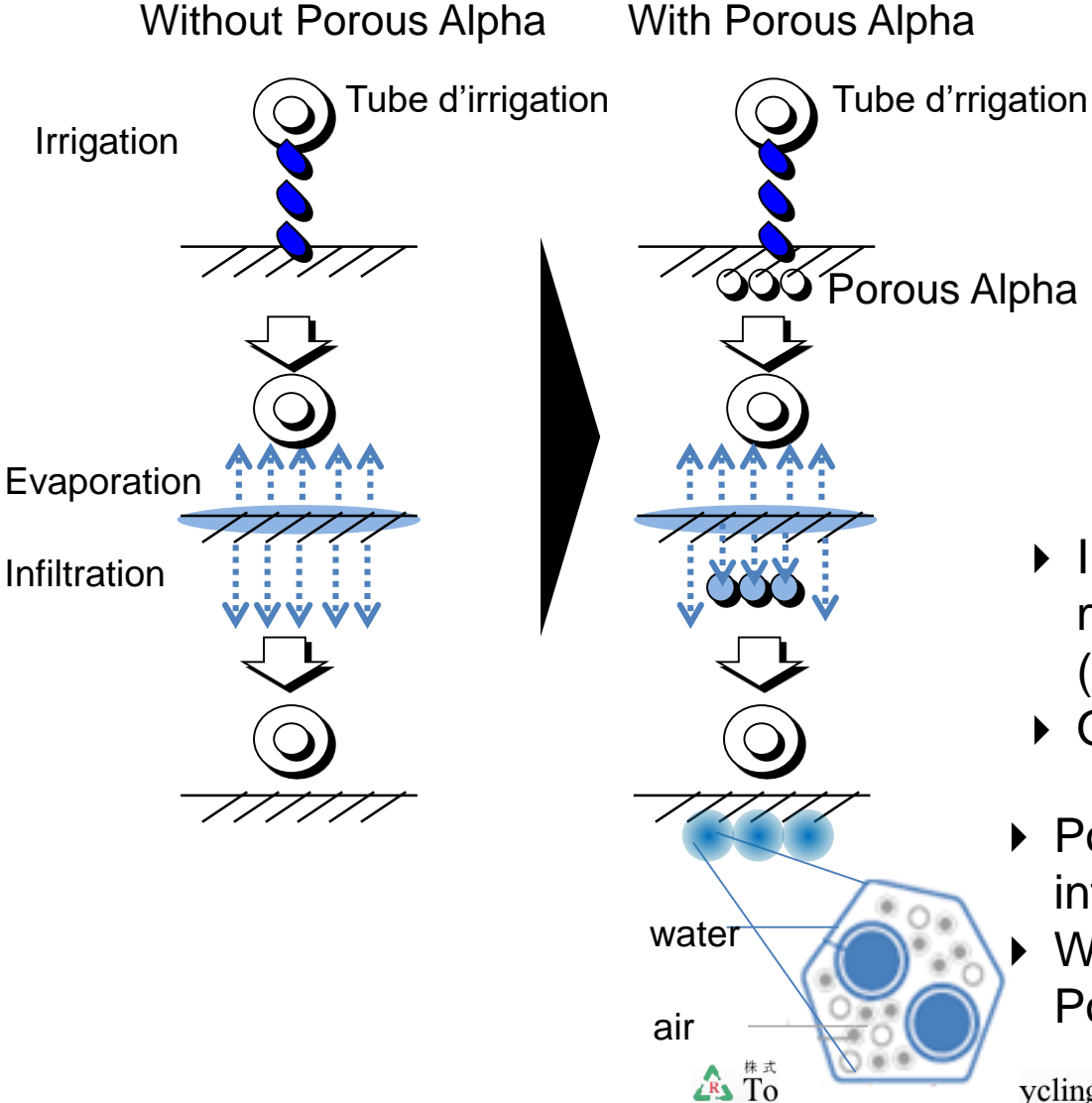


# Discussion on the experimentation in Baidoa & Bossaso, and way forward Tottori Resource Recycling

June 2018



# Simple installation of our soil amendment, Porous Alpha, realizes better water utilisation for 10 years



- ▶ Installation is so simple; just mixing Porous Alpha with soil (5L of Porous Alpha for 1m ridge)
- ▶ One time installation for 10 years
- ▶ Porous Alpha prevents part of the infiltration of the irrigated water
- ▶ Water loss is mitigated with Porous Alpha

