropping, prevalent in Kaninuru, offers a model for Halepura to diversify and mitigate risks, aligning with sustainable agriculture goals in Karnataka. A limitation of this study is its focus on one season, which may not capture long-term resilience trends. Future research should explore multi-year data and test IPM strategies for Rasbale. To enhance food security, we recommend promoting drip irrigation in Huskuru and Karya, training Halepura farmers in IPM to manage Panama Wilt, and encouraging intercropping across all villages to diversify income and reduce dependency on bananas alone (Sarkar, 2011)

Conclusion

This study examined banana farming outcomes across four villages Halepura, Huskuru, Kaninuru, and Karya revealing significant variations in yield and disease loss influenced by diverse agricultural practices and environmental conditions. Halepura demonstrated the highest mean yield of 18.27 tons/acre, suggesting the effectiveness of drip irrigation and fertile soils, while Kaninuru exhibited the lowest median disease loss of 11.23%, potentially due to its reliance on tissue culture planting and consistent water management. Huskuru and Karya, with mean yields of 16.47 and 15.77 tons/acre respectively, and higher variability in disease loss, reflect the challenges posed by mixed irrigation methods and ratoon planting in variable climatic conditions. The prevalence of pests and diseases such as Panama wilt, rhizome weevil, and bacterial soft rot underscores the need for integrated pest management strategies tailored to each village's context. These findings highlight the importance of location-specific farming techniques in optimizing banana production and minimizing losses. Future research could explore the economic impacts of these yield and disease variations, as well as the efficacy of intercropping and advanced irrigation technologies in mitigating disease risks across these communities.

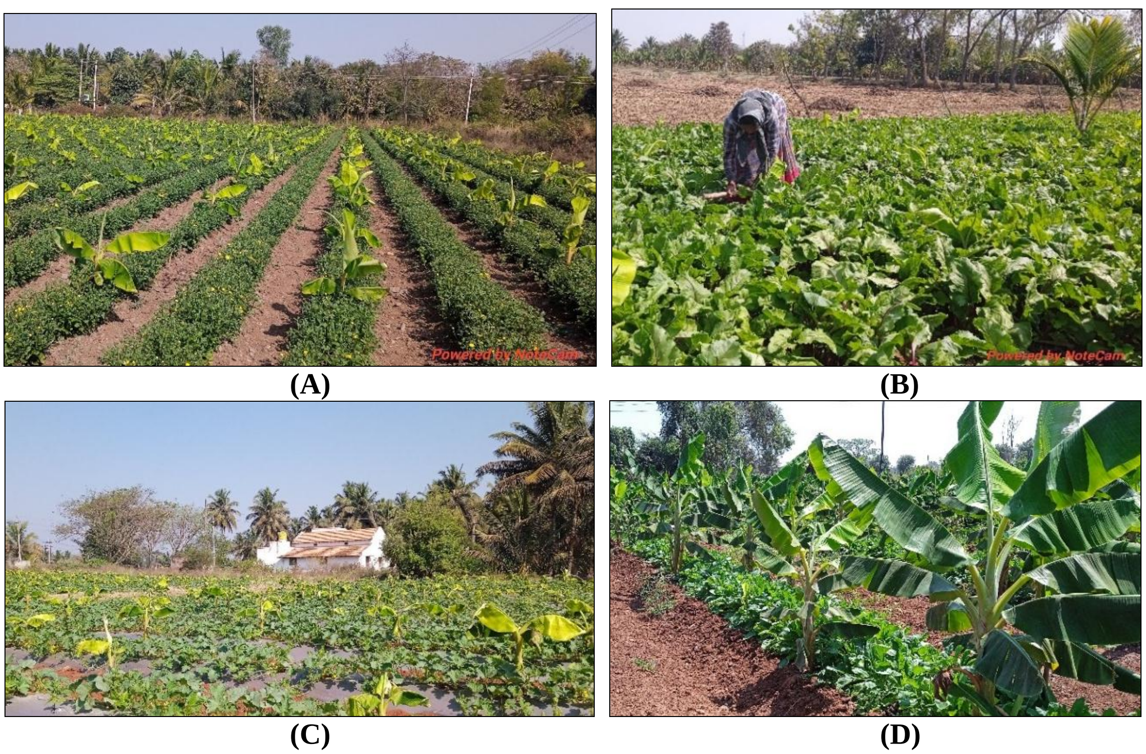

Fig. 1 : Banana intercropping with chrysanthemum (A), beetroot (B), Mangalur cucumber (C) and Amaranthus (D).

