



# Plantations International Mango Report

Assistant Professor Dr. Jenjira Chumpookam at Kasetsart University Agricultural Department in Bangkok visits Plantations International's plantations in Siracha and Kanchanaburi up to 3 times each year. With a main focus on PI's Mango Nam Dok Mai, Dr. Jenjira assesses the growth, quality and potential of our Mango plantation trees.

Any improvements or advice will be recommended by Dr. Jenjira and these insights will be reviewed by the Plantations team in Thailand to see if these can be adapted at the plantation. This is an independent observation of our mango plantations from a highly experienced, educated and informed consultant.

## Suggested Assessment & Timing

1. Soil Structure	After rainfall events or irrigation
2. Biological Activity	Early season, mid-season, end of season
3. Erosion	After harvest and during high-wind periods or after heavy rain. Also assess after planting.
4. Soil Test Organic Matter	After reviewing soil test data. Assess in fall or spring.
5. Soil Compaction	Spring to when plants are about 10" tall
6. Plant Health	Summer to late summer
7. Residue	Post-harvest, pre-plant, growing season
8. Infiltration	After rainfall events
9. Water-Holding Capacity	After soil is at field moisture capacity. Assess during growing season.

# PI - Progress Report Recording Sheet

DATE: 22 August 2024

CROP: Mango production

FIELD LOCATION: Siracha

YEAR OF PLANTING: 4 years

SOIL MOISTURE AT TIME OF SAMPLING:  DRY  ADEQUATE  WET

Indicator	Observations	Poor–Fair (0–3)	Fair–Good (4–7)	Good–Excellent (8–10)	Score
1. Soil Structure	Sandy loam to loam soil, with friable consistency; particle composition is 45-55% Sand: 32-37% Silt: 13-18% Clay, rather fine and soft to the touch, hard crust forms when dry but fairly flexible when moist.	Hard, no surface residue  Powder when dry, crusts easily after a hard rain  Large, hard clods, very hard to prepare seed bed	Crumbles with pressure  Some residue and organic matter  Crust only in areas such as wheel tracks	Very crumbly  No crusting, residue prevents surface hardening  Mellow, ready to plant	9
2. Biological Activity	Biological activity was not measured	Very old residue that does not decompose, no sign of soil life (insects, worms, etc.)	Moderate decomposition of residue, few soil organisms (insects or worms)	Rapid decomposition of residue, many soil organism and diverse population	-

<b>3. Erosion</b>	<p>The soil structure is good, with loosely bound soil particles, good porosity, and continuity of air spaces, allowing the mango tree roots to grow well. The soil has good aeration and water drainage. The structure of the soil is relatively strong and resistant to erosion. Additionally, grass grows around the mango trees, even though it may be considered a weed; it helps cover the soil, retain moisture, prevent surface soil erosion, and reduce the soil temperature. However, the grass is occasionally cut.</p>	<p>Signs of severe wind stress or gullies throughout field</p>	<p>Adequate control after windy period or hard rain</p>	<p>Excellent control after hard wind or hard rain</p>	<p>8</p>
<b>4. Soil Test Organic Matter</b>	<p>pH 6.40, Lime requirement 134-269 kg.CaCO<sub>3</sub>/rai, Organic mater 6.63-9.12, Total N 0.52-0.59 g/kg, Available P 21.3-23.7 mg/kg, Available K 45.7-50.9 mg/kg, Available Ca 684-790 mg/kg and Available Mg 80.7-116 mg/kg.</p>	<p>Downward trend</p>	<p>Static trend</p>	<p>Upward trend</p>	<p>8</p>

<p><b>5. Soil Compaction</b></p>	<p>The survey assessment on site together with the soil analysis tests showed that the soil is sandy loam, tending to loam in some areas. The organic matter content is low. When the soil is very moist, such as just after it rains, it is not recommended to use any agricultural machinery to work in the fields because the soil may become too dense.</p>	<p>Hard pan stops roots, roots grow laterally</p>	<p>Few roots grow through, some grow laterally</p>	<p>Roots grow straight down</p>	<p>8</p>
<p><b>6. Plant Health</b></p>	<p>The mango trees are healthy, exhibit good growth, have a beautiful canopy shape, and the young leaves are in perfect condition, free from diseases and pests. They are at the stage ready for the application of paclobutrazol to stimulate flower bud formation for off-season mango production.</p>	<p>Yellow, thin stems</p>	<p>Yellow-green, medium stems</p>	<p>Dark green, thick stems</p>	<p>9</p>

