Effects of porous silica on processing tomato cultivation

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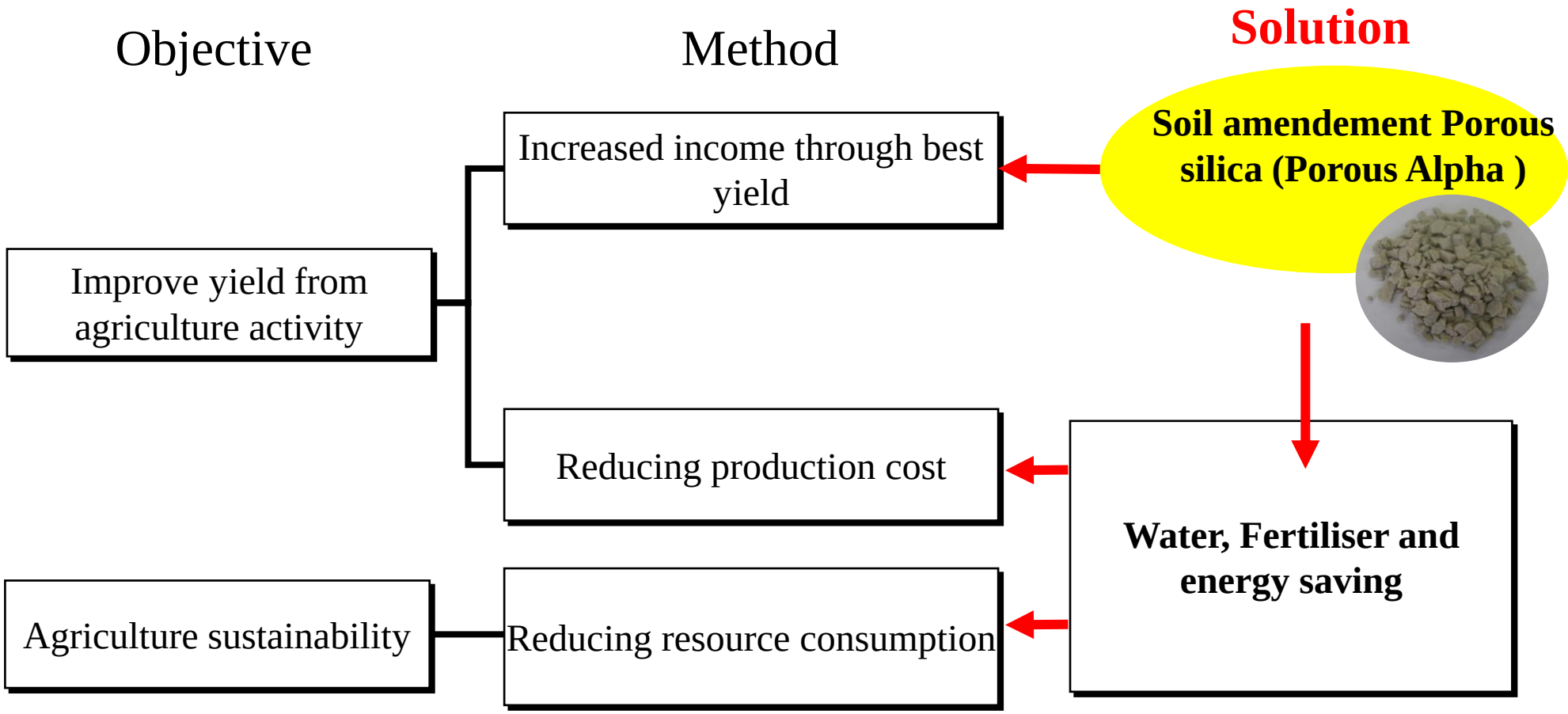
With inputs from Tottori Resource Recycling

Project Scope

- Test the effectiveness of porous silica under labartory condition on different soil profiles

