

Week-06-L-05

Value Engineering Agricultural Plan

Value Engineering Case Study

Case 2: Irrigation Strategies

✓ Creativity & Evaluation Phases

Prof. J. Ramkumar & Dr. Amandeep Singh

Dept. of Mechanical Engg. & Design
Indian Institute of Technology Kanpur



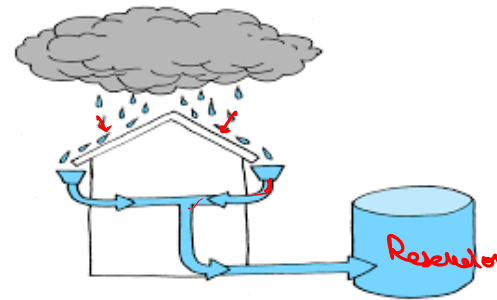
Creativity Phase

Efficient Irrigation in Challenging Environments:

- ✓ Drip Irrigation
- ✓ Subsurface Drip Irrigation
- ✓ Rainwater Harvesting



Source: www.trustbasket.com



Source: <https://sustainabilityworkshop.venturewell.org>

Creativity Phase

- ✓ Check Dams and Terracing :
- ✓ Sprinkler Irrigation
- ✓ Flood Irrigation :
- ✓ Solar-Powered Pumps : *without use of electricity*



Source: www.jains.com



Source: <https://in.pinterest.com/>

Creativity Phase

- ✓ Dig water wells : *Investment (initial)*
- ✓ Use water trucks : *Fuel consumption*
- ✓ Construct canals from nearby water source : *Heavy investment*
- ✓ Water reuse
- ✓ Rainfall
- ✓ Water redistribution
- ✓ Crop selection and rotation

Evaluation Phase

Brainstorming is conducted to identify the problem from the experts. The questionnaire depends on idea screening methods:

1. GO - NO GO – Scratch ideas that hold no interest.
2. Champion – Someone who supports the idea.
3. GFI (Go For It) – Discuss pros/cons and vote. – GFI is team average. – Combine ideas; add new ideas. *Record the assumptions.*
4. Trade-Off Study – Quantify performance characteristics. – Select top candidates using Pair-wise Comparison, etc. – Could use software such as Expert Choice.
5. Customer Acceptance – Determine & quantify customer acceptance criteria

Voting on Irrigation Strategies

Code	Idea	GO or NO GO	Champion
→ I-01	Drip Irrigation	Go ✓	Y ✓
I-02	Subsurface Drip Irrigation	No-Go	-
→ I-03	Rainwater Harvesting	Go ✓	Y
I-04	Sprinkler Irrigation	Go ✓	Y
I-05	Flood Irrigation	No-Go ✓	-
I-06	Solar powered Pumps	No-Go ✓	No
I-07	Dig Water Wells	Go ✓	Y
I-08	Use water trucks	No-Go ✓	No
→ I-09	Construct canals	Go ✓	Y
→ I-10	Pond Irrigation	Go ✓	Y
→ I-11	Water reuse	Go ✓	Y
I-12	Rain	No-Go ✓	-
I-13	Water redistribution	No-Go ✓	-
→ I-14	Crop Rotation and Selection	Go ✓	Y

Trade-Off Study

Code	Performance characteristics				Voting
	Easy Application ✓	Land Use	Continuity of supply	Easy Maintenance	
I-01	✓	✓	X	✓	
I-03	✓	○	X	✓	
I-04	2 crossed ✓	-	X	X	Reject
I-07	2 crossed X		✓	X	Reject
I-09	X	✓	✓	✓	
I-10	✓	✓	X	✓	
I-11	X		✓	✓	
I-14	✓	✓	X	✓	

✓ → Good
 X → Not good
 - → Can't say

Value Alternatives in Irrigation Strategies:

I-01

I-03

I-11

VA-I: Drip Irrigation with Rainwater Harvesting and Water Reuse:

- Utilize drip irrigation for precise water delivery to plant roots, minimizing wastage.
- Implement rainwater harvesting to collect and store rainwater during the rainy season.
- Reuse treated wastewater to further reduce the demand for freshwater.

Value Alternatives in Irrigation Strategies:

^{I-03}
VA-II: Rainwater Harvesting with Pond Irrigation and Crop Rotation and Selection: ^{I-10} ^{I-14}

- Establish rainwater harvesting systems for collecting and storing rainwater.
- Create ponds for water storage and irrigation, ensuring a consistent water supply.
- Optimize water usage and soil health through crop rotation and selection.
- Choose crops suited to the local climate and water availability.

Value Alternatives in Irrigation Strategies:

^{I-09}
VA-III: Construct Canals (for better water distribution) with Drip Irrigation: ^{I-01}

- Build canals for efficient water distribution from a water source to various fields.
- Implement drip irrigation within each field, reducing water loss through evaporation.
- Manage and redistribute water resources effectively through the canal system.

Thank You

