



Global Best Practices in AgroPV for Emerging Economies

Nguyet Thi TRINH, independent expert

Thibault FRISSON, independent expert & LEYTON

Word list and Introduction

Agro Agri	Voltaic Photovoltaic Energy PV	or	solar sharing	or	Land Sun	Dual use
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Open field



Green house



Shrimps, seafoods
& seaweed



GOETZBERGER, A. et ZASTROW, A. On the coexistence of solar-energy conversion and plant cultivation. International Journal of Solar Energy, 1982, vol. 1, no 1, p. 55-69.



Akira Nagashima

Japan, cradle of agrivoltaic



2004: Akira Nagashima, first agrivoltaic prototype (solar sharing)

- Synergy between PV and crops
- Patent free for public use in 2005

2013: Ministry of Agriculture, Forestry and Fisheries of Japan issued a notice to permit the temporal conversion of farmland

- Feed-in-tariff
- Needs permissions (3 years)
- Must be removable
- Yield should be > 80% of the annual region average

2018: 1347 permissions given to agricultural solar power plants

- Extension of permission to 10 years (under conditions)



Japan, agrivoltaic systems



Livelihood is not possible with agriculture, income from farming alone is insufficient

- Shortage of farmers
- Abandoned farmland

Agrivoltaic increases the income of farmers:

- Maintain farmers & attract new farmers
- Revive abandoned farmland

Main crops under agrivoltaic systems:

- Japanese ginger
- cleyera japonica
- Rice
- shiitake mushroom
- medicinal ginseng
- berries

Japan, agrivoltaic systems



Standard installation:

- project led by local farmer
- Between 50 kW and 100 kW
- Shielding rate ~ 30% (up to 100% for mushrooms)
- Thin PV panels (special production lines)

Local associations to help farmers
(installation, cultural practice...)

But many others systems (fix, 1D tracking, 2D tracking, pods...)









Isolated locations: solar pumps



Decentralized irrigation services:

- Reliable, cost-effective, and environmentally sustainable energy
- Cost-competitive with diesel powered pumps in many cases
- Reduced air pollution and CO2 emissions

Typical installation: pumps for co-operative or village in arid region (often women's work):

- free time
- more reliable income from the irrigation system
- Improve crop production

Isolated locations: solar cold storage



In developing countries, post-harvest storage is one of the largest sources of food losses

GUSTAVSSON, Jenny, CEDERBERG, Christel, SONESSON, Ulf, et al. *Global food losses and food waste*. Rome : FAO, 2011.

Off-grid storage and preservation of perishable foods:

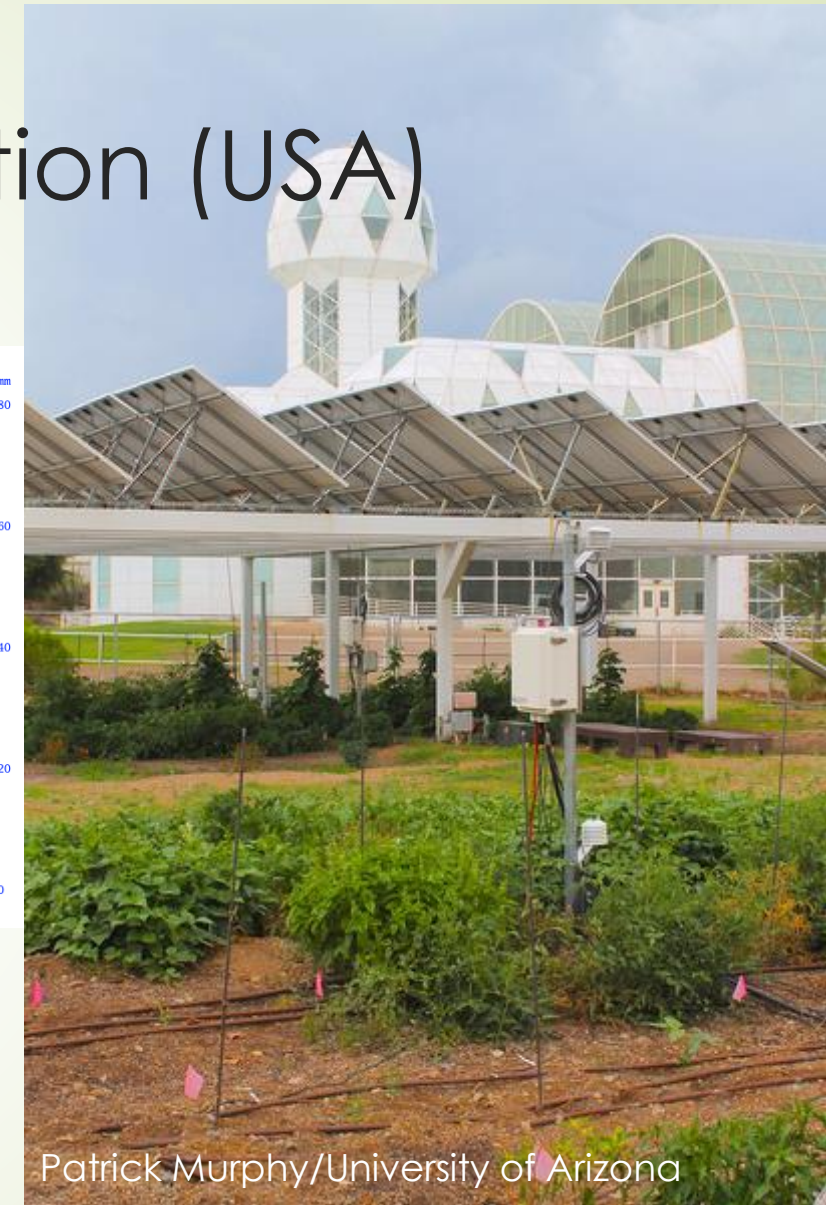
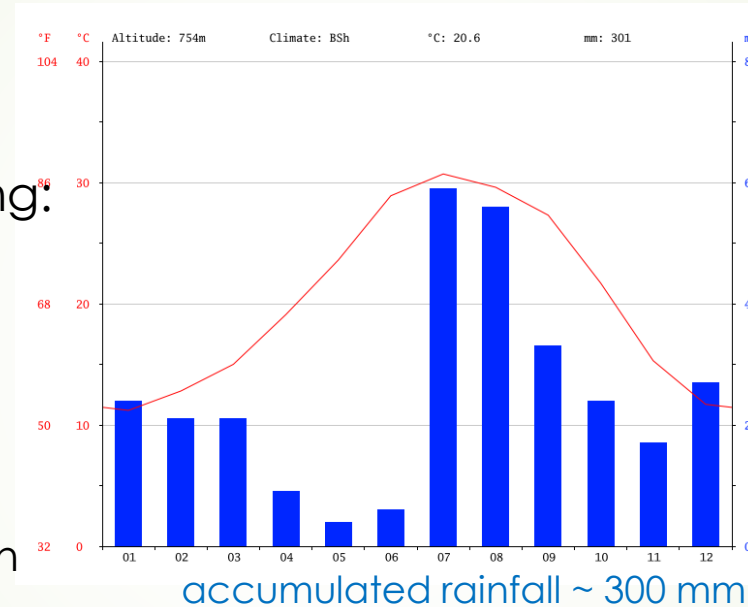
- Reduce post- harvest losses in fruits, vegetables and other perishable food
- Increase Local Farmer Income
- Create Jobs
- Reduce Malnutrition
- Self-Sustainable

Fight against desertification (USA)

