

Shade Effects on Okra and Eggplant Growth and Productivity in Fruit-tree Agroforestry Systems, Kenya

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BACKGROUND

- Vegetable production of smallholder farmers in coastal Kenyan is limited by rising temperatures, solar radiation and evapotranspiration.
- Fruit tree-based agroforestry can improve microclimate through shade-induced regulation, buffering climatic stress while diversifying farm output.
- Vegetable species-specific shade responses under fruit trees remain undocumented in this region.

Objective: To evaluate okra and eggplant growth and productivity across four shade levels under mango and baobab tree canopies in Kilifi County, Kenya.

CONCLUSIONS

- Fruit tree and vegetable species interactions in agroforestry systems in Kilifi County are species- and system-specific.
- Eggplant requires full light for optimal productivity, while okra tolerates partial shade under mango and baobab trees.

➔ Strategic **selection of suitable agroforestry systems** is needed to enhance agro-ecosystem functionality and sustainability and to support smallholder livelihoods.

METHODS

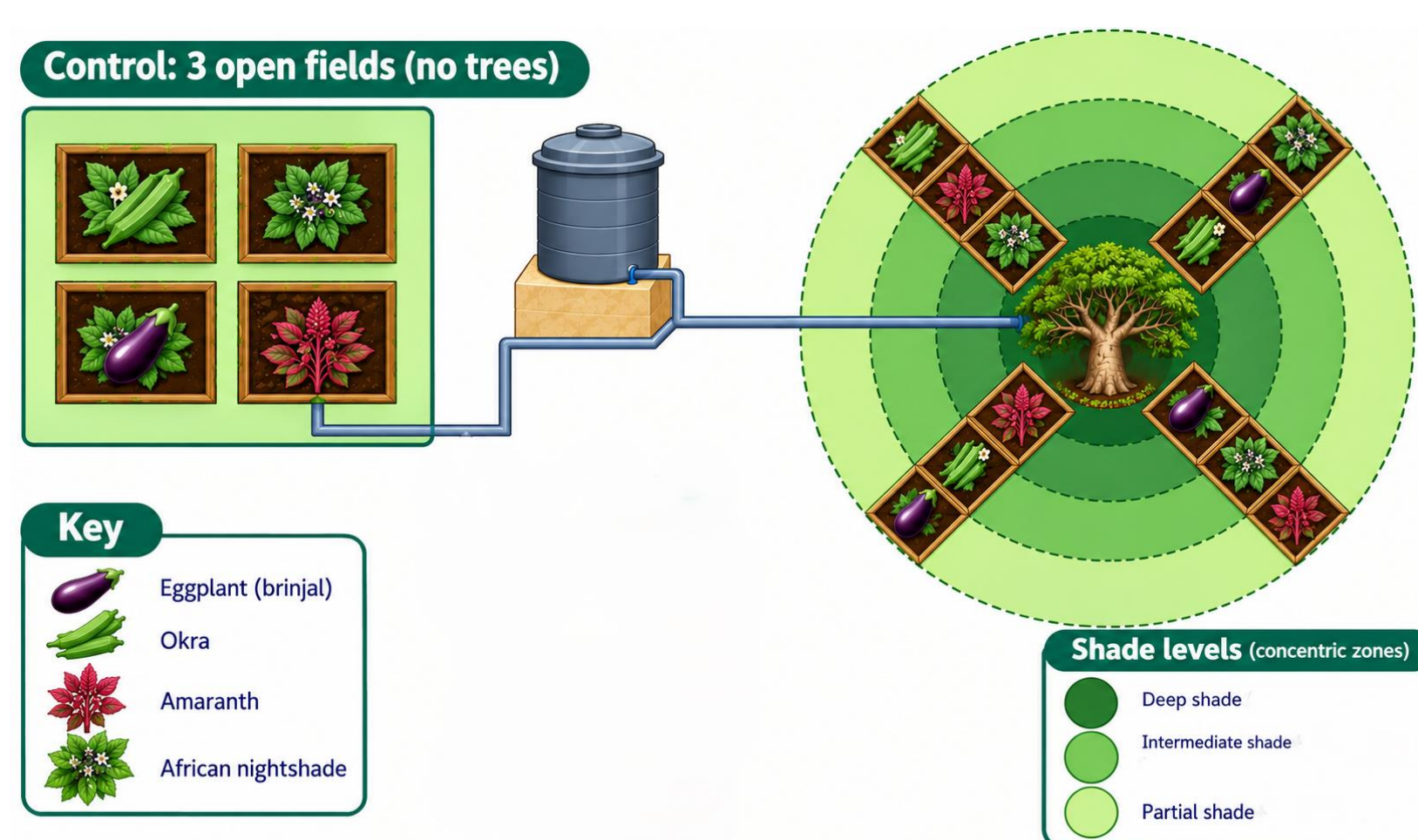


Fig. 1: Random complete block design (RCBD) layout in the field experiment under fruit trees (baobab, mango) on farmers' fields in Kilifi County, repeated three times.