Table 1 : Farm practices followed for banana crop in Huskuru village.

Number of farmers in Huskuru	Banana variety	Type of inputs	Irrigation Techniques	Planting Details			Intercropping Systems	Pests/Diseases Observed		Yield	Income
		Organic (compost, manure) /inorganic (NPK fertilizers)	Drip irrigation/ flood irrigation	Tissue culture/ suckers	spacing(feet)	Planting season	Crops grown with bananas	Type	% of plants affected	(tons per acre)	(Rupees/ acre)
1	Nendran	Manure and NPK	Drip	Tissue culture	6*6	November	Mangalur cucumber	Rhizome weevil	5	16	800000
2	Nendran	Manure and NPK	Drip	Tissue culture	6*6	April	No intercroppping	Rhizome weevil	10	18	900000
3	Nendran	Manure and NPK	Drip	Tissue culture	6*6	February	No intercroppping	Rhizome weevil	15	15	750000
4	Nendran	Manure and NPK	Drip	Tissue culture	6*6.5	April	beetroot	Rhizome weevil	8	16	800000
5	Nendran	Manure and NPK	Drip	Tissue culture	6*6	April	No intercroppping	Rhizome weevil	5	14	700000
6	Cavendish	Compost and NPK	Flood	Suckers	6*6.5	April	No intercroppping	Bacterial soft rot	15	30	1500000
7	Cavendish	Compost and NPK	Flood	Suckers	6*6.5	November	Mangalur cucumber	Bacterial soft rot	15	25	1250000
8	Nendran	Manure and NPK	Flood	Tissue culture	6*6	February	No intercroppping	Bacterial soft rot	10	18	900000
9	Nendran	Manure and NPK	Flood	Tissue culture	6*6	January	No intercroppping	Bacterial soft rot	15	19	950000
10	Nendran	Manure and NPK	Drip	Tissue culture	5*5	January	No intercroppping	Bacterial soft rot	20	14	700000
11	Nendran	Manure and NPK	Drip	Tissue culture	5*5	January	No intercroppping	Bacterial soft rot	15	12	600000
12	Nendran	Manure and NPK	Drip	Tissue culture	5*5	January	No intercroppping	Rhizome weevil	10	13	650000
13	Nendran	Manure and NPK	Drip	Tissue culture	6*6	January	Mangalur cucumber	Rhizome weevil	5	16	800000
14	Nendran	Manure and NPK	Drip	Tissue culture	6*6	April	No intercroppping	Rhizome weevil	15	18	900000
15	Nendran	Manure and NPK	Drip	Tissue culture	6*6	February	No intercroppping	Rhizome weevil	5	16	800000
16	Nendran	Manure and NPK	Drip	Tissue culture	6*6	December	No intercroppping	Rhizome weevil	10	18	900000
17	Nendran	Manure and NPK	Drip	Tissue culture	6*6	November	beans	Rhizome weevil	20	14	700000
18	Nendran	Manure and NPK	Drip	Tissue culture	6*6	November	No intercroppping	Rhizome weevil	16	12	600000
19	Nendran	Manure and NPK	Drip	Tissue culture	6*6	January	Chilli	Rhizome weevil	15	16	800000
20	Nendran	Manure and NPK	Drip	Tissue culture	6*6	December	No intercroppping	Rhizome weevil	10	17	850000
21	Nendran	Manure and NPK	Drip	Tissue culture	6*6	December	Mangalur cucumber	Rhizome weevil	5	20	1000000
22	Nendran	Manure and NPK	Drip	Tissue culture	6*6	December	No intercroppping	Bacterial soft rot	8	19	950000
23	Nendran	Manure and NPK	Drip	Tissue culture	6*6	November	No intercroppping	Bacterial soft rot	15	18	900000
24	Nendran	Manure and NPK	Drip	Suckers	6*6	December	No intercroppping	Bacterial soft rot	20	16	800000
25	Nendran	Manure and NPK	Drip	Suckers	6*6.5	December	No intercroppping	Bacterial soft rot	10	14	700000
26	Nendran	Manure and NPK	Drip	Suckers	6*6.5	November	Mangalur cucumber	Panama wilt	16	18	900000
27	Nendran	Manure and NPK	Drip	Suckers	6*6.5	December	Mangalur cucumber	Panama wilt	20	12	600000
28	Nendran	Manure and NPK	Flood	Suckers	6*6.5	November	Mangalur cucumber	Panama wilt	25	19	950000
29	Nendran	Manure and NPK	Flood	Suckers	6*6.5	December	Mangalur cucumber	Panama wilt	15	14	700000
30	Nendran	Manure and NPK	Flood	Suckers	6*6.5	April	No intercroppping	Rhizome weevil	15	16	800000

