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Short-Term Demonstrators for Sustainable Farm Development

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Alternative Analysis of Demonstrators

1. Mini Composting System

- **Current Expected Outcome:** Improves soil fertility and reduces waste by **30%**.
- **Alternative Strategy:** Adding bio-accelerators (e.g., bacteria cultures, Effective Microorganisms (EM) solutions) to speed up decomposition.
- **Improved Outcome:** Soil fertility improvement **+10%**, faster composting cycle.
- **Cost/Trade-offs:** Additional cost increase of **5%**.
- **Justification:** Enhancing composting with bio-accelerators ensures quicker decomposition, making nutrients available to crops more rapidly.

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2. Mini Rainwater Harvesting System

- **Current Expected Outcome:** Collects **70% of available rainwater**, enough for irrigation.
- **Alternative Strategy:** Adding first-flush diverters & UV filtration for better water quality.
- **Improved Outcome: +20% increase in usable water**, safer for crops & livestock.
- **Cost/Trade-offs: 8% cost increase** for better filtration.
- **Justification:** Ensuring cleaner water reduces contamination risks and enhances irrigation effectiveness.

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3. Sustainable Micro-Garden with Mulching

- **Current Expected Outcome:** Reduces water loss by **40%**, improves soil health.
- **Alternative Strategy:** Using compost-enriched mulch for extra nutrients.
- **Improved Outcome: +15% plant growth**, improved soil structure.
- **Cost/Trade-offs: 3% cost increase** for compost materials.
- **Justification:** Enriched mulch enhances moisture retention while supplying nutrients for healthier crops.

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4. Hybrid Energy System (Solar + Public Grid)

- **Current Expected Outcome**: Powers basic farm lighting, extends working hours.
- **Alternative Strategy**: Implementing a hybrid solar + public grid system with smart switching for cost and energy efficiency.

- **Improved Outcome: 30% reduction in energy costs during off-peak hours**, ensures 24/7 power availability.
- **Cost/Trade-offs: 4% increase in setup cost**, but long-term savings on electricity.
- **Justification**: Hybrid systems balance sustainability with reliability, reducing dependency on solar power alone while optimizing energy use.

Summary table

Demonstrator	Current Expected Outcome	Alternative Strategy	Improved Outcome	Cost/Trade-offs	Best Choice & Justification
Mini Composting System	Improves soil fertility and reduces waste by 30%.	Adding bio-accelerators (e.g., bacteria cultures, Effective Microorganisms (EM) solutions) to speed up decomposition.	Soil fertility improvement +10%, faster composting cycle.	Additional cost increase of 5%.	**Adding bio-accelerators** – Ensures quicker composting, making nutrients available faster for plant growth. The cost increase is minimal compared to long-term benefits.
Mini Rainwater Harvesting System	Collects 70% of available rainwater, enough for irrigation.	Adding first-flush diverters & UV filtration for better water quality.	**+20% increase in usable water**, safer for crops & livestock.	**8% cost increase** for better filtration.	**Adding filtration & diverters** – Ensures cleaner water, reducing risks of contamination while improving irrigation effectiveness.

Sustainable Micro-Garden with Mulching	Reduces water loss by 40%, improves soil health.	Using compost-enriched mulch for extra nutrients.	**+15% plant growth**, improved soil structure.	**3% cost increase** for compost materials.	**Compost-enriched mulch** – Enhances moisture retention while adding nutrients, leading to healthier plants with minimal additional cost.
Hybrid Energy System (Solar + Public Grid)	Powers basic farm lighting, extends working hours.	Implementing a **hybrid solar + public grid system** with smart switching for cost and energy efficiency.	**30% reduction in energy costs during off-peak hours**, ensures 24/7 power availability.	**4% increase in setup cost**, but long-term savings on electricity.	**Hybrid solar + public grid** – Balances sustainability with reliability, reducing dependency on solar power alone while optimizing cost savings.