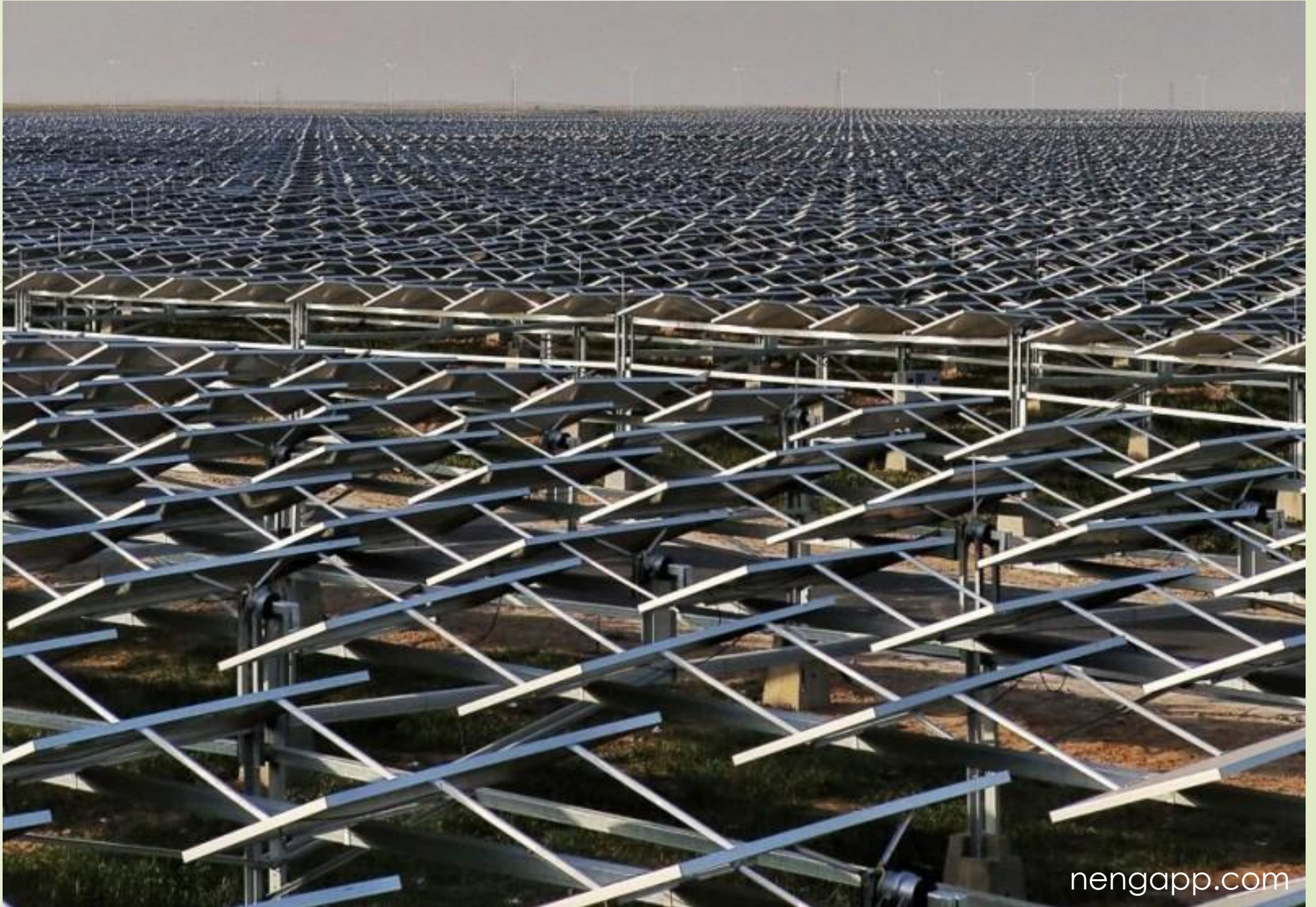
Studies of crop growing under solar panels in arid regions
(University of Arizona)

Microclimatic conditions monitoring:

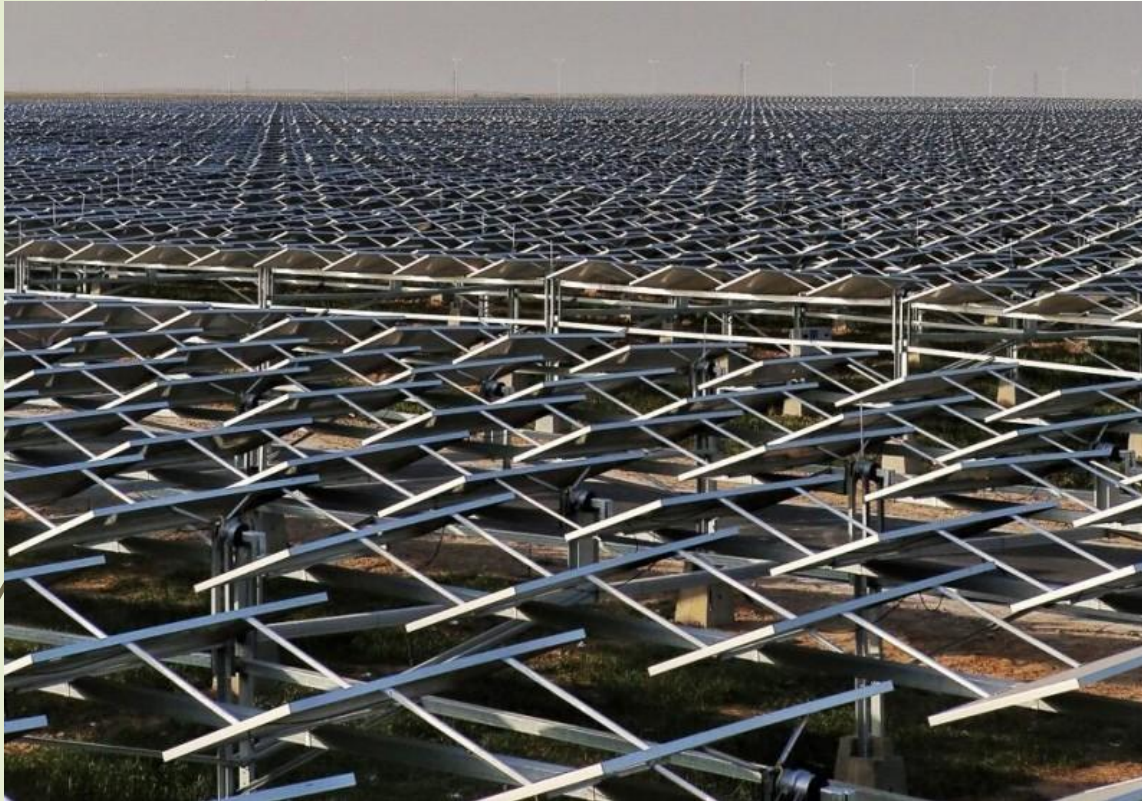
- light levels
- air temperature
- relative humidity
- PV panel temperature
- soil moisture
- irrigation water use
- plant ecophysiological function
- plant biomass production



Promising results for chiltepin fruit, tomato and jalapenos production.



Fight against desertification (China)



Shadowing saves water, drip irrigation:
Food can grow in former desert

Desert Gobi : interesting results in
controlling desertification in Ningxia



Fight against desertification (China)



Shadowing saves water, drip irrigation:
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Kubuqi Desert in Inner Mongolia :

- poverty reduction
- convert sand to arable land
- energy production

Kubuqi desert greening project praised by the UN
Environment Programme

Conclusion

Lots of projects worldwide:

- Promising results for arid regions and isolated locations.
- Mixed results in temperate regions

Each agro PV project is unique (context, goal, climate, field...) but agriculture must be the priority:

What would my crop production be
if I don't install solar panels?

