



Water in Africa: Hydro-Pessimism or Hydro-Optimism?

Água em África: Hidro-pessimismo ou Hidro-optimismo

Centro de Estudos Africanos da Universidade do Porto
Porto, Portugal, 2-3 October 2008

CONFERENCE ON WATER IN AFRICA

SESSION ON WATER AND AGRICULTURE

Rainwater Management for Increased Agricultural production

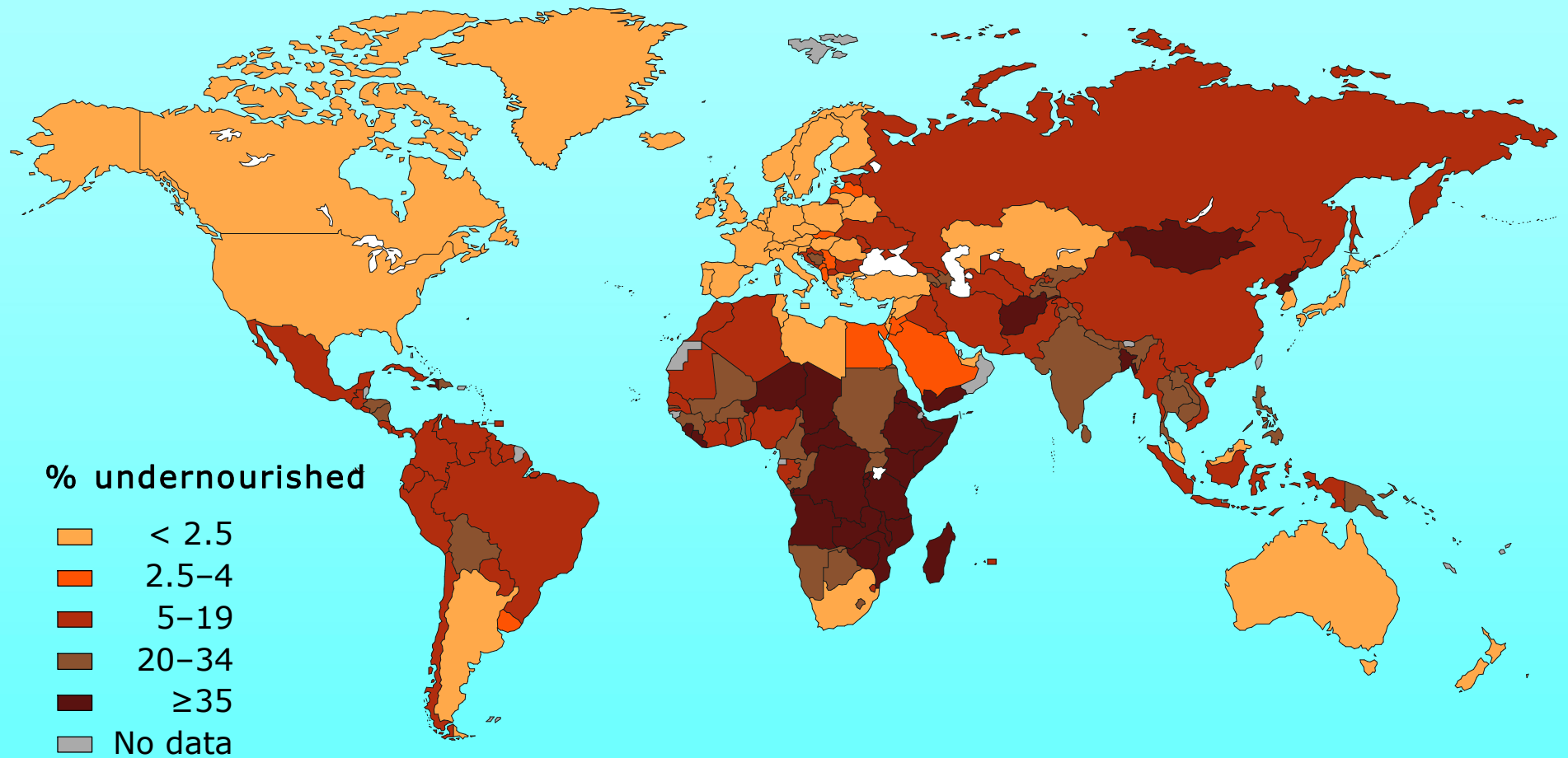
Nico van Leeuwen

Centre of African Studies – Porto- Portugal 2 – 3 October 2008

Outline

- Food for all ?
- Key role of water
- Smallholder adapted technologies
- Where does the rainwater go ?
- Options for management of rainwater
- Conclusions

