Impact of Global Climate Change on Food Security & Livelihood Sustainability in the Kilombero Valley:

Identification of Adaptive Agricultural Design & Land-use Techniques

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Introduction & Project Orientation

Design Challenge: improve food security and livelihood sustainability

Kilombero Valley & Mang'ula B

- Current vulnerability
  - Predominantly dependent on rain fed agriculture
- Current inefficiencies
  - (a) Optimizing crop production per unit area
  - (b) Accounting for climate change & variability
  - (c) Selecting & diversifying crop varieties
  - (d) Managing land for diversified use

Current Climate & Observed Changes

Tanzanian Climate

Temperature

- Coastal Region: warm and humid, 20-23°C
- Inland Highlands and Mountains: 17-25°C
- ***Mang'ula B: 27-31°C***

Precipitation

- Seasonally driven by migration of ITCZ
  - Long rains: March, April & May
  - Short rains: October, November & December

Observed Changes

Temperature

- 1.0°C warming since 1960 (0.23°C per decade)
  - Most warming occurring during JF

Precipitation

- Declines of 3.3% per month per decade

Projected Climate Change & Impact

Temperature

- 1.5-4.5°C warming by 2100 (low and high emissions scenarios)

Precipitation

- -4-30% increase by 2100
  - Generally occurring during wet seasons
- 5-10% decrease in dry season precipitation
- Increase in intensity and frequency of extreme weather events
  - 1-day events: 24mm increase
  - 5-day events: 37mm increase

Project Aim & Identified Themes

Aim: *To produce* ***viable, simple agricultural and land-use designs*** *that can be implemented at* ***little-to-no cost*** *to increase the effectiveness of small scale farming methods, via* ***sustainable intensification****, in order to* ***break the cycle of low yield and poverty*** *in Mang'ula B.*

Themes

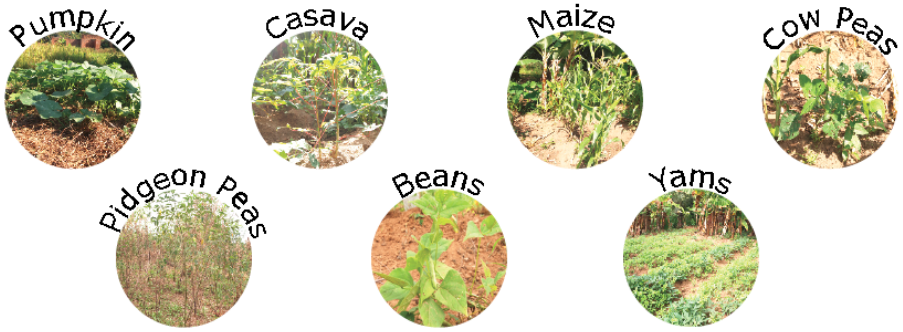
1. Crop Selection & Diversification
2. Agricultural Intensification
3. Agroforestry
4. Land-use Planning

