Ignored Crops that Can Change Sahelian Agriculture

By

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“Orphan crops” refers to those crops that are not treated and neglected by the agricultural development establishment.

I prefer using the term “ignored crops” that better demonstrates the attitude of the establishment to these crops. They might know about them but ignore them.

This presentation will deal with three important crops for semi arid Africa; a fruit tree (Pomme du Sahel), a field crop (dolich) and an vegetable crop (okra). All three have huge potential for improving food security and human nutrition and for generating income to poor farmers.

Pomme du Sahel

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Pomme du Sahel (PDS) is the name given by ICRISAT to the domesticated *Ziziphus mauritiana* (Jujube in French).

Jujube is a small to medium sized tree growing wild in most of the Sudano Sahel and in other semi arid regions of Africa and East Asia.

The tree is tolerant to drought, heat, flooding and salinity. It grows in sandy, rocky and clay soils.

It produces dense populations in places that are inundated for some period of the year.

The fruit of the wild jujubier is small, weighing a few grams. The dry fruit of the local tree is sometimes collected by farmers and sold in Sahelian markets.


Pomme du Sahel fruit
(left) by a wild jujube fruit

Nutritional composition of fresh PDS and apple fruit.

Fresh fruits:	Food Value Per 100 g of Edible Portion	
	PDS	**Apple**
Protein	0.8 g (x3)	0.26 g
Fat	0.07 g	0.17 g
Fiber	0.60 g	2.4 g
Carbohydrates	17.0 g	13.8 g
Calcium	25.6 mg (x4)	6.0 mg
Phosphorus	26.8 mg	11.0 mg
Iron	1.8 mg (x15)	0.12 mg
B-carotene	0.021 mg	0.027
Ascorbic Acid (Vit. C)	70.0 mg (x15)	4.6

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Best scions for Pomme du Sahel are:

Ziziphus spina christi. This species grows in the drier regions of the Sahel.

Fast growing in nursery (seven months from sowing to sale) drought tolerant

Ziziphus rotundifolia. Originated in dry India. Fast growing in nursery (six months from sowing to sale), drought tolerant. Seeds can be obtained from ICRISAT-Niger.

Ziziphus mauritiana. Grows slow in nursery (ten months from sowing to sale). Less drought tolerant than the other two species.

So far 10 PDS varieties were tested at ICRISAT-Niger. Best varieties are:

- Mgharoon-Very tasty, small seed, partial tolerance to fruit fly
- Kaithili-Big and crunchy fruit, lower yields
- Ben Gurion-Medium size fruit, tasty, high yield

Right of photo

Kaithli, left-Ben Gurion

Farmers in India have selected over hundreds of years trees with large and tasty fruit. The weight of the fruit of the selected trees range from 15-30g depending on variety and growing conditions.

The Indian varieties are usually called by the name of the location from where they come from.

For many years Pomme du Sahel was grown in India as a “backyard” tree

Pomme du Sahel started spreading in India in the second half of the 20th century mostly due to efforts of the Central Arid Zone Research Institute (CAZRI) in Rajasthan

Pomme du Sahel was first introduced to the Sahel by Dr. Modibo Sidibe from IER-Mali

In 1998 the International Program for Arid Land Crops (IPALAC) operating from the Ben Gurion University in Israel introduced Pomme du Sahel to Senegal Mali and Burkina Faso.

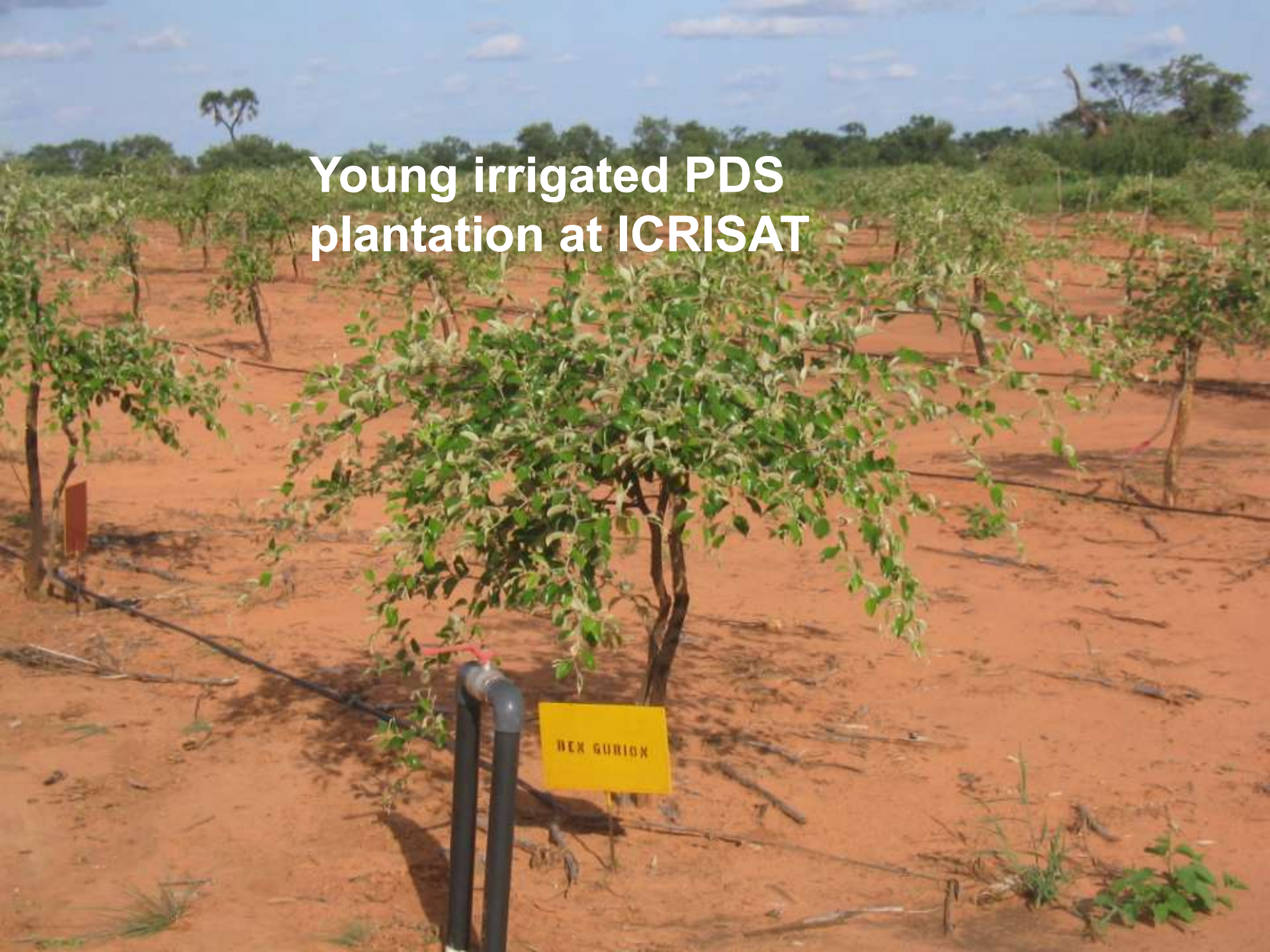
In 2001 Pomme du Sahel was introduced by ICRISAT to Niger.