Note: Biofertilizers are used for seed inoculation and to calculate income average banana price of 50rs/kg is taken as it varies with season.

Table 2 : Farm practices followed for banana crop in Kaninuru village.

Number of farmers in Kaninurua	Banana variety	Type of inputs	Irrigation Techniques	Planting Details			Intercropping Systems	Pests/Diseases Observed		Yield	Income
		Organic (compost, manure) /inorganic (NPK fertilizers)	Drip irrigation/ flood irrigation	Tissue culture/ suckers	Spacing(feet)	Planting season	Crops grown with bananas	Type	% of plants affected	(tons per acre)	(Rupees/ acre)
1	Yelakki	Manure and NPK	Drip	Tissue culture	6*6	April	Mangalur cucumber	Bacterial soft rot	10	16	800000
2	Nendran	Manure and NPK	Drip	Suckers	6*6	December	Mangalur cucumber	Bacterial soft rot	12	18	900000
3	Nendran	Manure and NPK	Drip	Tissue culture	6*6	December	Mangalur cucumber	Rhizome weevil	5	17	850000
4	Nendran	Manure and NPK	Drip	Suckers	6*6	November	Mangalur cucumber	Rhizome weevil	10	14	700000
5	Yelakki	Manure and NPK	Drip	Tissue culture	6*6	January	Mangalur cucumber	Rhizome weevil	13	14	700000
6	Yelakki	Manure and NPK	Drip	Tissue culture	6*6	December	Mangalur cucumber	Bacterial soft rot	14	19	950000
7	Yelakki	Manure and NPK	Drip	Tissue culture	6*6	April	Beans	Rhizome weevil	5	16	800000
8	Yelakki	Manure and NPK	Drip	Tissue culture	6*6	December	Beans	Rhizome weevil	8	18	900000
9	Yelakki	Manure and NPK	Drip	Tissue culture	6*6	December	Beans	Rhizome weevil	10	14	700000
10	Yelakki	Manure and NPK	Drip	Tissue culture	6*6	November	Beans	Rhizome weevil	5	18	900000
11	Yelakki	Manure and NPK	Drip	Tissue culture	6*6	January	Chilli	Bacterial soft rot	12	17	850000
12	Yelakki	Manure and NPK	Drip	Tissue culture	6*6	January	No intercroppping	Rhizome weevil	8	16	800000
13	Yelakki	Manure and NPK	Drip	Tissue culture	6*6	December	No intercroppping	Bacterial soft rot	5	18	900000
14	Nendran	Manure and NPK	Drip	Tissue culture	6*6	December	No intercroppping	Bacterial soft rot	14	14	700000
15	Nendran	Manure and NPK	Drip	Tissue culture	6*6	April	Mangalur cucumber	Bacterial soft rot	16	17	850000
16	Yelakki	Manure and NPK	Drip	Tissue culture	6*6	December	No intercroppping	Bacterial soft rot	14	14	700000
17	Nendran	Manure and NPK	Drip	Tissue culture	6*6	February	Chilli	Rhizome weevil	16	15	750000
18	Yelakki	Manure and NPK	Drip	Tissue culture	6*6	November	No intercroppping	Rhizome weevil	10	18	900000
19	Nendran	Manure and NPK	Drip	Tissue culture	6*6	November	No intercroppping	Rhizome weevil	12	16	800000
20	Nendran	Manure and NPK	Drip	Tissue culture	6*6	February	No intercroppping	Rhizome weevil	6	17	850000
21	Nendran	Manure and NPK	Drip	Tissue culture	6*6	January	Mangalur cucumber	Rhizome weevil	8	18	900000
22	Nendran	Manure and NPK	Drip	Tissue culture	6*6	January	No intercroppping	Rhizome weevil	14	16	800000
23	Nendran	Manure and NPK	Drip	Tissue culture	6*6	January	No intercroppping	Rhizome weevil	15	18	900000
24	Cavendish	Compost and NPK	Drip	Suckers	6*6.5	December	Mangalur cucumber	Panama wilt	22	15	750000
25	Nendran	Manure and NPK	Drip	Tissue culture	6*6	April	No intercroppping	Bacterial soft rot	14	16	800000
26	Nendran	Manure and NPK	Drip	Tissue culture	6*6	December	Mangalur cucumber	Bacterial soft rot	12	15	750000
27	Nendran	Manure and NPK	Drip	Tissue culture	6*6	December	Beans	Bacterial soft rot	15	14	700000
28	Nendran	Manure and NPK	Drip	Tissue culture	6*6	November	Beans	Bacterial soft rot	10	16	800000
29	Nendran	Manure and NPK	Drip	Ratoon	6*6	January	Beans	Rhizome weevil	14	13	650000
30	Nendran	Manure and NPK	Drip	Tissue culture	6*6	December	Mangalur cucumber	Rhizome weevil	10	15	750000