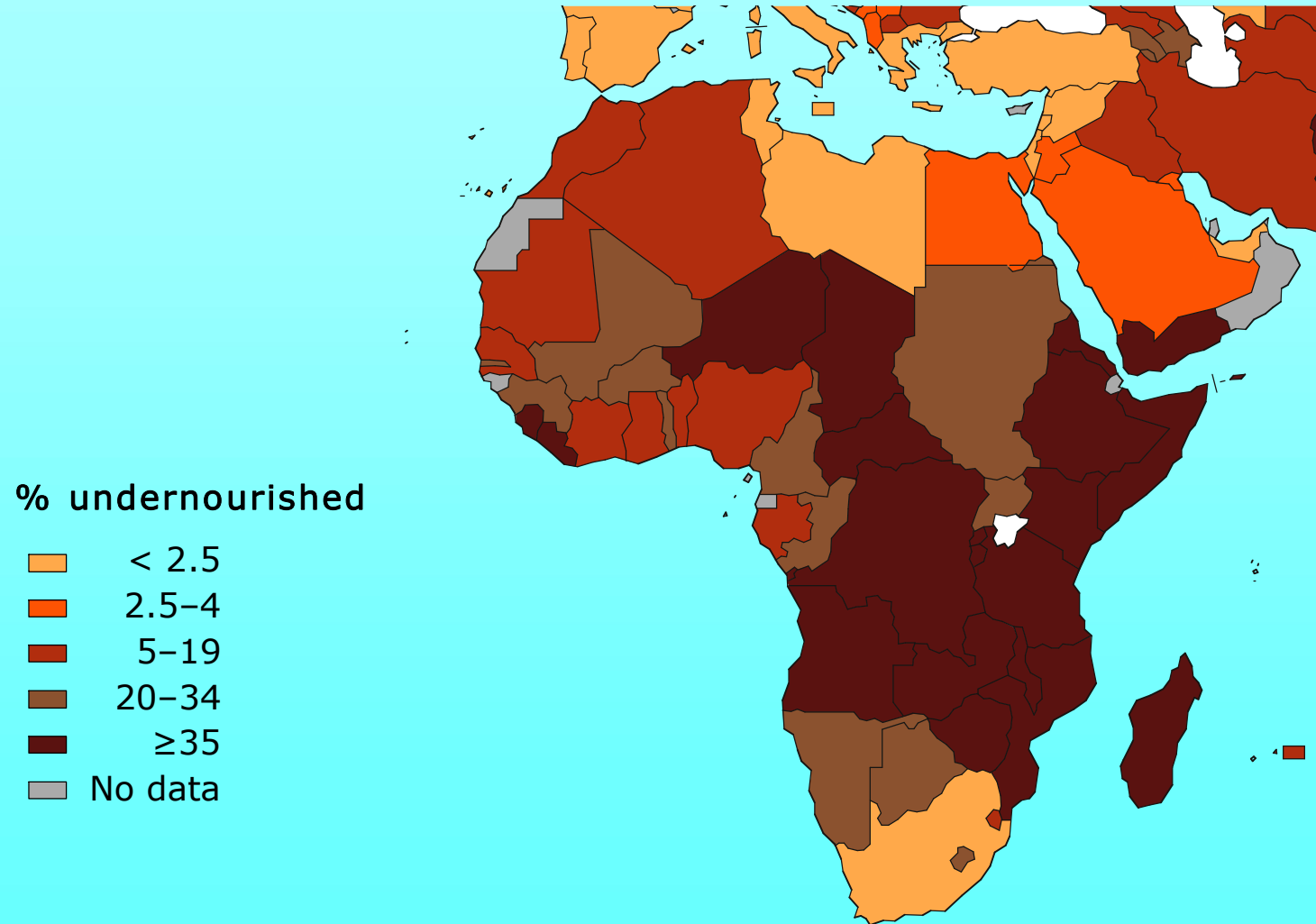
UNDERNOURISHMENT



UNDERNOURISHMENT IN THE WORLD

- 776 million people in developing countries remain undernourished
- World Food Summit goal (1996) to reduce undernourishment to 410 million but present expectations are 610 million