Indicator	Observations	Poor–Fair (0–3)	Fair–Good (4–7)	Good–Excellent (8–10)	Score
7. Residue	Random testing for potentially harmful chemicals in the soil detected small amounts of Total Cd, Total Cr, Total Pb Total Hg Total As and Total Se, which were all lower than the permitted levels and are at levels not considered dangerous to living things.	Little or no surface residue, few roots in subsoil	Moderate surface residue, moderate roots	Heavy surface residue, dense roots, tunnels of decomposed roots	9
8. Infiltration	There was a slight accumulation of water in the mango planting area due to the rainy season, with continuous rainfall every day. As a result, there was a small amount of water pooling between the mango trees.	Ponding visible	Some ponding visible after 12–24 hours	No ponding	8

<b>9. Water-Holding Capacity</b>	<p>The soil in the planting area is loamy sand, which has good water drainage but retains little moisture. When watered, the water easily flows through, and the soil does not absorb plant nutrients very well. This type of soil is prone to erosion and surface runoff due to the lack of cohesion between soil particles. For cultivation, the soil should be improved to enhance its fertility by adding compost, manure, and various organic materials, as well as planting legumes and incorporating them into the soil through plowing.</p>	<p>Crops wilt quickly after water events</p>	<p>Crops curl or wilt but quickly come back</p>	<p>Crops tolerate draughty conditions</p>	<p>9</p>
<p><b>Score Results</b></p>	<p><b>Poor–Fair 12–36pts</b></p>	<p><b>Fair–Good 37–72pts</b></p>	<p><b>Good–Excellent 73–80pts</b></p>	<p><b>TOTAL</b> 68/80</p>	

## Recommendations/Observations –

<p><b>Plantation Location:</b> Siracha</p>	<p><b>Date:</b> <u>22 / 8 / 2024</u></p>
<p><b>Summary of Mango Plantation Assessment from the Site Visit to Ratchaburi</b></p> <p>1. soil structure- Most of the soil is sandy loam to loam soil, with friable consistency. The particle composition is 45-55% sand: 32-37% silt: 13-18% clay, rather fine and soft to the touch, hard crust forms when dry but fairly flexible when moist.</p> <p>2. Biological Activity-Biological activity was not measured</p> <p>3. Erosion- the soil structure is good, with loosely bound soil particles, good porosity, and continuity of air</p>	

spaces, allowing the mango tree roots to grow well. The soil has good aeration and water drainage. The structure of the soil is relatively strong and resistant to erosion. Additionally, grass grows around the mango trees, even though it may be considered a weed; it helps cover the soil, retain moisture, prevent surface soil erosion, and reduce the soil temperature. However, the grass is occasionally cut. The soil erosion and degradation have an impact on the changes in soil properties in each area, leading to widespread deterioration of agricultural land resources. This results in changes in soil properties as well as crop yields, with effects on both ecology and socio-economic aspects. However, soil and water conservation should be carried out in the form of integrated agricultural systems, such as reducing plowing, surface soil cover, and crop rotation.

**4. Soil Test Organic Matter** - analysis of random samples of soil from the mango plantation site showed that the soil pH was 6.40 (slightly acidic), Lime requirement 134-269 kg.CaCO<sub>3</sub>/rai, Organic material was 6.63-9.12 (low), Total N was 0.52-0.59 g/kg, Available P was 21.3-23.7 mg/kg (rather high), Available K was 45.7-50.9 mg/kg (very low), Available Ca was 684-790 mg/kg (low), and Available Mg was 80.7-116 mg/kg (low). Fertilizing mango trees should align with their growth stages, such as the stages of branch, stem, and leaf development, flowering, fruit set, and the period before harvest. Before applying fertilizer, soil analysis and leaf nutrient analysis should be conducted to determine the nutrient requirements at each growth stage. This will help determine the appropriate amount of fertilizer to use for economic efficiency. Organic fertilizers should also be applied alongside chemical fertilizers, as the use of organic fertilizers helps improve soil structure, making it looser and more porous, which allows air and water to penetrate more easily. Additionally, it enhances the effectiveness of chemical fertilizers for the mango tree. For example, in the Sriracha orchard, the mango trees are 4 years old and are at the appropriate stage for flowering. Before the mango trees begin to form flower clusters, some areas are experiencing rain. To control the growth of new leaves, foliar fertilizer should be applied to prevent the trees from producing new shoots. Use a fertilizer formula of 0-52-34 at a rate of 100 grams per 20 liters of water, and spray 1-2 times with a 10-14 days interval. Fruit set stage: when mangoes begin to set fruit and reach the "matchstick" stage, apply a soil fertilizer with a formula of 15-15-15 at a rate of 1-2 kilograms per tree. Pre-harvest stage: to improve fruit quality in terms of sweetness and crispness, apply a foliar fertilizer with a formula of 13-0-46 or 0-0-60 at a rate of 50 grams per 20 liters of water, spraying 1-2 times.