Table 3 : Farm practices followed for banana crop in Karya village.

Number of farmers in Karya	Banana variety	Type of inputs	Irrigation Techniques	Planting Details			Intercropping Systems	Pests/Diseases Observed		Yield	Income
		Organic (compost, manure) /inorganic (NPK fertilizers)	Drip irrigation/ flood irrigation	Tissue culture/ suckers	spacing (feet)	Planting season	Crops grown with bananas	Type	% of plants affected	(tons per acre)	(Rupees/ acre)
1	Cavendish	Compost and NPK	Drip	Ratoon	6*6.5	November	No intercroppping	Panama wilt	25	14	700000
2	Cavendish	Compost and NPK	Drip	Suckers	6*6.5	February	No intercroppping	Panama wilt	15	18	900000
3	Yelakki	Manure and NPK	Drip	Tissue culture	6*6	January	No intercroppping	Rhizome weevil	5	16	800000
4	Cavendish	Compost and NPK	Drip	Suckers	6*6.5	January	Mangalur cucumber	Panama wilt	20	13	650000
5	Nendran	Manure and NPK	Drip	Tissue culture	6*6	January	No intercroppping	Rhizome weevil	13	15	750000
6	Yelakki	Manure and NPK	Drip	Suckers	6*6	January	No intercroppping	Bacterial soft rot	18	18	900000
7	Cavendish	Compost and NPK	Drip	Suckers	6*6.5	January	No intercroppping	Panama wilt	20	15	750000
8	Cavendish	Compost and NPK	Drip	Suckers	6*6.5	April	Mangalur cucumber	Panama wilt	15	17	850000
9	Cavendish	Compost and NPK	Drip	Suckers	6*6.5	February	No intercroppping	Panama wilt	22	16	800000
10	Cavendish	Compost and NPK	Drip	Suckers	6*6.5	December	No intercroppping	Panama wilt	20	17	850000
11	Nendran	Manure and NPK	Drip	Tissue culture	6*6	November	Mangalur cucumber	Bacterial soft rot	12	16	800000
12	Nendran	Manure and NPK	Drip	Tissue culture	6*6	November	No intercroppping	Rhizome weevil	10	18	900000
13	Nendran	Manure and NPK	Drip	Tissue culture	6*6	January	No intercroppping	Rhizome weevil	5	19	950000
14	Nendran	Manure and NPK	Drip	Tissue culture	6*6	December	No intercroppping	Rhizome weevil	16	14	700000
15	Nendran	Manure and NPK	Drip	Tissue culture	6*6	December	Mangalur cucumber	Rhizome weevil	10	17	850000
16	Yelakki	Manure and NPK	Drip	Ratoon	6*6	November	No intercroppping	Rhizome weevil	24	13	650000
17	Yelakki	Manure and NPK	Drip	Tissue culture	6*6	December	Mangalur cucumber	Rhizome weevil	20	16	800000
18	Nendran	Manure and NPK	Flood	Tissue culture	6*6	November	No intercroppping	Rhizome weevil	10	19	950000
19	Nendran	Manure and NPK	Flood	Tissue culture	6*6	December	No intercroppping	Rhizome weevil	12	16	800000
20	Nendran	Manure and NPK	Flood	Tissue culture	6*6	April	No intercroppping	Rhizome weevil	5	17	850000
21	Nendran	Manure and NPK	Flood	Tissue culture	6*6	December	Mangalur cucumber	Rhizome weevil	8	18	900000
22	Nendran	Manure and NPK	Drip	Tissue culture	6*6	December	No intercroppping	Bacterial soft rot	12	16	800000
23	Nendran	Manure and NPK	Drip	Tissue culture	6*6	November	No intercroppping	Bacterial soft rot	13	17	850000
24	Cavendish	Compost and NPK	Drip	Ratoon	6*6	January	Mangalur cucumber	Panama wilt	20	14	700000
25	Nendran	Manure and NPK	Drip	Tissue culture	6*6	January	No intercroppping	Bacterial soft rot	10	16	800000
26	Nendran	Manure and NPK	Drip	Tissue culture	6*6	December	Mangalur cucumber	Rhizome weevil	16	16	800000
27	Nendran	Manure and NPK	Drip	Tissue culture	6*6	December	No intercroppping	Rhizome weevil	20	14	700000
28	Nendran	Manure and NPK	Drip	Tissue culture	6*6	April	No intercroppping	Rhizome weevil	15	17	850000
29	Nendran	Manure and NPK	Drip	Ratoon	6*6	December	No intercroppping	Rhizome weevil	23	13	650000
30	Nendran	Manure and NPK	Drip	Tissue culture	6*6	February	Mangalur cucumber	Rhizome weevil	15	14	700000

Table 4 : Farm practices followed for banana crop in Halepura village.