- Seven out of ten of the world's poor live in rural areas and depend on agriculture
- Arid zones cover 45% of the world area

UNDERNOURISHMENT SUB- SAHARA AFRICA

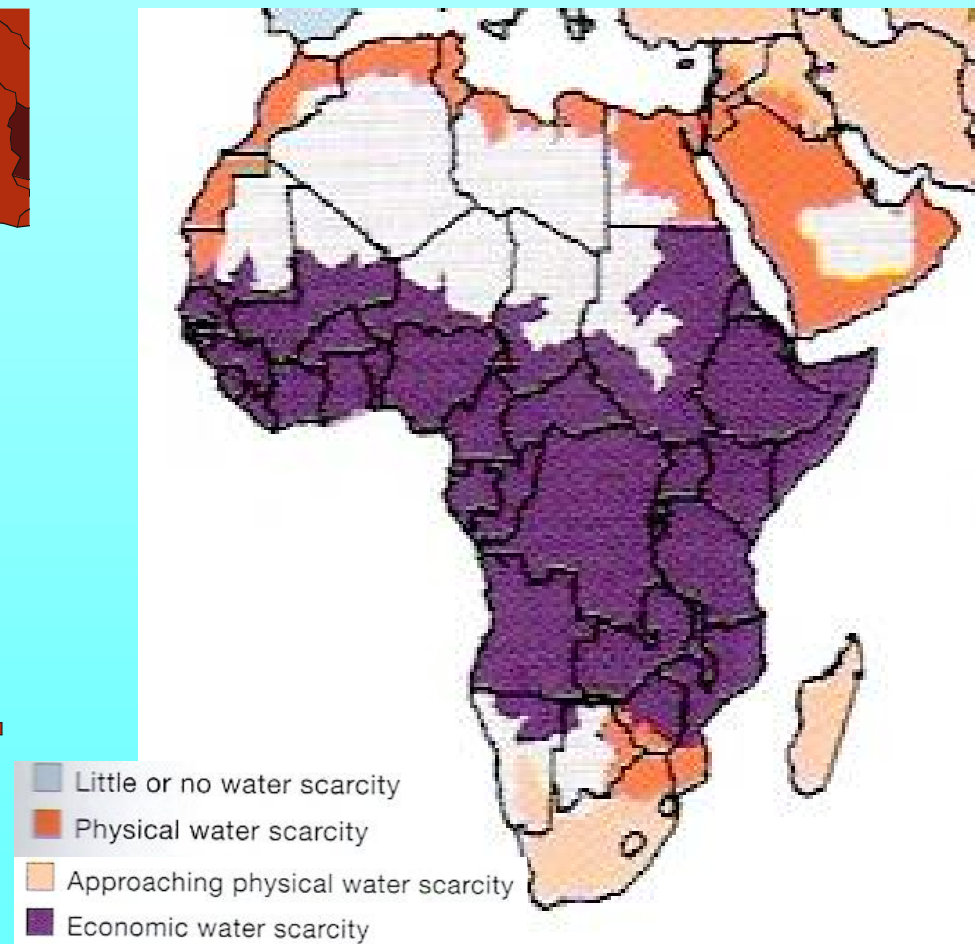
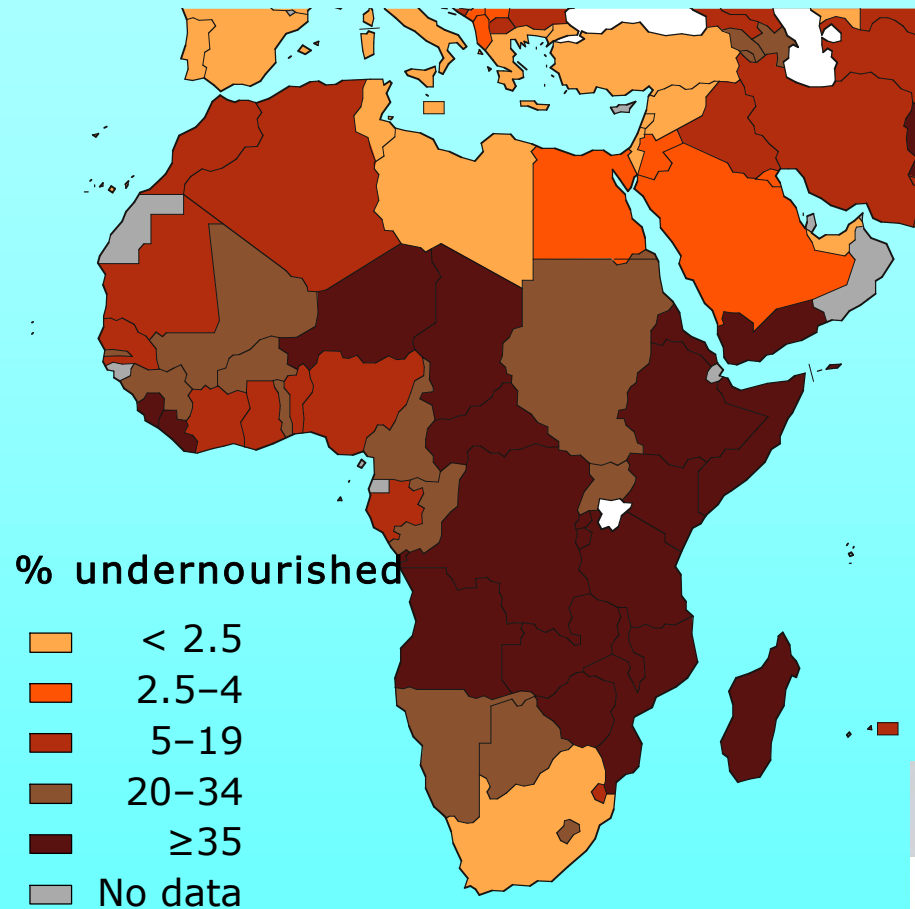