Fruit-tree on-farm trial	
Location	Three baobab and three mango trees on farmers' fields in Kilifi County, Kenya
Experimental design	RCBD with factorial arrangement (Fig. 1, Fig. 2)
Shading levels	Control (full light), partial shade (PS), intermediate shade (IS), deep shade (DS) (Fig. 3)
Data collection	- At plant maturity from 8 tagged plants in the core of a plot (growing season Nov 2025 – Feb 2026) - Measured variables: Total number of fruits (TF), summed-up fresh weight of all fruits (FW), and plant height (PH) (Fig. 4)
Data analysis	Data analysed using ANOVA with Tukey HSD tests (mean separation)



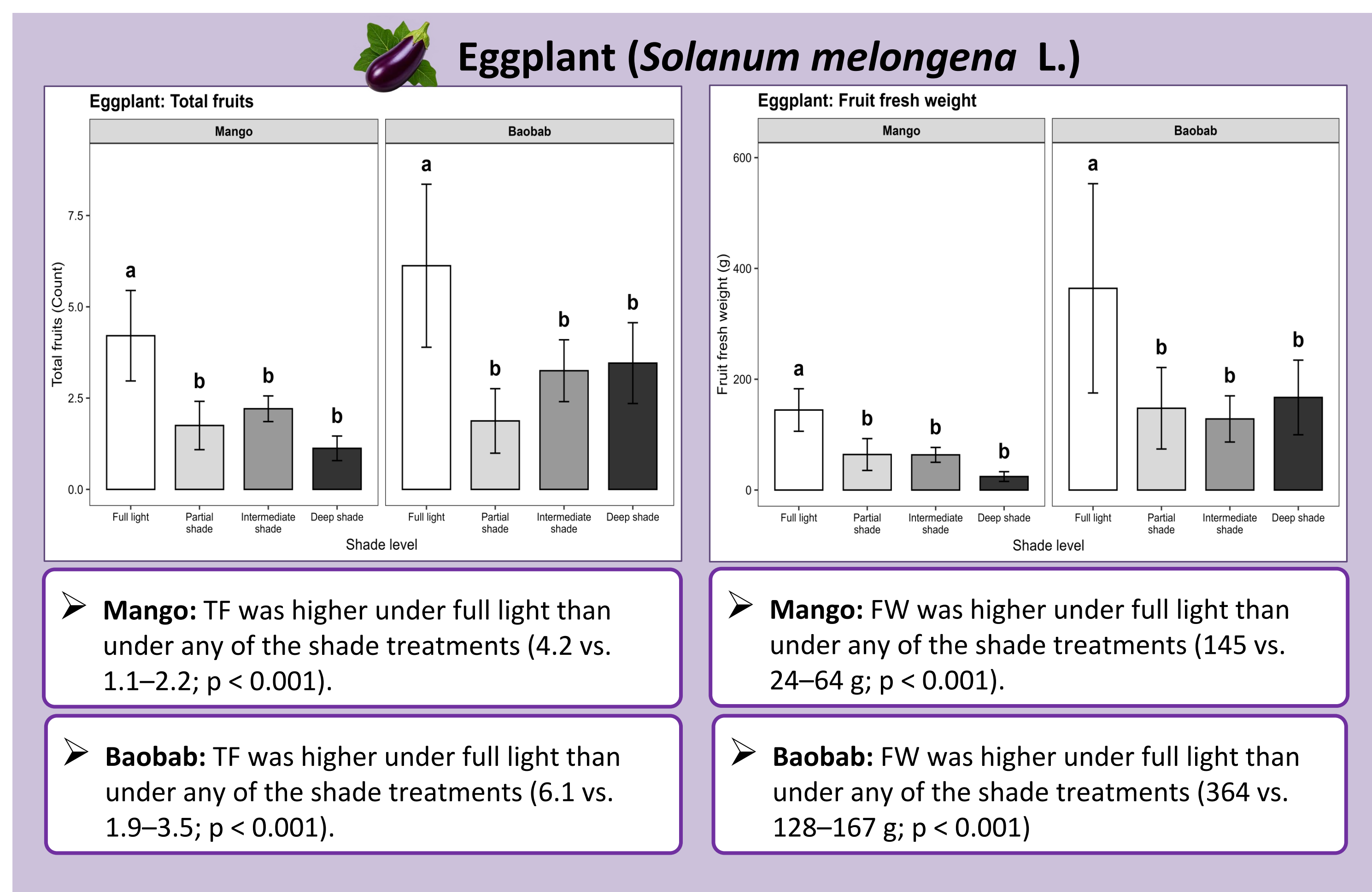
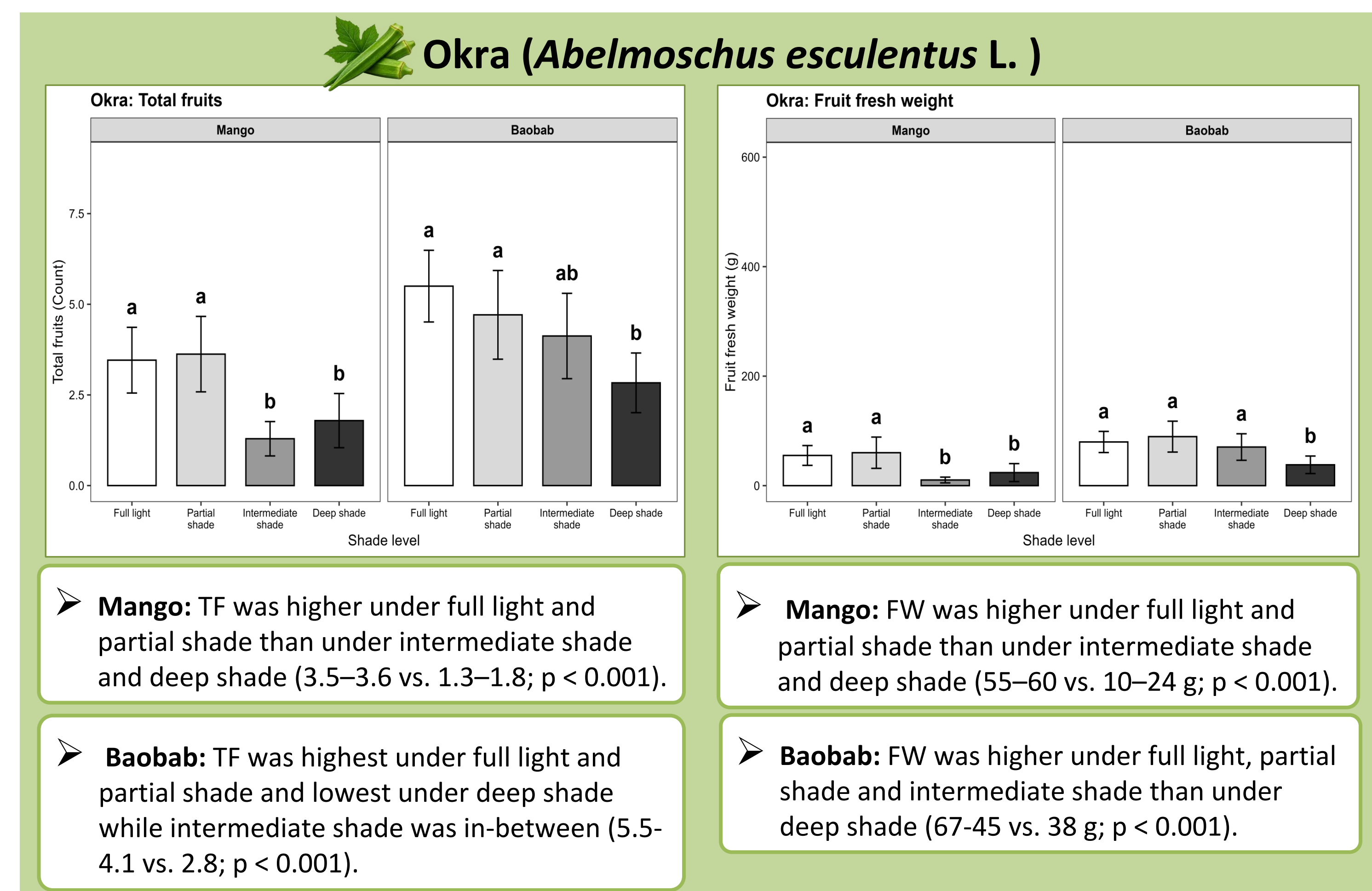
Fig. 2: Random complete block design (RCBD) layout in the field experiment under a mango fruit-tree in Vyambani study site, Kilifi County.