Number of farmers in Halepura	Banana variety	Type of inputs	Irrigation Techniques	Planting Details			Intercropping Systems	Pests/Diseases Observed		Yield	Income
		Organic (compost, manure) /inorganic (NPK fertilizers)	Drip irrigation/ flood irrigation	Tissue culture/ suckers	spacing(feet)	Planting season	Crops grown with bananas	Type	plants affe	(tons per acre)	(Rupees/ acre)
1	Cavendish	Compost and NPK	Drip	Tissue culture	6*6	April	No intercroppping	Panama	15	30	1500000
2	Yelakki	Only NPK	Drip	Tissue culture	6*6	April	No intercroppping	Panama	20	13	650000
3	Cavendish	Compost and NPK	Drip	Tissue culture	6*6	April	No intercroppping	Panama	30	25	1250000
4	Cavendish	Compost and NPK	Drip	Tissue culture	6*6	November	No intercroppping	Panama	15	20	1000000
5	Cavendish	Compost and NPK	Drip	Tissue culture	6*6	November	No intercroppping	Panama	25	22	1100000
6	Yelakki	Only NPK	Drip	Tissue culture	6*6	May	No intercroppping	Rhizome weevil	15	14	700000
7	Yelakki	Only NPK	Drip	Tissue culture	6*6	December	No intercroppping	Rhizome weevil	10	32	1600000
8	Cavendish	Compost and NPK	Drip	Suckers	6*6	November	No intercroppping	Bacterial soft rot	15	20	1000000
9	Yelakki	Only NPK	Drip	Suckers	6*6	May	No intercroppping	Rhizome weevil	15	16	800000
10	Cavendish	Compost and NPK	Drip	Suckers	6*6	February	No intercroppping	Rhizome weevil	25	25	1250000
11	Nendran	Compost and NPK	Drip	Suckers	6*6	April	No intercroppping	Rhizome weevil	10	18	900000
12	Yelakki	Only NPK	Drip	Suckers	6*6	November	No intercroppping	Panama	20	14	700000
13	Yelakki	Only NPK	Drip	Suckers	6*6	March	Chrysanthemum	Panama	15	15	750000
14	Nendran	Compost and NPK	Drip	Suckers	6*6	March	No intercroppping	Panama	20	20	1000000
15	Nendran	Only NPK	Drip	Suckers	6*6	March	Mangluru cucumber	Panama	10	14	700000
16	Nendran	Only NPK	Drip	Suckers	6*6	February	Beet root	Bacterial soft rot	14	15	750000
17	Nendran	Only NPK	Drip	Tisue culture	6*6	November	No intercroppping	Panama	20	16	800000
18	Rasbale	Manure and NPK	Drip	Suckers	5*5	December	No intercroppping	Panama	35	18	900000