UNDERNOURISHMENT IN SUB-SAHARAN AFRICA

- SSA undernourishment rose from 200 m people in 1995 to 450 m today.
- SSA population 62% in rural areas
- SSA rural poverty accounts for 90% of total poverty
- SSA 80% of the poor depend on agriculture
- 38 % of SSA is arid land

Undernourishment and water scarcity

Sub- Sahara Africa



Dry land areas and rain fed agriculture

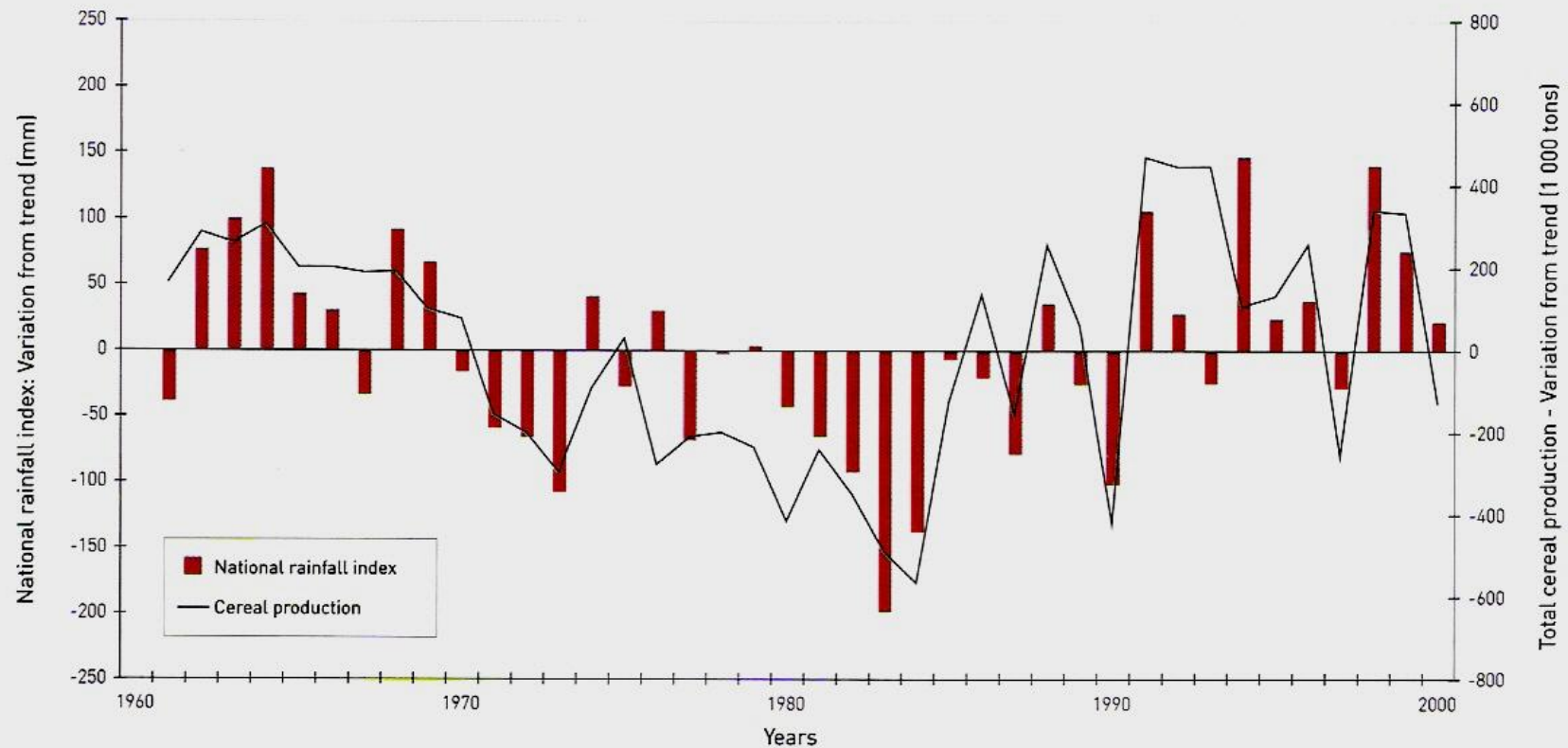
Definition and distribution of dry land areas