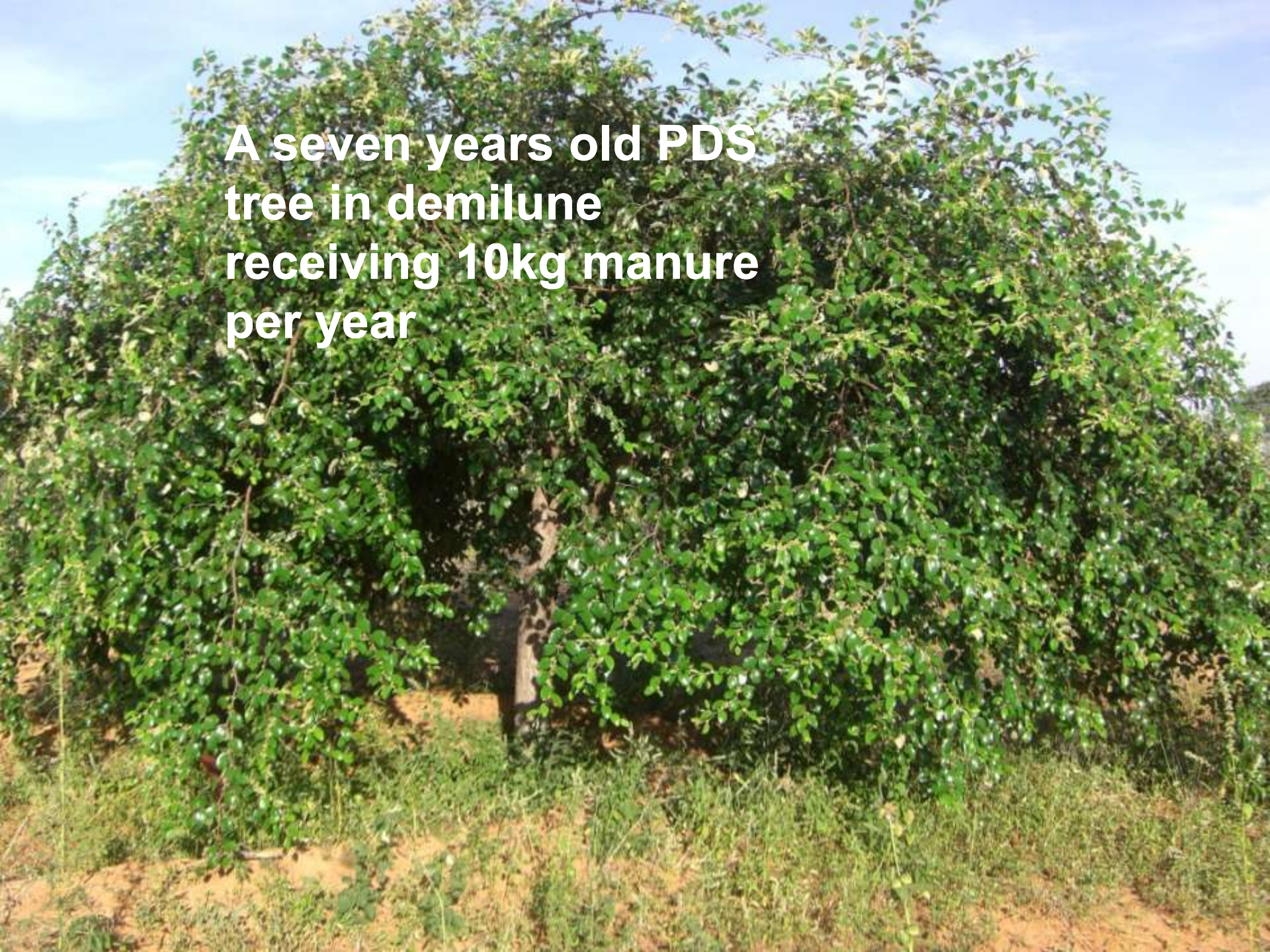
The tree has been slowly spreading in Senegal, Mali and Burkina Faso but it has spread very fast in Niger due to the efforts of ICRISAT.