19	Rasbale	Manure and NPK	Drip	Suckers	5*5	March	dill leaves,coriander,methi	Panama	40	19	950000
20	Rasbale	Manure and NPK	Drip	Suckers	5*5	February	No intercroppping	Panama	35	16	800000
21	Nendran	Compost and NPK	Drip	Tissue culture	6*6	November	No intercroppping	Rhizome weevil	15	19	950000
22	yelakki	Only NPK	Drip	Tissue culture	6*6	April	No intercroppping	Rhizome weevil	10	16	800000
23	Nendran	Compost and NPK	Drip	Tissue culture	6*6	April	No intercroppping	Bacterial soft rot	20	17	850000
24	Yelakki	Only NPK	Drip	Tissue culture	6*6	May	No intercroppping	Bacterial soft rot	15	15	750000
25	Nendran	Compost and NPK	Drip	Tissue culture	6*6	May	No intercroppping	Bacterial soft rot	20	16	800000
26	Nendran	Only NPK	Drip	Tissue culture	6*6	November	No intercroppping	Bacterial soft rot	10	17	850000
27	Nendran	Compost and NPK	Drip	Tissue culture	6*6	November	No intercroppping	Bacterial soft rot	15	18	900000
28	Nendran	Compost and NPK	Drip	Tissue culture	6*6	April	No intercroppping	Rhizome weevil	20	20	1000000
29	Yelakki	Only NPK	Drip	Tissue culture	6*6	April	No intercroppping	Rhizome weevil	20	15	750000
30	Cavendish	Manure and NPK	Drip	Tissue culture	6*6	April	No intercroppping	Rhizome weevil	15	25	1250000

Table 5: Summary of Mean Yield, Disease Loss, and Income by Villages.

Village	Mean Yield (tons/acre)	Mean Disease Loss (%)	Mean Income (Rs/acre)
Halepura	18.27	18.30	925,000
Huskuru	16.47	12.40	841,667
Kaninuru	16.07	11.23	800,833
Karya	15.93	14.47	800,833

Table 6: Distribution of Irrigation Techniques by Villages.

Village	Drip Irrigation (%)	Flood Irrigation (%)
Halepura	100	0
Huskuru	77	23
Kaninuru	100	0
Karya	87	13

Table 7: Prevalence of Pests and Diseases by Villages.

Village	Panama Wilt (%)	Rhizome Weevil (%)	Bacterial Soft Rot (%)
Halepura	40	30	30
Huskuru	20	50	30
Kaninuru	3	50	43
Karya	17	60	23

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References

Balraj, G., Palpandian, P., Monika, G. and Rageshwari, S. (2021). Banana: Tropical fruit crops Theory to practical. ResearchGate, 43–114.

