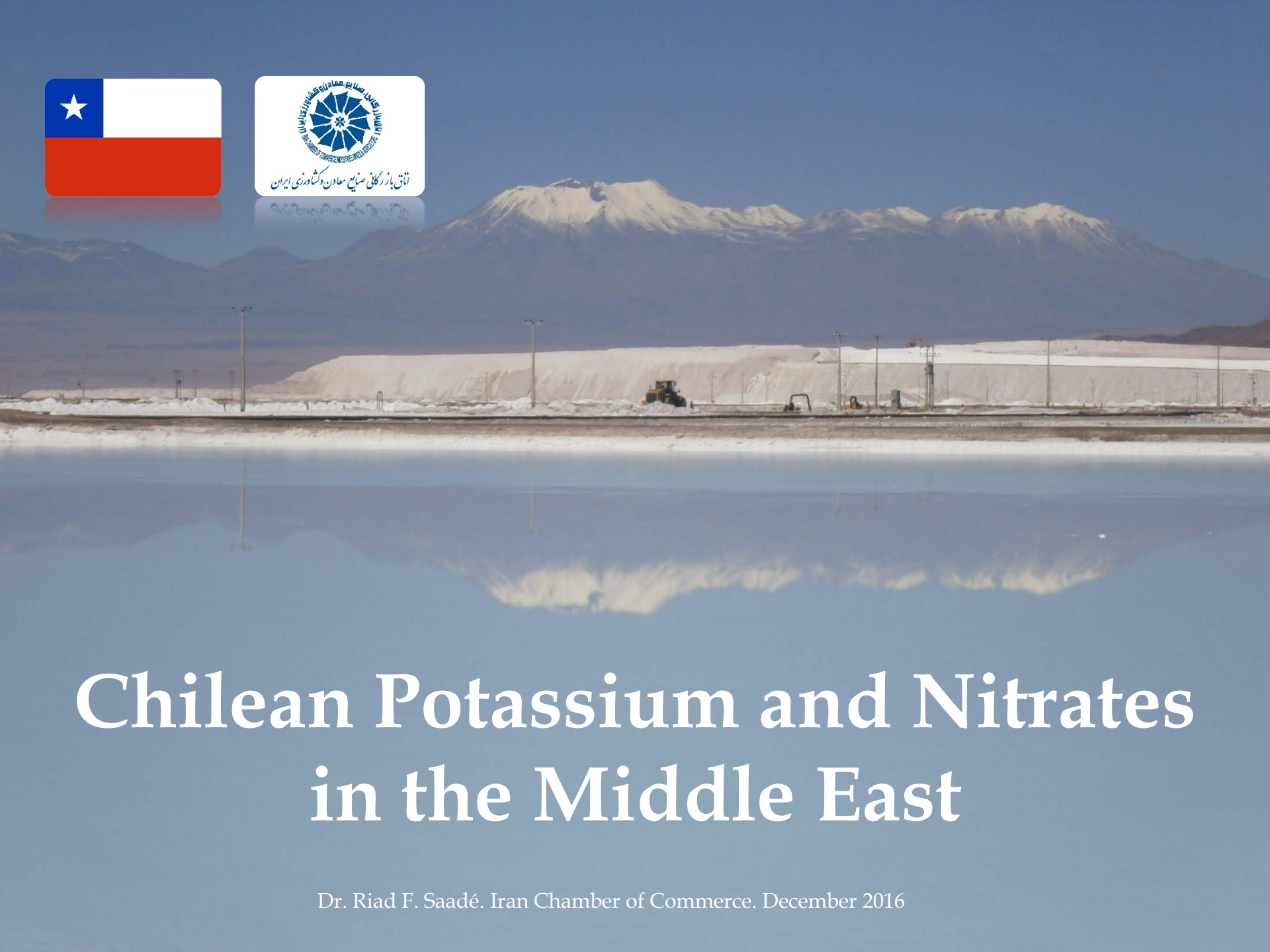


Chilean Potassium and Nitrates in the Middle East

Dr. Riad F. Saadé. Iran Chamber of Commerce. December 2016

Chile: processing of fertilizers in an environmentally friendly way

Caliche Ore

Salar Brines

Nitrates

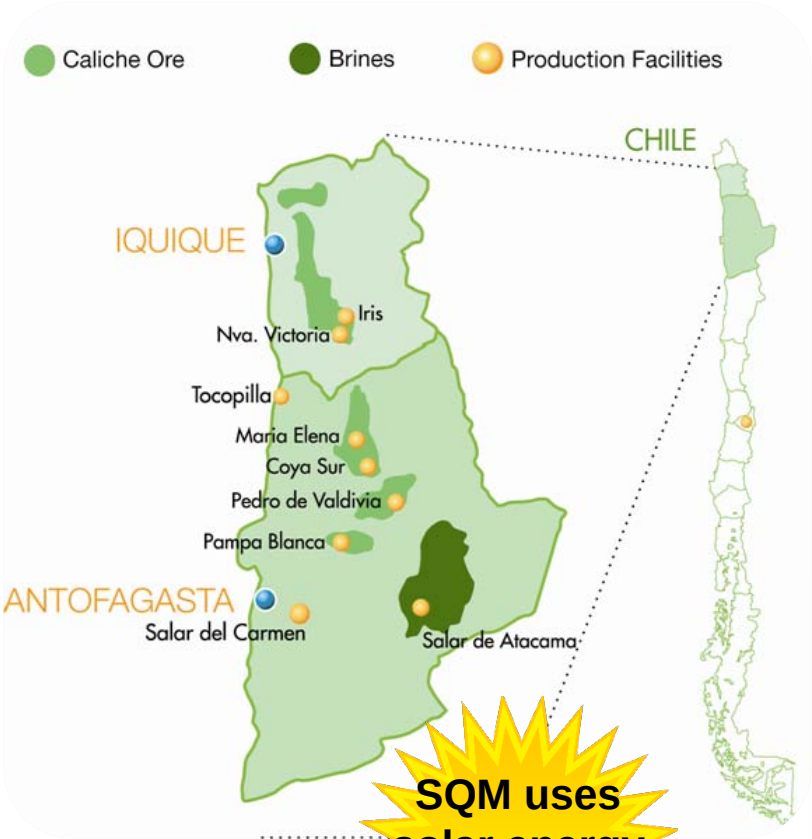
Iodine

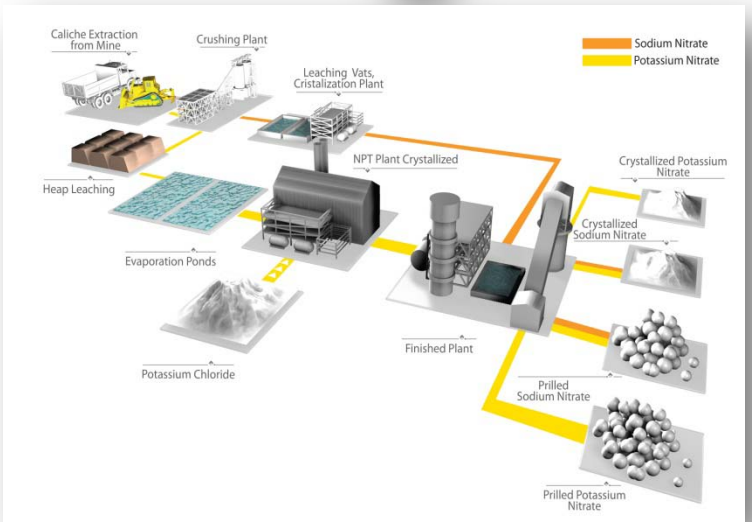
Potassium

Lithium

$NaNO_3$ + KCl = KNO_3 + NaCl (Salt)

Worldwide, SQM has the Lowest Carbon Footprint in its Production of Potassium Nitrate





Chilean Natural Nitrates
Beginnings in the Middle East

In the early 20th century, the sole source of Nitrogen fertilizers was the Chilean natural nitrate of soda. Later, Germany developed the synthetic chemical Nitrogen fertilizers.