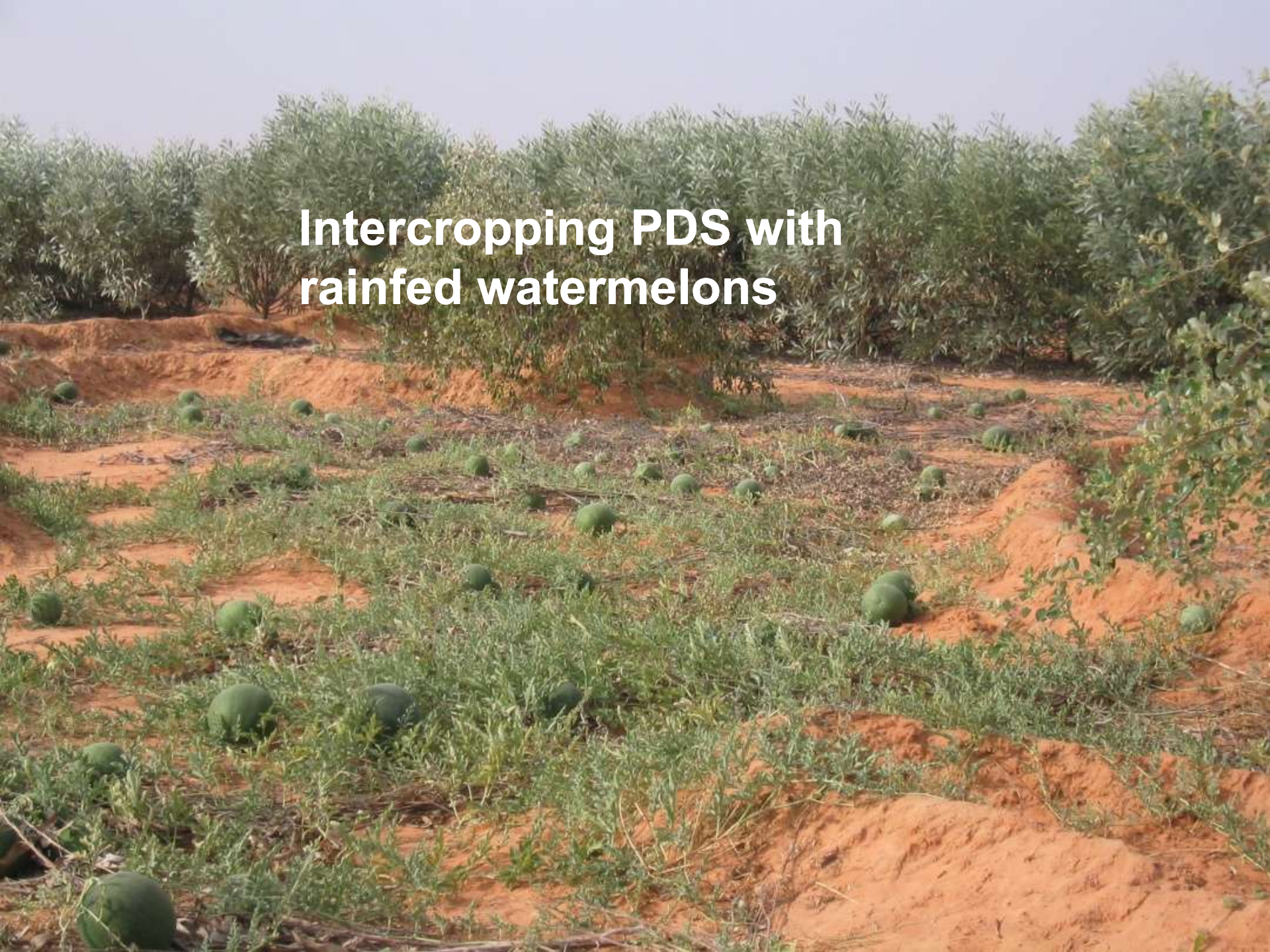
Three ways for dissemination of Pomme du Sahel