# We carried out pilot project in Somlia for the verification of the performance of Porous Alpha

## ▶ Timeline

- Date of agreement for the project: November 2016
- Training for Teachers at JKUAT: November 2016
- Season 1 in Baidoa: April 2017 – September 2017
  - Collaboration with IOM and READO (Rural Education and Agriculture Development Organization)
- Season 2 in Bossaso: October 2017 – March 2018
  - Collaboration with IOM and Ministry of Agriculture of Somalia

## ▶ Objective

- Confirm the Porous Alpha's performance on water-saving and yield increase
- Confirm the non-existence of negative impact on soil and crop

## ▶ Crops

- Orange fleshed sweet potatoes (OFSP) for Baidoa
- Tomato, Spinach, Lettuce, Hot pepper, Bell pepper for Bossaso

Lecture session on Porous Alpha and the Installation training in the field of JKUAT



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© IOM / Miski Mohamed 2016

# In the preliminary test in Baidoa, the water-saving effect was identified

- ▶ Soil texture: Silt loam
  - Farmers avoid heavy clay soil for Orange fleshed sweet potato (OSPF) production due to the risk of insufficient root development
- ▶ Irrigation method: Flooding
- ▶ Result
  - 50% water reduction was realized by Porous Alpha
    - Four times a week without Porous Alpha -> Twice a week with Porous Alpha
  - Harvest was observed to be good under water-saving condition, but was not recorded quantitatively