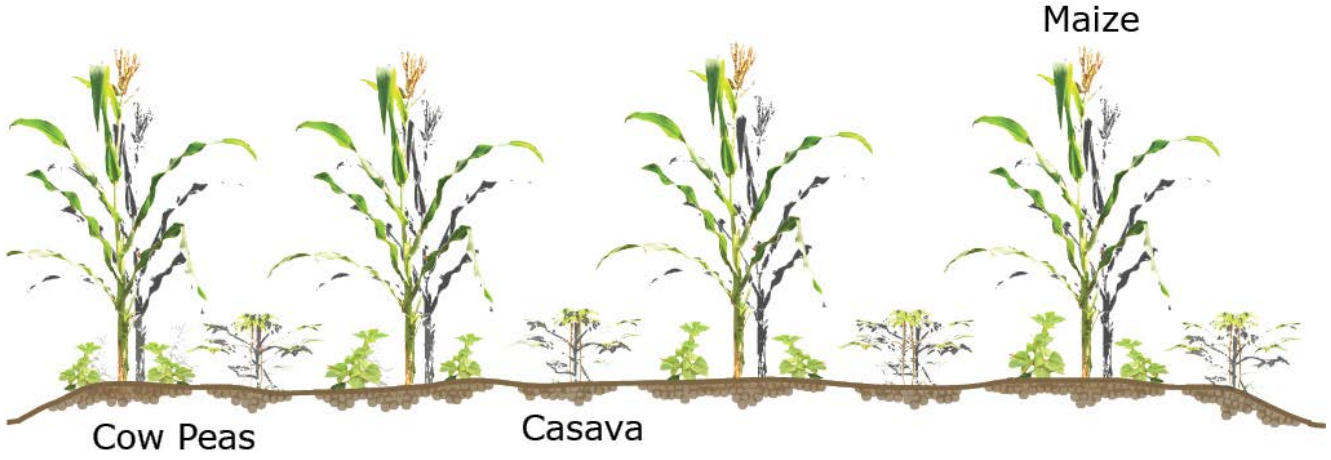
Crop Selection & Diversification

Current

- Low yields due to: (1) intense and variable rain; (2) intense temperature and sun; & (3) lack of “best use” agricultural practices

Recommendations





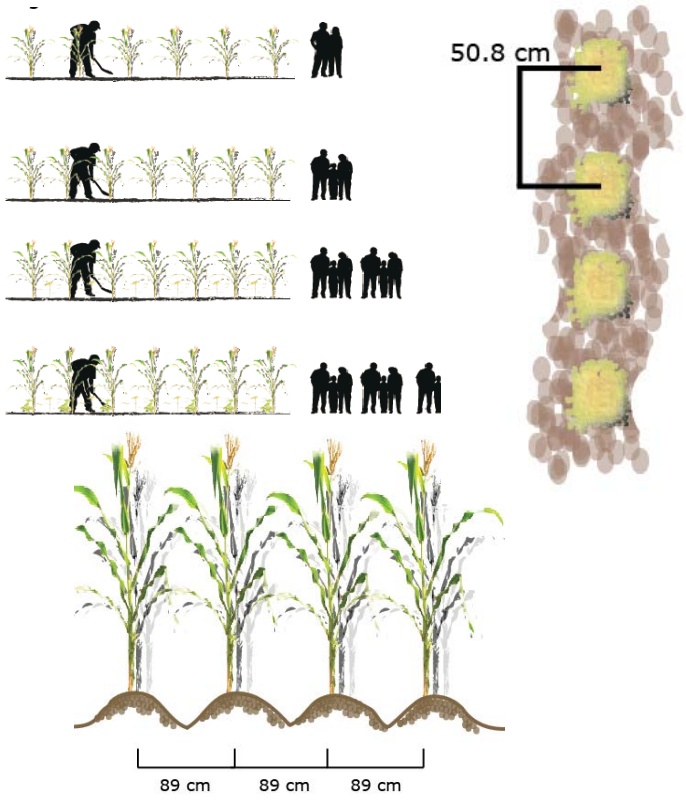
Agricultural Intensification

Current

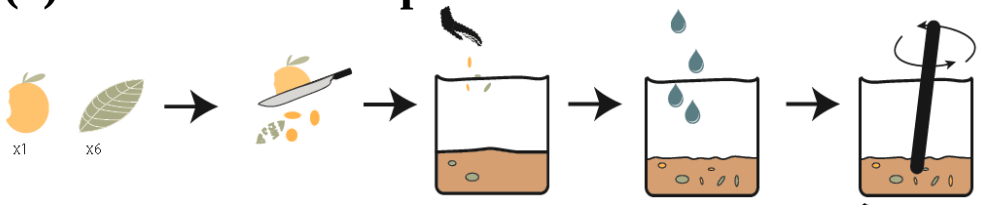
- Low yields due to: (1) underutilized plots; (2) little use of drip-irrigation technology; & 3) low fertilizer use

Recommendations

(1) Plot Optimization



(2) Household Compost



(3) Drip-Irrigation

Agroforestry

Current

- Little to no use of agroforestry or inter-cropping leading to: (1) little fuel independence & (2) greater food insecurity

Recommendations

(1) Fruit, fuel & income

Mangifera indica – Mwembe (exotic)
Height: 10-15 m
Uses: food, fuel and fodder

Citrus sinensis (exotic)
Height: up to 5 m
Uses: food

Musa spaientum (exotic)
Height: 2-6 m
Uses: food

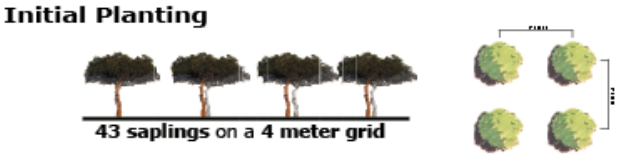
Carica papaya (exotic)
Height: 5-10 m
Uses: food