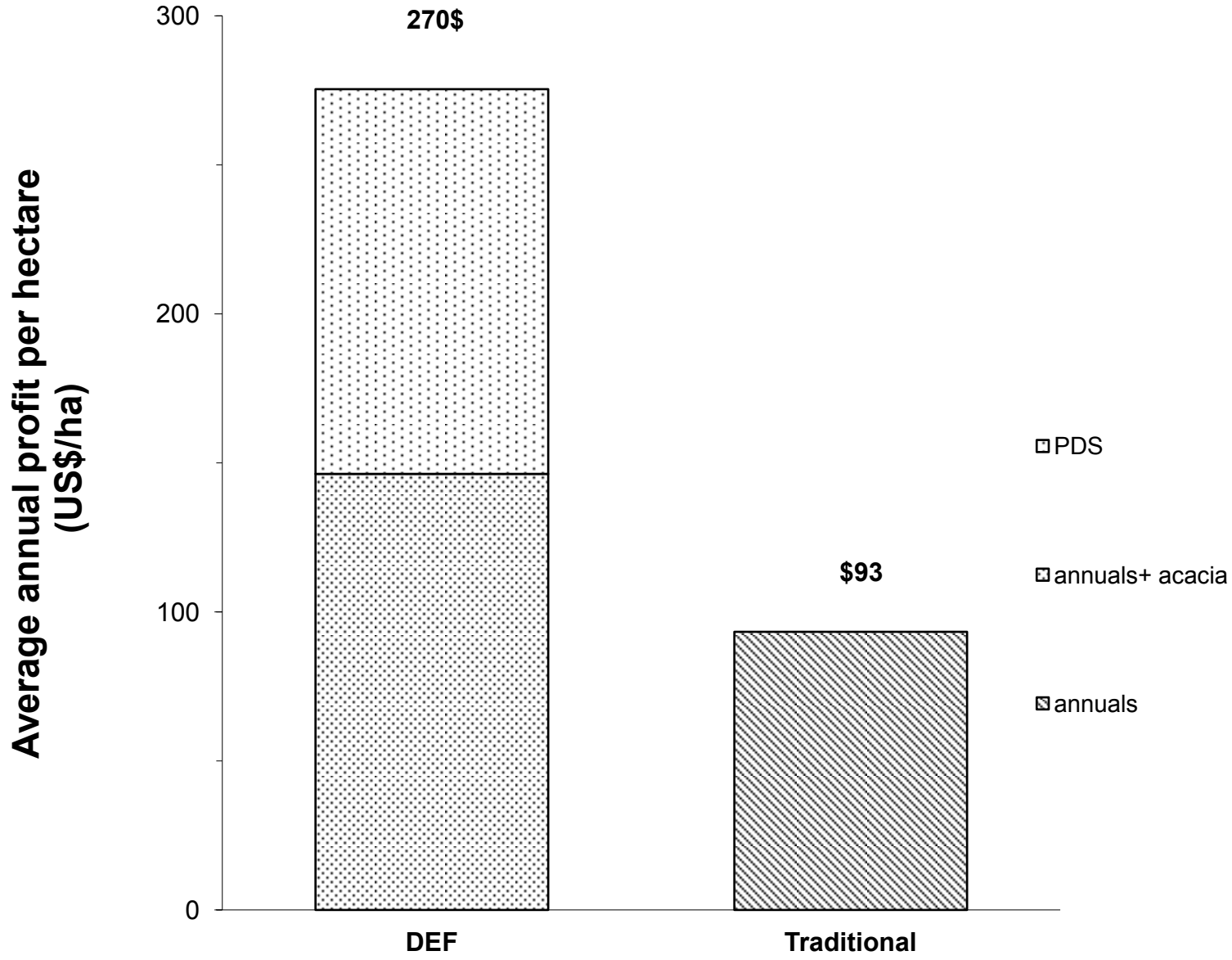
In Niger:


1. ICRISAT nursery produces
50,000 grafted plants per year


Young irrigated PDS
plantation at ICRISAT
BEN GURION

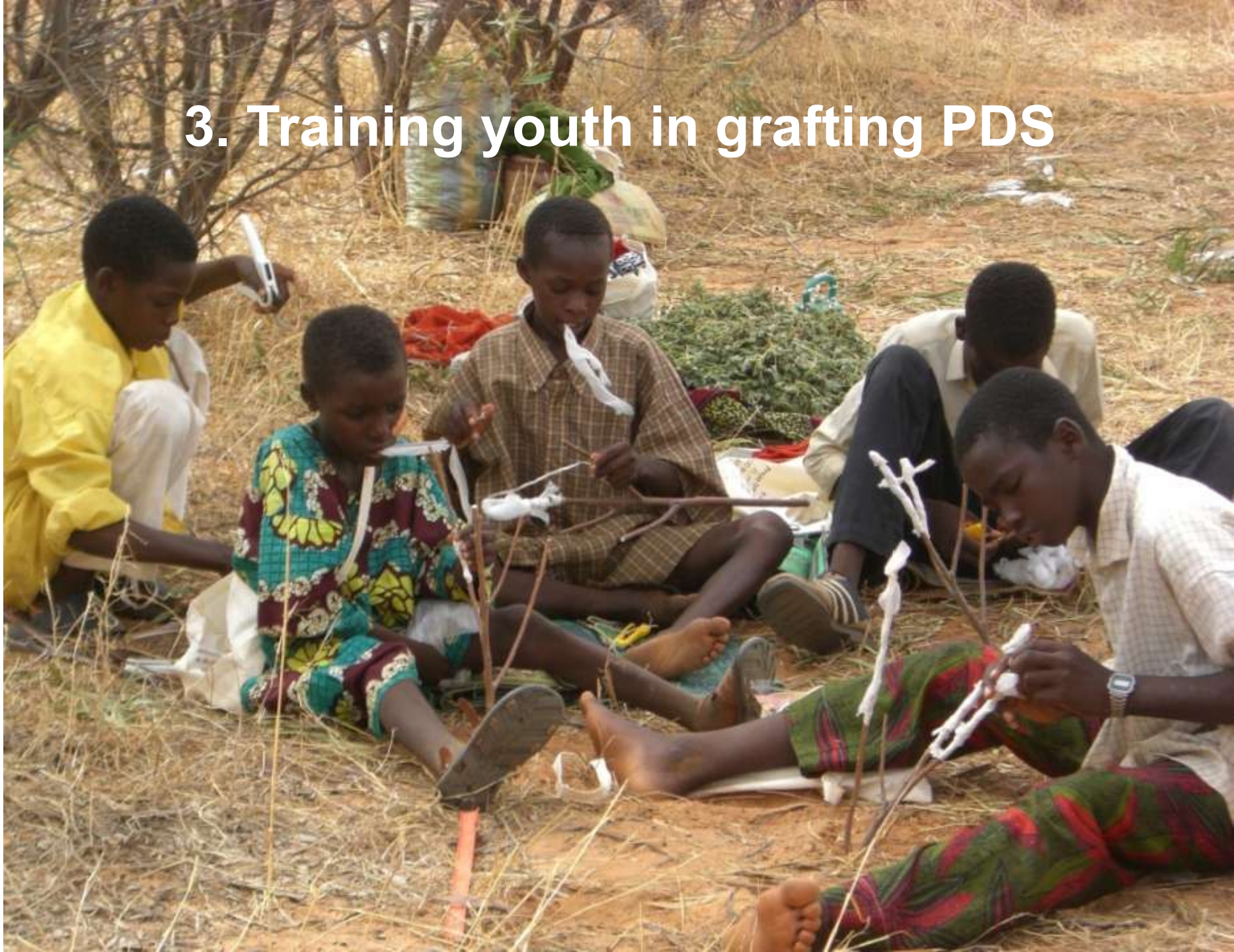

A seven years old PDS tree in demilune receiving 10kg manure per year


Intercropping PDS with
rainfed watermelons


Average annual profit per hectare (US$/ha)
300
200
100
0
270$
$93
DEF
Traditional
PDS
annuals+ acacia
annuals