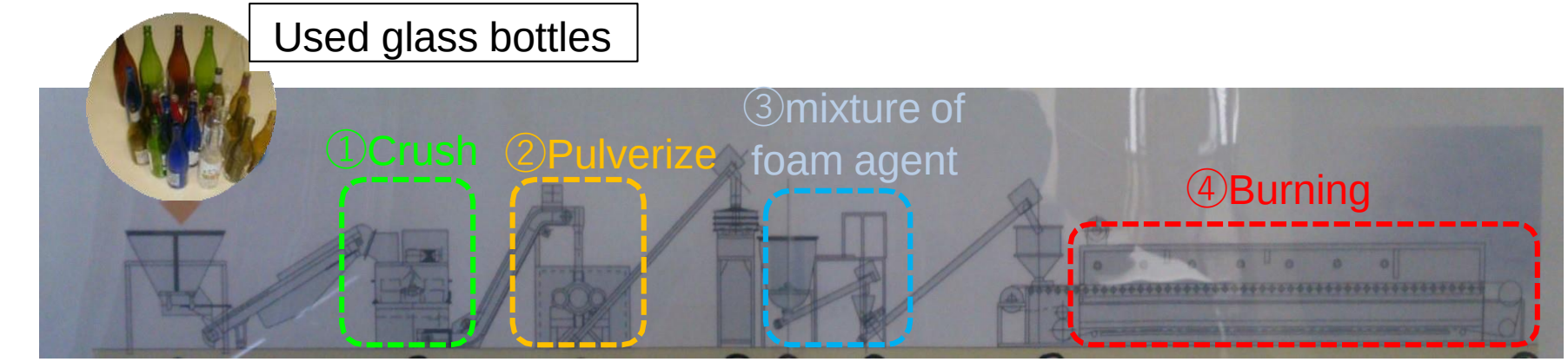
- Test the effectiveness of porous silica in Victoria through field trials on processing tomatoes

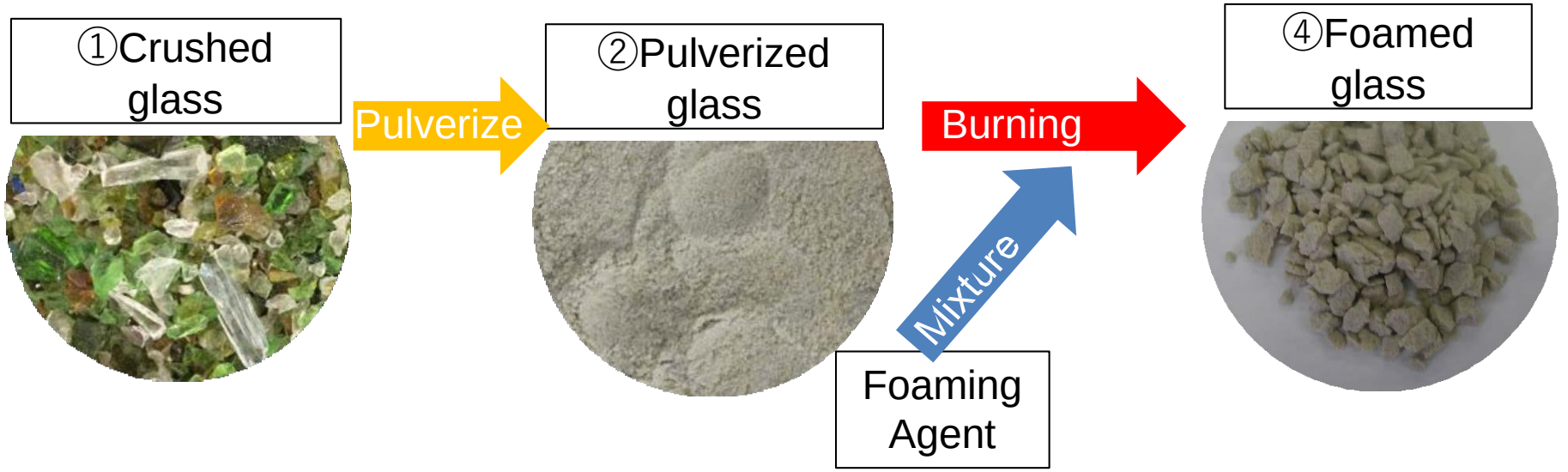
Porous silica (Porous Alpha) could save water and soluble fertilizer use