Classifica- tion	Length of growing period for annual crops in days*	% of World Land area	% of land area Sub-Saharan Africa
Hyper arid	0	19	24
arid	1 – 59	7	6
semi-arid	60 – 119	20	13
dry-sub humid	120 - 179	18	19

Arid land: 45% of world area,
38% of Sub-Saharan Africa

Strong relationship between water availability and cereal production

Figure 1 Burkina Faso: rainfall and cereal production, 1960–2000



Source: Molden (2007).

In order to reach the World Food Summit and Millennium goals

- to reduce the number of undernourished**
- and feed the world population expected to increase by 30% over the next 30 years**

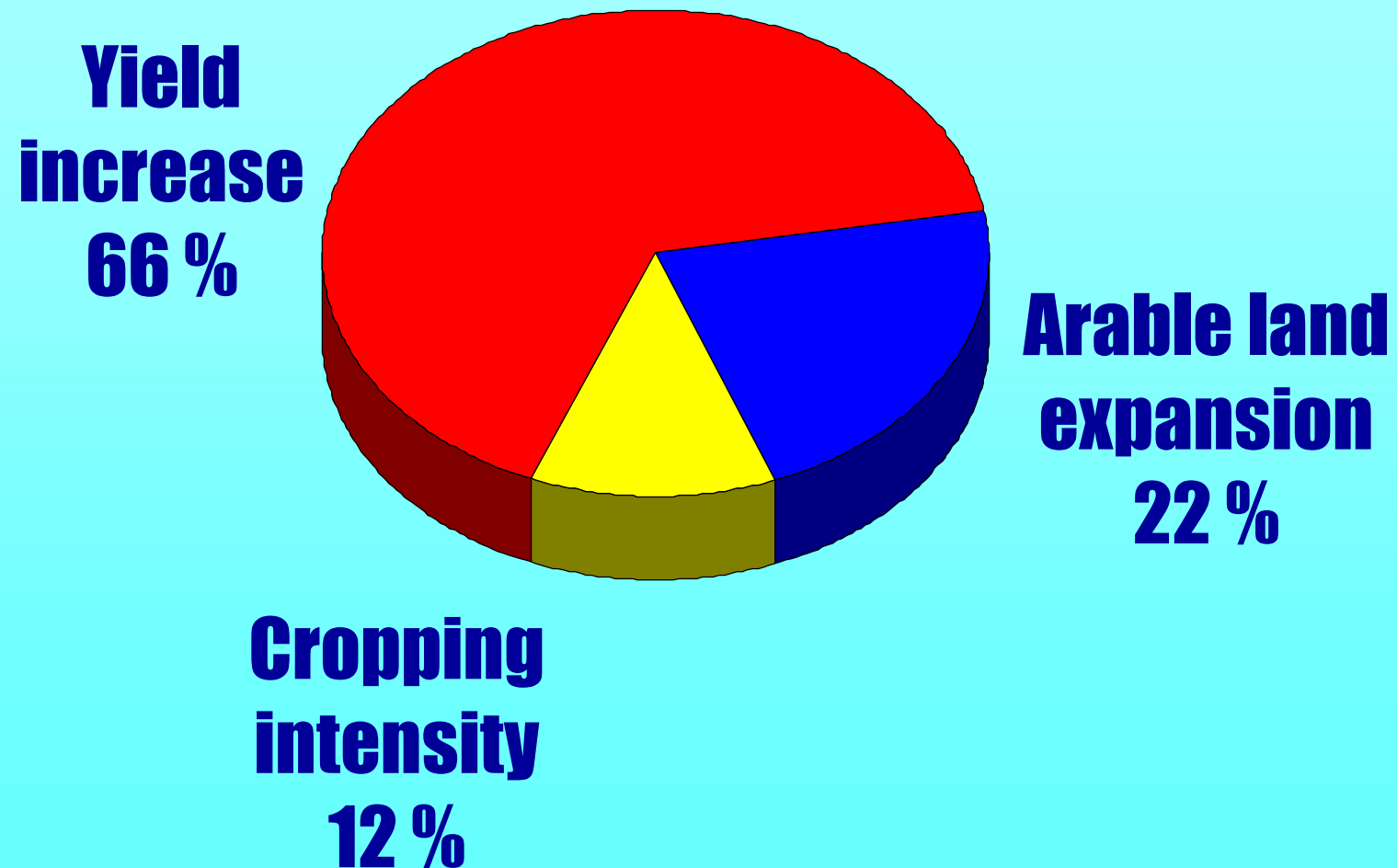
world food production should

be increased by 50 % in 2030

Some realities:

- **The green revolution is slowing down**
- **Serious environmental problems are appearing**
- **Investment in agriculture and irrigation has been reduced**
- **Groundwater resources are dangerously low in many countries**

How to grow 50 % more food in 2030



Yield Increase:

- Adequate **water** supply to crops through **Irrigation, water harvesting/runoff farming.**
- Improved seed
- Fertiliser
- Agricultural practices

Arable land expansion

- **Irrigate** dry areas
- Expand use of **wetlands**
- **Water** harvesting on arid lands

Cropping intensity

- Expand and improve **irrigation**
- Reclamation and intensive use of **wetlands**

Large irrigation projects for small number of farmers ?

or

Small-scale water development for a large number of farmers?

