

Decentralized Renewable Energy Solutions in the MENA Region: A Driver of Local Value and Job Creation

**Job creation potential in Morocco
and Tunisia and training programs**

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Content

Intro: Solar pumping is only one area of „Decentralized Renewable Energy Solutions and **does mean more than off-grid**

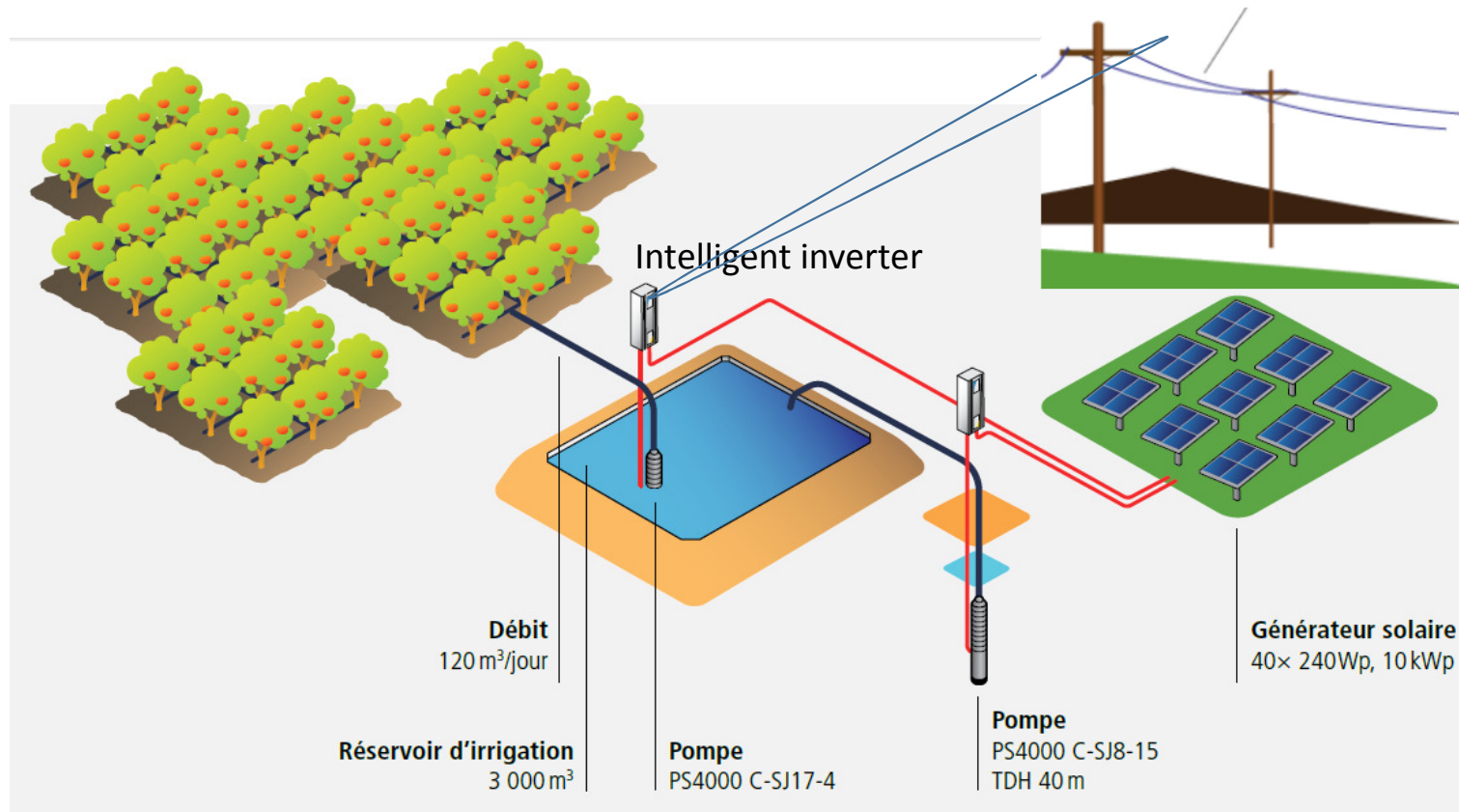
1 Today's situation: legal framework, financing and capacities

2 Perspectives: Policy Targets, Market, Market potential

3 Numerous challenges



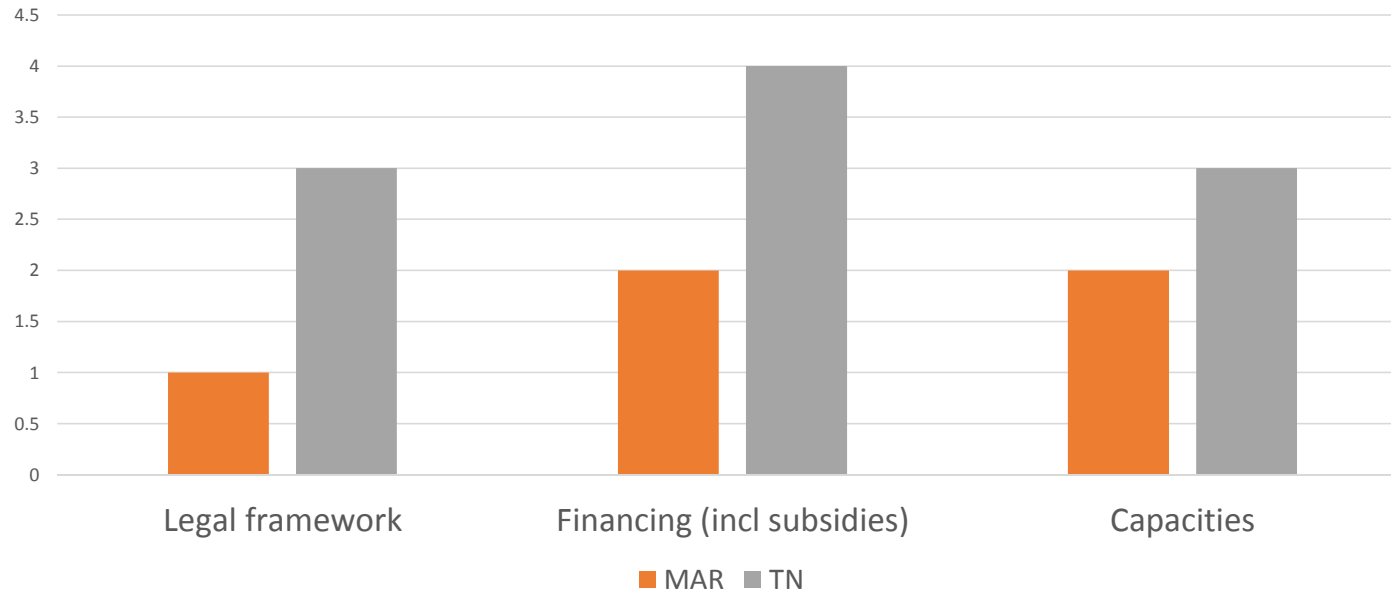
The „classical“ systeme for solar pumping.....and the new reality