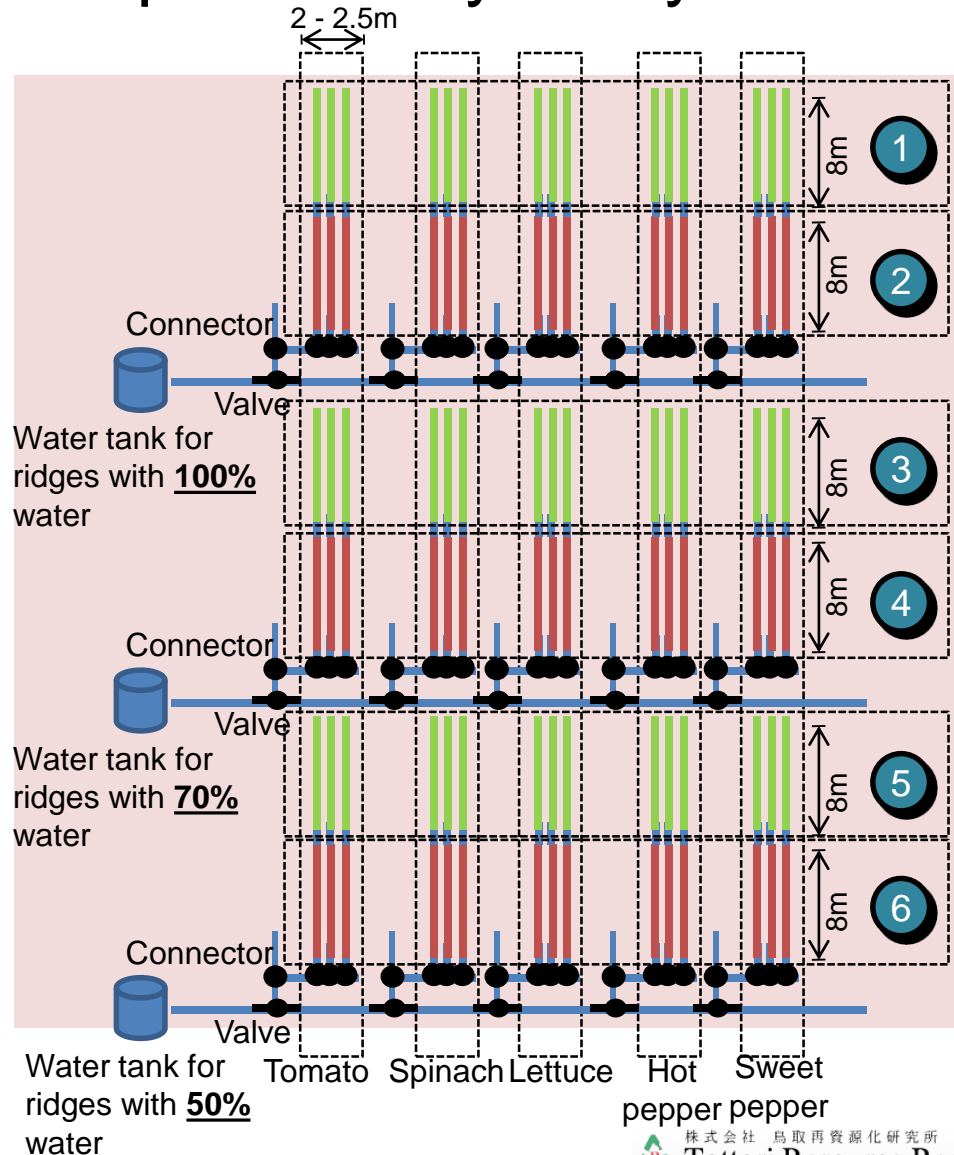


Mixing Porous Alpha with soil



Checking the harvested OSPF

# The other experiment in Bossaso was carried out to qualitatively verify the effect of Porous Alpha



- █ Ridges with Porous Alpha
- █ Ridges without Porous Alpha
- Irrigation tube
- ① ~ ⑥ Experimentation condition No.

Condition #	Irrigation	Porous Alpha
1	100%	Without Porous Alpha
2	100%	With Porous Alpha
3	70%	Without Porous Alpha
4	70%	With Porous Alpha
5	50%	Without Porous Alpha
6	50%	With Porous Alpha