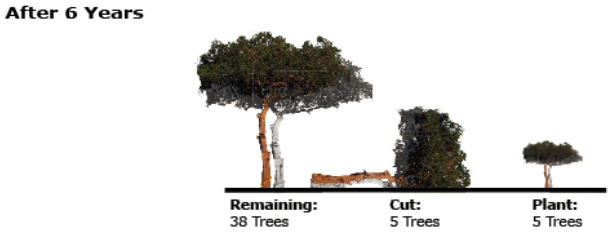
Brachystegia spicrformis (indigenous)
Height: 8-15 m
Uses: firewood,

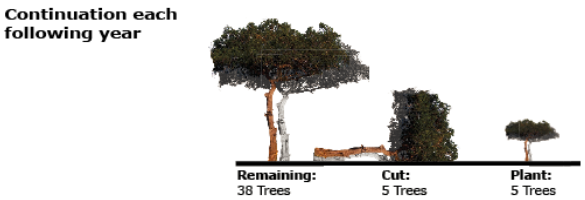
Mangifera indica – Mwembe (exotic)
Height: 10-15 m
Uses: food, fuel, fodder

Acacia albida (indigenous)
Height: up to 60 m
Uses: timber, fuel, medicinal

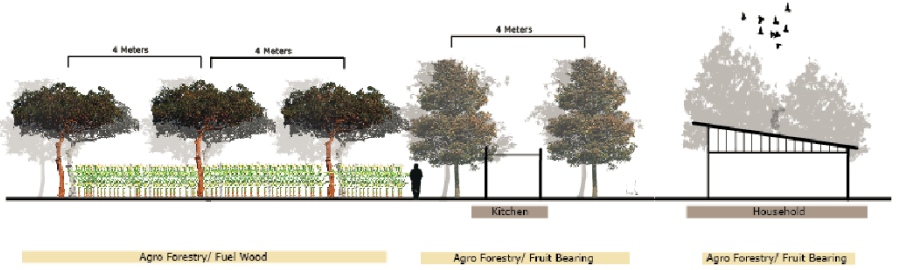
(2) Greater fuel independence







(3) Intercropping



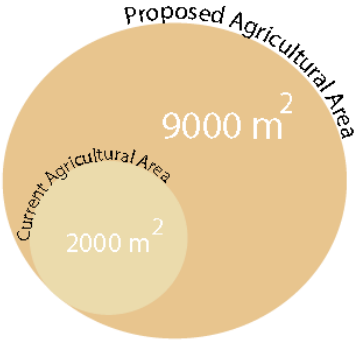
Land-use Planning

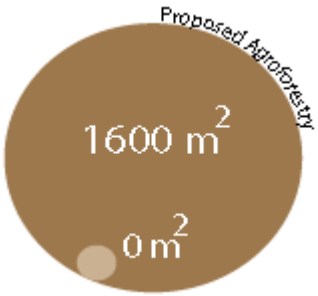
Current

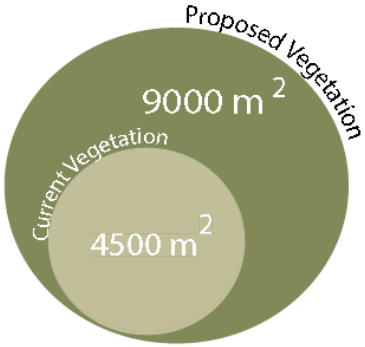
- Not optimizing plot or community land-use

