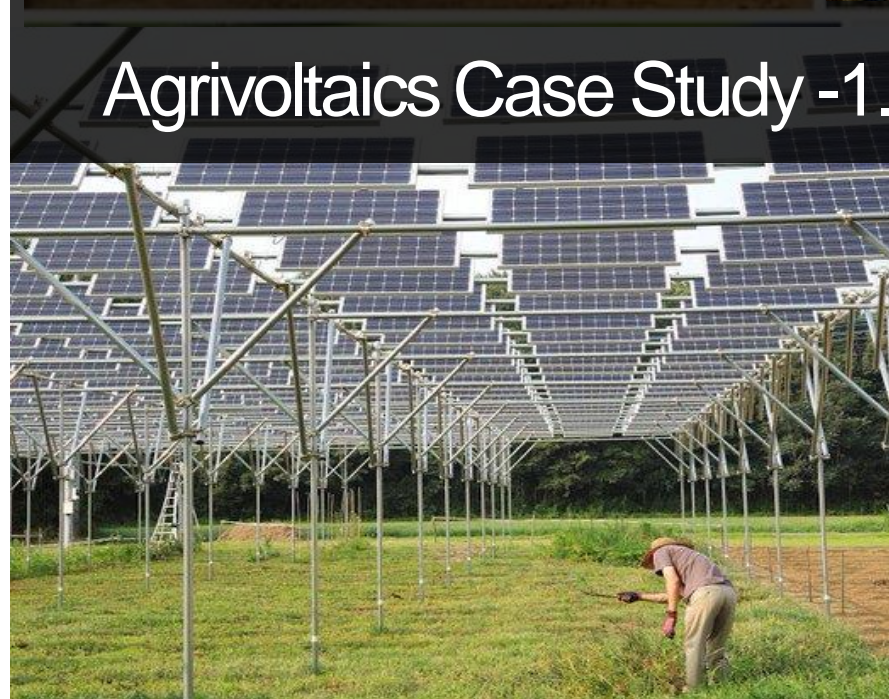




SunSeed APV & GIZ

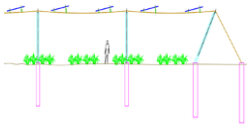
Agrivoltaics Case Study -1.4 MW in Parbhani



- Europe leading Agrivoltaics project development – driven by lack of land availability
- India – land is available for utility scale projects but need Agrivoltaics to drive distributed power generation close to urban centers at MW scale
- Agrivoltaics can have a different driver in India – bringing professional capital into Agriculture to improve the productivity of farming. It can address multiple reasons for farm distress by:
 - Aggregation of small land sizes
 - Use of technology and sustainable practices
 - Climate resilience via reduction of high temperatures
 - Requirement of less water
- Agrivoltaics best suited for horticulture & floriculture – low light requirements & high value
- Agrivoltaics can both improve returns for the developers and improve lives of marginal farmers

Prove the bankability and improve the economics for both developers and farmers

1



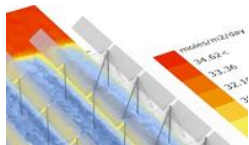
**Light weight
Elevated Structures**

2



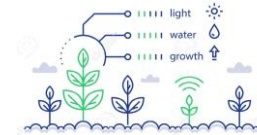
Solar – Agri Synergies

3



**Light, Microclimate
and Yield Simulations**

4



**Agriculture Models
Adapted for APV**

5



**Advance Sales contracts
for the produce**

6



Water Management



- Cable Stabilized Light Weight Structure
- Retractable Shade Nets
- Horticulture Farming Models

- Established Farm Economics
- Climate Resilient Agriculture
- Single Axis trackers or fixed tilt





- Cherry Tomatoes
- Sweet Pepper
- Cucumber
- Betel Leaves
- Chrysanthemum
- Dutch Rose
- Hibiscus
- Rajanigandha



APV Shade House – 560 KW – 1.5 Dutch Roses

SunSeed APV











Agri – PV Synergies

Dual use of land, Dual use of elevated structure - supports agricultural infrastructure such as shade-Nets, trellises and foggers.

High Crop Yields

High yield organic horticulture or floriculture. Crop resilience to climate change. Controlled shading reduces temperature increasing crop yields. Multilayer farming with sustainable practices.

Higher PV Generation

Higher PV generation from bifacial panels due to elevated installation and higher albedo of shade net/soil/crop system. Possibly lower panel temperatures due to crop evapotranspiration

Water Savings

40% reduction in water use due to reduced evapotranspiration. Can possibly bring marginal lands back into agriculture

O&M Savings

No requirement of day-time security. Dual use of farm personnel for panel cleaning. No separate weeding costs. Low dust generation from horticulture activities and crop cover.



