



Cacao Research

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Characteristic of Cacao

Cacao (*Theobroma cacao*) is a tropical evergreen tree native to Central and South America and now widely cultivated in the Philippines. Its seeds, known as cacao beans, are used to produce tablea (pure Filipino cacao tablets), cocoa powder, and chocolate. Cacao thrives in humid, shaded environments and is valued for its rich flavor and high antioxidant content. It plays an important cultural and economic role in many farming communities.

Culinary Uses (Dishes)

- Tablea tsokolate (Filipino hot chocolate-based dishes)
- Champorado
- Chocolate cake, brownies, and pastries
- Chocolate mousse
- Mole sauces
- Cocoa-infused marinades
- Chocolate-based desserts and confections
- Truffle fillings
- Cocoa nib crusts for meat or fish
- Ice cream and gelato bases



Simple Ways to Eat

- Raw cacao nibs
- Lightly roasted cacao beans
- Dark chocolate (70%+ cacao)
- Tablea eaten as chunks
- Cacao nibs mixed into oatmeal or yogurt
- Nibs sprinkled on fruit
- Cacao-based energy bites

Drinks

- Hot chocolate / tsokolate
- Cacao tea (brewed husks)
- Chocolate milk
- Cacao smoothie
- Iced chocolate
- Mocha drinks
- Cacao-infused protein shakes
- Fermented cacao juice (from pulp)



Nutrients per 100 g (Unsweetened Cocoa Powder)

- Calories: ~228 kcal
- Protein: 19.6 g
- Fat: 13.7 g
- Carbohydrates: 57.9 g
- Fiber: 37 g
- Iron: 13.9 mg
- Magnesium: 499 mg
- Potassium: 1524 mg
- Zinc: 6.8 mg
- Copper: 3.8 mg
- Manganese: 3.8 mg
- Antioxidants: Flavanols, polyphenols



Health Benefits

- High antioxidant activity (polyphenols)
- Supports heart health
- Improves blood flow and circulation
- Enhances mood (serotonin & phenylethylamine precursors)
- Anti-inflammatory properties
- Supports brain function
- High magnesium for muscle & nerve health
- Rich in iron for oxygen transport
- Aids digestion due to high fiber
- May improve insulin sensitivity

Cacao Tree Characteristics

Cacao (*Theobroma cacao*) is a small evergreen tree that typically grows **3–8 m** tall under cultivation. It has a straight trunk, thin bark, and a dense canopy of large, glossy, drooping leaves. Cacao is an **understory species**, naturally adapted to partial shade in tropical rainforests. Flowers emerge directly on the trunk and major branches (cauliflory), developing into pods containing beans surrounded by sweet pulp. It prefers warm, humid climates with stable rainfall and thrives in fertile, well-drained soils.



Root System Overview

- **Taproot:** Strong central taproot extending up to **1.5 m** deep in good soils.
- **Lateral Roots:** Spread widely near the soil surface (0–30 cm depth), forming a dense mat that absorbs nutrients rapidly.
- **Feeder Roots:** Fine, fibrous roots sensitive to drought, waterlogging, and soil compaction.

Implications for Growth

1. Water & Moisture Needs

- The shallow feeder roots require **consistent moisture** but not flooding.
- Best growth occurs in soils with **good drainage** and **high organic matter**.
- Prolonged drought stresses the tree quickly, reducing pod set.

2. Shade & Sunlight Response

- Young cacao: **50–70% shade** during the first 2–3 years keeps soil moisture stable and roots cool.
- Mature cacao: Performs best in **30–50% filtered sunlight**; excessive direct sun can damage leaves and reduce pod production.
- Root health improves under moderated light because soil temperatures remain lower.

3. Soil Texture & Structure

- Prefers **loam to clay-loam** soils — deep, fertile, and friable.
- Compacted soils harm root expansion and reduce nutrient uptake.

4. Nutrient Management

- Extensive feeder roots mean cacao responds well to **regular light fertilization**, compost, and mulching.
- Sensitive to nutrient deficiencies (Mg, K, N), especially in fruiting stages.

5. Competition Considerations

- Because cacao's roots dominate the topsoil, avoid planting near aggressive or shallow-rooted species.
- Intercropping must consider **shade trees** with deeper taproots (e.g., coconut, madre de cacao, bananas) to avoid root competition.