Current

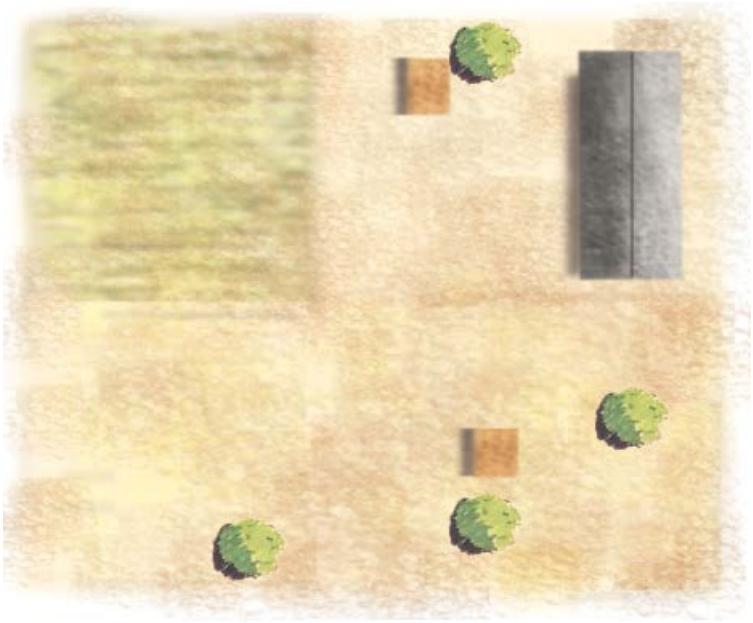
Recommendation



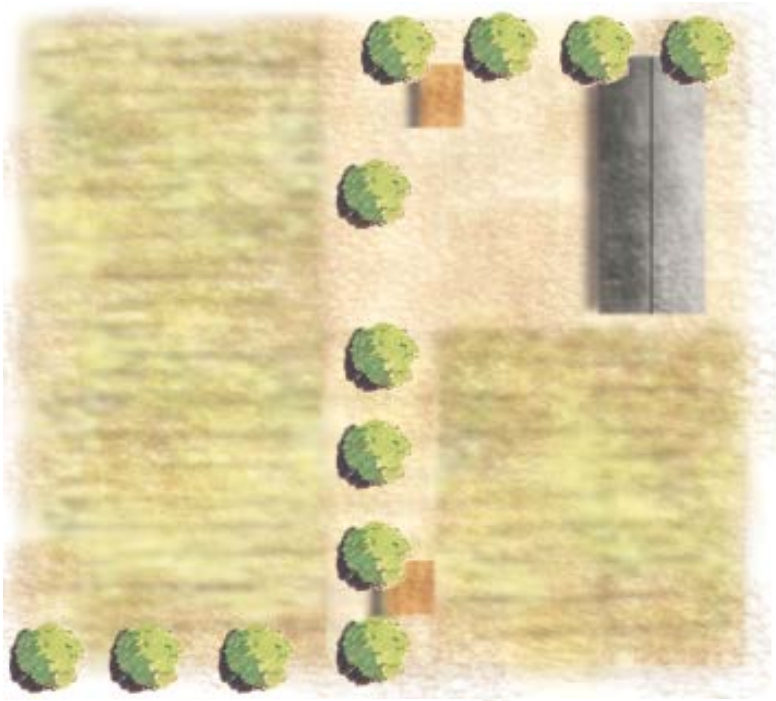


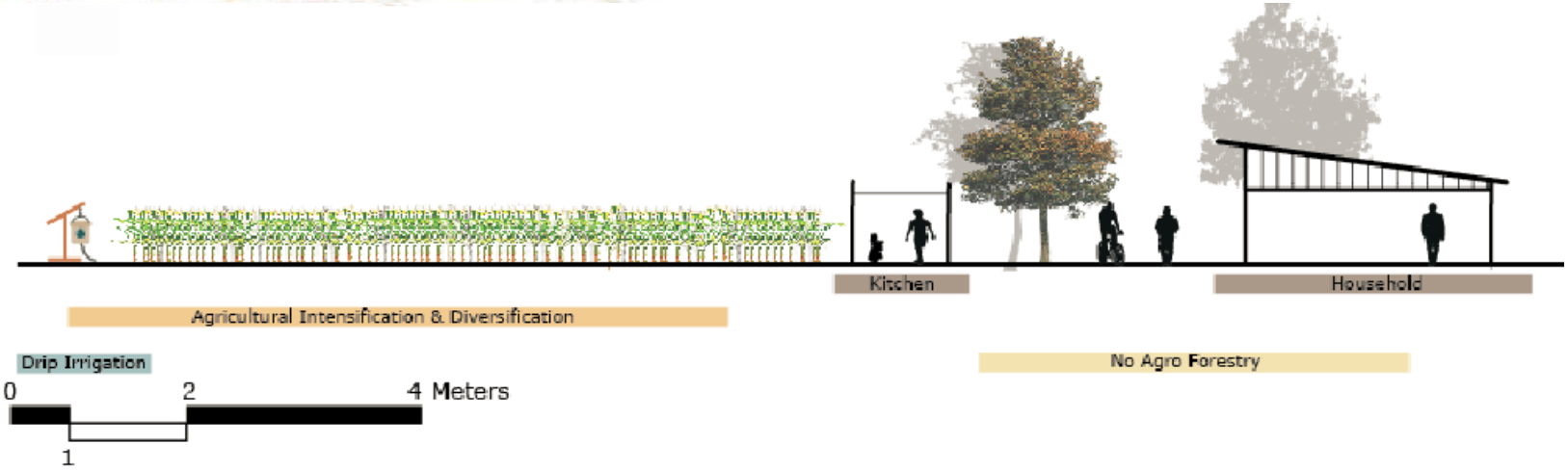


Design A: Current Practices

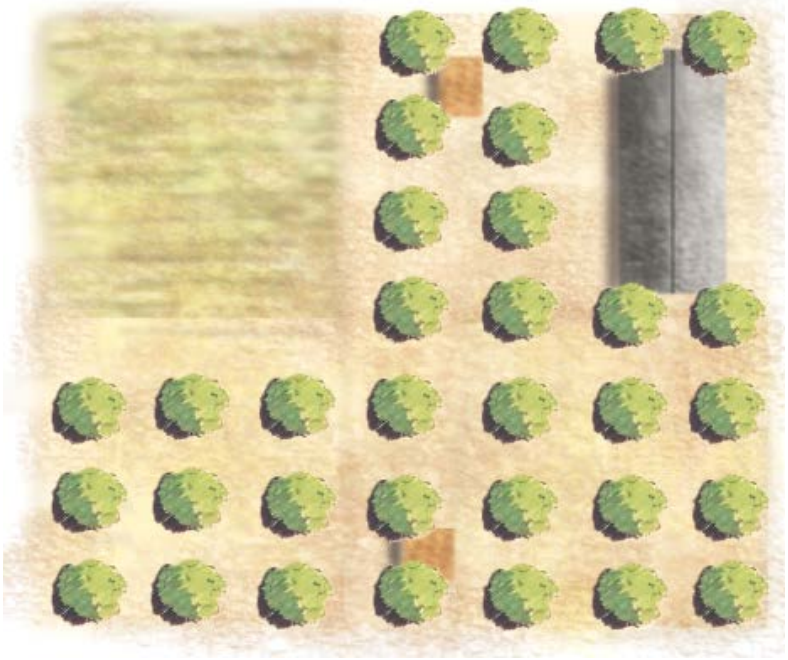