Level of market maturity – the „magic“ tripod

State of maturity of MAR and TN for PV



The weakest pillar limits the development of the market

Legal framework for RE and feeding-in electricity....for residential houses and industry, but also for solar pumping

Morocco

- off-grid: no regulation than on the water side (**new** wells) -> authorization -> problems with existing stock
- On-grid: „Netmetering“ – **not yet** feasible to feed in exceeding power (whether MV nor LV grid) – expected to enter into force at the end of 2017
- **Strict** limitation to self-supply -> loss of economic viability (by seasonality etc)
- Around 20 companies working in the field, strong informal sector (-> quality problems)
- **High subsidies for butane gas, widely used for pumping with diesel motors -> economic viability at risk**
- 2013: first announcement of a solar pumping subsidy program – **not yet in place -> wait-and-see-position – barrier to market development**
- **Estimated** market size: around 2 MW /year

Tunisia

- Since 2009, a regulation for grid-connected LV-MV PV-systems (PROSOL Elec) -> more than **15000** systems (mostly residential, but also agricultural) realized
- Technical and financial support for residential and agricultural sector (subsidy of up to 50%) by ANME
- LV-regulation quite favorable: just drawing up a balance of consumption and production, exceeding production is transferred to the next month
- MV-regulation quite complexe -> limitation of feed-in to 30% of total production; low electricity tariffs -> only 50 installations up to now (but with a power up to 300 kWp) -> and **around 4 MW in the project pipeline**
- More than 200 companies certified, but nevertheless quality problems (mostly MV)
- **Estimated** market size: around 5 MW /year

Characteristics of irrigated farms in Morocco and Tunisia

Big farms (>20 ha, 4 %)

- Energy supply for irrigation: electricity by grid (MV) or fuel (diesel);
- Exportation of the harvest;
- Important property assured and stable;
- Acces to credits without problems

Small and medium farms (between 1 et 20 ha, 68 %)

- Energy supply for irrigation: electricity by grid (MV or LV), fuel or MA: butane gas (bottles);
- **Some difficulties of acces to financing and credits**
- **Lack of technical assistance**
- **50% of employment for rural population in Morocco and 45% in Tunisia**

Micro-farms (< 1 ha, 28 %)

- Energy for irrigation: MA: Butane gas or diesel fuel (MA,TN)
- Low economic productivity
- **Difficulties for access to financing programs**
- **Lack of technical, financial and human capacities**

IFC **Morocco Business Case**

Comparison of energy costs for Lorentz solar pump installation in Morocco

For: daily water requirements: 120 m³, daily energy requirements: 30 kWh

Energy source	Diesel	Butane	PV
Efficiency	30 %	32 %	100 %
Energy required	100 kWh	100 kWh	100 kWh
Fuel energy content	9.29 kWh/l	160.23 kWh/bottle	-
Fuel consumed	10.76 l	0.62 bottles	-
Cost per unit	0.864 USD/l	5.28 USD/bottle	0 USD
Fuel cost per day	9.30 USD	3.30 USD	0 USD
Fuel cost per month	283 USD	100 USD	0 USD
Fuel cost per year	3,395 USD	1,203 USD	0 USD
5 year cost			
Fuel cost	16,973 USD	6,014 USD	0 USD
Cost of fuel deliveries/refilling	3,000 USD	3,000 USD	0 USD
Engine servicing/replacement parts	3,600 USD	3,000 USD	0 USD
Initial cost	2,400 USD	2,400 USD	16,800 USD
Total costs	25,973 USD	14,414 USD	16,800 USD
Costs per m³	0.12 USD	0.07 USD	0.08 USD

Both diesel and butane are subsidized (butane over 50 %) by government. Significant cost increases in diesel and butane are inevitable over the next years as market prices increase and subsidies are removed. The solar solution provides the cheapest and most fixed known cost over five years of ownership.