# Soil in Bossaso is clay-loam alkali soil

## ▶ Soil texture

- Sand: 30%
- Clay: 32%
- Silt: 38%

## ▶ Soil alkali level

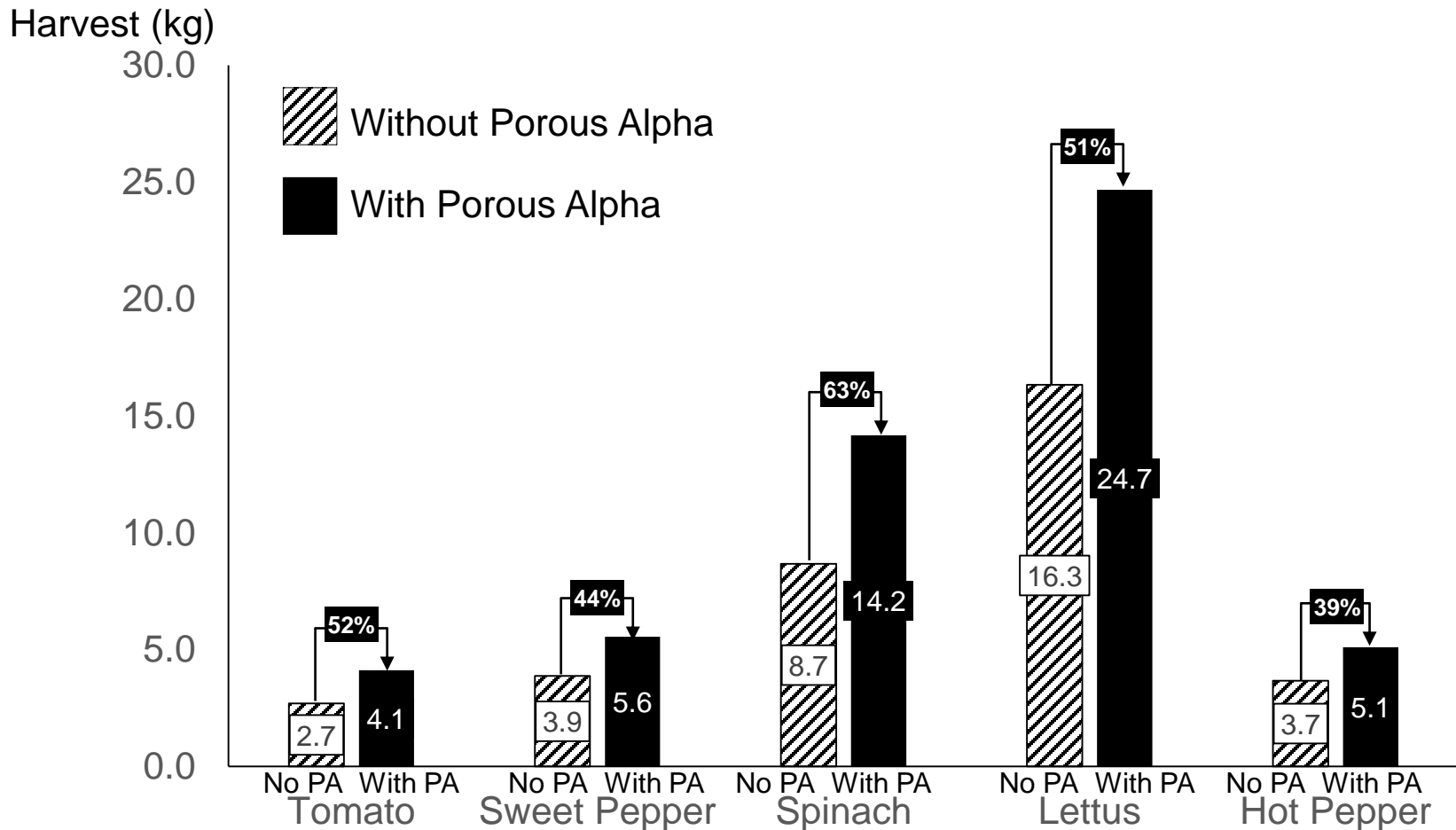
- pH: 7.97
- EC: 0.93 mS/cm