Cacao Growing Characteristics Table

| Characteristic | Description / Requirement |
|-----------------------|---|
| Scientific Name | <i>Theobroma cacao</i> |
| Tree Height | 3–8 m (cultivated), up to 12 m wild |
| Canopy Type | Dense, umbrella-shaped, evergreen |
| Sunshine Demand | Partial sun; 30–50% filtered light for mature trees |
| Shade Demand (Young) | 50–70% shade in first 2–3 years |
| Temperature Range | 21–32°C optimal |
| Rainfall | 1,500–3,000 mm/year, evenly distributed |
| Soil Type | Deep loam or clay-loam, high organic matter |
| Soil pH | 6.0–7.0 |
| Root System | Taproot + shallow laterals; sensitive to water stress |
| Spacing | 3 m × 3 m to 4 m × 4 m, depending on variety and shade system |
| Time to First Harvest | 3–4 years |
| Peak Production | 7–10 years |
| Lifespan | 40–50 years (productive), up to 100 years biologically |
| Wind Tolerance | Low; needs windbreaks |
| Humidity | High humidity required (~70–100%) |
| Pollination | Mostly by midges; improves with shade and moisture |

Short Summary

Cacao is a small, shade-loving tropical tree with a deep taproot and shallow lateral feeder roots that require moist, well-aerated soils. Its root structure makes it sensitive to drought, waterlogging, and soil compaction, meaning consistent moisture, and good drainage are essential. Young cacao needs heavy shade, while mature trees thrive in filtered sunlight. When provided with stable humidity, fertile soil, and proper shade management, cacao becomes a long-lived and productive crop.





Top 5 Cacao Varieties in the Philippines

| Variety / Clone | Type | Why commercial | Commercial role (bulk / specialty) | Evidence / notes |
|-----------------------------------|---|---|---|--|
| CCN-51 | Hybrid (high-yield Forastero/Trinitario selection) | Very high yield, disease tolerant and widely adopted by farmers for stable production. | Mostly bulk / commodity , sometimes improved by careful fermentation for higher quality. | CCN-51 highlighted in Philippine multilocation trials and literature for large pods and productivity; widely used globally as a high-yield rescue cultivar. ISP Platform ⁺¹ |
| BR 25 (NSIC-registered) | Trinitario-type clone (locally selected) | NSIC-approved clone with good pod size and favored by local bean-to-bar makers for pleasant flavor notes. | Specialty / single-variety & farmer-preferred commercial clone. | BR-25 is NSIC-registered and used by specialty farms; cited in DA production materials and industry profiles. High Value Crops Program ⁺¹ |
| UF 18 (NSIC / widely used) | Local clone (commonly Forastero/Trinitario hybrids) | One of the commonly distributed NSIC-recommended clones with good yield and farmer adoption. | Bulk / commercial (farmers use for reliable production). | UF-18 appears in DA/PCAARRD nursery & propagation programs as one of prevalent NSIC clones. High Value Crops Program ⁺¹ |
| PBC-123 (aka PBC123) | Local/clonal selection | Frequently distributed in government nurseries and promoted for farm rehabilitation and good agronomic performance. | Commercial / mixed (bulk → specialty depending on handling) . | PBC-123 listed among NSIC-registered / recommended clones and used in community nurseries. USDA Portal ⁺¹ |
| PG610 | Trinitario-type (promising breeding line) | Showed high beans-per-pod and low pod index in PCAARRD multilocation trials — promising for yield. | Commercial (promising high-yield clone) — candidate for registration/release. | PCAARRD multilocation trial singled out PG610 for bean count and favorable pod index. ISP Platform |

Notes on choosing varieties

- **If your goal is steady income & ease of farming:** CCN-51 and NSIC clones (UF-18, BR-25) are proven choices — they give reliable yields and disease tolerance, and local nurseries supply them. ISP Platform⁺¹
- **If your goal is premium / single-origin chocolate:** BR-25 and carefully selected Trinitario/Arriba-type clones fed through meticulous post-harvest (fermentation + drying) can reach the specialty market and command higher prices. Silva
- **Emerging options:** varieties such as PG610 (and W10 in some trials) are promising; PCAARRD is testing multiple lines across agro-climatic zones for adaptation and yield.