Total Market Potential of solar pumping in Morocco

A targeted potential of
393 500 farmers

Total
market
volume **5**
Mrd €

A conversion of
30%

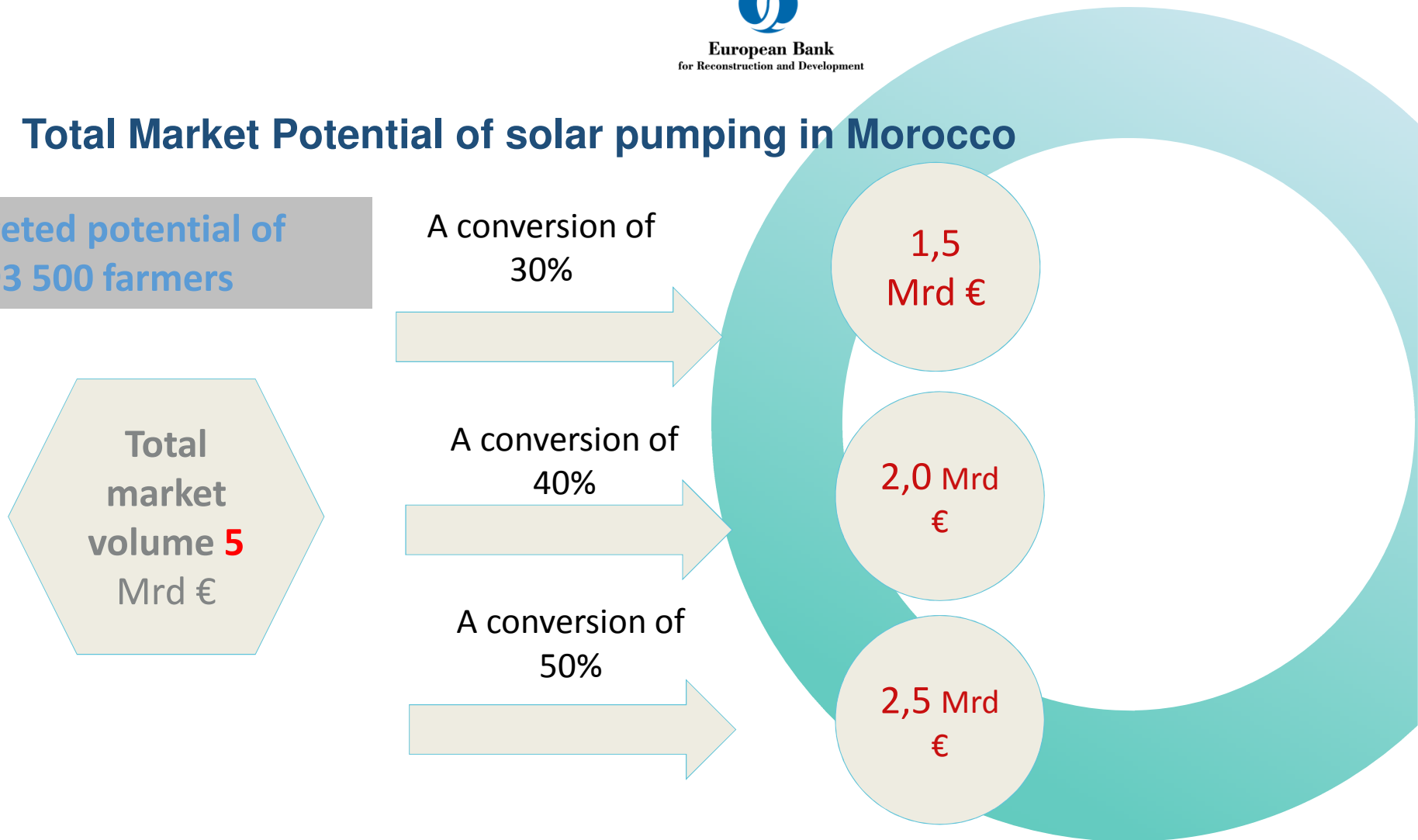
1,5
Mrd €

A conversion of
40%

2,0 Mrd
€

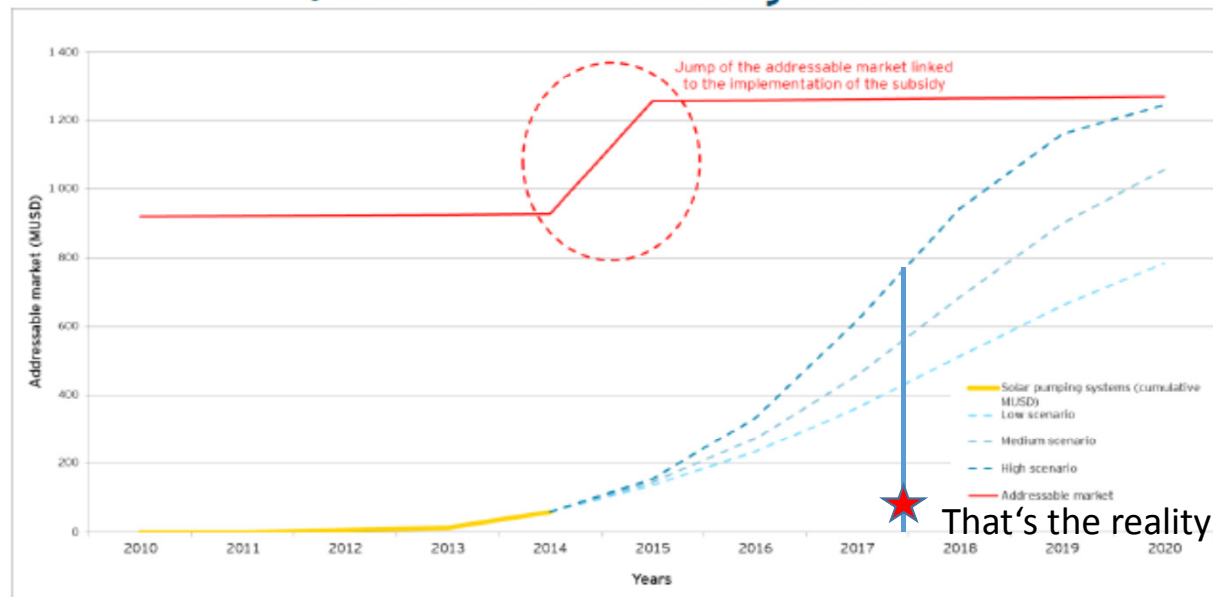
A conversion of
50%

2,5 Mrd
€





Solar pumping in Morocco could represent a cumulated \$1 billion market by 2020



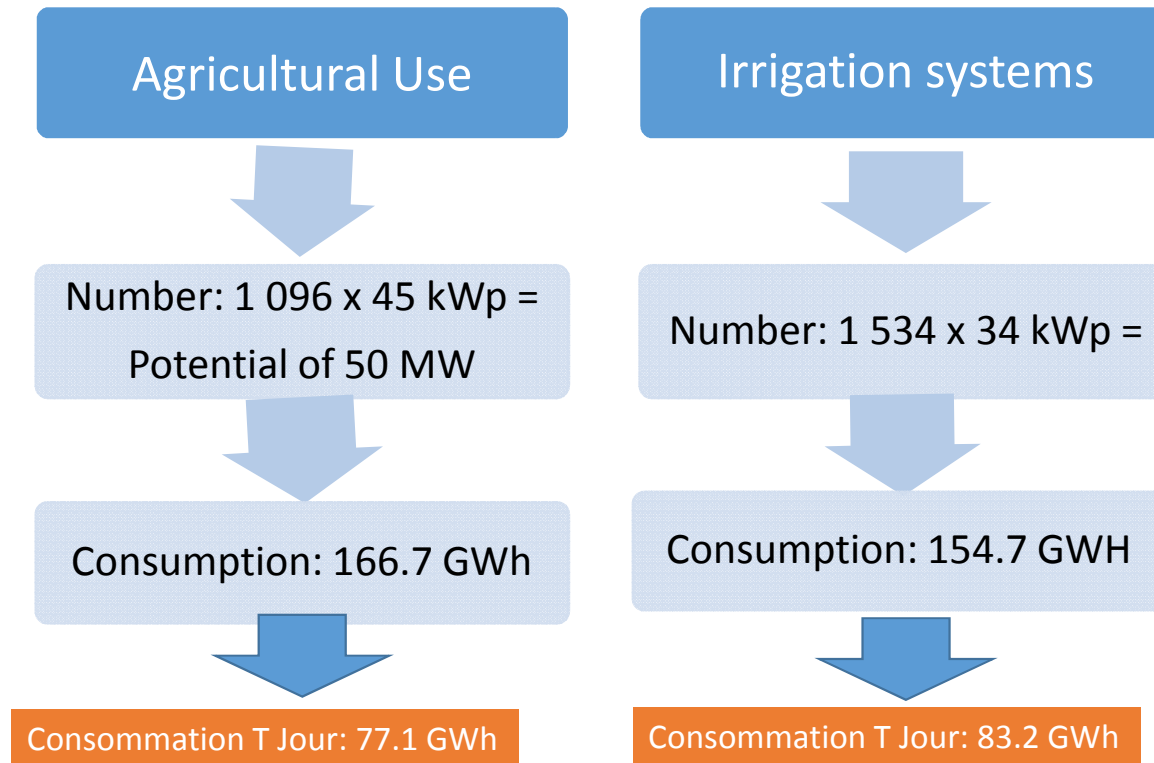
- More than 60% of the total number of water pumps could be replaced by 2020 represent an addressable market of 100,000 pumps.
- The value of the Moroccan solar pumping market by 2020 is estimated to be \$800 million and \$1.3 billion

Tunisia: Cost Comparison for pumping system: diesel vs grid LV vs PV solar

Stand-alone, electricity consumption 4000 kWh/an

The pump is the same in all cases	Option 1: Grid connection LV	PV System	GENSET gasoil, efficiency 30%
Type of energy and quantity	Electricity by the LV grid : 150 m/m/kWh (~ 6 cts€)	PV Generator of 2,5 kWp	GenSet, for the production of 4000 kWh of electricity we need 12000 kWth, gasoil has an energy content of ~ 10 kWh/liter
Necessary Investment	Grid connection line: ????? TD	2,5 * 4000 TD = 10000 TD – 50% subsidy = 5000 TD	4000 TD
Yearly cost of operation	4000*150 m/m = 600 TD	1% = 100 TD	1200 liter of gasoil à 1,4 TD/l = 1680 TD
Operational costs over 20 years	12000 TD (+increase of electricity tariffs by STEG)	2000 TD	33 600 TD (without increase of price)
Total costs over 20 years	12000 TD + grid line costs distributed over 20 years + Replacement of the pump 1x (1400 TD)	7000TD + Replacement of the inverter and of the pump 1x (4000 TD)	37 600 + Replacement of GENSET and pump (1 – 2 x)

Statistics of the electricity consumption of the agricultural sector – **Medium voltage grid** (2013)