In developing countries

- 80% of the farmers are smallholder farmers
- practicing mainly subsistence farming
- located largely in arid and semi-arid zones or zones with erratic rainfall

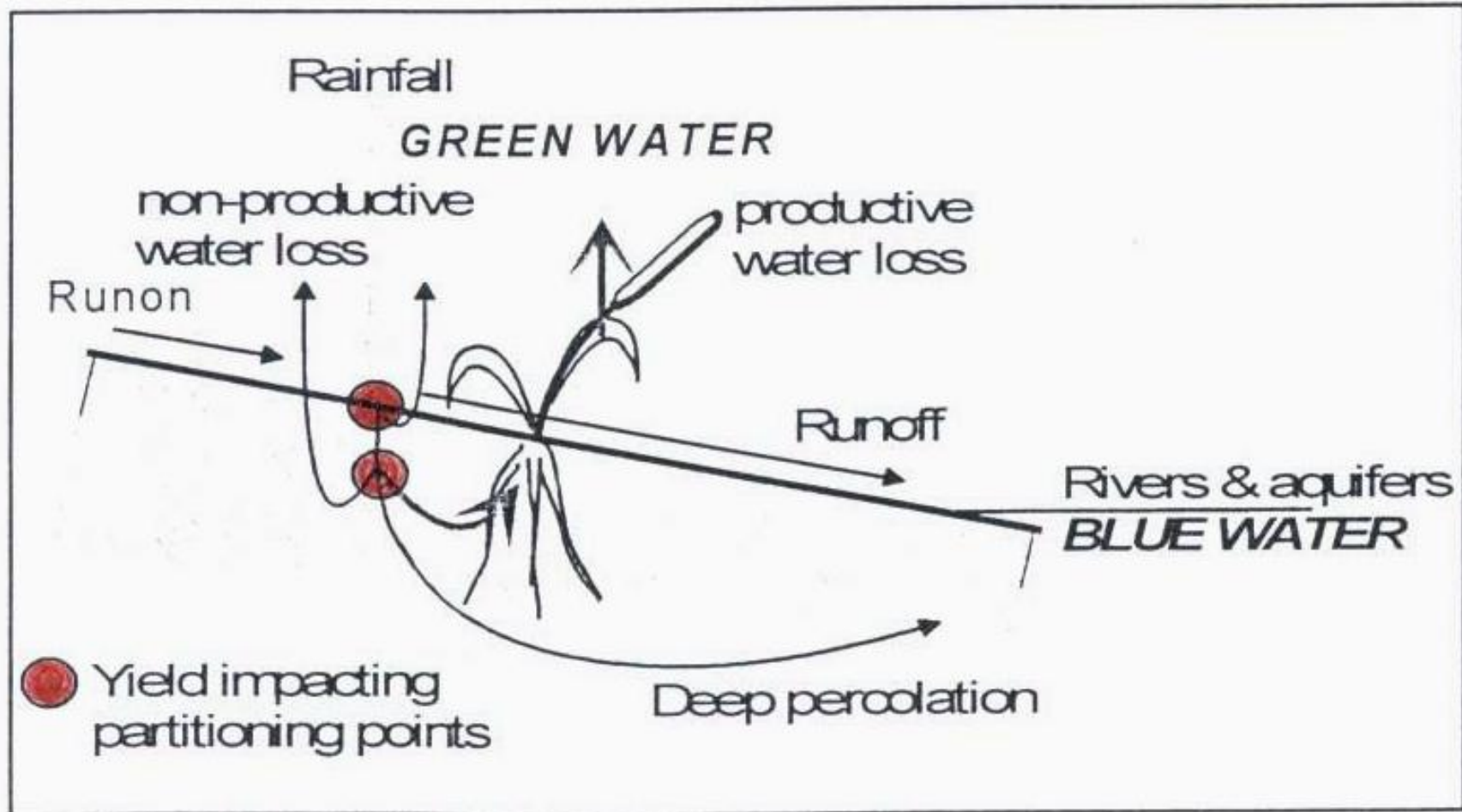
Improvement of water supply to crops

- accessible and affordable
- to poor,
- smallholder
- subsistence farmers

Most appropriate technologies for smallholder farmers:

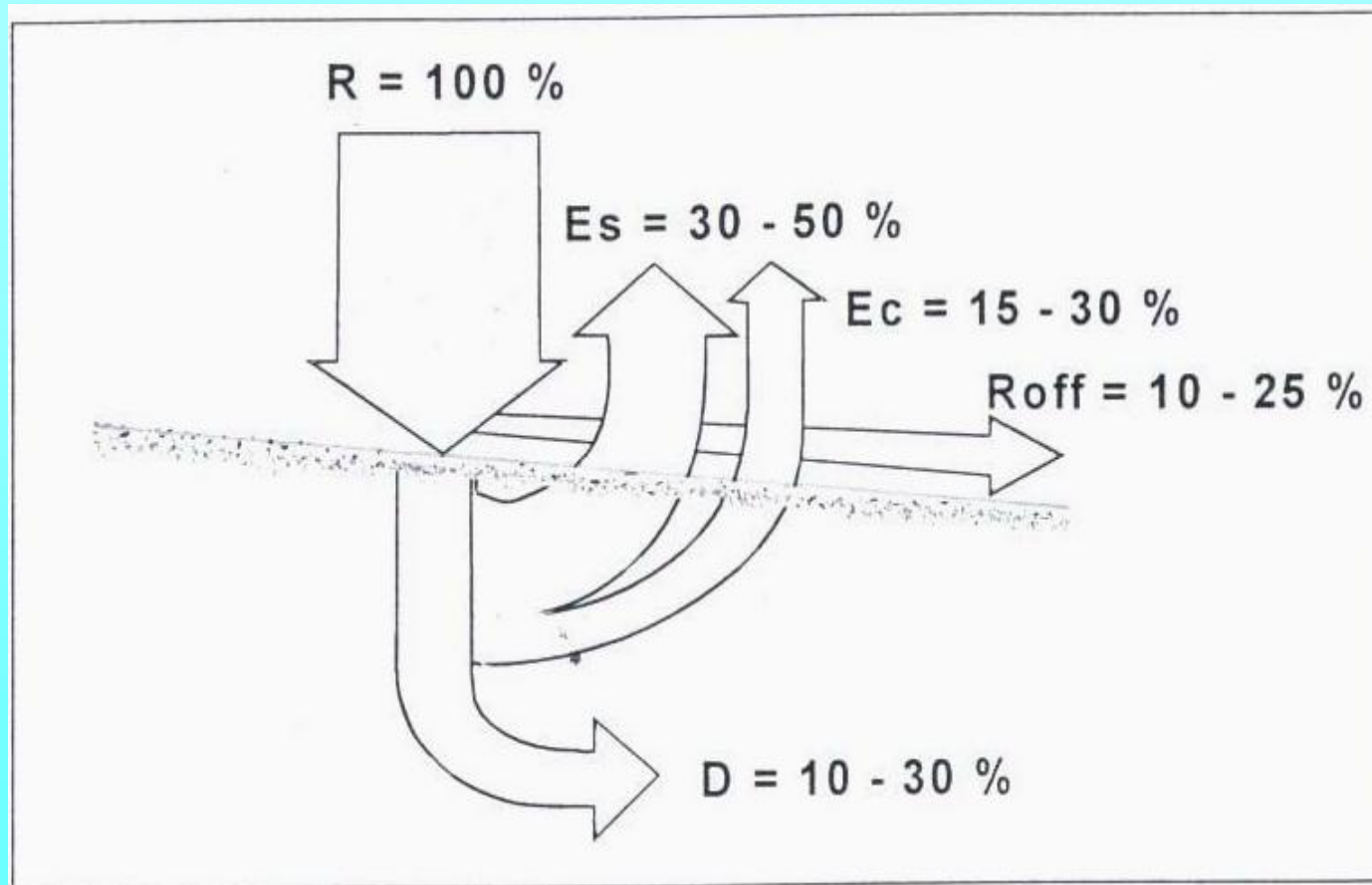
- Very-small-scale irrigation (with groundwater, surface water or collected/stored rainwater)
- Water management in wetlands and valley bottoms
- Management of water from rainfall.