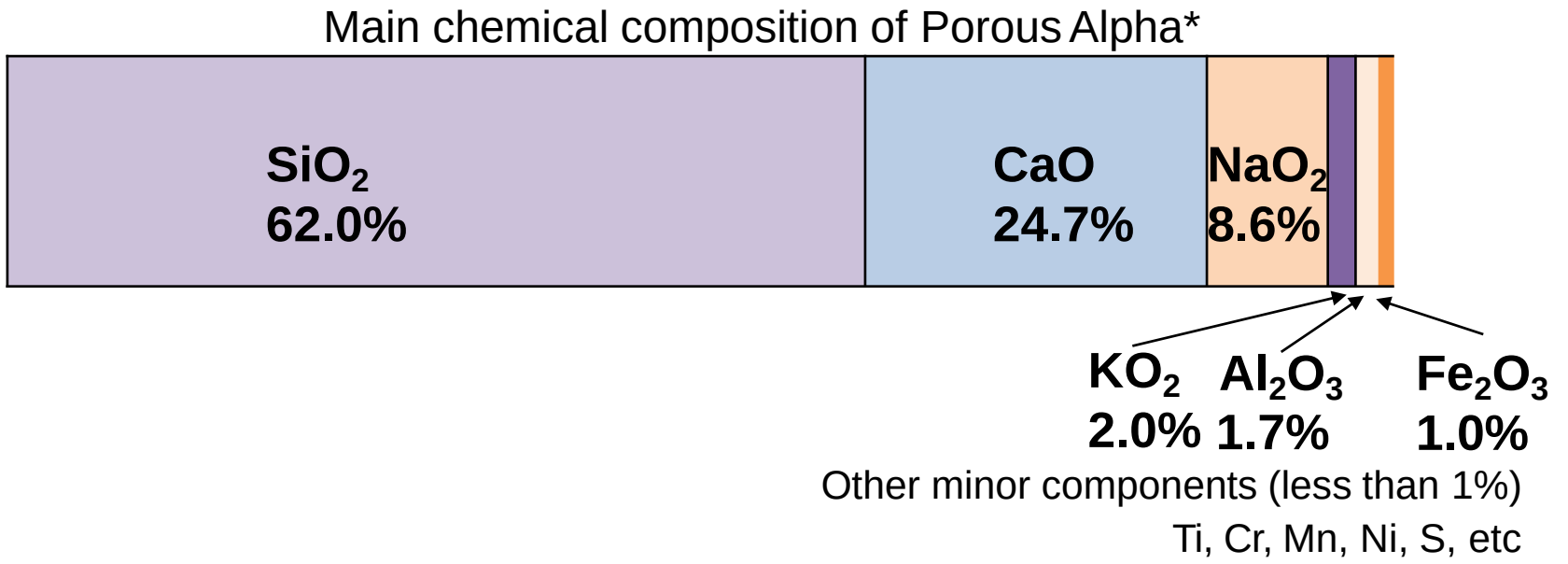
What is porous silica (Porous Alpha)?

Porous Alpha is made by burning of mixture of pulverized glass and shells



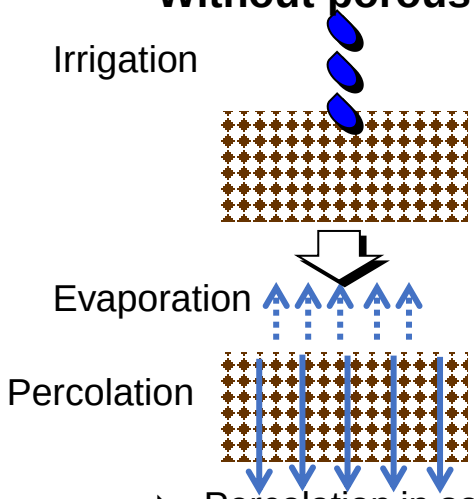


Porous Alpha is mainly composed of silica and calcium oxide, similar to the chemical composition of natural sand

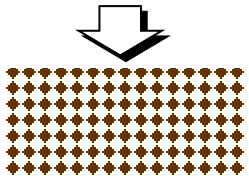


The pores of Porous Alpha increases water retention capacity of the soil, especially of sandy soil

Without porous silica

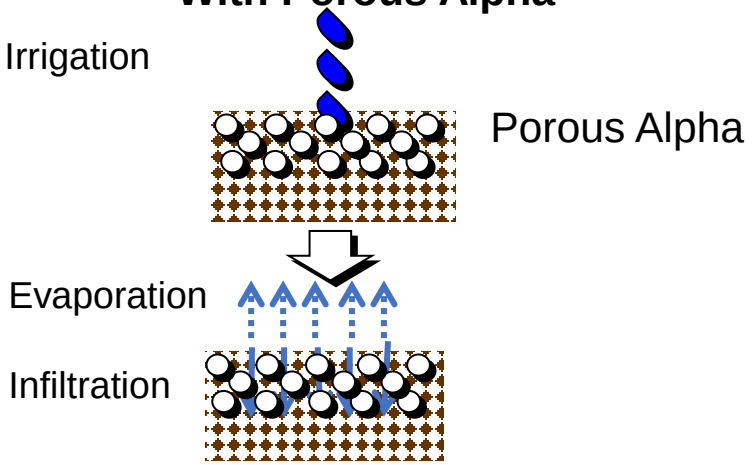


- Percolation in soil can be very high
- A lot of irrigated water and liquid fertilizers are not absorbed by plants

