Economic assessment of large power PV irrigation systems in the ECOWAS region

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Advantages
• Plug and play
• Low initial investment

Disadvantages
• Weak water sources
• Power limitation
• Tuning in factory
Advantages

• Large power
• Reliable water sources
• High efficiency and reliability

Disadvantages

• High initial investment
• On-site tuning
• High diesel cost and grid tariff

• Low grid reliability

• Farms far from the grid

IS LARGE POWER PV IRRIGATION FEASIBLE IN ECOWAS REGION?
• 7 countries

• 380 kWp on a North-South tracker

• 4 study cases:
  • Pumping to a water pool: substitution of Diesel for Grid
  • Direct pumping: substitution of Diesel for Grid

• www.sisifo.info

• Results: NPC, IRR, Payback period, LCoE
ECONOMIC ASSESSMENT

SCENARIO

<table>
<thead>
<tr>
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<tr>
<td>Benin</td>
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<td>9.96</td>
<td>5.6</td>
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<td>17.27</td>
<td>18</td>
<td>4.2</td>
<td>13.24</td>
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- Ep ($/kWh): electricity price
- DP ($/l): diesel price
- t (%): corporate tax rate
- i’ (%): nominal interest rate
- f (%): annual GDP deflator
- i (%): real interest rate

NPC  
IRR  
Payback period  
LCoE
IRR – water tank
• Diesel: 15 – 32%
• Grid: 19 – 47%

IRR – constant pressure
• Diesel: 8 – 20%
• Grid: 10 – 31%
PBP – water tank
- Diesel: 3 - 6 years
- Grid: 2 - 5 years

PBP – constant pressure
- Diesel: 5 - 10 years
- Grid: 3 - 9 years
LCoE – water tank
- Diesel: 50 – 83% of savings
- Grid: 53 – 84% of savings

LCoE – constant pressure
- Diesel: 30 – 76% of savings
- Grid: 33 – 76% of savings
SENSITIVITY ANALYSIS

- Diesel cost: ±25%
- Grid cost: ±10%
- PV size: 380, 150, 45 kWp

NPC
IRR
Payback period
LCoE
SENSITIVITY ANALYSIS

PBP

Diesel, to a water tank

Diesel, constant pressure

Electric Grid, to a water tank

Electric Grid, constant pressure
### PV SIZE

<table>
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<th>kWp</th>
<th>380</th>
<th>150</th>
<th>45</th>
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<td>$/Wp</td>
<td>1.7</td>
<td>1.84</td>
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NPC values (x10^5$) obtained for the 380 kWp system (columns shadowed in grey) and for the two smaller irrigation systems considered in the sensitivity analysis.
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www.maslowaten.eu

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