2. ICRISAT trained hundreds of nurserymen in grafting PDS and other fruit trees

3. Training youth in grafting PDS




Z. Mauritiana grafted with
Pomme du Sahel, fruiting
six months after grafting-
a breakthrough


Water Hole in Gorum –NE Burkina

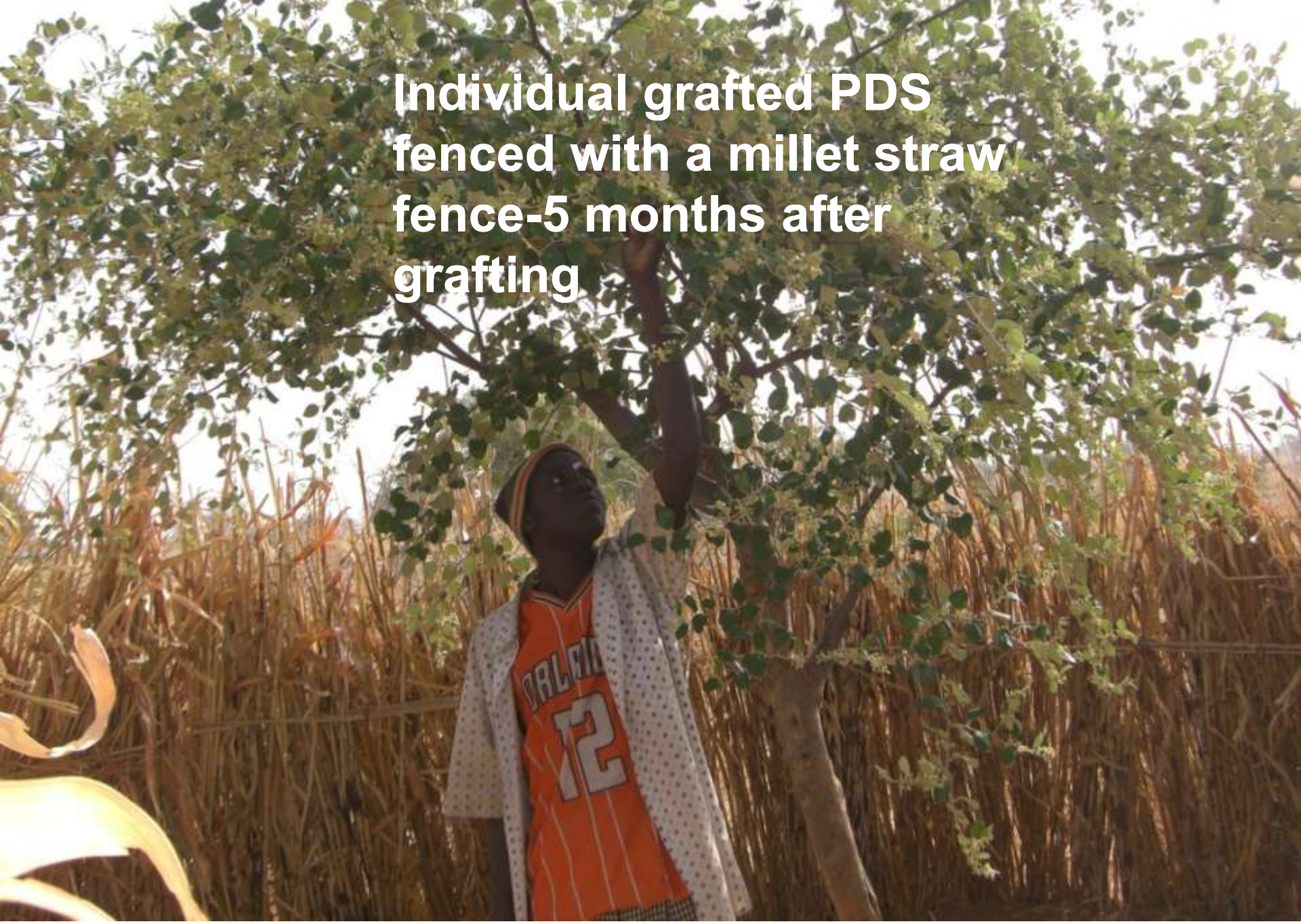

Wild Jujubier planted around Gorum water hole. Imagine what will happen if we graft these trees with PDS?