**5. Soil Compaction-** The survey assessment on site together with the soil analysis tests showed that the soil is sandy loam, tending to loam in some areas. The organic matter content is low. When the soil is very moist, such as just after it rains, it is not recommended to use any agricultural machinery to work in the fields because the soil may become too dense. Therefore, to avoid impacting root growth, when operating agricultural machinery with a tire pressure of 200 kilopascals, the machinery should be used in mango orchards when the soil moisture does not exceed 18.74% for sandy loam soil, 17.88% for silty clay loam soil, and 20.27% for loamy soil. However, if organic matter is added to the soil, it can increase the soil's ability to accommodate machinery operation even when moisture levels are higher.

**6. Plant Health-** The mango trees are healthy, exhibit good growth, have a beautiful canopy shape, and the young leaves are in perfect condition, free from diseases and pests. They are at the stage ready for the application of paclobutrazol to stimulate flower bud formation for off-season mango production. If the mango tree is not producing new shoots, it can be stimulated to produce new growth by using a fertilizer with a high nitrogen content and providing consistent watering. Alternatively, potassium nitrate at 2.5% (500 grams per 20 liters of water) or thiourea at 0.5% (100 grams per 20 liters of water) can be sprayed evenly over the tree during the period when the mango leaves are fully mature to stimulate bud development. The use of paclobutrazol should be applied by watering the substance around the base of the tree or around the canopy, as it is well absorbed through the roots. The concentration of the substance varies depending on the age and size of the canopy. For older mango trees with larger canopies, a higher amount of the substance is used compared to younger trees with smaller canopies. For the 'Nam Dok Mai' mango variety, apply paclobutrazol at a rate of 1 gram of active ingredient per 1 meter of canopy diameter. For example, if the canopy diameter measures 3.5 meters, use 3.5 grams of paclobutrazol. Afterward, water the mango tree regularly for at least 7 more days to ensure better absorption of the substance into the tree. About two and a half months after applying the substance, the mango tree will begin to bloom all over the canopy.

**7. Residue-**Tests of potentially hazardous chemicals in the soil detected Total Cd at 0.15-0.24 mg/kg, Total Cr at 10.80-10.90 mg/kg, Total Pb at 16.70-21.50 mg/kg, Total Hg at 17.4-17.6 µg/kg, Total As at 8,758-9,452 µg/kg and Total Se at 42.5-191 µg/kg. These are low levels and are all well below the allowed standard, so they pose no danger to living things.



8. **Infiltration-** There was a slight accumulation of water in the mango planting area due to the rainy season, with continuous rainfall every day. As a result, there was a small amount of water pooling between the mango trees.

9. **Water-Holding Capacity-** The soil in the planting area is loamy sand, which has good water drainage but retains little moisture. When watered, the water easily flows through, and the soil does not absorb plant nutrients very well. This type of soil is prone to erosion and surface runoff due to the lack of cohesion between soil particles. For cultivation, the soil should be improved to enhance its fertility by adding compost, manure, and various organic materials, as well as planting legumes and incorporating them into the soil through plowing.