In 1931, Chilean natural nitrate of soda was first introduced in the Middle East by starting with Lebanon and quickly spreading to Egypt, Syria, Iraq and Turkey

Source: Google Earth

Chilean Natural Nitrates
Exports to the Middle East

Vessel loading in Tocopilla – Northern Chile

In the 1960s, exports to the region reached approx. 50,000 MT per year shipped by large vessels calling at various Mediterranean ports.

Chilean Natural Nitrates
Exports to the Middle East

Fouad Saade, pioneer of Chilean Nitrates in the Middle East, with Ambassador Ramon Huidobro.

M/V Argolis unloading in Beirut, 1956.

How Modern Technology Boosted Chilean Nitrates

Advances in cultural practices were caused by the emergence of new technologies, of which fertigation was one of the most important.

Fertigation

Modern farming technology has evolved to adopt fertigation.

Fertigation is key for the optimal management of the water and nutrients needs of the crop.

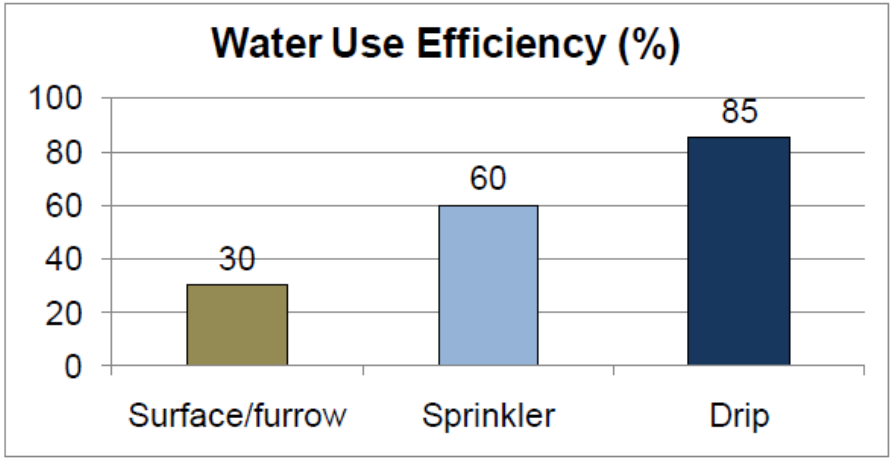
It allows the perfect control of water and nutrients supplies at each vegetative stage of the plant.

Fertigation is best applied through drip irrigation.