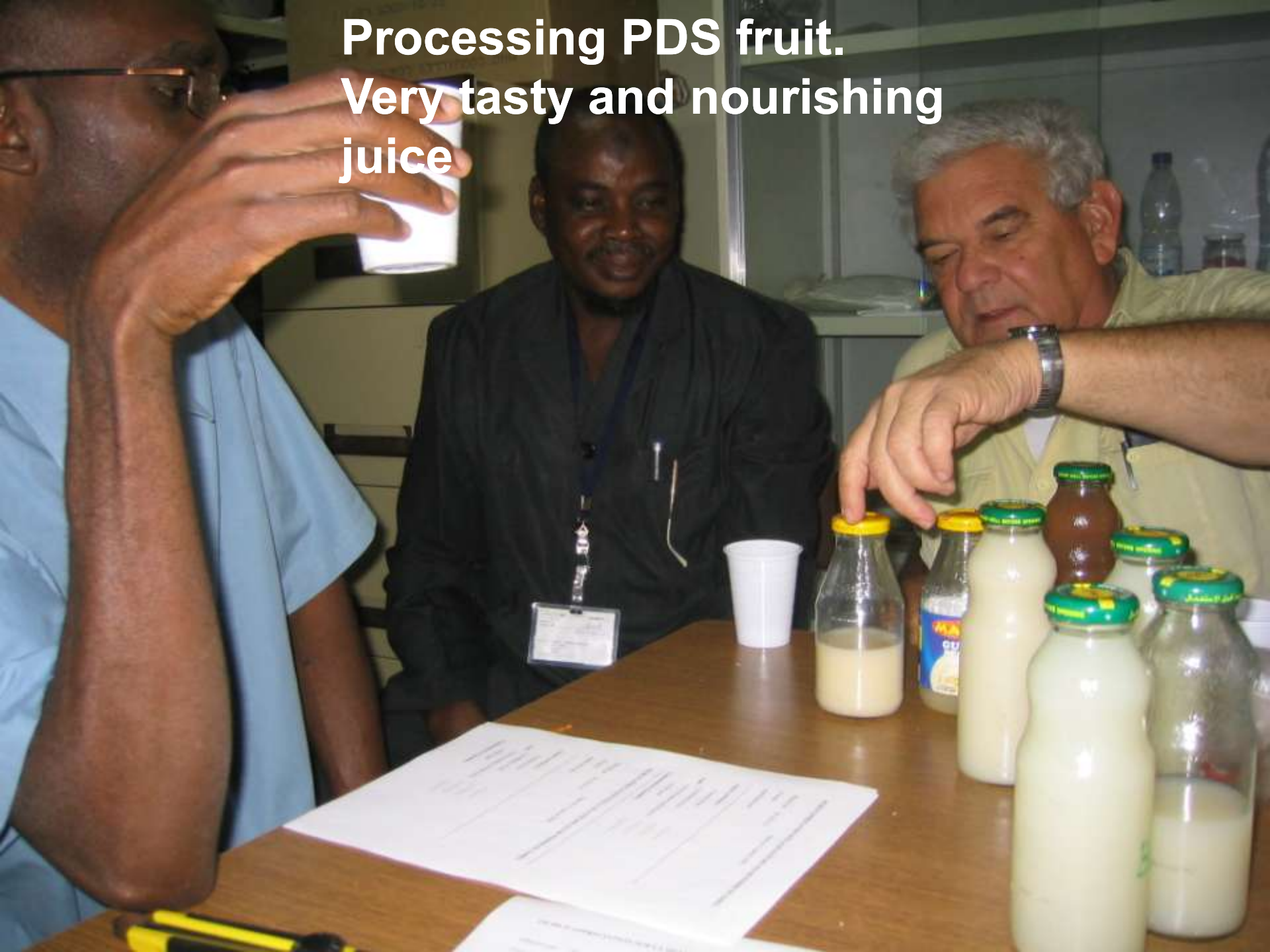

In seven years PDS became
popular fruit in Niger

PDS is one of the very few fruit trees that can grow and produce in the Sahel without irrigation and much care.

Still, to obtain maximum yield the following procedures should be followed:

- ❖ Tree pruning in May before sprouting. About 50% of the canopy is removed
- ❖ Addition of manure. At pruning time 10kg of manure is buried in the ground near the tree
- ❖ Water harvesting. Construction of demilunes around each tree increases water supply and yield
- ❖ Spraying against fruit fly-three sprays per season
- ❖ Planting density for dryland or irrigated plantations is 8x8 m2
- ❖ Fencing is a must


Individual grafted PDS fenced with a millet straw fence-5 months after grafting


Processing PDS fruit.
Very tasty and nourishing
juice

In 2012 the Yaajeende USAID food security program grated 9,000 big Jujube trees with PDS scions

It is planning to graft 100,000 wild jujubier in a period of 4 years.

With an average of 25kg of fruit/tree the grafted trees will give 2,500 tons of PDS fruit for the poor population of Eastern Senegal.

Farmers in Maradi practicing FMNR started grafting their wild jujubier tress with PDS

PDS scions and *Z. rotundifolia* seeds can be obtained from ICRISAT nursery. Please contact Moustapha Amadou at m.amadou@icrisatne.ne


Dolich (Lablab purpureus)

Dolich (*Lablab purpureus*)

Dolich (or Hyacinth bean) is a crawling or climbing leguminous species resembling cowpea.

Dolich is an African species but it is better known in other continents such as Asia, South America and Australia than in Africa.

In West Africa it grows profoundly in the region of Tahoua of Niger but very little elsewhere.

Dolich is a dual purpose (grains and fodder) plant.

It has deep and extensive root system allowing it to complete a full growth cycle on water stored in the soil.

❖ Dolich can easily give a grain yield of 2.0 tons/ha and a forage yield of 3.0 tons/ha (dry weight) without any irrigation. These yields are more than double grain and forage yields of cowpeas.

❖ Dolich leaves when cooked serve as a tasty and nutritious leafy vegetable.