Experimentation field in Bossaso



# The harvest with Porous Alpha under 100% irrigation increases by 39% ~ 63%

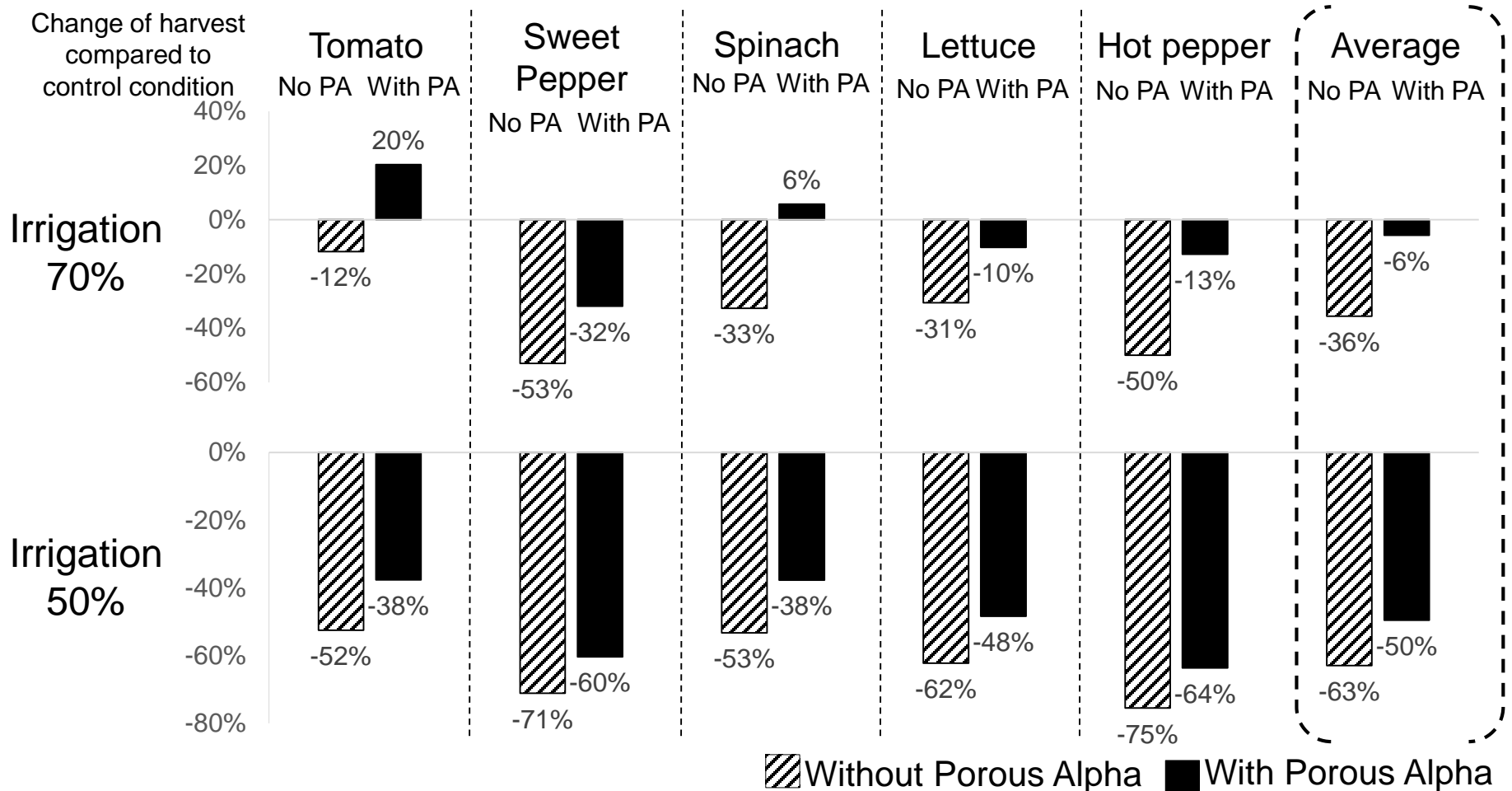
Average harvest (8m ridge) of each vegetable with 100% irrigation