Irrigation Systems
Sprinkler, Pivot, and Drip Irrigation

Why is Fertigation so important?
It improves Nutrient and Water Use Efficiency

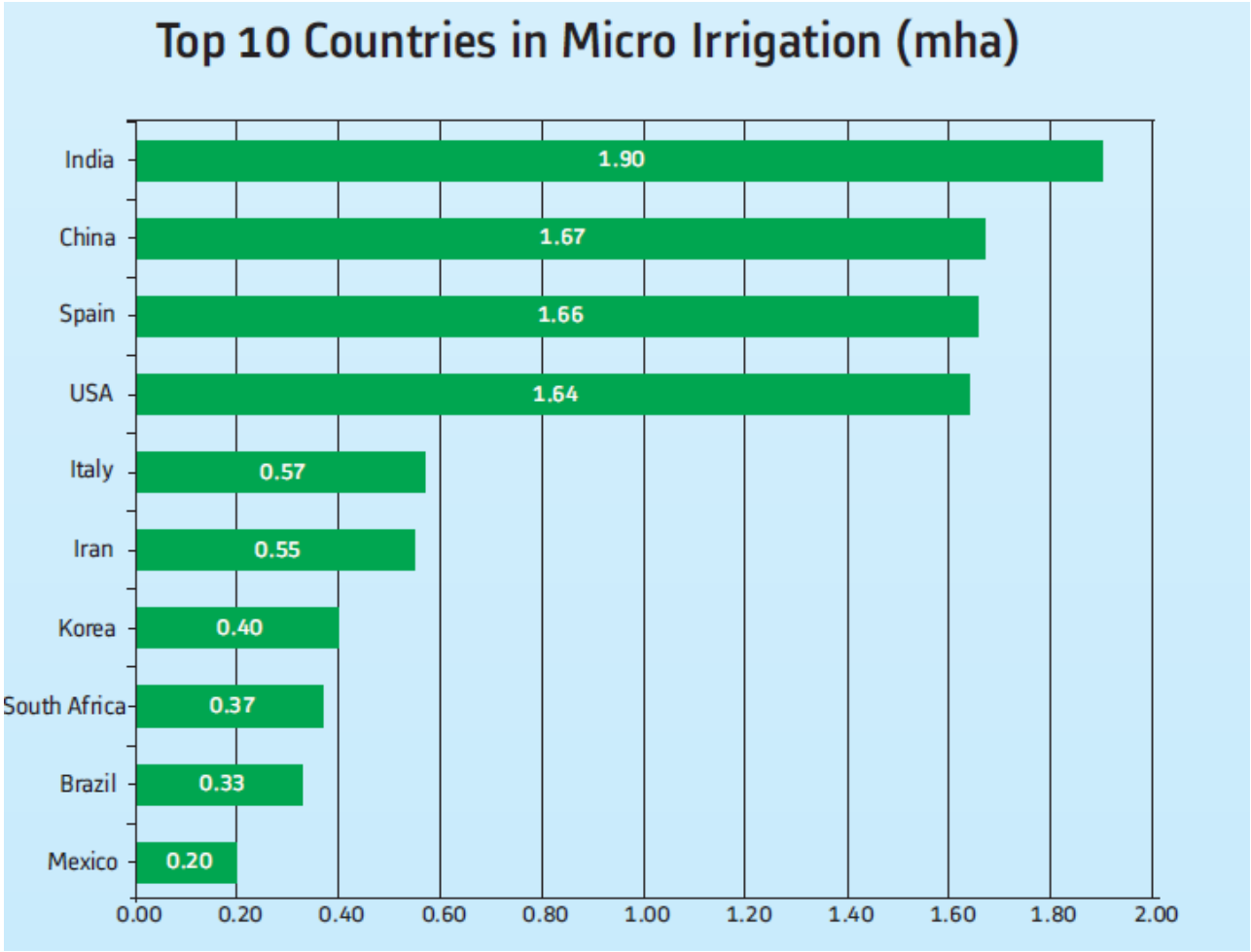
- Fast growing world population
- Increased scarcity of water, suitable for agriculture
- Less land available for agriculture (competition of urban development, industry, …)
- Need for increased water and nutrient use efficiency.



By feeding plants, not the soil

Fertigation increases fertilizer and water use efficiency.

Water Management and Irrigation is Critical



Source: ICID (1999-2013)

Drip irrigation trends in selected countries

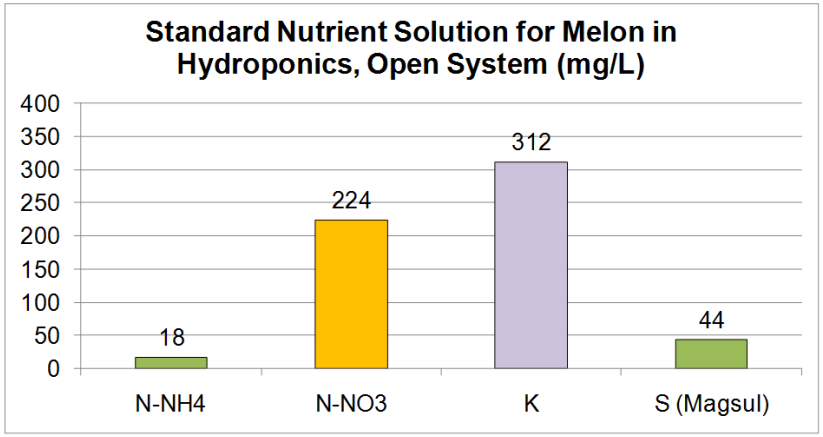
(in 1000s of hectares)