**Pictures: Location - \_\_\_ Siracha \_\_\_**







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เลขที่คำขอรับบริการ: 67.S371\_1-2

เลขที่ใบเสร็จ: 5481/0870

วันที่รับตัวอย่าง: 26 สิงหาคม 2567

วันที่ทดสอบ: 3 กันยายน 2567

วันที่รายงานผล: 7 พฤศจิกายน 2567

ผู้ตรวจสอบผลการทดสอบ: ผศ.ดร.พิมพ์ทอง ธรรมสนทยา

ข้อมูลลูกค้า

ชนิดตัวอย่าง: ดินปน

สถานที่เก็บตัวอย่าง: จังหวัดราชบุรี

วิธีทดสอบ: <sup>1</sup>Thomas (1996) <sup>2</sup>Woodruff (1948) <sup>3</sup>Gee and Bauder (1979) <sup>4</sup>Walkley and Black (1934) <sup>5</sup>Bray and Kurtz (1945) <sup>6</sup>Helmke and Sparks (1996) <sup>7</sup>Suarez (1996)

ผลการทดสอบ

เลขที่คำขอรับบริการ	พื้นที่ค่าขอ	ความต้องการปุ๋ย <sup>2</sup> (กน. CaCO <sub>3</sub> /ไร่)	การแจกกระจายขนาดอนุภาคดิน <sup>3</sup> (%)			อินทรีย์วัตถุ <sup>4</sup> (ก./กน.)	ฟอสฟอรัส ที่เป็นประโยชน์ <sup>5</sup> (มก./กน.)	โพแทสเซียม ที่เป็นประโยชน์ <sup>6</sup> (มก./กน.)	แคลเซียม ที่เป็นประโยชน์ <sup>7</sup> (มก./กน.)	แมกนีเซียม ที่เป็นประโยชน์ <sup>7</sup> (มก./กน.)
			ดินทราย (%)	ทรายแป้ง (%)	ดินเหนียว (%)					
67.S371_1-2	6.4 (กรดเล็กน้อย)	134	55	32	13	6.63 (ต่ำ)	23.7 (ค่อนข้างสูง)	45.7 (ต่ำมาก)	684 (ต่ำ)	80.7 (ต่ำ)
67.S371_2-2	6.4 (กรดเล็กน้อย)	269	45	37	18	9.12 (ต่ำ)	21.3 (ค่อนข้างสูง)	50.9 (ต่ำมาก)	790 (ต่ำ)	116 (ต่ำ)



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หัวหน้าโครงการพัฒนาวิชาการดิน ปุ๋ย และสิ่งแวดล้อม  
ผู้อนุมัติผลการทดสอบ

สิ้นสุดการรายงานผลทดสอบ

รายงานนี้มัลเฉพาะกับตัวอย่างที่ทำการทดสอบเท่านั้น และห้ามนำมาสำเนารายงานผลเฉพาะบางส่วนไปโดยไม่ได้รับอนุญาต

มีข้อสงสัย ติดต่อคณาจารย์ E-mail: soilscience@ku.ac.th LINE ID: @kusoilab



รายงานผลการทดสอบห้องปฏิบัติการโครงการพัฒนาวิชาการดิน ปุ๋ย และสิ่งแวดล้อม

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ชนิดตัวอย่าง: ดินบน

สถานที่เก็บตัวอย่าง: จังหวัดราชบุรี  
ผลการทดสอบ

เลขที่คำขอรับบริการ: 67.S371\_1-2  
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ผู้ตรวจสอบผลการทดสอบ: ผศ.ดร.ทีมทอง ดรุณสนทยา

เลขที่คำขอรับบริการ	Total N (g/kg)	Total Cd (mg/kg)	Total Cr (mg/kg)	Total Pb (mg/kg)	Total Hg (ug/kg)	Total As (ug/kg)	Total Se (ug/kg)
67.S371_1-2	0.52	0.24	10.9	16.7	17.4	8,758	42.5
67.S371_2-2	0.59	0.15	10.8	21.5	17.6	9,452	191



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สิ้นสุดการรายงานผลทดสอบ

รายงานนี้มีผลเฉพาะกับตัวอย่างที่ทำการทดสอบเท่านั้น และห้ามนำสำเนารายงานผลเฉพาะบางส่วนไปใช้โดยไม่ได้รับอนุญาต

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หน้า 1 / 1

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Signed: \_\_\_\_\_ *Jenjira Chumpookam* \_\_\_\_\_

Date: 11/11/2024

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