LEYTON



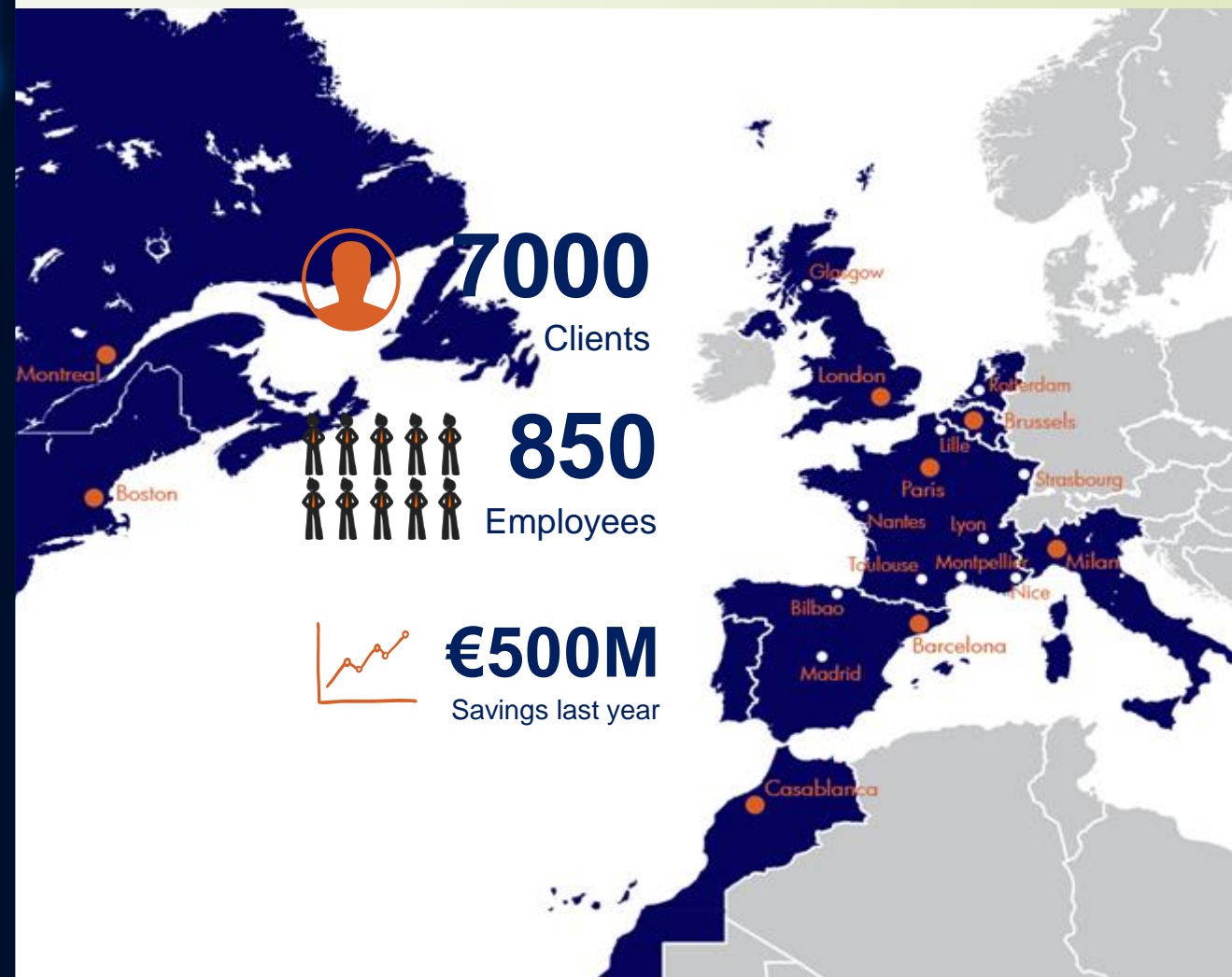
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