1.75 Elevation Bifacial Panels – 280 KW – 0.8 acres – Watermelons

SunSeed APV



1.75 Elevation Bifacial Panels –Watermelons

SunSeed APV



REDMI NOTE 12 PRO 5G

1.25m Elevation Bifacial Panels – 280 KW - 0.8 acres

SunSeed APV



- Muskmelon – between rows
- Methi, Spinach, Coriander – below panels

1.25m Elevation Bifacial Panels – 280 KW - 0.8 acres

SunSeed APV



- Muskmelon – between rows
- Methi, Spinach, Coriander – below panels



1.75 Elevation Monofacial Panels – 280 KW – 0.8 acres

SunSeed APV

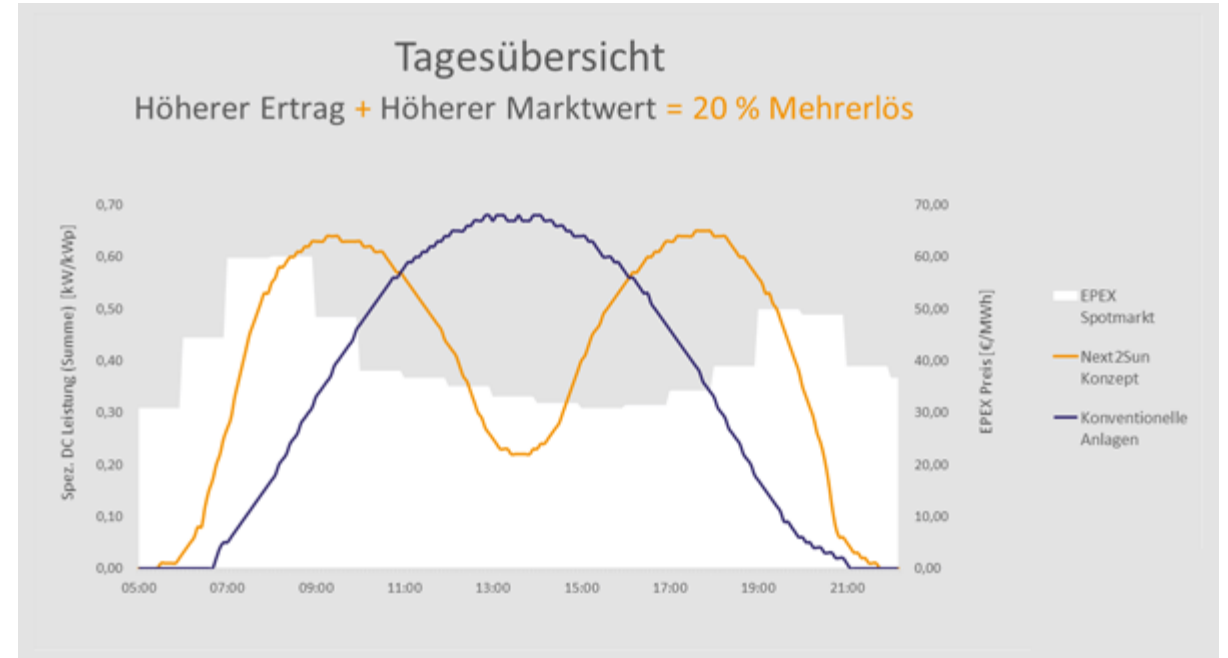
- Marigolds between rows
- Italian Basil below panels

REDMI NOTE 12 PRO 5G

1.75 Elevation Monofacial Panels – Marigold

SunSeed APV





Could be a good system for growing grains, legumes etc. which have high light requirements

Control Plot for Shadehouse Crops – 0.8 acres

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Soil Ploughing, Aeration via Mini Tractor

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Elevated Walkway for Shifting Robots for Panel Cleaning