COUNTRY	2009	2010	2011	2012	2013	2014	2015
United States	1200	1533	1640	1640	1640	1640	1640
Spain	1502	1502	1629	1629	1658	1708	1756
Saudi Arabia	198	198	198	198	198	198	198
Mexico	200	200	200	200	200	200	200
Egypt	104	104	104	104	104	104	104
Iran	160	270	270	270	547	570	594
Turkey	170	26	26	150	340	340	340
Syria	62	62	62	62	62	62	62
Chile	23	23	23	23	23	23	23
Total	**3619**	**3918**	**4152**	**4276**	**4772**	**4845**	**4917**

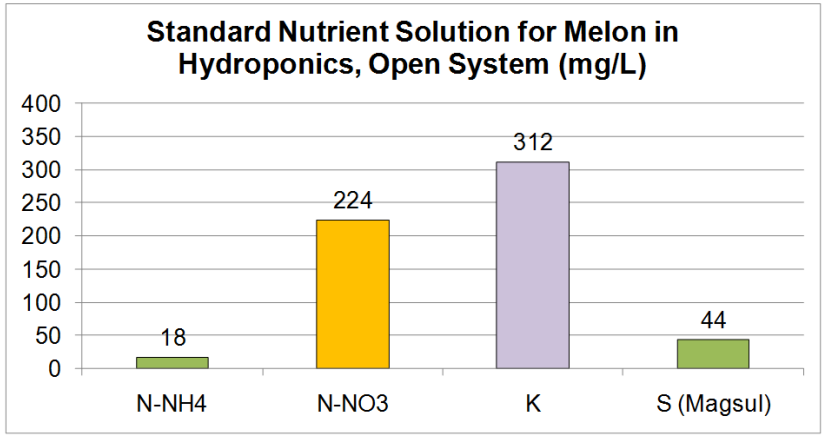
Source: Annual Reports ICID - http://www.icid.org/annualreport.html

Potassium Nitrate Avoids Over supply of Sulfate → Salt stress

Potassium Nitrate



Potassium Sulfate



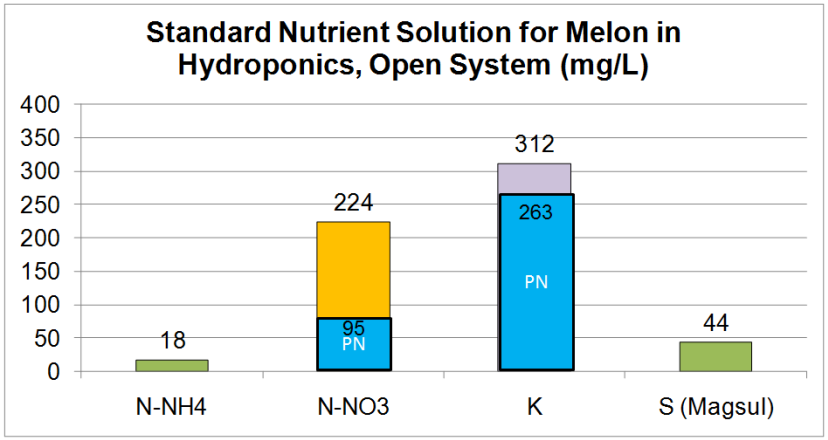
Two options left to feed potassium!

Which one? Let's test it on melon production!

Source: Wageningen Universtity publication on greenhouse nutrient solutions; Plant Nutrition of Greenhouse Crops,(2009) Wim Voogt

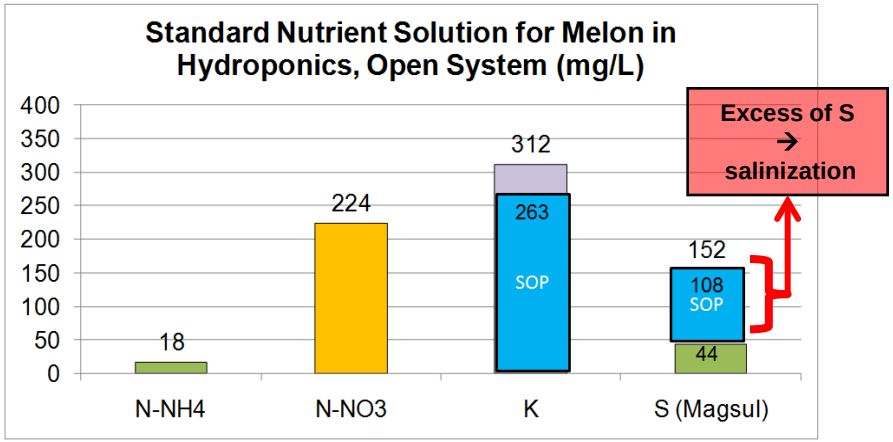
Potassium Nitrate Avoids Over supply of Sulfate → Salt stress

Potassium Nitrate



KNO3 minimal contribution to soil salinity.