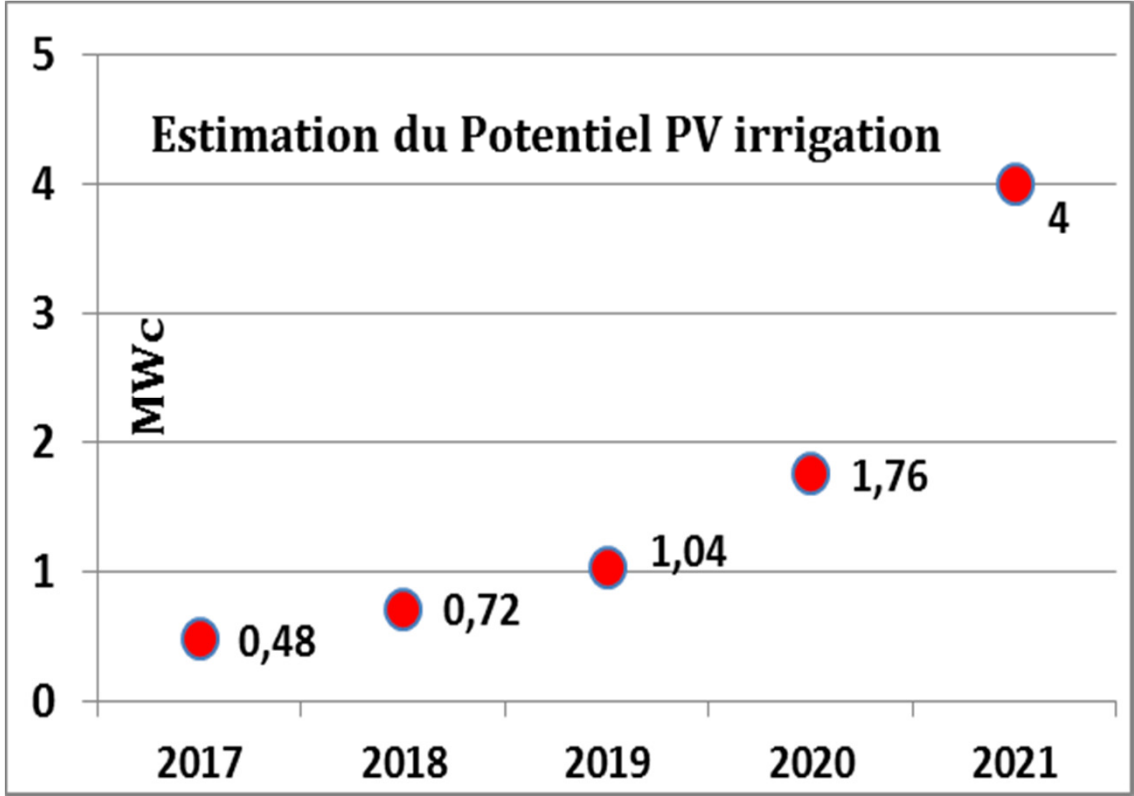
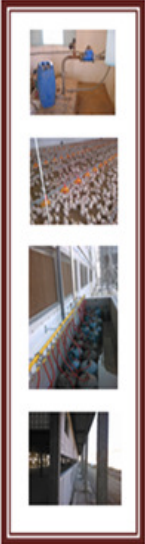


Total coverage of needs during the day:

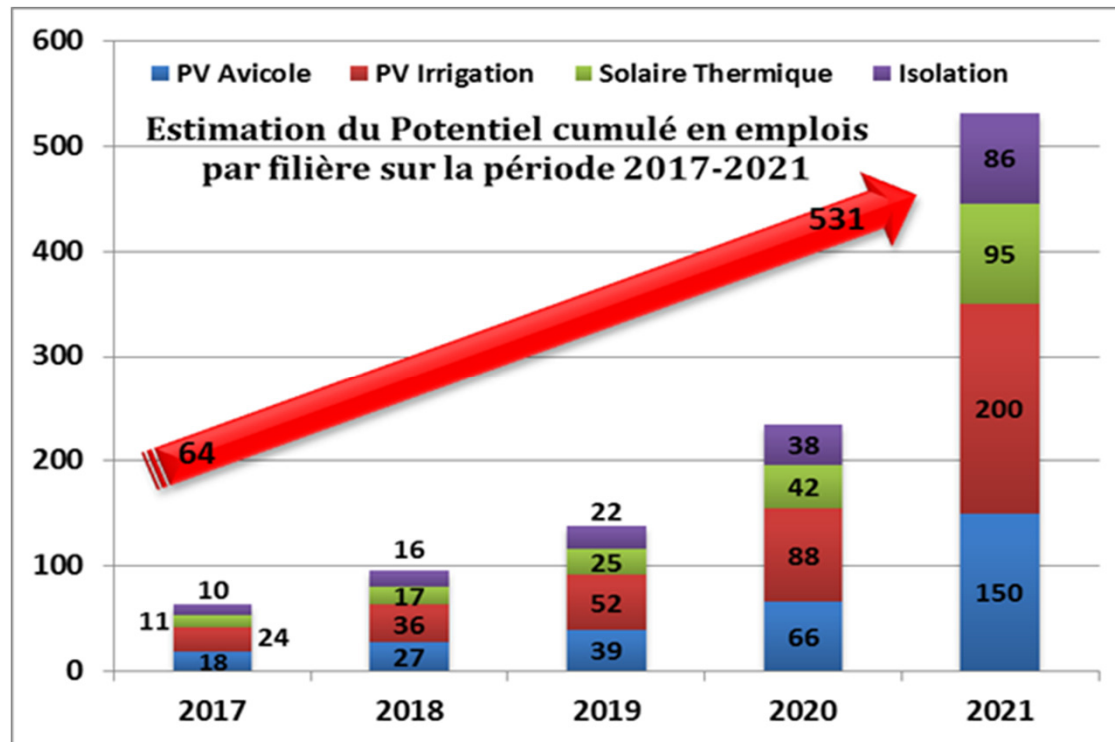
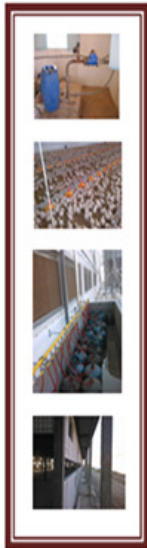
Average PV power agricultural use: 45 kWc/ installation

Average PV power for irrigation: 34 kWc/ installation

Prevision for installed PV power for irrigation in Tunisia



Total potential of job creation in Tunisia by PV in the agro-sector until 2021



Do not forget: the creation of INDIRECT jobs – namely in agriculture – can be up to 50+ fold of direct jobs !!!!