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Albedometer



Diffuse Normal Pyranometer



Plant Canopy Analyzer



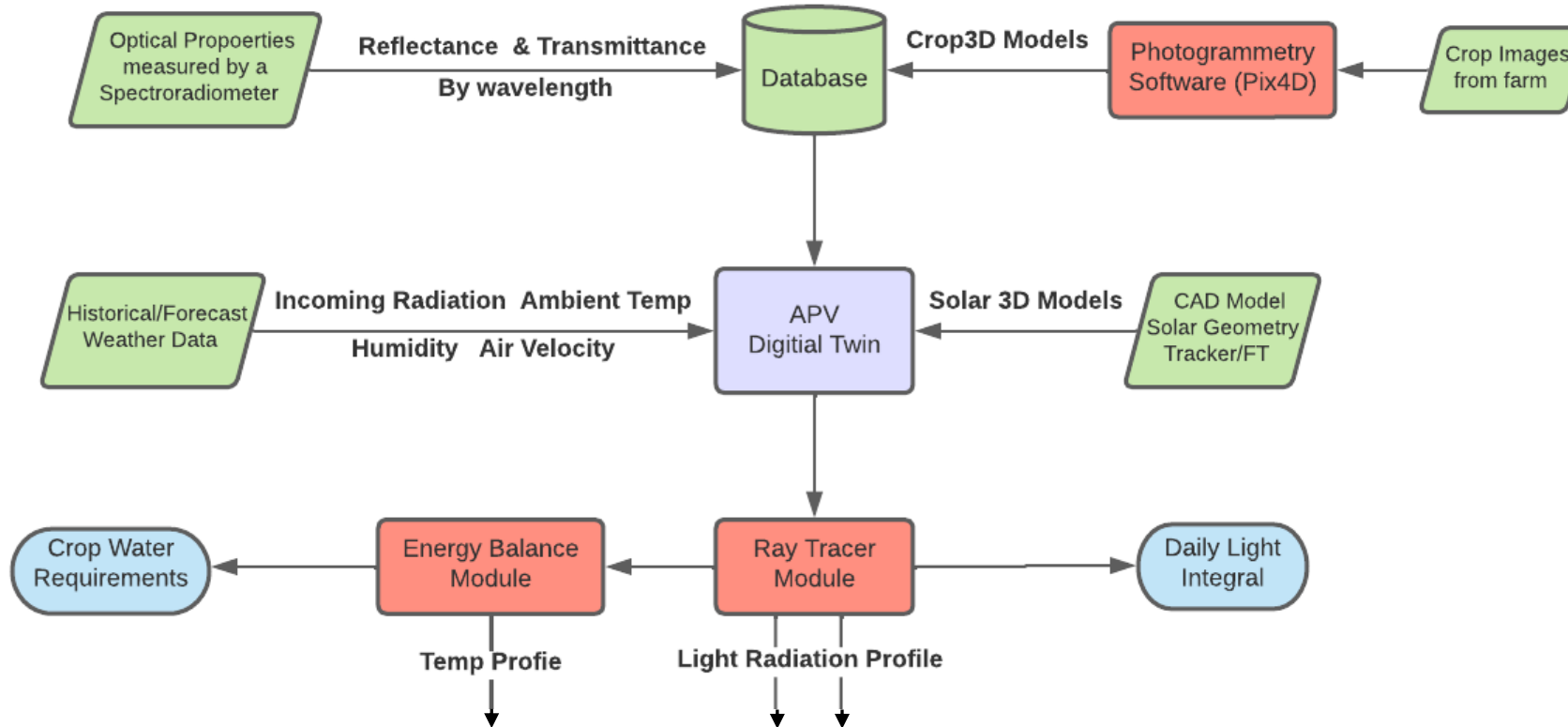
Weather Stations for each crop – air temp, humidity, soil temp, soil moisture, pH, EC, wind speed