Potassium Sulfate



SOP often leads to oversupply of S :

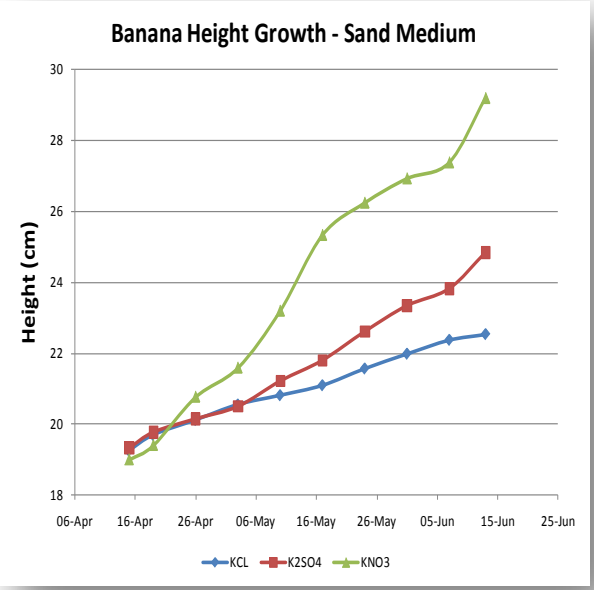
- Salt stress
- Nutritional imbalances (eg. Relation blossom end rot)

Source: Wageningen Universtity publication on greenhouse nutrient solutions; Plant Nutrition of Greenhouse Crops,(2009) Wim Voogt
Remark 1: Potassium (K) level is not filled to 100%, because we complete the P need with MKP which also contributes to K in solution

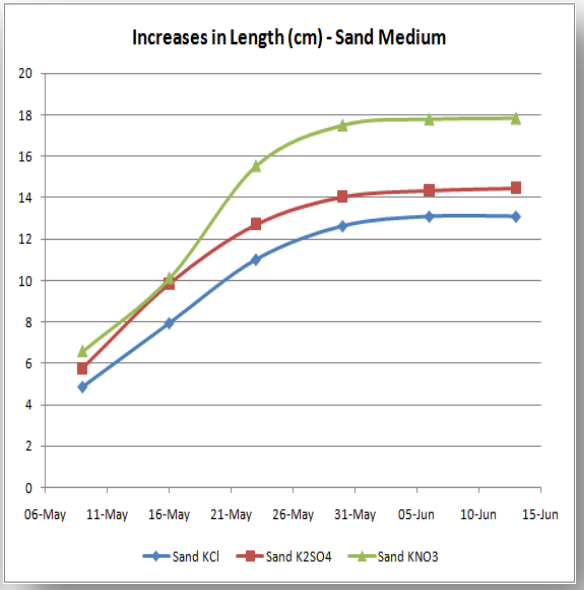
Potassium Nitrate (KNO_3) Relieves Soil Salinity Stress