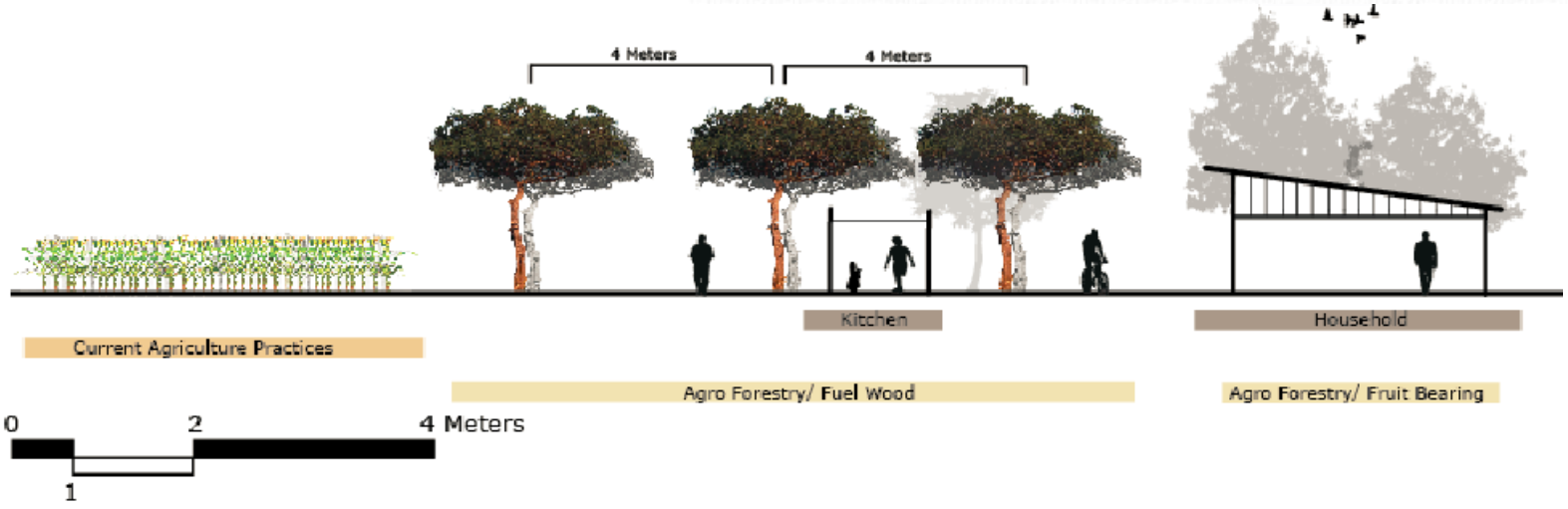
Design B: Agricultural Intensification



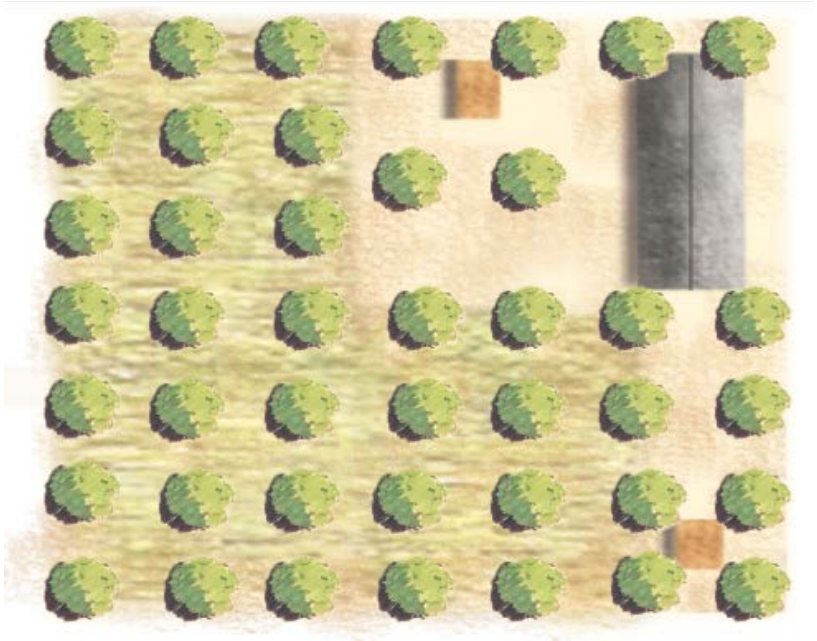


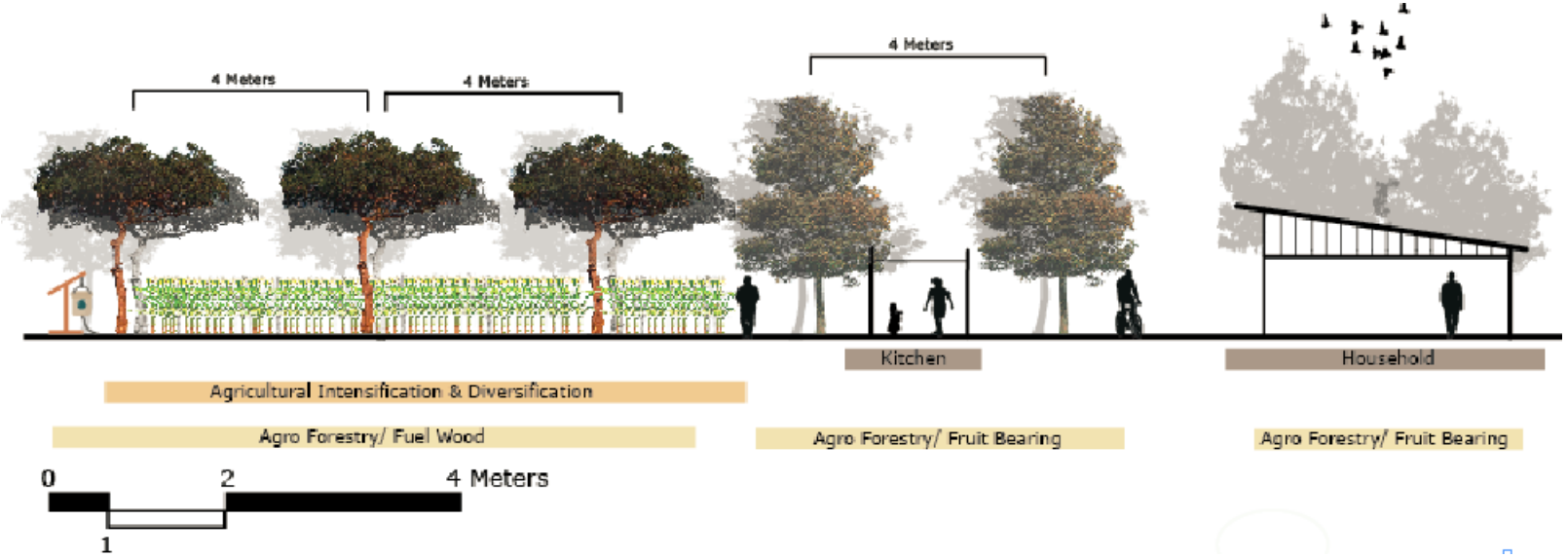
Design C: Agroforestry Intensive





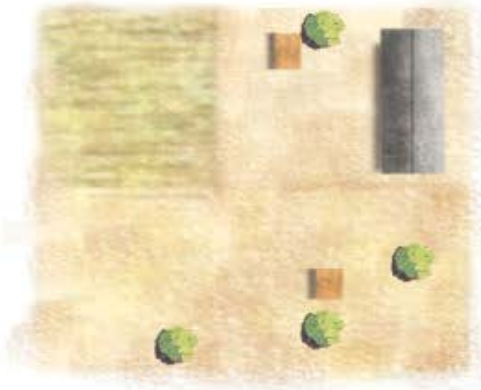