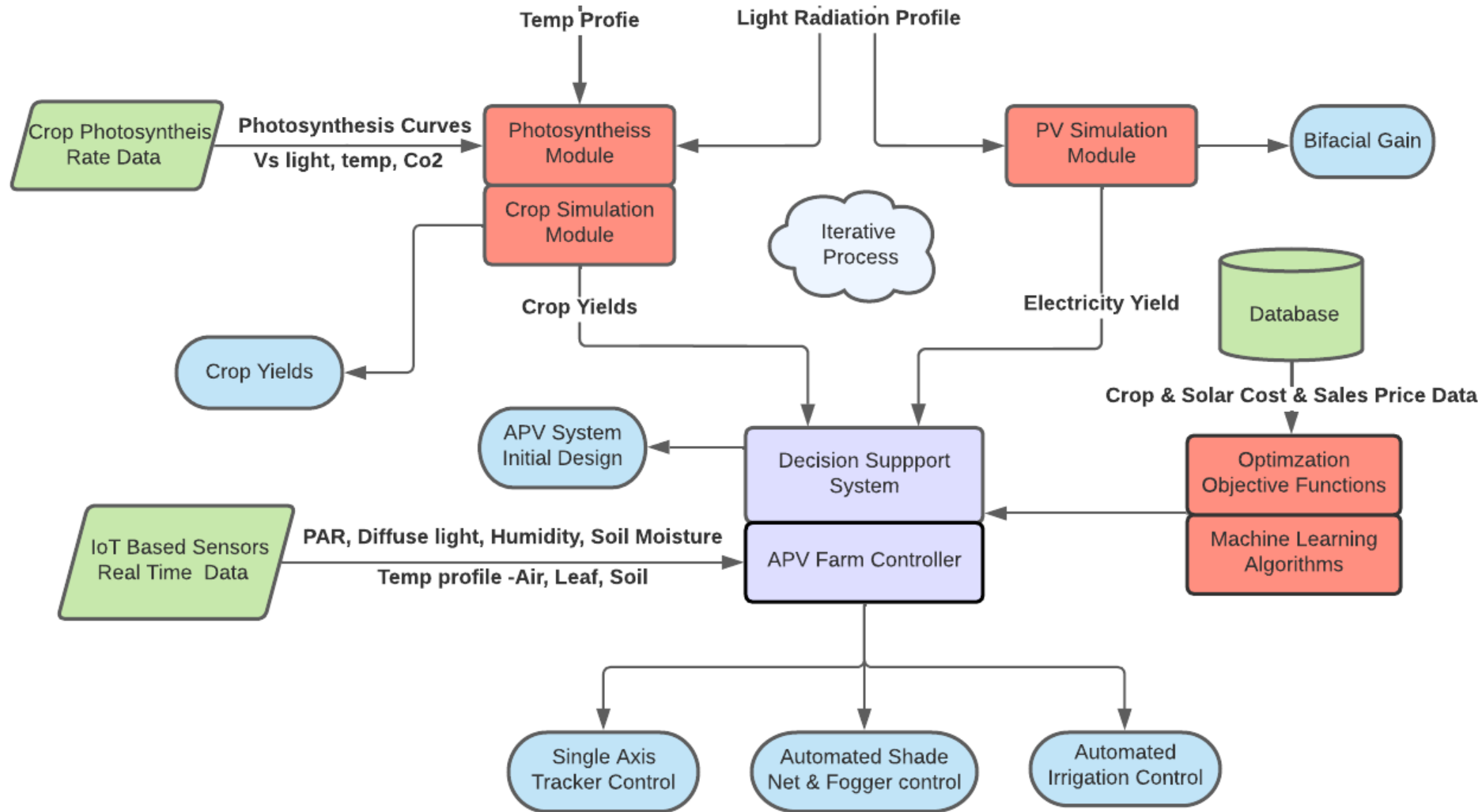


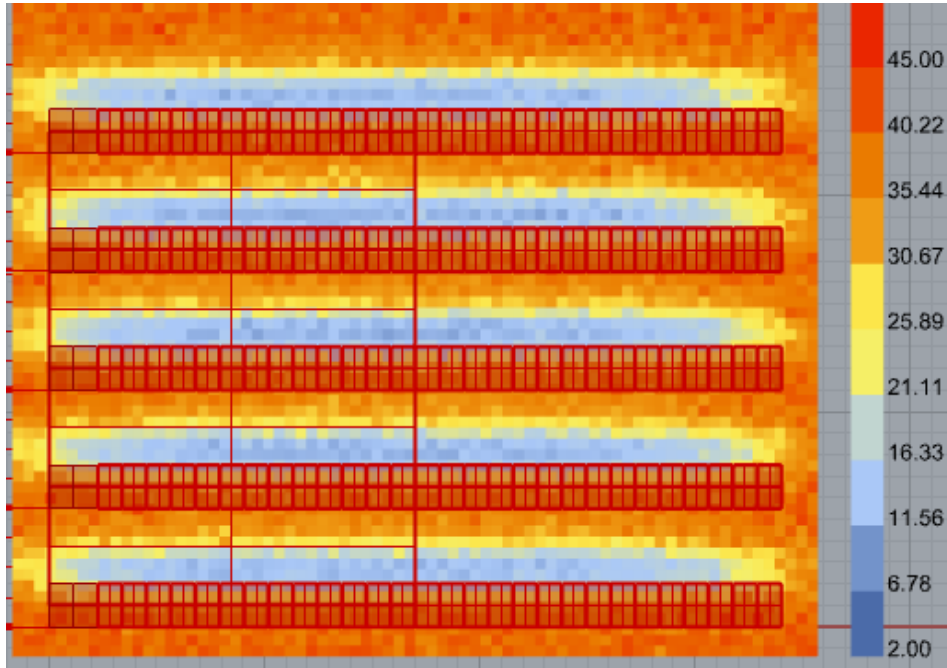


Photosynthesis Meter

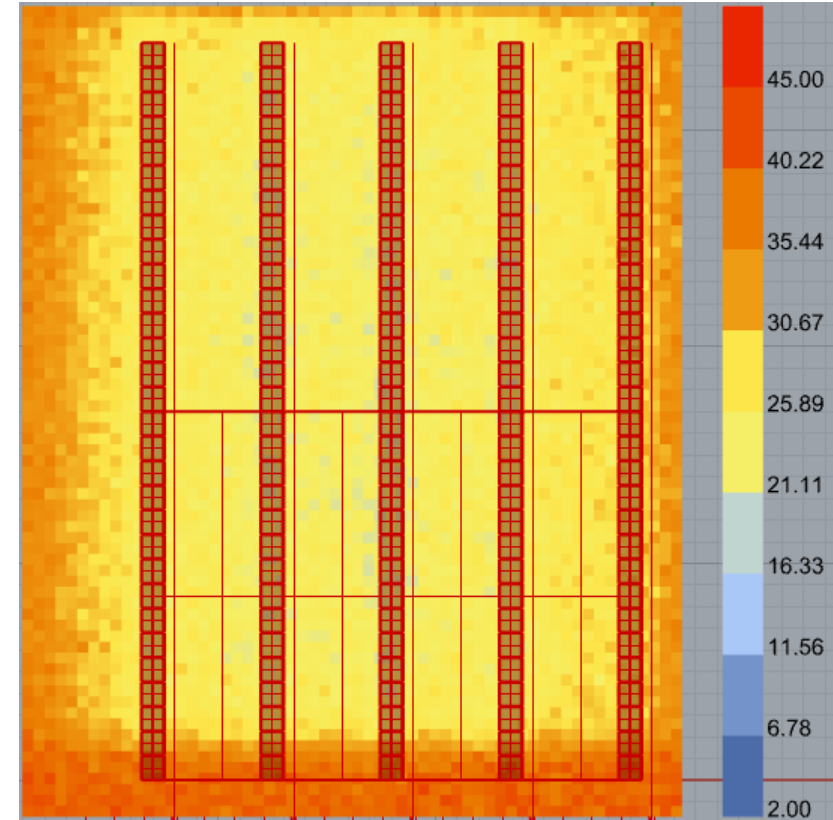
- Photosynthesis Rates
- Light response curves
- Temp response curves
- Co2 response curves