Nitrate (-) helps to combat chloride (-) uptake in saline conditions

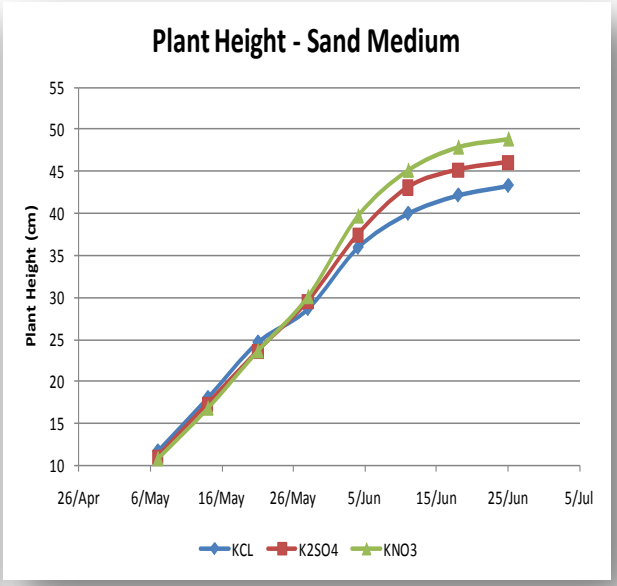
SQM trial: In Banana, orange and tomato, growth was most vigorous when the solution was made up with KNO_3! (<-> to SOP or MOP).



Banana



Citrus



Tomato

Summary & Conclusions

- Chilean Nitrates have a long history in the region
- Chilean Nitrates are also produced as much as possible in an environmentally friendly way
- Especially in fertigation they have an important role to play
- As water and land becomes more scarce, efficient irrigation and fertilization become more and more important
- Salinity is becoming more and more a problem in Iran. **Efficient fertilization with premium fertilizers as potassium nitrate is part of the solution**

Thank you for your attention

Extra Slides: Soil Salinity in Crops

Soil Salinity

Outdoor Pistachio growing (Iran)

Greenhouse Tomato growing in soil (Europe)

Heavy Salinity can be seen as whitish salt spots on soil surface

Salinity Stress for Crops

First symptoms of salinty stress in cucumber – marginal chlorosis – (Europe)

Marginal chlorosis in wine grape (Chile)

Extreme salinity stress in Tomato (SA)