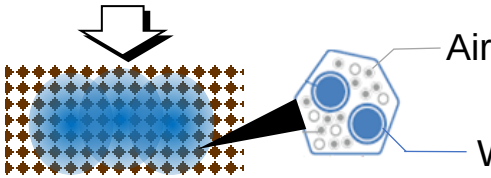


- Humidity in soil can be low, which requires frequent irrigation

With Porous Alpha



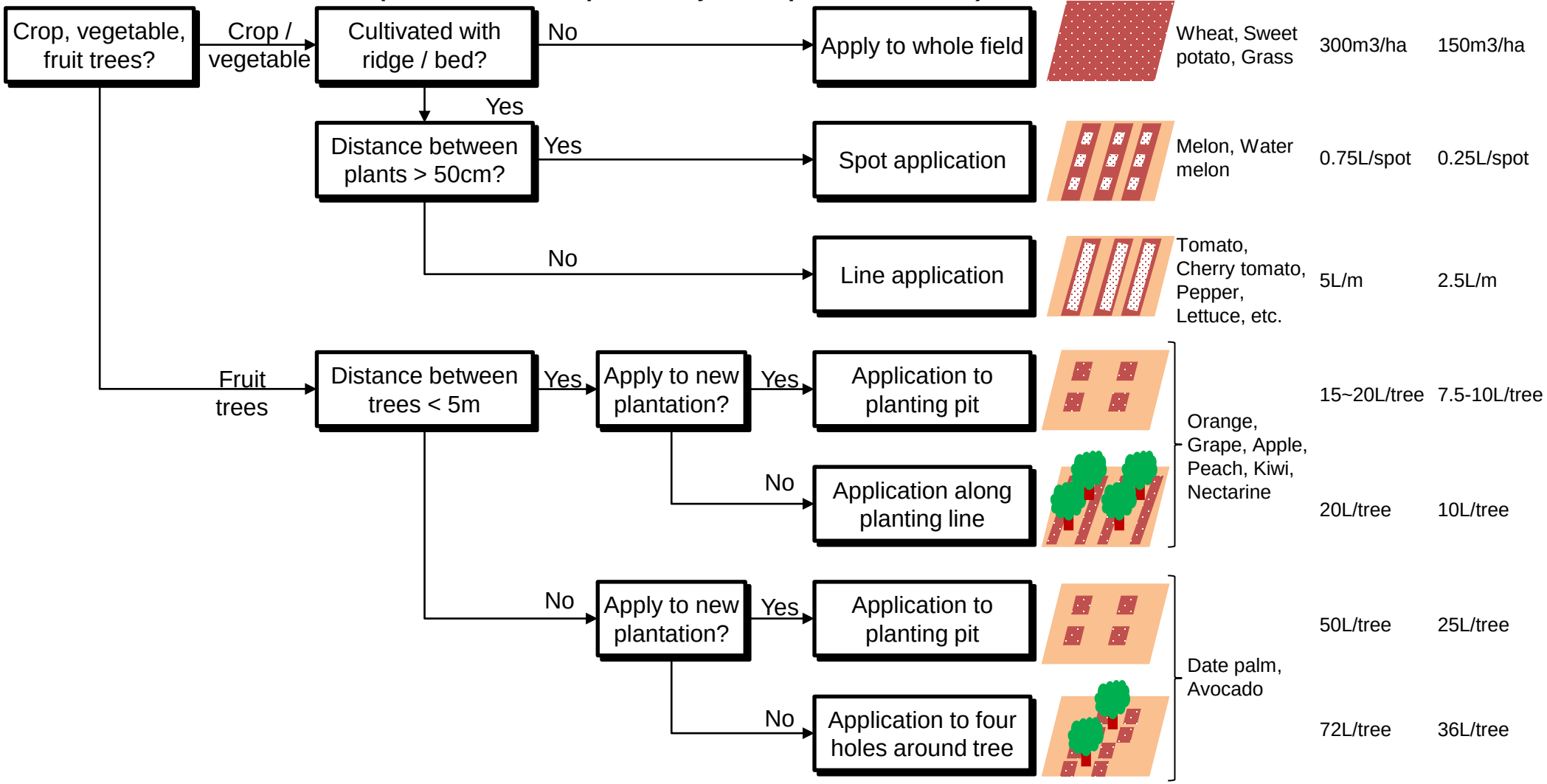
- Porous Alpha capture the irrigation water and liquid fertilizer
- Plants can absorb more water and liquid fertilizer