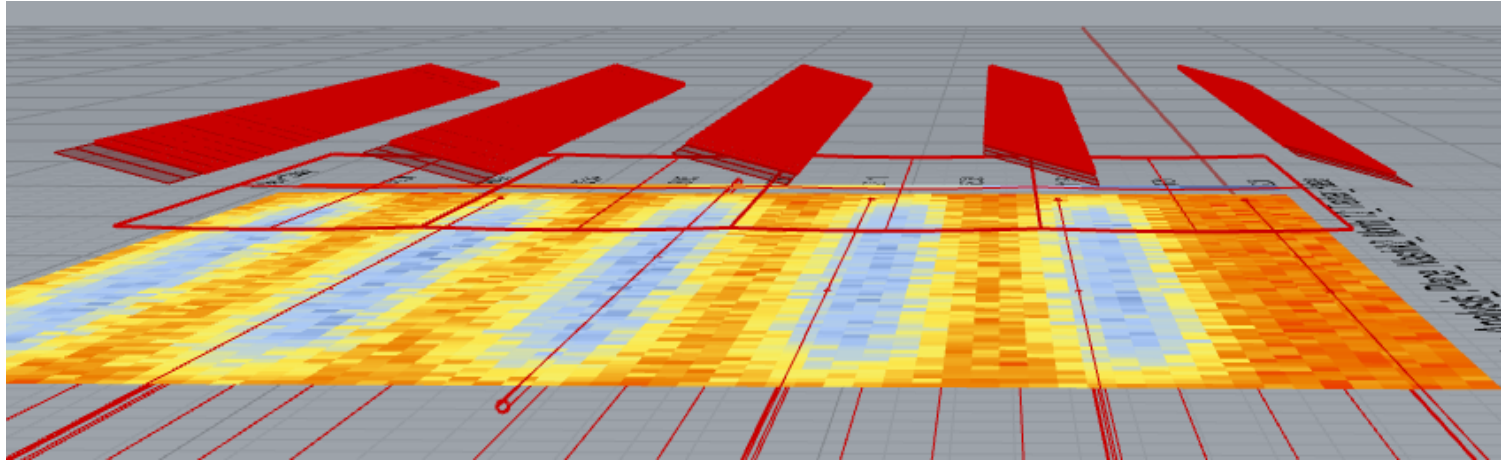




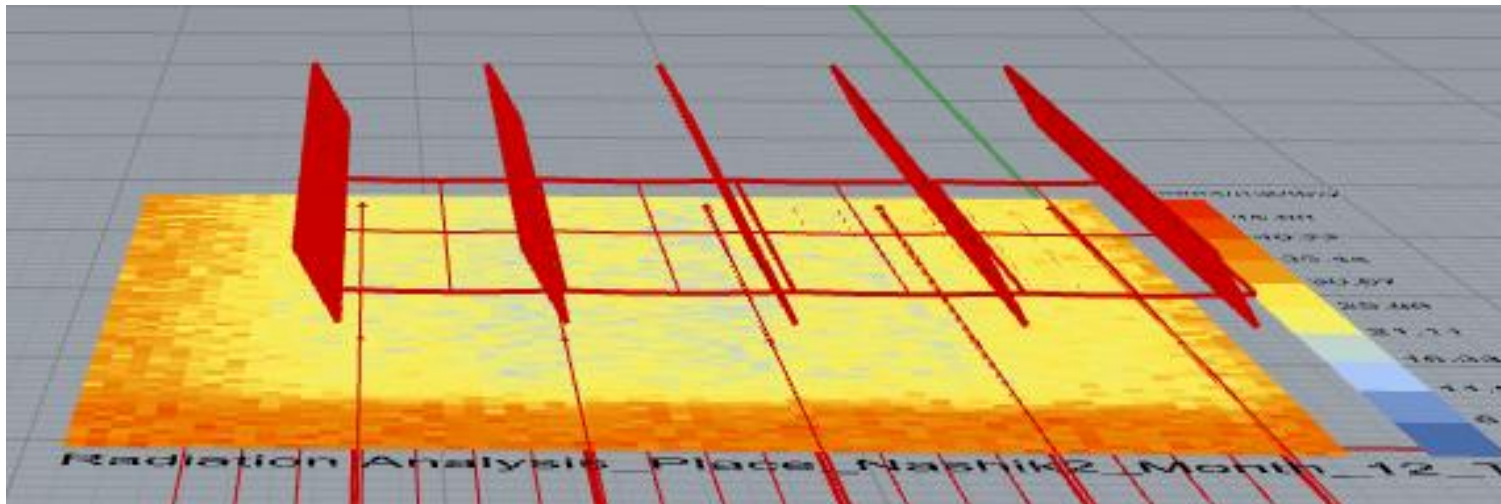
Fixed Tilt – Sept 30



Single Axis Tracker – Sept 30

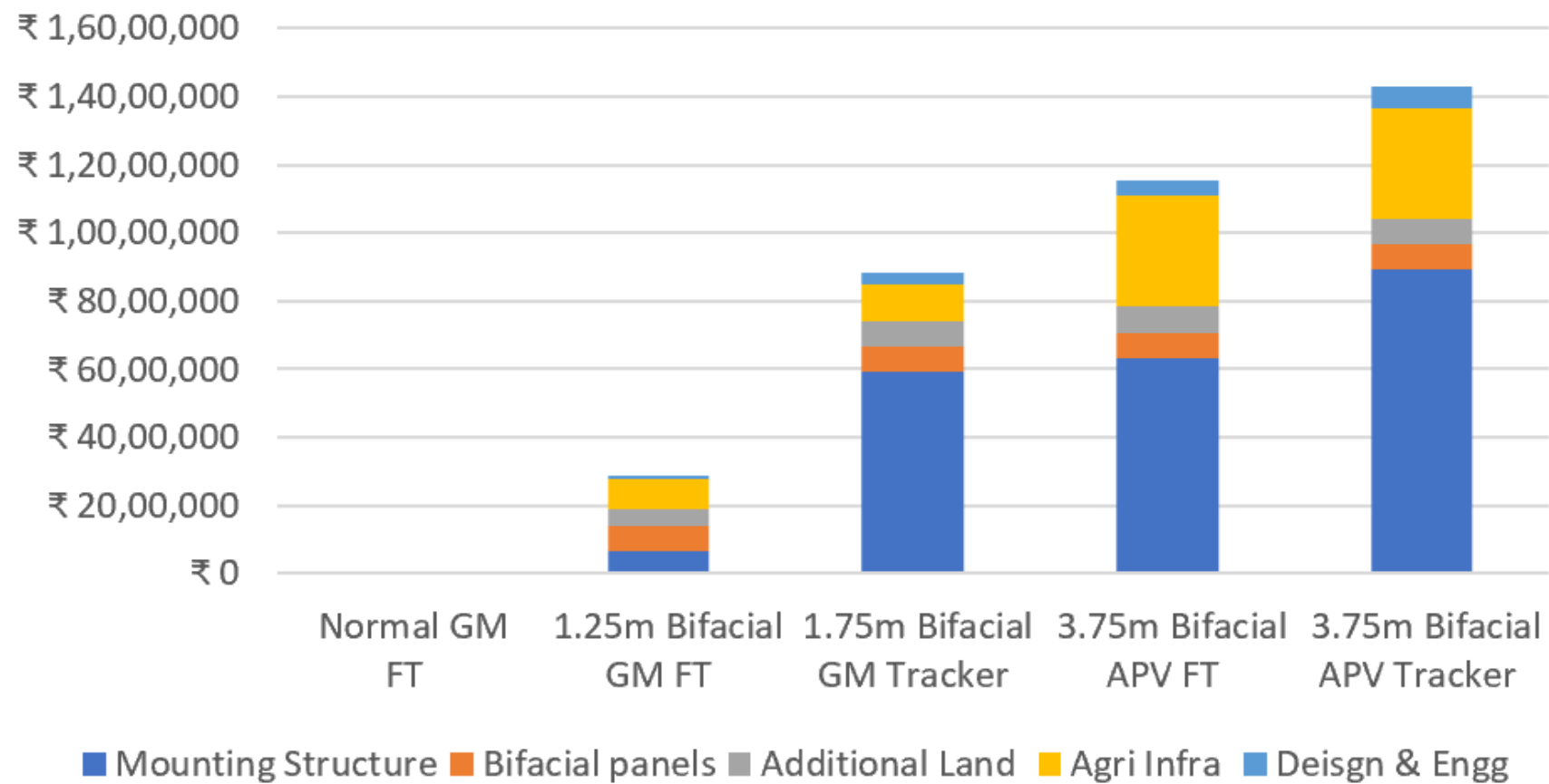


Fixed Tilt Dec 30

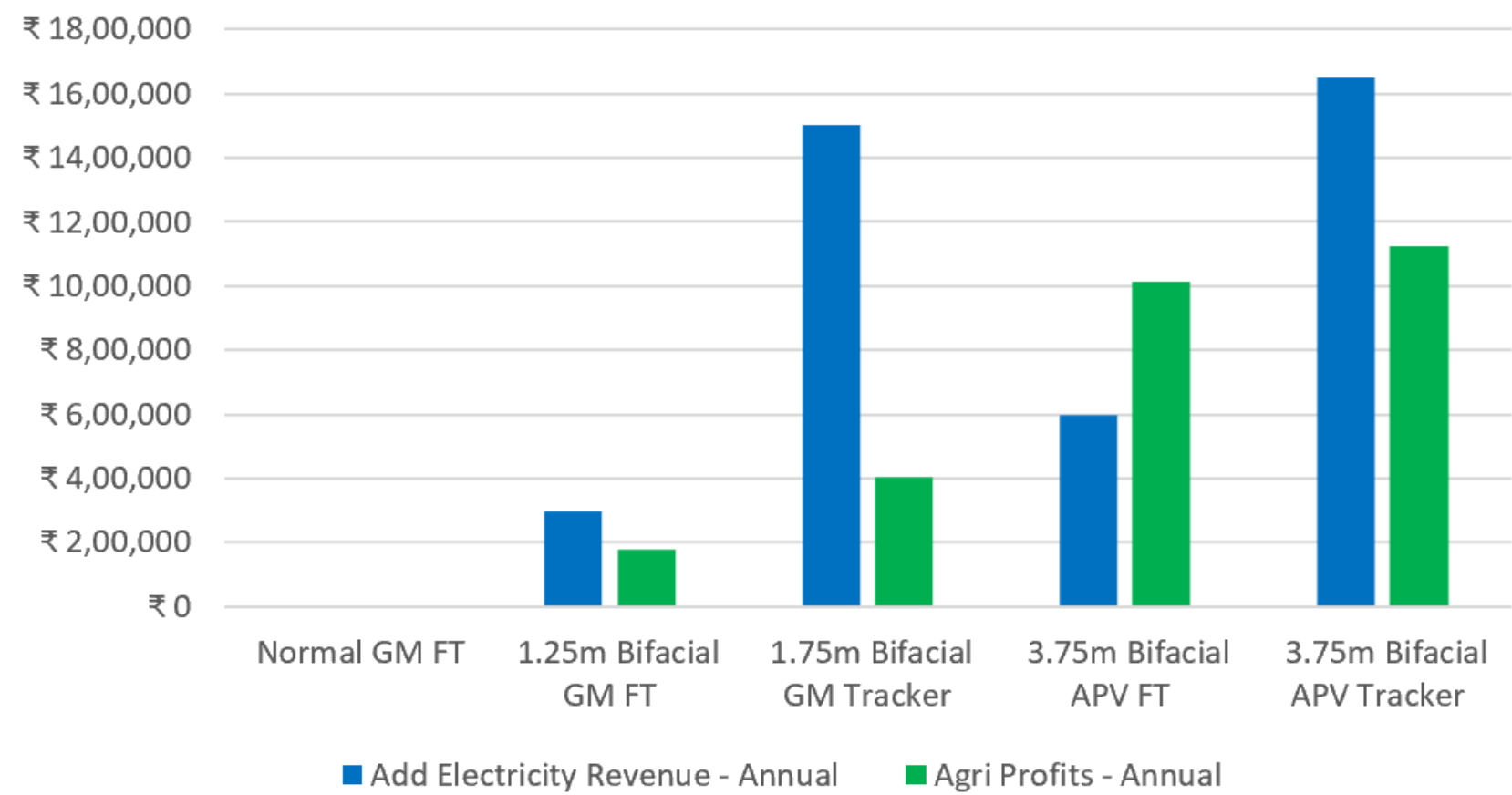


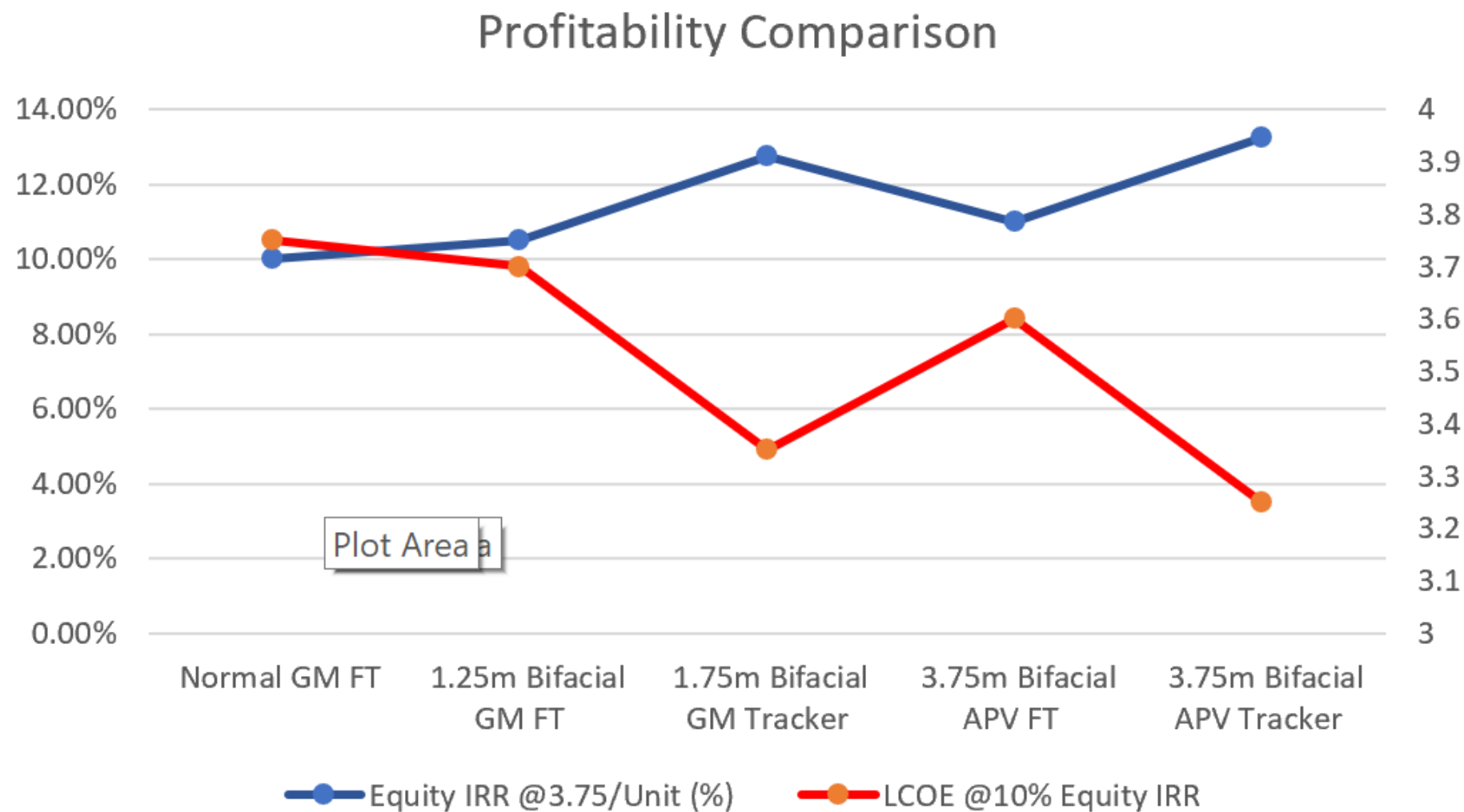
Tracker Dec 30

Additional APV Costs



APV - Additional Annual Revenue