RAINWATER MOVEMENTS



(Rockström, Fox, Persson et Falkenmark(SIWI)

Rainwater distribution in arid areas



(Rockström, Fox, Persson et Falkenmark(SIWI)

Improved use of rainwater

- Prevent run-off
- Reduce evaporation from soil surface
- Keep water in the root zone en prevent deep percolation

“Rainwater that falls on my land remains on my land”

Options:

- Conservation agriculture
- Rainwater harvesting – run-off farming

CONSERVATION AGRICULTURE

- No tillage
- Maintain coverage on soil surface
- Stimulate biological functioning of the soil
- Reduces evaporation and run-off

Conservation agriculture only works when rainfall is sufficient



Small-scale conservation agriculture

A photograph of a garden bed. The plants are green with heart-shaped leaves, growing in rows. The ground between the plants is covered with a thick layer of dry straw or mulch. The text "Permanent soil coverage" is written in red across the middle of the image.

Permanent soil coverage

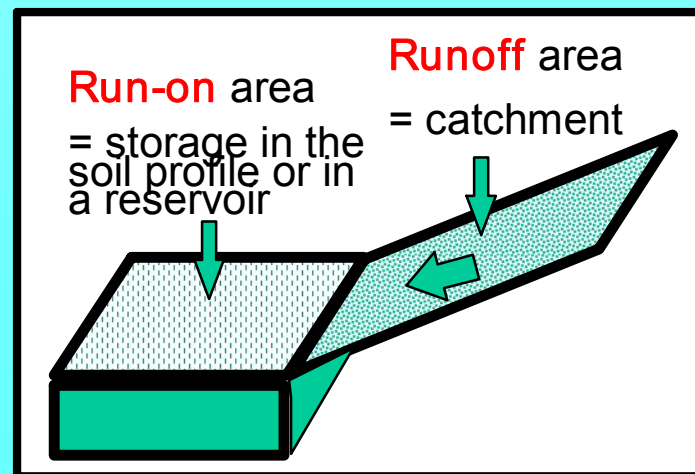


Mechanized conservation agriculture

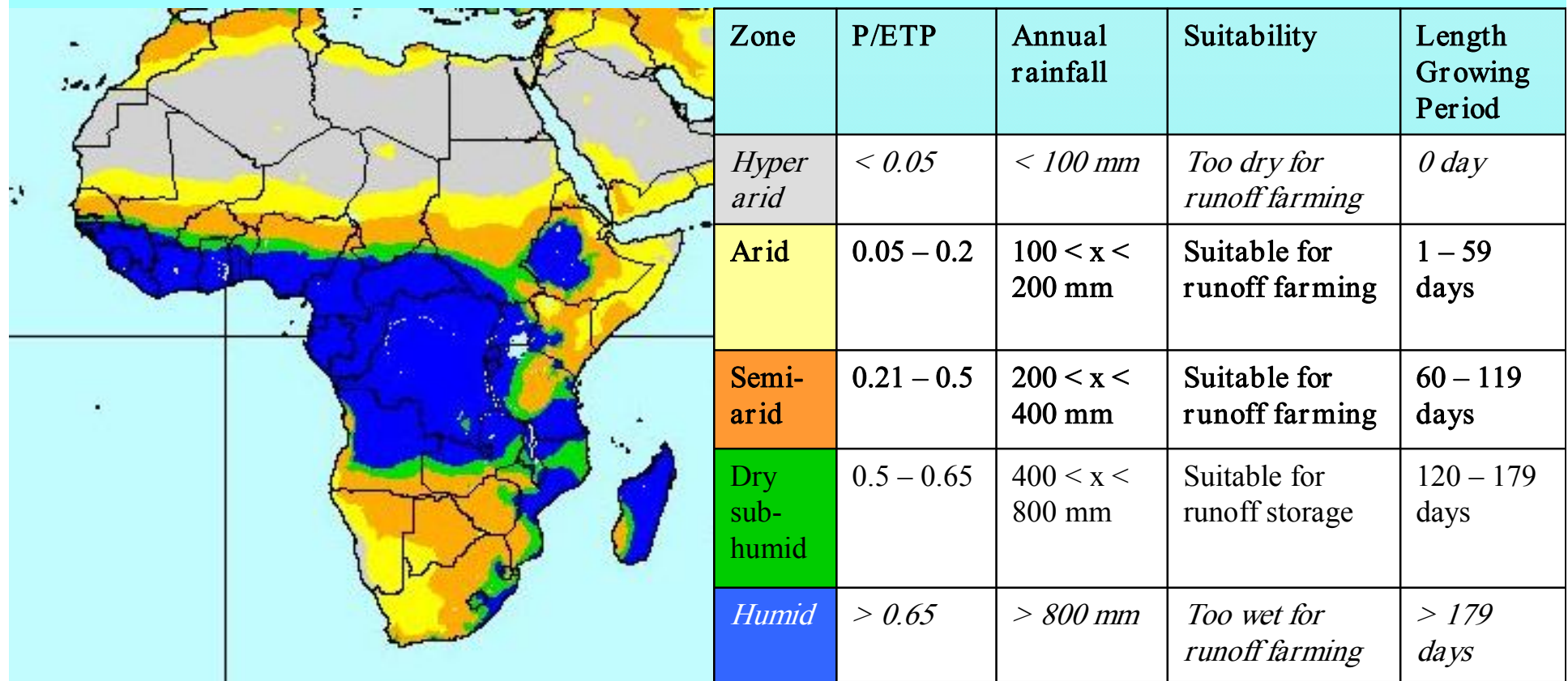
Rainwater Harvesting

The collection of runoff for its productive use

- Water applied to the crop and stored in the soil profile: runoff farming
- Water stored in a reservoir for future use : irrigation, Domestic use, livestock, aquaculture, etc



Potential areas for runoff farming



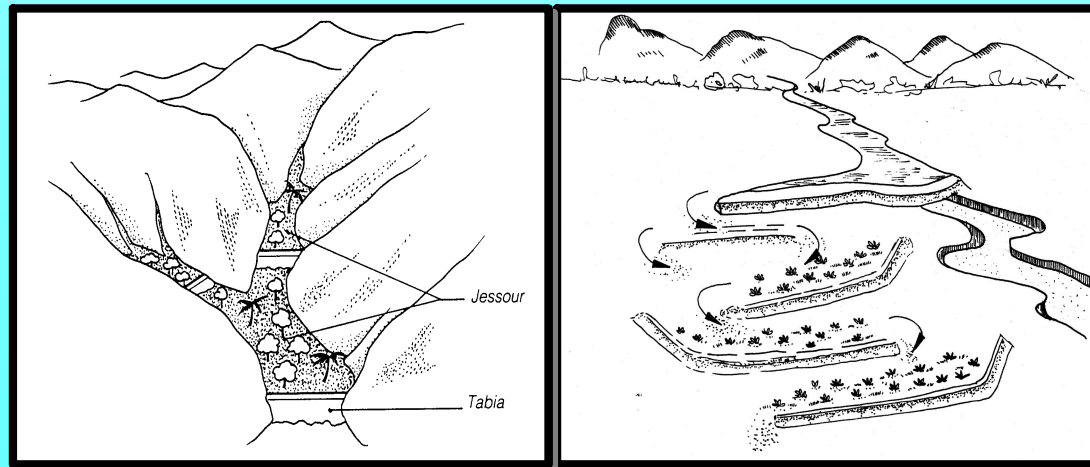
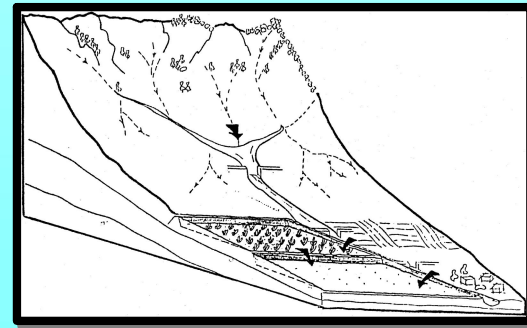
Source: GAEZ (FAO – IIASA, 2003)

Types of run-off farming water harvesting

Microcatchment



Macrocatchment



Floodwater harvesting



Small-scale rainwater harvesting (zai)