- The soil with Porous Alpha has higher humidity
- As Porous Alpha is inorganic material it can work for more than 10 years

Depending on cultivation method, the mixing area/points varies for optimized return on investment

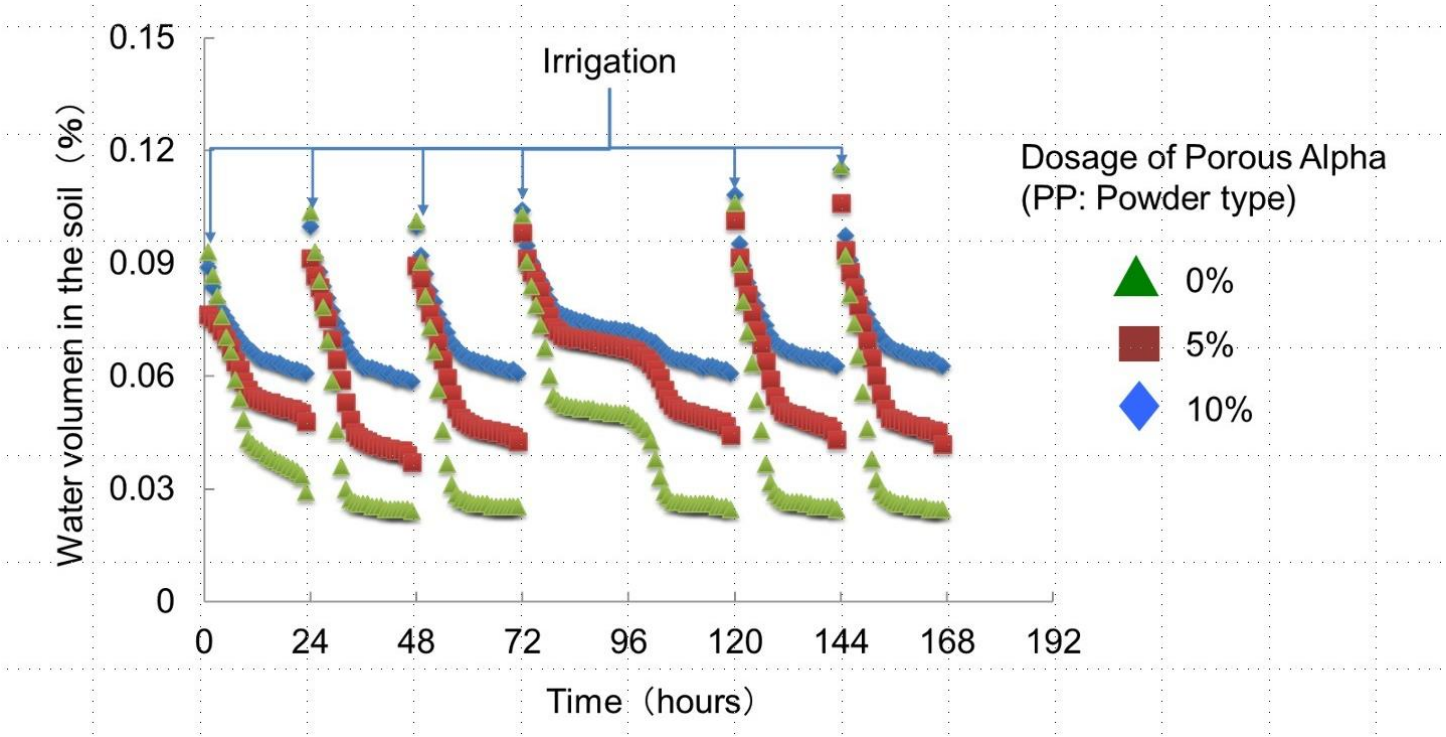
Standard dosage of Porous Alpha for different crops and installation timing
(Customisation required subject to specific condition)



	Example	Dosage P310	Dosage P03
Apply to whole field	Wheat, Sweet potato, Grass	300m3/ha	150m3/ha
Spot application	Melon, Water melon	0.75L/spot	0.25L/spot
Line application	Tomato, Cherry tomato, Pepper, Lettuce, etc.	5L/m	2.5L/m
Application to planting pit	Orange, Grape, Apple, Peach, Kiwi, Nectarine	15~20L/tree	7.5-10L/tree
Application along planting line		20L/tree	10L/tree
Application to planting pit	Date palm, Avocado	50L/tree	25L/tree
Application to four holes around tree		72L/tree	36L/tree