APV Business Model – Developer & Marginal Farmer

SunSeed APV

Developer's Economics – 1.0 MW

₹ Additional CapEx	₹ 1,40,00,000
₹ Additional Power	27.5%
₹ Agri Revenue	₹ 27,50,000
₹ Agri Profit	₹ 13,50,000
₹ Developer's share @85%	₹ 11,25,000
₹ Increase in Equity IRR	3-4%

Design Assumptions

- Land Area: 5 acres
- Bifacial Panels 540Wp
- Structure: Height 3.75m
- Ground coverage ratio -35%
- Column Span: 7.0m
- Single Axis Trackers

Marginal Farmer's Economics – Current

₹ Land Holding	5.0 Acres
₹ Farming Profits	₹ 2,50,000

Marginal Farmer's Economics – APV

₹ Land Lease	₹ 1,25,000
₹ Fixed Wages	₹ 1,50,000
₹ Share of Profits @15%	₹ 2,25,000
₹ Total Income	₹ 500,000

Doubling of Farmer Income

What Next? – Roof top APV – Solar Generation with Urban Farming

SunSeed APV



- Organic farming in soilless medium. Possible production of heirloom or exotic varieties.
- Efficient supply chain with no food wastage
- Fresh produce to consumers within hours of harvest.
- Sales directly to consumers eliminating middlemen.
- Diversification of cash flows results in significant reduction of risk



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