Overview on promotion instruments Morocco and Tunisia in the agro sector for PV

Type of promotion instrument	Morocco	Tunisia
Access to low-voltage grid	Not yet	yes
Access to medium voltage grid	Not yet	yes
Subsidy to PV-investment for SP on farms in rural areas	Not yet	40% of CAPEX, cap of 8.000€
Subsidy to PV investments MT	no	20% of CAPEX, cap of 40.000€
Access to credits by banks	Yes*	Yes*
Subsidies for complex studies	no	70%, cap of 28.000 €



Overview on the results of the different legal framework in Morocco and Tunisia

Today's results of policy on RE	Morocco	Tunisia
Nr PV Pumping systems off grid (rough estimation – lack of data !!!)	3000	1000
Nr PV systems on-grid LV, MV (est) all sectors	300	15000
Nr PV on-grid systems for agriculture, irrigation and pumping	3	300
Installed total capacity (MW) - estimation	30	37 MW + 0
Number of module producers	3	5
Number of SMEs in the field	around 30	> 200
Potential for job creation by solar pumping (and PV) until 2020 under the condition of.....	420.....>>>	600.....>>>>



Overview on the political targets for RE and PV in Morocco and Tunisia

Definition of the target	Morocco	Tunisia
Overall RE-capacity 2020	6000 MW	1000 MW
% of installed power capacity	42%	n.a
Technology specific	2000 MW solar (CSP+PV) 2000 MW wind 2000 MW hydro	650 MW PV 350 MW wind
Small-scale auto-production PV (Pipeline, No of projects, capacity)	n.a	130 MW (35; 4 MW)
Overall RE-capacity 2030	10 600 MW (CSP+PV+wind)	3800 MW
% of installed power capacity (MAR) % of power production (TN)	52 %	30%
For PV	n.a	1500 MW



Barriers to scaling solar irrigation

Potential Solution

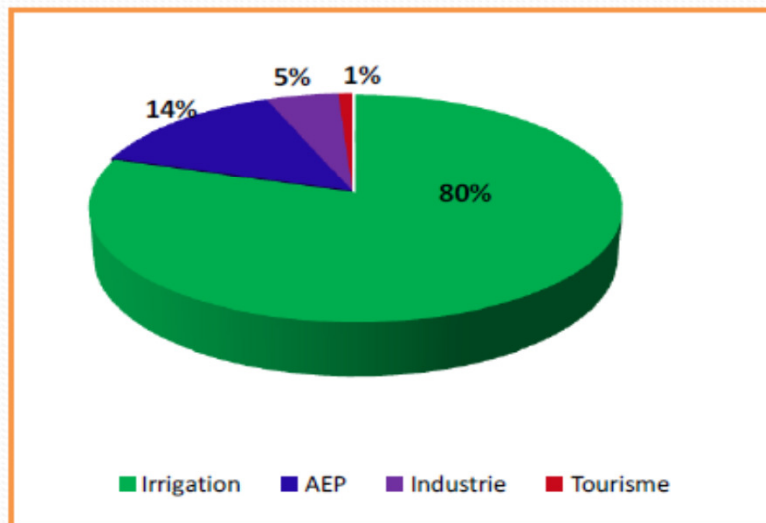
Activities



La sensibilisation aux ressources d'eau

UTILISATIONS DES RESSOURCES EN EAUX

❖ Le volume moyen annuel d'eau consommée a atteint pendant les trois dernières années 2.6 Km³ répartie comme suit :



* Agriculture irriguée

- 420 Mha en intensif
- 50 Mha en semi intensif

Occupe 8% de la SAU et consomme 80% des ressources en eau et assure :

- ➔ 36% de la valeur de la production Agricole
- ➔ 27% de l'emploi.
- ➔ 90% des besoins en légumes.

* Eau potable :

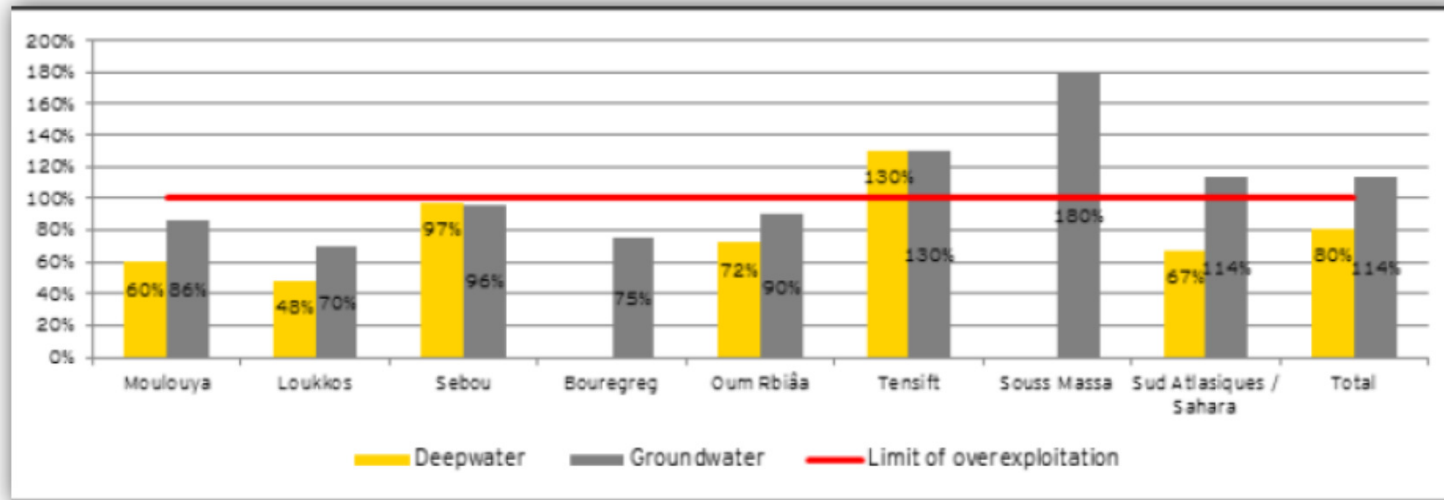
- Desserte:
- En milieu Urbain : 100%
 - En milieu Rural : 95%

- DEFIS:
- *pérennité des ressources en quantité et en Qualité*
 - *équité entre les régions Urbaines et Rurales*