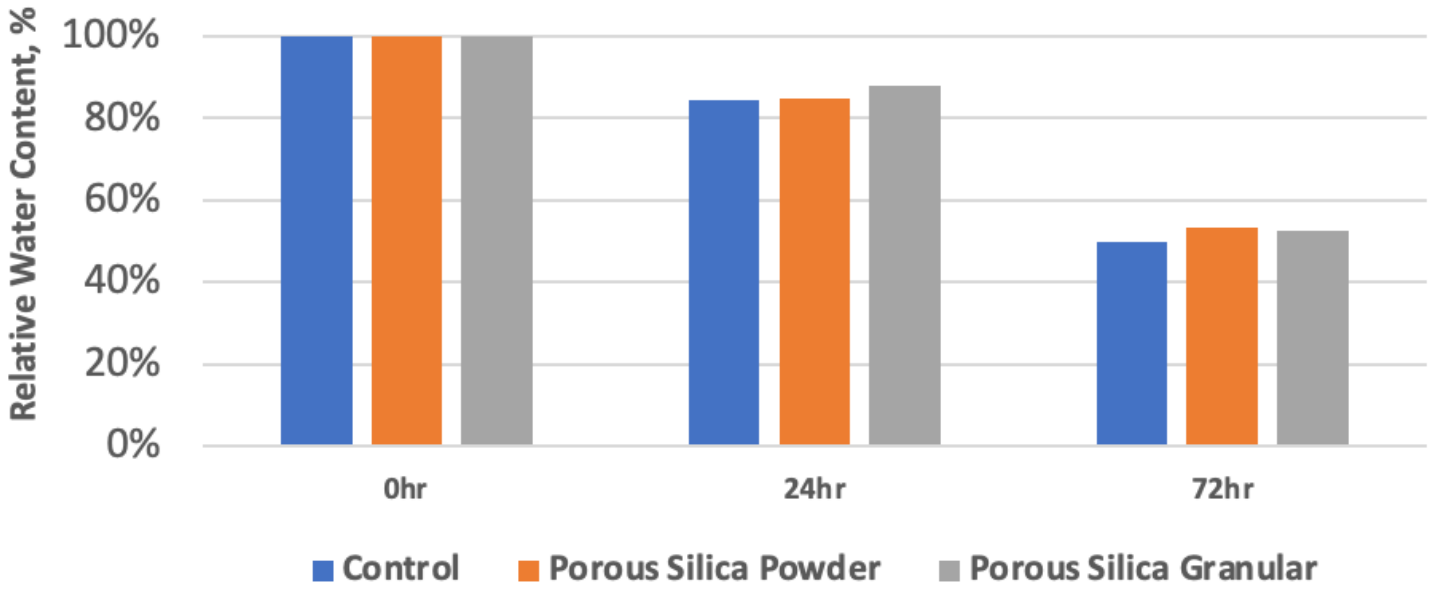
Results: Lab Tests

- Test 1: Moisture retention capacity of sandy soil increased significantly when mixed with porous silica