Intercropping Compatibility Table

| Crop Tree | Good / Bad | Why (Shade, Roots, Competition) | Recommended Spacing | Notes |
|--------------------------|-------------|---|---|--|
| Coconut | Very Good | Tall, light-filtering canopy; deep roots don't compete with cacao's shallow roots. Provides stable 40–60% shade. | Coconut 8–10 m × Cacao 3 × 3 m planted between palms | Ideal overstory for cacao; proven combination in Mindanao. |
| Mangosteen | Good | Slow-growing, dense canopy, prefers same humidity. Provides good shade once mature. Roots not very aggressive. | Mangosteen 6–8 m spacing, cacao rows at 3 × 3 m between trees | Both shade-tolerant; good for humid zones like Bukidnon. |
| Guyabano (Soursop) | Good | Medium-height, moderate canopy; allows filtered light. Not aggressive roots. | Guyabano 5–6 m; cacao 3 × 3 m staggered | Good during early–mid stage; prune to maintain 40–50% light. |
| Guavapple | Good | Medium height, manageable canopy, fast-growing. Roots moderately competitive but manageable. | 5–6 m spacing; cacao in between | Prune yearly to avoid over-shading cacao. |
| Chico (Sapodilla) | Fair | Dense canopy can overshadow cacao if unpruned; deeper roots but some surface competition. | Chico 8 m; cacao 3 × 3 m offset | Works only with aggressive pruning to keep light at 30–50%. |
| Atis / Sugar Apple | Fair | Small tree, open canopy gives <i>too much</i> sun; not ideal as cacao shade provider. | 4–5 m spacing | Works when used with another taller shade tree (coconut). Not enough shade alone. |
| Oranges (Secondary crop) | Fair to Bad | Requires full sun; canopy too open + heavy feeder roots + dry soil preference conflicting with cacao moisture needs. | 5–6 m spacing but <i>not recommended</i> as primary shade | Oranges → sun-loving; cacao → shade-loving. Only workable in multi-storey with coconuts above. |
| Mango | Bad | Large, dominant roots; heavy shade when mature; allelopathic leaf litter; wide-spread canopy reduces cacao yield drastically. | Avoid intercropping; if unavoidable keep ≥10–12 m separation | Mango shading is too heavy; roots steal moisture; not recommended. |



Figure 1. A farm layout of a coconut-cacao cropping model under square planting system of coconut 8-10 m)

Summary (Short & Practical)

Cacao performs best under **tall, light-filtering crops** like **coconuts**, which are the *ideal primary canopy*. **Mangosteen, guyabano, and guavapple** make good partners when spaced and pruned well. **Chico** can be used but requires tighter canopy control. **Atis** is only acceptable when paired with a taller overstory tree. **Oranges** and especially **mango** are poor intercrops for cacao due to mismatched sunlight, moisture needs, and root competition. Proper spacing and shade control are essential to maintain cacao's preferred **30–50% filtered light**.

Market Demand & Acceptance

- **Growing domestic demand for Philippine cacao products.** The national Chocolate Market is expanding (market reports show strong growth in 2023–2024) and specialty bean-to-bar is driving local willingness to pay premiums for quality, fermented beans. This supports market pull for well-handled Bukidnon cacao. [MarkNtel Advisors](#)
- **Institutional support and buyer networks center in Mindanao (Davao) but reach Bukidnon.** Davao's trading/processing hubs and DA-supported facilities (grading/sorting) make it easier for Mindanao producers to connect to processors, exporters and specialty brands. [Philippine Rural Development Project+1](#)
- **Local acceptance in Valencia City markets is solid for fresh fruit and agrofoods; cacao products (tablea, single-origin bars) have niche traction in urban/retail spaces and farmers' markets.** Valencia's public market and farmers' bazaars are practical local outlets for processed cacao products (tablea, chocolate snacks). [GeoView](#)
- **Price sensitivity at farmgate remains.** Most smallholders sell dry beans to traders; premiums exist for properly fermented/dried specialty beans but require investment in post-harvest. The Roadmap emphasizes quality improvement and value-chain strengthening to capture these premiums.