**Porous Alpha has proved its effect to increase the yield without increasing any other input**

# The decrease of harvest due to the limited water is smaller with the installation of Porous Alpha

Change of the harvest compared to the 100% irrigation without Porous Alpha



**Porous Alpha has proved its effect to mitigate the harvest decrease by the water-shortage**



# Implication: Porous Alpha can contribute to improve the food safety and to mitigate the impact by water shortage

- ▶ Increase of food production under normal climate
  - With Porous Alpha, food production can be increased by more than about 30% without additional input
- ▶ Mitigation of the impact by short rain-fall
  - The reduction of the harvest by water shortage can be mitigated with Porous Alpha
    - If Porous Alpha is not installed, the harvest reduction of the water shortage of 30% is -36%.
    - However, if the Porous Alpha is installed, that reduction compared to the control condition is limited to -6%
    - In case of the water shortage of 50%, the decrease of harvest is 63% without Porous Alpha and 50% with Porous Alpha
- ▶ One time installation of Porous Alpha realizes food security improvement for 10 years

# Way forward: Larger project for more beneficiaries

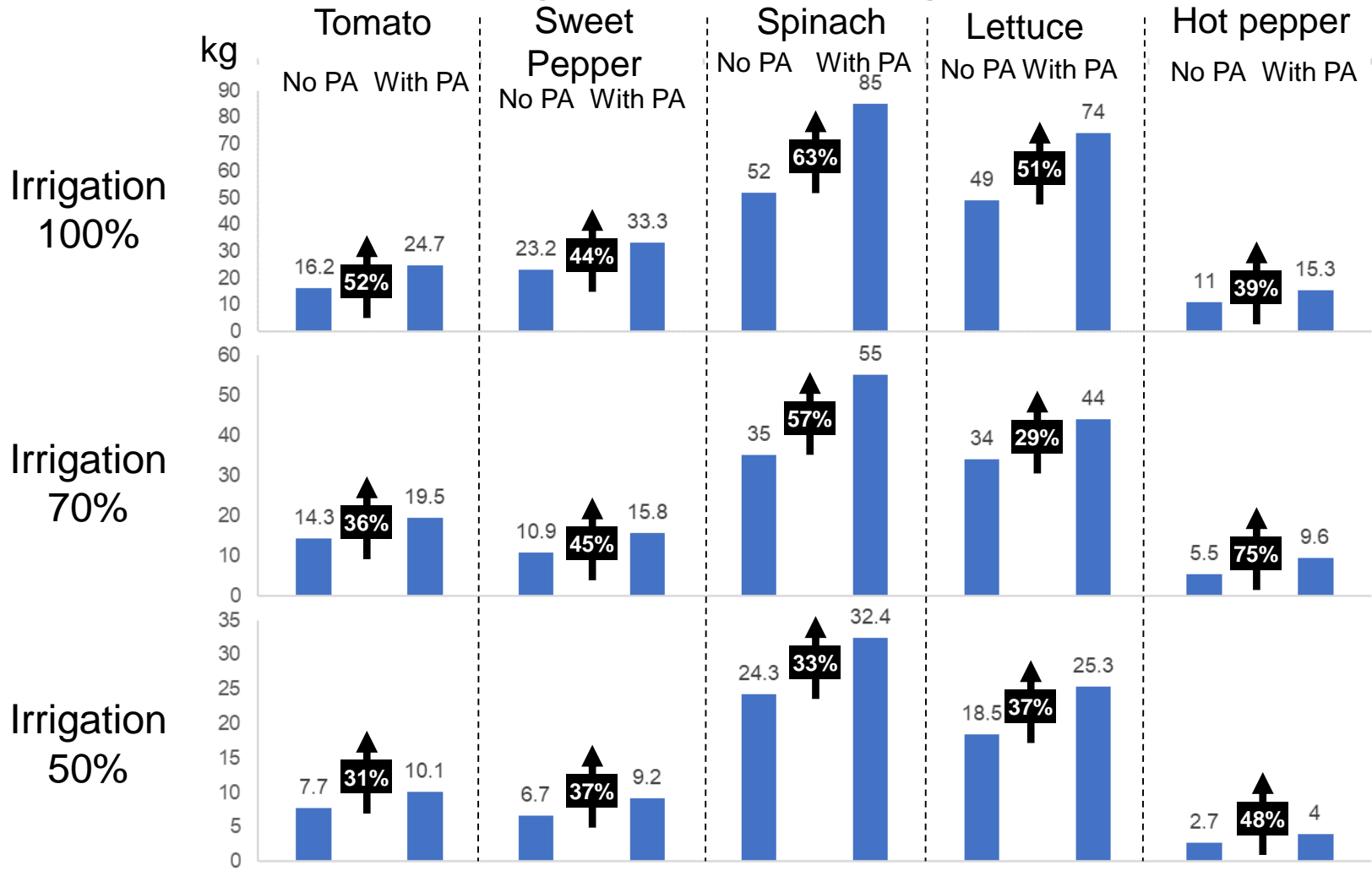
- ▶ As one-time installation of Porous Alpha realizes the effect for 10 years, there's no need to install the product every year
- ▶ Simple installation method with no maintenance after the installation ensures the long-term effect (no need to worry about after service such as maintenance, spare parts, etc...)
- ▶ More Porous Alpha installed in Somalia, higher autonomous food supply and more preparedness for unpredictable short rainfall and drought are realized
- ▶ Porous Alpha can be applied not only for vegetables but also the others. For larger project, it would be better to use our product for the other crops such as cereal (e.g. wheat) or fruit trees (e.g. citrus, date palm, etc.)

# Our contacts

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# Annex: Harvest of 3 ridges for all the conditions in Bossaso

Total harvest of each vegetable under each irrigation and Porous Alpha condition



## Annex: Illustrative cost of Porous Alpha

- ▶ Dosage: 5L for 1m of ridge
- ▶ If there're 20 ridges/ha and each ridge's length is 100m, the required volume of Porous Alpha is  
 $5\text{L/ridge} \times 20 \text{ ridges/ha} \times 100\text{m/ridge} = 10 \text{ m}^3$
- ▶ Unit cost of Porous Alpha: 400USD/m<sup>3</sup> (CIF Mombasa)
- ▶ Cost of Porous Alpha/ha = 4000USD for 10 years
- ▶ Cost of Porous Alpha per year = 400 USD/ha

(There's another product type whose dosage is half of the above. If this applies, cost can be half)