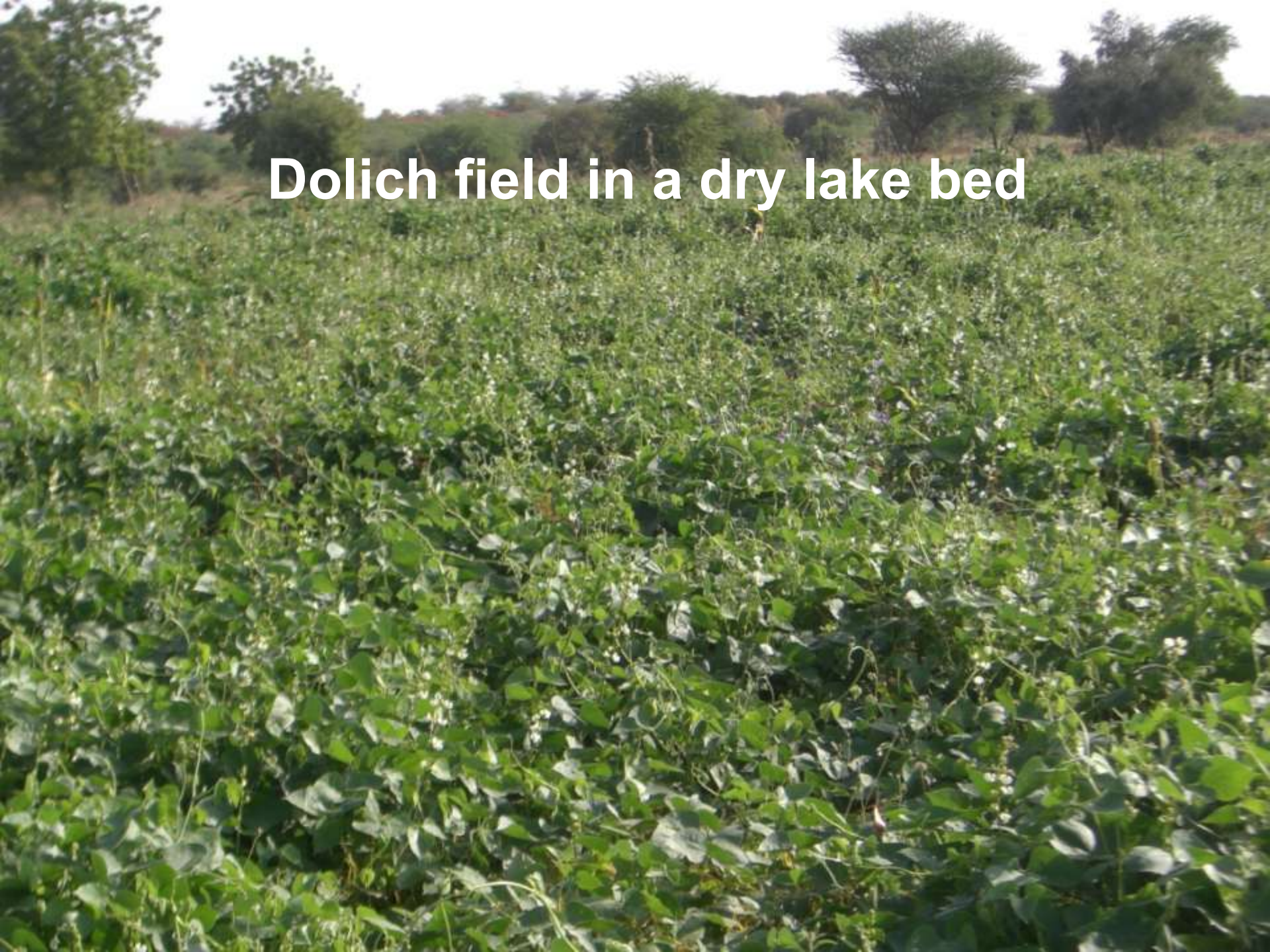
❖Dolich can be planted in rice fields after the rainy season rice crop is harvested. It is planted in soils of receding temporary lakes or rivers.

❖ In places with sufficient rains it is intercropped with maize and sorghum two-four weeks after sowing the grain crops to prevent grain yield reduction by the legume. After maize and sorghum are harvested the dolich spreads and produces a grain and fodder yield.

❖ Dolich can and should be planted in most climatic regions of Africa starting in the Sahel and ending in tropical regions

❖ Dolich fixes atmospheric nitrogen at a rate of 15–40 kg per 1,000 kg of dry matter produced (or about 100kg/ha of N) significantly enriching crop fields