- Agriculture : 2.080 Km³
- Eau potable : 0.365 Km³
- Industrie : 0.130 Km³
- Tourisme : 0.025 Km³

} 90% Distribuée par la SONEDE

Efficient Water Use for Sustainable Agricultural Activities



Issue: Water Scarcity and Climate Change Strain Sustainable Development in Morocco

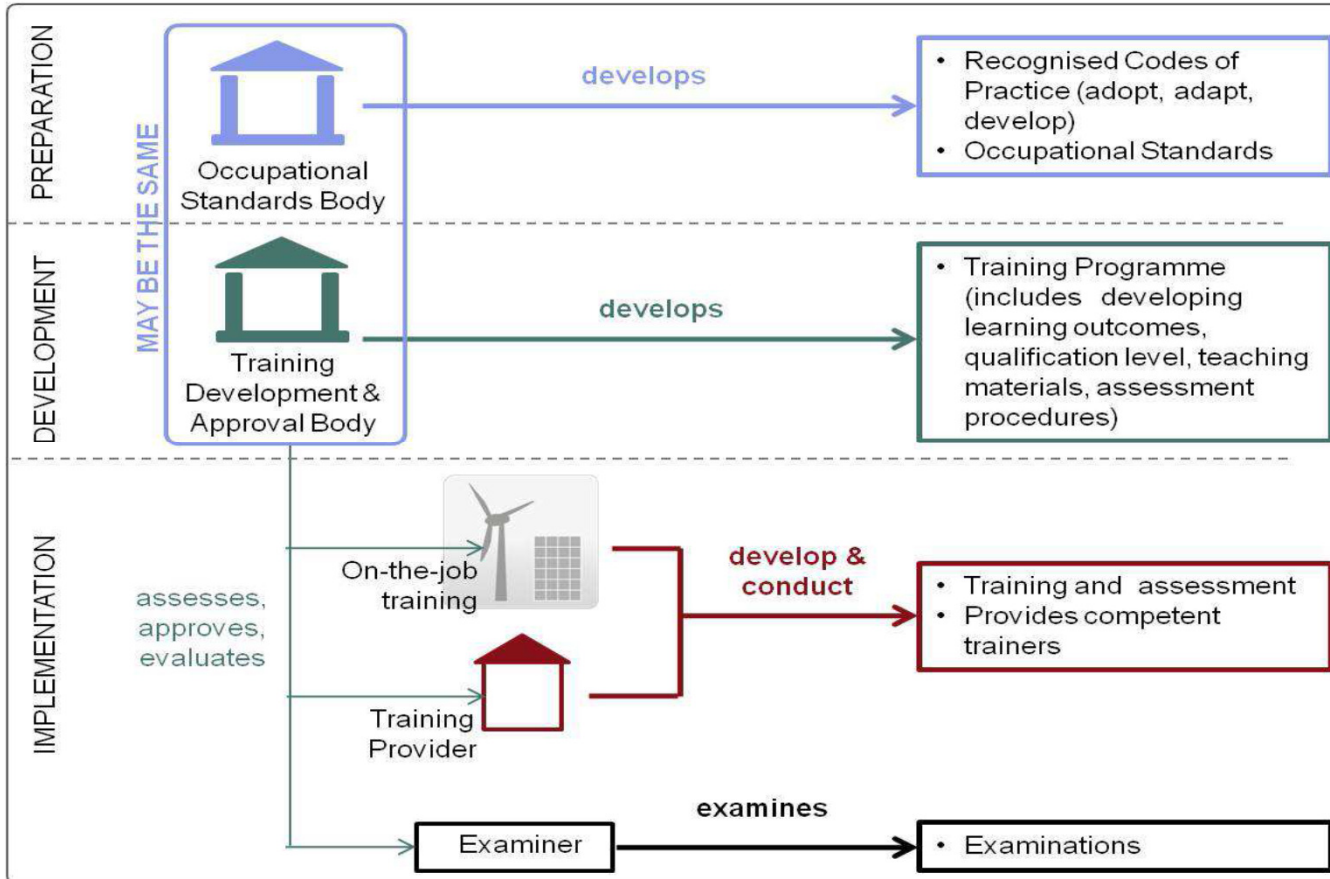
Solution: Climate Smart Approaches/Technologies
(Drip Irrigation – Solar Pumping – Climate Resilient Crops ...etc)



The sector of „formation“ on RE/PV is not well structured...

- Everybody is ok that the development of PV needs informed and well-skilled people on all levels
- But the reality is quite different:
 - a multiplicity – but also diversity – of approaches in terms of
 - target groups
 - short term / long term formations and curricula
 - content and
 - necessary level at entry and after examen for appropriate
 - certification schemes
 - accreditation of trainers and institutions
 -
-and nobody feels the responsibility to structurize all this.....except RECREEE with support from RE-ACTIVATE