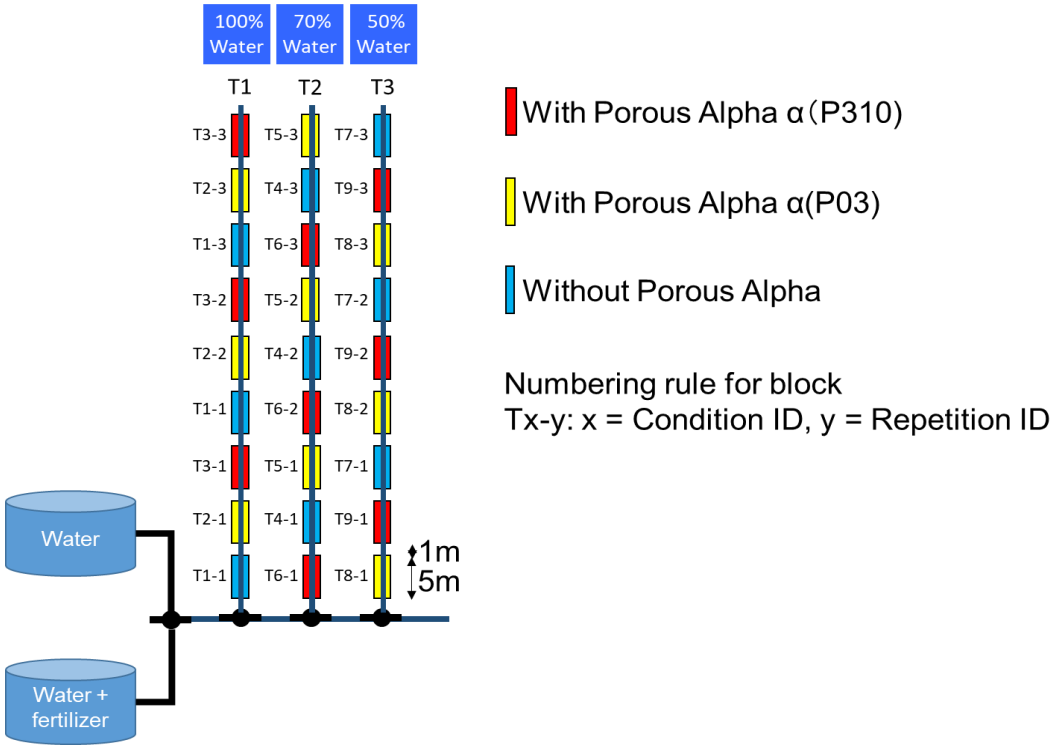
Results : Lab Tests

- Test 2: Effect of porous silica on water retention capacity of soil was significantly diminished for dense soil (high clay content)
- Experiments were performed on soil with 6:4 clay:sand in environment chamber @ 30DegC and 40% humidity



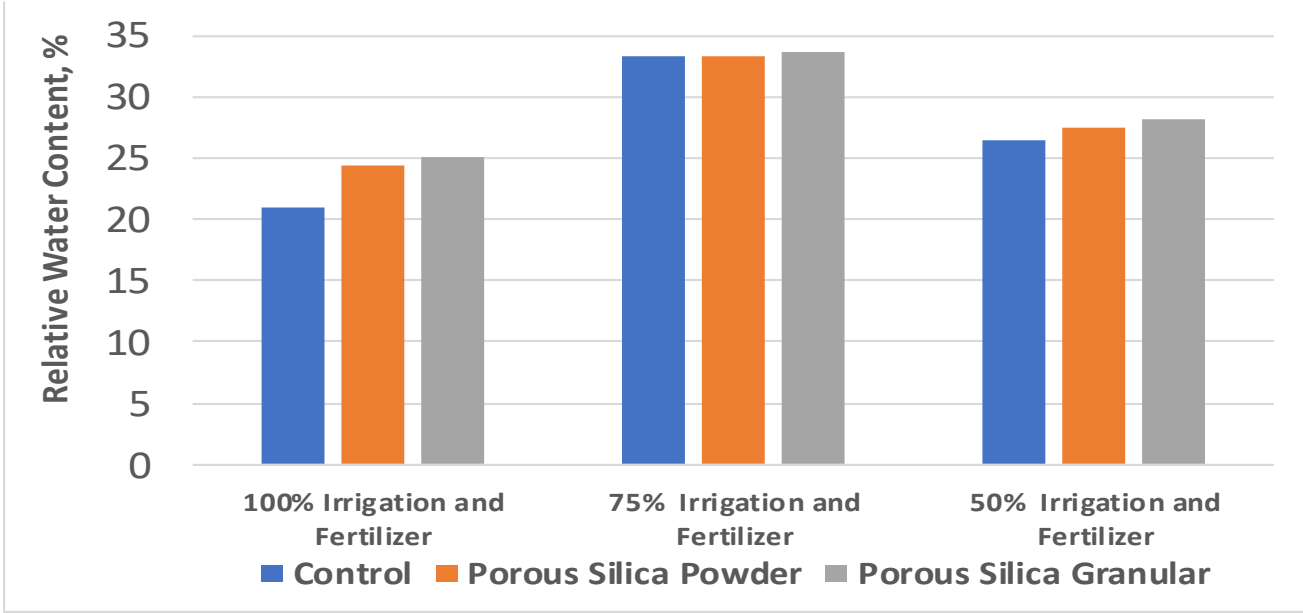
Field Tests

- Field Tests were performed in Echuca in partnership with Kagome
- Three different irrigation conditions and porous silica conditions were tested