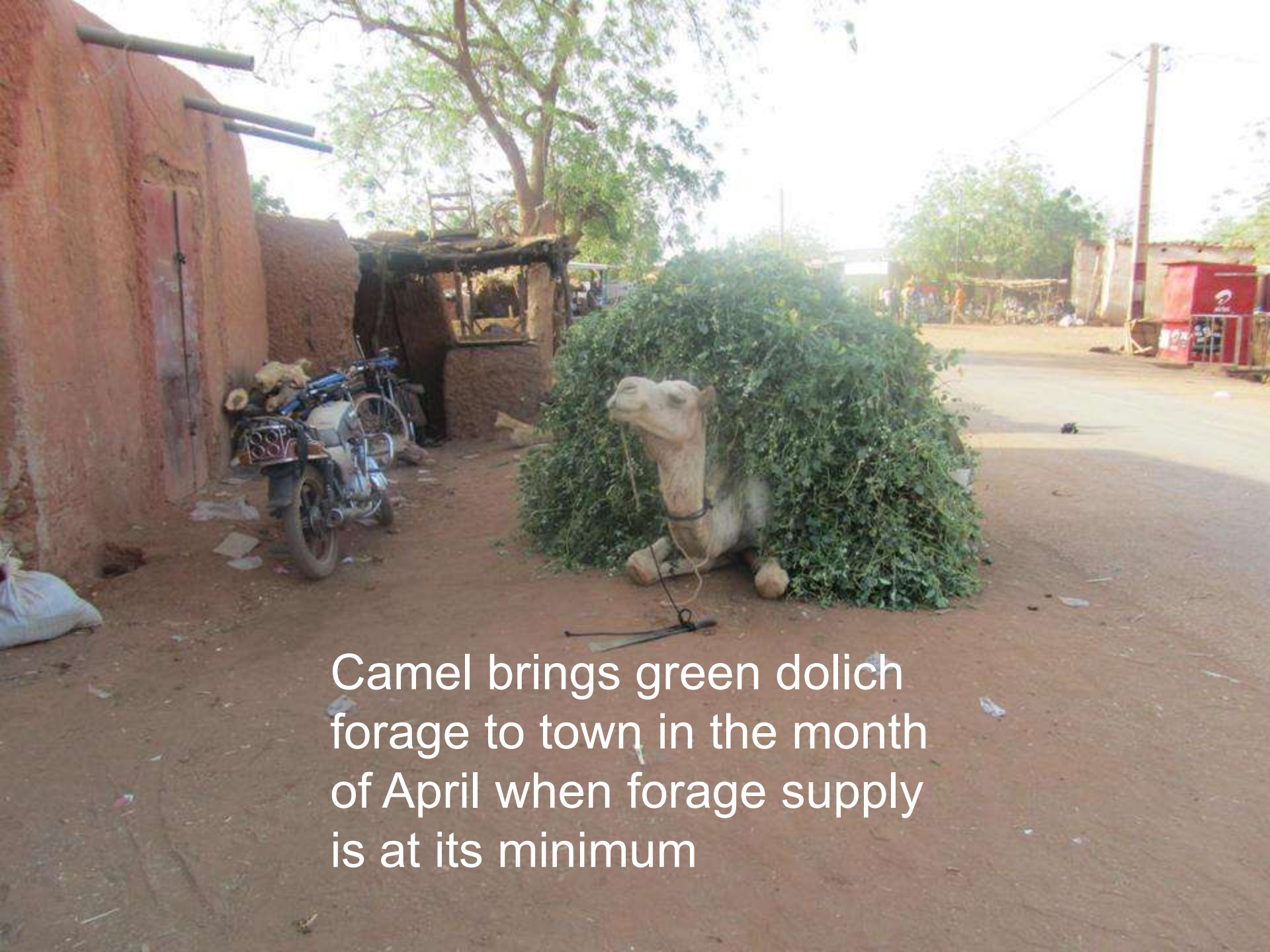

Dolich is planted in the moist soil
as the lake recedes


Dolich field in a dry lake bed


Large dolich field after planting


Dolich intercropped with sorghum


Dolich planted in a sorghum field
Sorghum (or maize) is cut and
dolich starts spreading



Camel brings green dolich forage to town in the month of April when forage supply is at its minimum

On a dry matter basis whole dolich plants contain 18% protein while both leaves and seeds contain 28% protein. A good animal forage. A healthy human food

Dolich has very few pest and diseases. No need to spray. It grows in the dry season. Minimum weeding.

Dolich is the “ultimate food security crop”. Dolich is planted on water saturated soils and when we plant it **we are sure** to get a yield.

Contrary to dolich rainfed crops fail very often due to droughts, diseases and pests.

Dolich production, so simple and so effective!


Konni Okra

Okra (*Abelmoschus spp.)* is a traditional vegetable crop with huge socio-economic potential in West and Central Africa. It has been called “a perfect villager’s vegetable” because of its robust nature, dietary fibers and distinct seed protein balanced in both lysine and tryptophan amino acids (unlike the proteins of cereals and pulses) it provides.

However, okra has been considered a minor crop and no attention was paid to its improvement in the international research program.

The WCA region accounts for more than 75%

of okra produced in Africa, but the average productivity in this region is very low (2.5 t/ha) compared to East (6.2 t/ha) and North Africa (8.8t/ha).

Okra is a drought tolerant species and one of the few vegetables that can grow in the Sahel without irrigation.

It is a very important source of sauce in the rural population diet.

It can be eaten fresh or it can be dried and a powder can be produced. Okra processing is an extremely important trait because it allows the conservation of the rainy season harvest for one whole year


Nara-Mali. Woman preparing okra for drying


Sun drying of okra.
Vitamin A is destroyed

Many okra varieties are short day varieties. They will not flower during the rainy season which in the Sahel it is the main production season for okra.

AVRDC/ICRISAT introduced 250 varieties and lines of okra from the USDA collection. In addition three land races from Niger were introduced.

A land race coming from Birnie N'Konni in Niger performed best under Sahelian conditions. It is day-length insensitive and in the rainy season it starts producing fruit 50 days after planting.

It can grow during most months of the year except for the cool period of December-February

This land race was purified and distributed in a few Sahelian countries under the name Konni.

ICRISAT demonstrated that Konni okra can produce a reasonable fruit yield (3-4 tons/ha) in degraded lands if planted in zaï holes containing 200g of dry manure.

Konni variety can be planted **under irrigation** during the month of February to produce a high yield (8.0 tons/ha) from April to July which is the dry hot season and the beginning of the rainy season.

Fresh okra prices are highest during this time of the year.


Purification of Konni
at ICRISAT-Niger

Women sowing okra in zaï holes in a degraded land


Collecting okra planted on degraded lands in a year when millet yields failed due to drought


June harvesting of Konni
in an irrigated field


Taking Konni okra
for sale in June


Selling okra to local traders. A very important cash crop

In Summary

Okra is a most important vegetable in West and Central Africa. In most places it is produced by women. It is highly nutritious, the seeds providing rare amino acids. Okra production should be promoted all over West Africa as a leading vegetable crop.

The selection and purification of the Konni variety resulted in a high yielding early producing rain-fed and irrigated variety with high yields and good fruit quality.

Seeds of Konni (and other promising vegetable varieties) can be obtained from the Ainoma seeds company in Niger (masalifou@yahoo.fr)

Conclusions

The common features of the three crops described in this presentation are:

- All three crops originated in Sub-Saharan Africa
- These crops can be disseminated with very little outside investment. Every farmer can do it and every development agency should promote them
- The three crops if properly applied will **significantly** increase food security, improve nutrition and mitigate the effects of climate change.


Where there is a will there is a way
Thank You