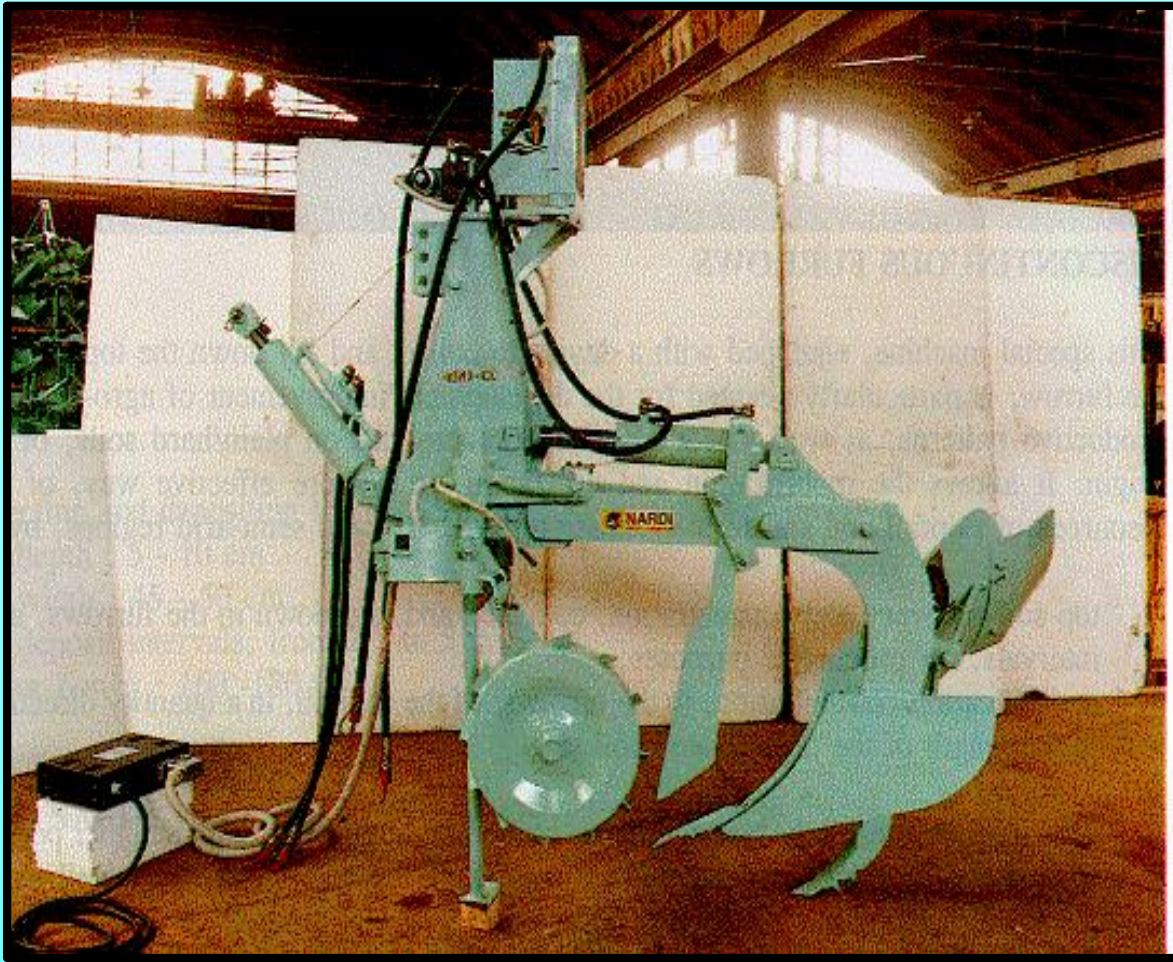


Tree planting for reforestation or land rehabilitation



Inter-row water harvesting in orchard in arid area²⁹

Microcatchments made by the “Dolphin-plough”



DIMENSIONS :

length 4 -5 m



width
0.40 m

depth 0.40 m

ADVANTAGE :

- coverage of 10-15 ha / day

DISADVANTAGE :

- high investment costs





Mechanized runoff farming

Rainwater harvesting or conservation

- Very small scale
- Large scale

Keita project in Niger FAO/Italy and WFP 1984 – 1999
13 000 km² - 300,000 people living in 400 villages

- 50 artificial lakes
- 42 dams
- 65 village wells
- 10,000 ha water conservation
- 16 million trees
- Infrastructure: schools, maternity centres, veterinary facilities, storehouses, micro-credit, literacy courses, etc.

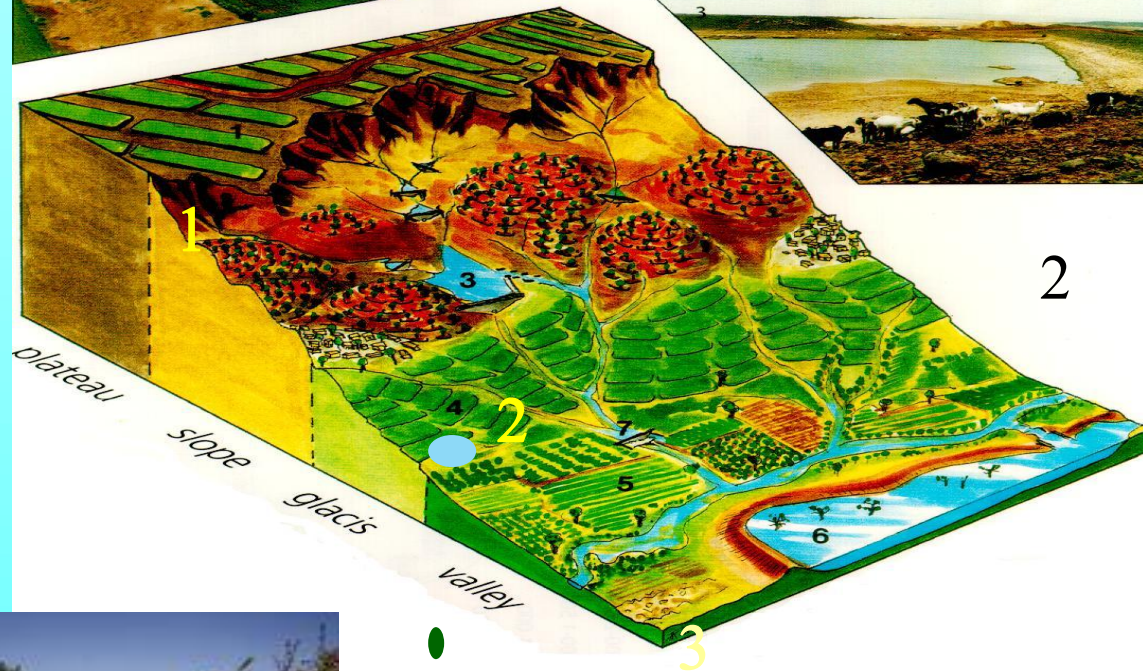
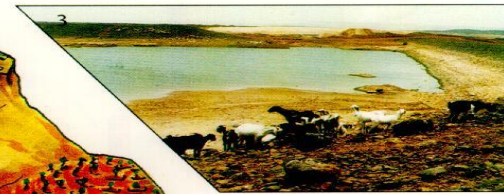


Keita project Niger



Keita project Niger

1



Characteristics of run-off farming techniques

- Oriented towards increased agricultural production
- Reduces risks of crop failure and encourages other investments (seed, fertilizer, etc)
- Relatively Low-Cost and high return of investment
- Immediate benefits to farmers
- Reduces downstream flooding and consequent damages

more.....

Characteristics of run-off farming techniques

- **Contributes to increased recharge of groundwater**
- **Protects and rehabilitate the environment**
- **Combat desertification**
- **Alleviates the negative impact of climate change on water resources**

**Rainwater management:
a new green revolution ?**

Thanks for your attention

Merci pour votre attention

Obrigado