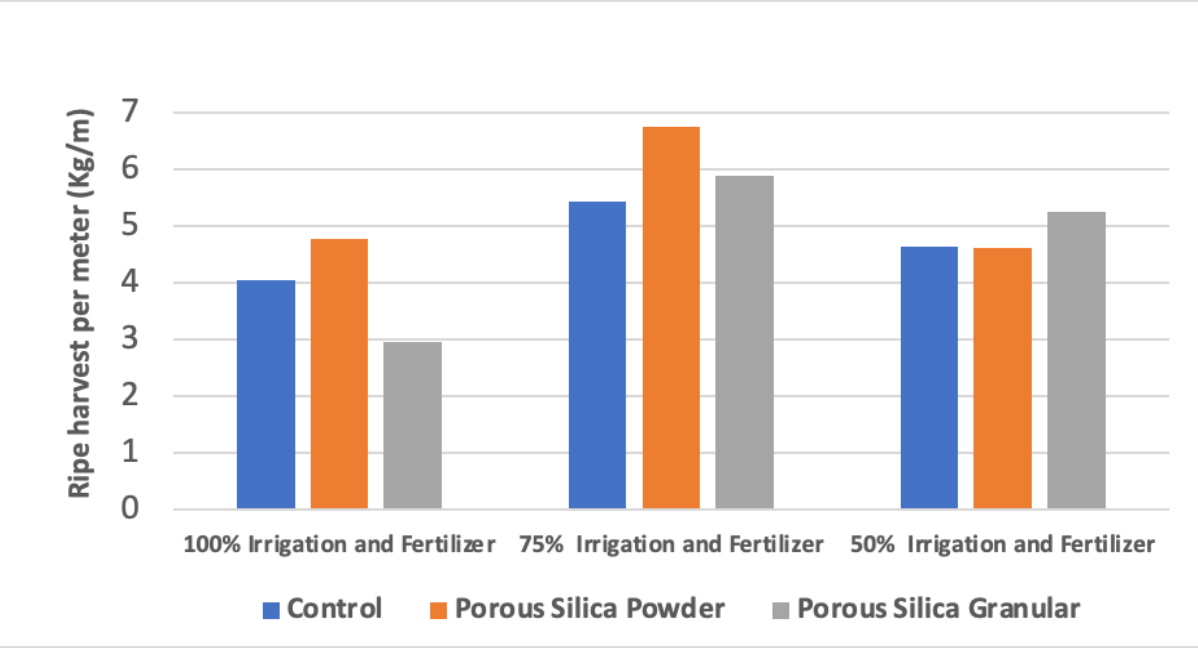
Results: Field Tests

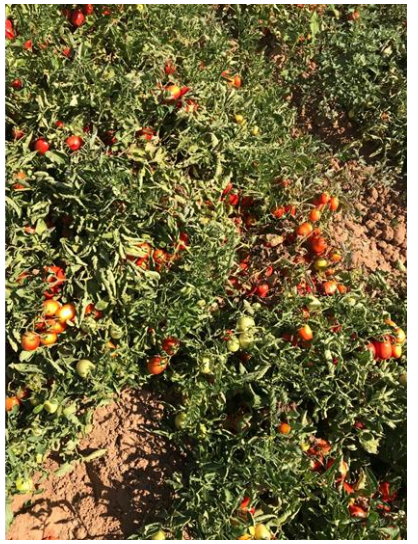
- Porous silica did not have any adverse effect on moisture levels in the soil
- For all irrigation levels, porous silica resulted in marginal increase in soil moisture
- Sections with 100% irrigation was affected because of flooding and faulty drip line



Results: Field Tests

- Porous silica did not adversely impact yield
- For all irrigation levels, use of porous silica resulted in an increase in yield
- Effects of powdered vs granular type porous silica was inconsistent
- No adverse impacts on caliber or Brix detected





Results: Field Tests

- Porous silica did not affect overall soil profile
- No adverse impacts on heavy metal concentration detected

Element	Result (ppm)			
	Control (Before Tests)	Control (After Harvest)	Soil Mixed with Powered Porous Silica, 2l/m	Soil Mixed with Granular Porous Silica, 5l/m
Copper	19.5	19.3	18.6	20.1
Zinc	28.4	27.7	25.3	27.1
Cadmium	0.0703	0.0915	0.0751	0.0514
Lead	14.8	14.9	15.6	14.6
Mercury	0.0243	0.0173	0.032	0.0234
Chromium	44.4	43.4	41.7	42.8
Nickel	17.5	16.5	15.7	17.5

Conclusion & Recommendation

- Soil mixed with porous silica appears to deliver increase in yield
- This could result in increased water saving and soluble fertilizer use
- Further large-scale field tests is recommended
- Porous silica, if imported may not be cost effective for processing tomatoes
- This soil additive maybe more suited for perennial crops with well established root systems

Acknowledgements

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