Design D: Ideal Efficient Design





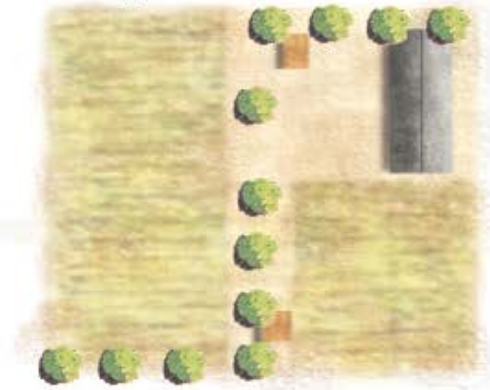
Design Evaluation

Design A



Initial Cost
Diversification
Intensification
Optimization
Agroforestry
Income Potential
Food Security

Design B



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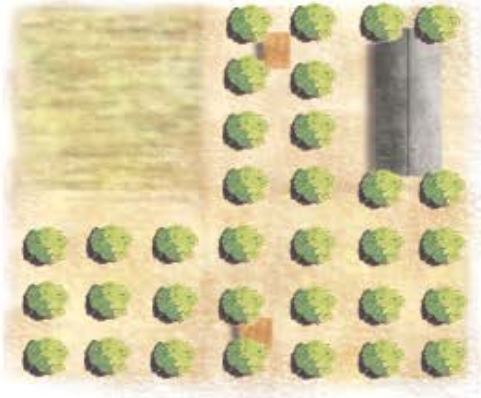

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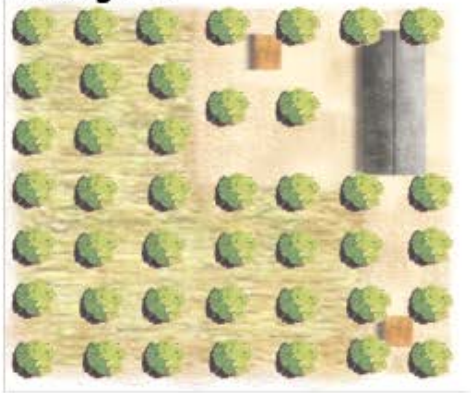

Initial Cost
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Conclusion