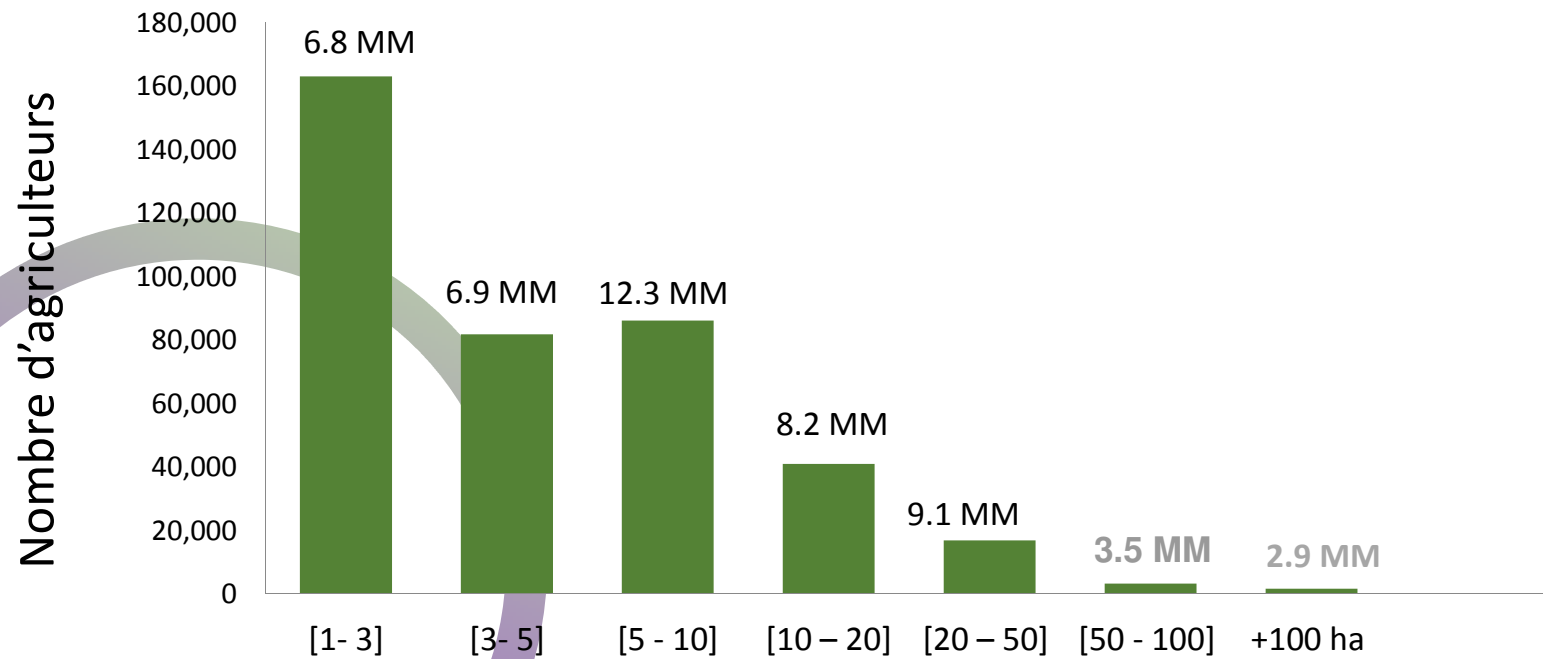


Thank you for your attention !

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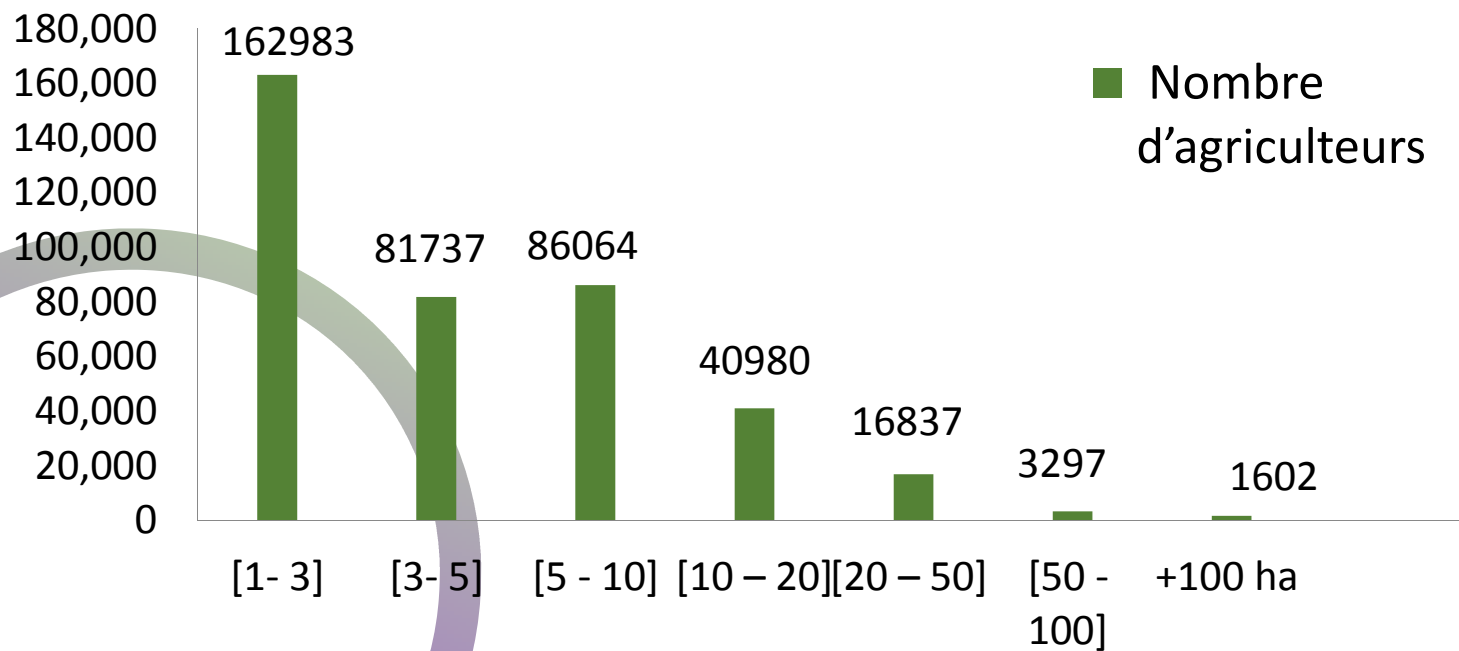


Potentiel du marché par taille d'exploitation



Un potentiel de 49.7 Milliards DH

Agriculteurs ciblés par le pompage solaire



**Un potentiel de 393 500
agriculteurs cible**