Fig. 3: Growth performance of eggplant under (a) full shade, (b) intermediate shade and (c) partial shade of a baobab tree, and (d) in full sunlight conditions.

RESULTS

Vegetable productivity



Growth performance

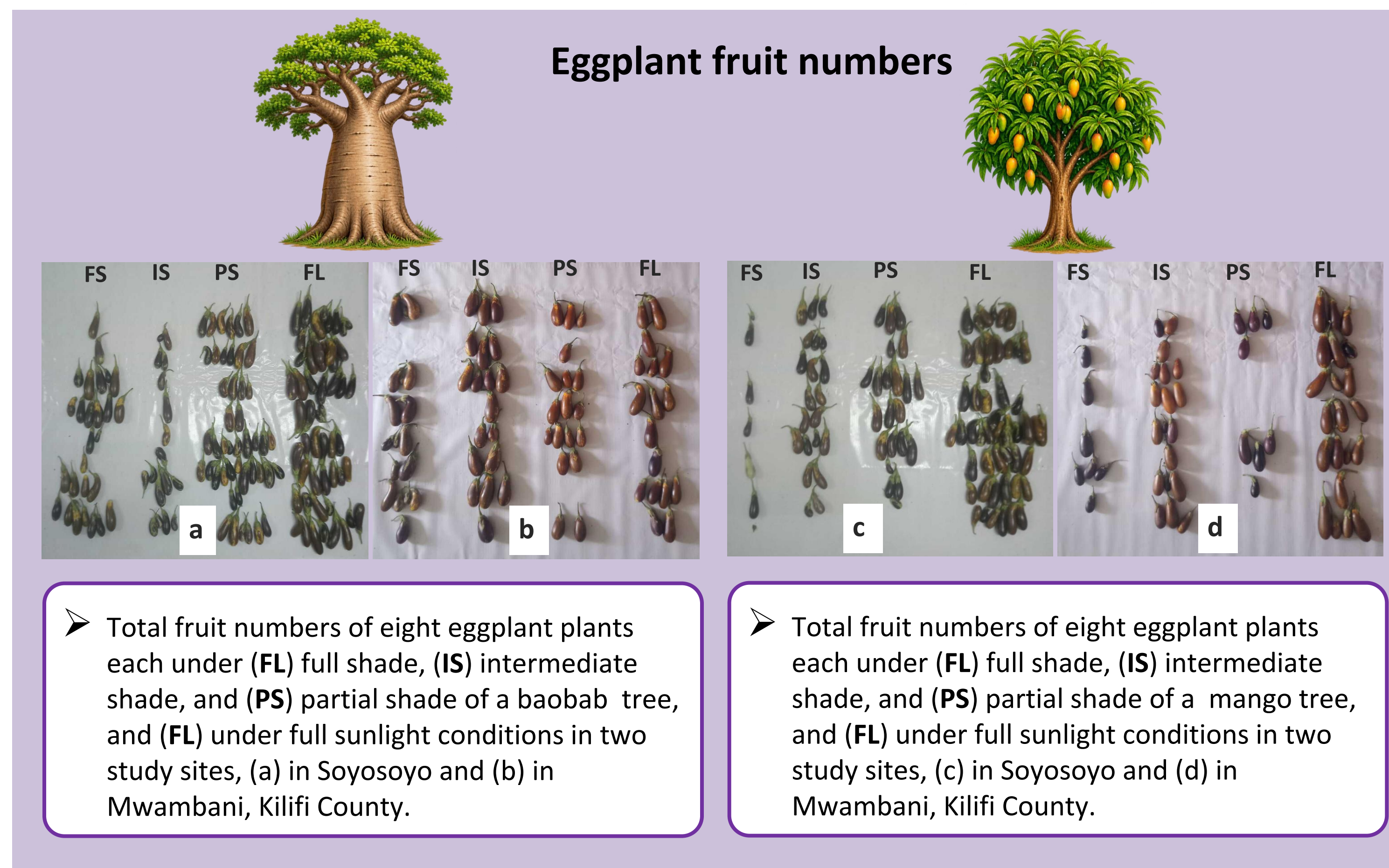
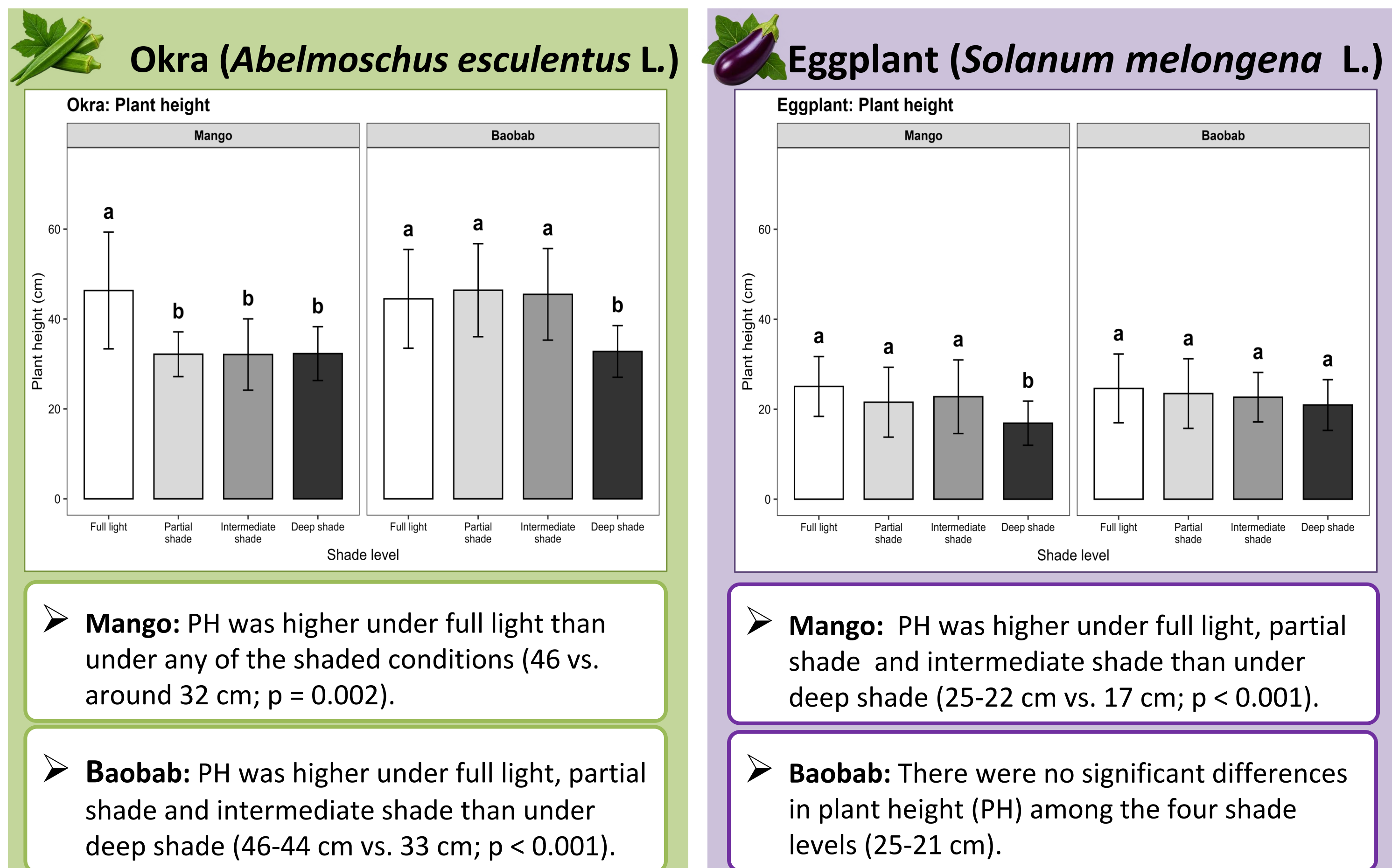


Fig 4: Data collection: (a) plant height measurement, and (b) fruit weight measurement.

- Vegetable productivity varied across tree species and shade levels, highlighting tree-specific responses to understory growing conditions.
- High variability among the three locations may be linked to variation in soil and microclimatic conditions beneath the trees on the three selected farms.
- Multi-season trials and wider testing across coastal Kenya are recommended to validate and scale the findings.