Best Local Markets & Commercial Hubs

- **Davao Region (Davao City, Davao del Sur, Davao Oriental)** — the country's cacao/chocolate hub; home to large numbers of farms, cooperatives and major bean-to-bar makers (e.g., Malagos) and local marketing cooperatives such as *Cacao City*. Davao supplies most domestic processing and export-grade beans. Guide to the Philippines+2Malagos Chocolate+2
- **Metro Manila (specialty & retail markets)** — specialty bean-to-bar brands and retail chains (Kultura, Auro, online specialty shops) sell Philippine single-origin bars and tablea; Manila is a major buyer/market for processed product and specialty beans. Kultura Filipino | Support Local+1
- **Regional processing clusters / cooperatives** — pockets in Mindanao (outside Davao), some Visayas islands and selected Luzon areas host community-based nurseries, cooperatives and tablea producers who buy local beans (examples appear in PCAARRD/DA outreach). ISP Platform+1

Risks & Challenges (how they play out locally)

- **Post-harvest quality & buyer standards.** Without good fermentation/drying and traceability, beans fetch commodity prices. Specialty buyers require consistent quality and traceability — a gap for many smallholders. [USDA Portal](#)
- **Price volatility & global cocoa markets.** International price swings affect farmgate returns; local farmers may be squeezed during global downturns or face boom-bust cycles. [MarkNtel Advisors+1](#)
- **Access to aggregation & processing.** Southern Bukidnon growers need reliable collection/fermentation hubs or cooperatives to reach Davao processors; lacking these raises transaction costs and reduces margins. [Philippine Rural Development Project](#)
- **Agronomic risks** — pests, diseases (e.g., black pod, witches' broom in general cacao contexts), and climate variability (drought / dry spells) threaten yields and consistency. Roadmap recommends resilient varieties and extension. [USDA Portal](#)
- **Competition for land & crop fit (e.g., Valencia oranges).** Valencia oranges and other proven cash crops have known local markets and grower experience in Bukidnon; convincing farmers to convert or mix cacao requires clear comparative returns and risk mitigation. [GeoView](#)

Opportunities

- **Niche specialty & farm-to-bar market.** Bukidnon beans that are well-fermented and traceable (single-origin, “Valencia/Bukidnon” provenance) can command premiums in Metro Manila and specialty export markets. Investment in farmer training + centralized fermentation can unlock this. [MarkNtel Advisors+1](#)
- **Intercropping with coconuts and fruit trees.** Roadmaps and local projects emphasize coconut–cacao intercropping (leveraging existing coconut land) to



scale area while preserving income and shade — a pathway for smallholders to add cacao without full land conversion. [USDA Portal+1](#)

- **Local processing & value capture.** Small-scale tablea and single-origin chocolate production in Valencia/nearby towns can keep more value locally and sell through farmers' markets, malls and online platforms. Valencia's active public market and bazaars are practical initial sales channels. [GeoView](#)
- **Access to funding & roadmap programs.** National and regional cacao roadmaps (and donor/NGO programs) are mobilizing technical support, nurseries, and market linkages — Bukidnon producers can tap these to reduce technical and financial barriers. [USDA Portal+1](#)

Practical Recommendations

1. **Form or join a cooperative** for aggregation, shared fermentation facilities, quality control, and collective bargaining with Davao processors. (Reduces transport/transaction costs.) [Philippine Rural Development Project](#)
2. **Invest in post-harvest training & a small fermentation/drying hub.** Even modest improvements increase access to specialty buyers and 10–30% price premiums when traceability and fermentation are consistent. [USDA Portal+1](#)
3. **Pilot intercropping on coconut or partially cleared plots** (coconut + cacao + occasional fruit trees) to diversify income while establishing cacao trees. Use recommended clones for fast yield/quality mix. [USDA Portal](#)
4. **Use Valencia City markets and events** (farmers' markets, bazaars, mall kiosks) to test tablea, bean-to-bar samples and build local brand recognition before scaling to Metro Manila or exporters. [GeoView](#)

Short Summary

Southern Bukidnon — including **Valencia City** — sits in a favorable position: strong local demand for fresh and processed agrofoods, proximity to Mindanao processing hubs (Davao), and growing national interest in Philippine cacao quality. However, farmgate value today is constrained by post-harvest gaps, aggregation/processing access, and price volatility. The clearest path to better returns is cooperative aggregation, investment in fermentation/drying and traceability, plus value-adding (tablea, single-origin chocolate) sold locally (Valencia markets/Metro Manila) or through Mindanao processors. National roadmap initiatives and buyer forums are actively creating enabling links — a strategic window for organized Bukidnon growers. [GeoView+4USDA Portal+4Philippine Rural Development Project+4](#)