Department of Horticulture, Government of Karnataka. (2023–2024). *Horticultural statistics of Karnataka*. Government of Karnataka.

Directorate of Economics and Statistics. (2021–2022). *Horticultural statistics at a glance*. Ministry of Agriculture and Farmers Welfare, Government of India.

Dita, M., Barquero, M., Heck, D., Mizubuti, E. S. G. and Staver, C. P. (2018). Fusarium wilt of banana: Current knowledge on epidemiology and research needs toward sustainable disease management. *Frontiers in Plant Science*, ***9***, 1468.

Ghosh, U., Sarkar, N. and Biswas, R. K. (2018). A review on performance evaluation of drip irrigation system in banana cultivation. *Journal of Pharmacognosy and Phytochemistry*, ***7***(1), 866–869.

ICAR-National Research Centre for Banana. (2023). *Advances in banana cultivation and integrated management of Fusarium wilt: Workshop proceedings*. ICAR-National Research Centre for Banana.

Kumar, V., Pandey, V., Nath, V. and Kumar, D. (2019). Effect of drip irrigation and fertigation on growth, yield and water use efficiency of banana. *International Journal of Current Microbiology and Applied Sciences*, ***8***(3), 1234–1242.

Mallikarjun, K., Yusuf, A. N. and Guruprasad, G. S. (2017). Management of soft rot of banana caused by *Erwinia carotovora* subsp. *carotovora*. *International Journal of Plant Protection*, ***10***, 381–385.

Ordonez, N., Seidl, M. F., Waalwijk, C., Drenth, A., Kilian, A., Thomma, B. P. H. J., Ploetz, R. C. and Kema, G. H. J. (2015). Worse comes to worst: Bananas and Panama disease—When plant and pathogen clones meet. *PLoS Pathogens*, ***11***(11), e1005197.

Pegg, K. G., Coates, L. M., O'Neill, W. T. and Turner, D. W. (2019). The epidemiology of Fusarium wilt of banana. *Frontiers in Plant Science*, ***10***, 1395.

Ploetz, R. C. (2015). Fusarium wilt of banana. *Phytopathology*, ***105***(12), 1512–1521.

Ploetz, R. C. and Pegg, K. G. (2000). Fusarium wilt. In D. R. Jones (Ed.), *Diseases of banana, abacá and enset* (pp. 143–159). CABI Publishing.

Ravi, I. and Mustaffa, M. M. (2013). Impact, adaptation and mitigation strategies for climate-resilient banana production. In C. P. S. Harish, N. K. S. Rao and K. S. Shivashankar (Eds.), *Climate-resilient horticulture: Adaptation and mitigation strategies* (pp. 45–52). Springer India.

Saraswathi, M. S., Uma, S., Kannan, G., Selvarajan, R. and Mustaffa, M. M. (2016). *Banana cultivation and management: Recent advances*. ICAR-National Research Centre for Banana.

Sarkar, S. (2011). Intercropping between pineapple (*Ananas comosus*) and banana (*Musa acuminata*). *Asian Journal of Horticulture*, ***6***(1), 96–97.

Sharma, R. and Kispotta, W. (2016). Study on drip irrigation in banana in Kaushambi district of Uttar Pradesh. *IOSR Journal of Business and Management*, ***18***(1), 10–12.

Shashidhara, K. K., Bheemappa, A., Hirevekanagoudar, L. V. and Shashidhar, K. C. (2007). Benefits and constraints in adoption of drip irrigation among plantation crop growers. *Mysore Journal of Agricultural Sciences*, ***20***(1), 82–84.

Singh, M. C. and Sairam, C. V. (2016). Effect of spacing and intercropping with cowpea on weed growth in banana. *International Journal of Scientific Engineering and Technology*, ***5***(2), 558–563.

Staver, C., Pemsl, D., Scheerer, L., Perez, E. and Pallangyo, B. (2015). Ex ante assessment of returns on research investments to address the impact of Fusarium wilt Tropical Race 4 on global banana production. *Frontiers in Plant Science*, ***6***, 766.