# Annex: Specification and applicable conditions of soil conditioning by Porous Alpha

- ▶ Applicable soil texture : Sandy soil and clay soil
- ▶ Application method

	Crops cultivated with ridges	Crops cultivated without crops	Trees: Porous Alpha applied at plantation	Trees: Porous Alpha applied for planted trees
Method	Before setting ridge, distribute Porous Alpha on the location of ridge. Mix Porous Alpha with soil by hand tractor or tractor. Then set up ridge Porous Alpha	Spread Porous Alpha in the field and mix Porous Alpha with soil by hand tractor or tractor	Mix Porous Alpha with the soil for planting pit	Ditch around the terminal of lateral root. Mix the Porous Alpha with the soil from ditch. Then recover the soil with Porous Alpha to the ditch
Dosage	10% of rooting zone (Porous Alpha $\Phi$ :3mm – 10 mm) or 5% of rooting zone soil (Porous Alpha in powder) * Rooting zone: Ridge volume x Root depth (e.g. For the ridge with width of 30cm and root depth is 15cm, the dosage is 5L/m ( $\Phi$ 3mm-10mm) or 2.5L/m in powder))	10% of rooting zone (Porous Alpha $\Phi$ :3mm – 10 mm) or 5% of rooting zone soil (Porous Alpha in powder) * Rooting zone: Field area x Root depth (e.g. For the crop with root depth of 15cm, the dosage is 15L/m <sup>2</sup> ( $\Phi$ 3mm-10mm) or 7.5L/m <sup>2</sup> (in powder))	10% of rooting pit ( $\Phi$ 3mm-10mm) or 5% or rooting pit (in powder)	10% of ditched soil ( $\Phi$ 3mm-10mm) or 5% of ditched soil (in powder)
Choice of spec.	If high soil pH is acceptable, the powder product is applicable. (e.g. The crop is resistant to alkaline soil or the soil pH is originally so high that the pH of irrigation water is lowered by acid additive) For the other case, the product of $\Phi$ 3mm-10mm should be used			

- ▶ Durability: More than 10 years (If Porous Alpha is applied to crops with ridge and the tillage is done horizontally to the ridge, the Porous Alpha can be scattered out of the zone of ridge. In that case, the Porous Alpha needs to be installed again)
- ▶ Our expert supports the best application method customized for each situation

# Annex: Soil texture in Bosasso

## RE: SOIL TEXTURE ANALYSIS (HYDROMETER METHOD) & MOISTURE CONTENT

Below please find analysis results for one soil sample from Bosaso, Somalia Lab. No. 8988-8989/2016. (Ref: Hinga G. F. N.Muchena and C. M. Njihia, Physical and chemical methods of analysis, 1980).

Sample Description	Soil Depth (cm)	Lab. No./2016	Sand %	Clay %	Silt %	Texture Grade	Moisture Content % (w/w)
1	top	8988 & 8989	30	32	38	CL	2.8

### KEY:

CL – Clay Loam

I. V. Sijali: **COORDINATOR, IRRIGATION, DRAINAGE AND MANAGEMENT OF PROBLEM SOILS RESEARCH PROGRAMME**

# Annex: Soil physical and chemical analysis



Kenya Agricultural & Livestock Research Organization  
 National Agricultural Research Laboratories  
 P. O. Box 14733, 00800 NAIROBI  
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 Email: soilabs@yahoo.co.uk



## SOIL TEST REPORT

Name	Nyawira Kimondo
Address	c/o IOM P. O. Box 1810 – 00606, Nairobi
Location of farm	Bosaso, Puntland, Somalia
Crop(s) to be grown	Chillies, lettuce, tomato
Date sample received	04-11-16
Date sample reported	25-11-16
Reporting officer (through Director NARL)	A. Chek

Soil Analytical Data								
Lab. No/2016	8987							
Soil depth cm	top							
Fertility results	value	class	value	class	value	class	value	class
* Soil pH	7.97	medium alkaline						
* Total Nitrogen %	0.09	low						
* Total Org. Carbon %	0.68	low						
* Phosphorus ppm	7	low						
Potassium me%	0.48	adequate						
Calcium me%	3.8	adequate						
Magnesium me%	2.38	adequate						
Elect. Cond. mS/cm	0.93	high						

\* ISO/IEC 17025 accredited