Salinity stress: Marginal chlorosis (yellowing), necrosis, and leaf wilting

Selected Background Information on Agriculture in Iran

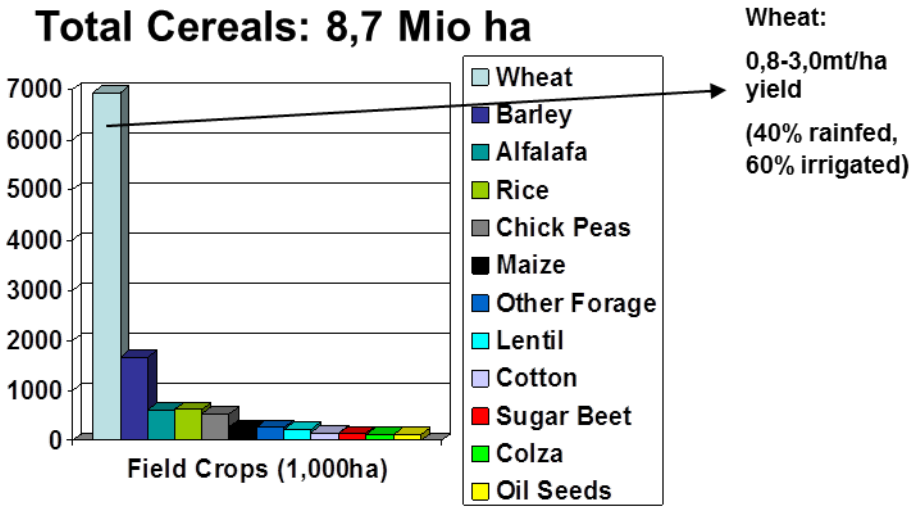
Agricultural Area in Iran

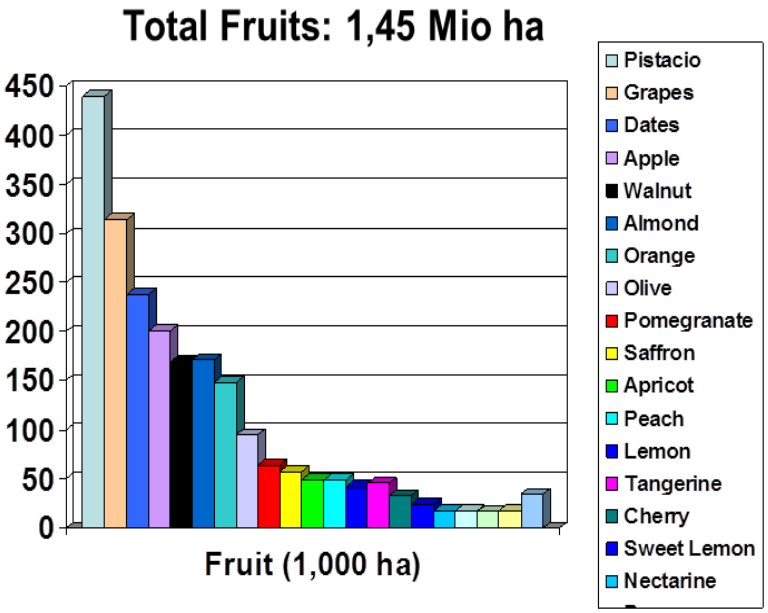
	mil ha	%
Total Area	164.8	
Used for agriculture	18.5	11%
Irrigated	7.0	38%
Dry land	7.0	38%
Fallow	4.5	24%
** Horticulture	2 mil ha	
Pressurized irrigation system	1 mil ha	
increasing ha / year	150000 ha	15%

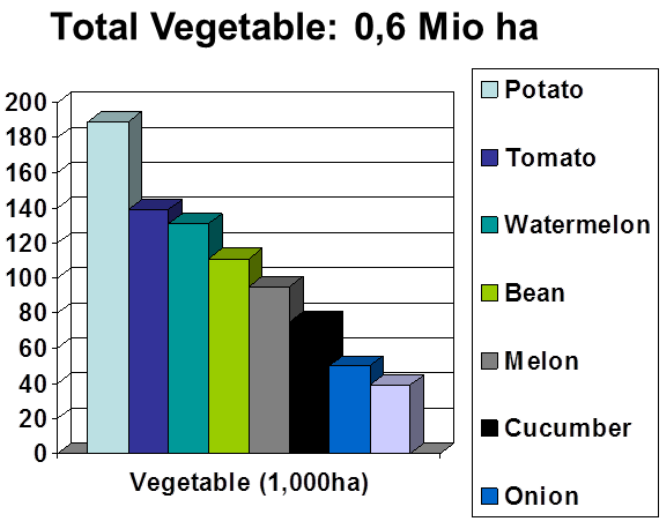
Map of Horticultural Crops by Region

	Area	Pistachio	Citrus	Stones / Apples	Greenhouses	Walnut	Dates
Kerman	370,000	280,000	12,000	13,000	75	16,400	22,000
Fars	267,000	50,000	16,000	11,000	10,000	10,000	
Khorasan	190,000	30000	33000	15000	8500	5500	
Mazandaran	105,000	60000	6000	4500	2000	1500	260
East Az	87,000	30000	16000	9500	6500	3400	2000
West Az	81,000	45000	13000	4000	2500	2000	
Jiroft	73,000	26000	1250	30000	1500	1200	
Qazvin	67,000	30000	5000	3000	3000	2500	3000
Hormozgan	64,000	16000	9000	5400	110	1500	2800
Esfahan	53,000	16000	6000	3000	2500	900	7000
Zanjan	48,000	20000	8000	6500	3800	1200	1200
Hamedan	46,000	17000	3500	2500	1200	14000	2300
Tehran	46,000	2400	5500	5500	5400	2500	5400
Khozestan	40,000	4000	350	27000	1400		
Markazi	28,000	10000	5000	400	2000	2800	2700
Charmahal	27,000	10000	4700	2600	2000	6500	
Yazd		31000	850	5500	10500	2000	2800
Semnan		10000	3500	80	1500	1000	4000
Qom		1300	3500	4000	1400		

Agricultural Area in Iran







Major Crops Production in Iran

FIELD CROPS	
Product	Acreage (1,000 ha)
Wheat	6,879
Barley	1,567
Alfalfa	638
Rice	630
Chickpeas	603
Maize	292
Lentils	209
Potatoes	164
Colza	161
Cotton	117
Beans	97
Soybeans	82
Clover	72
Sugarcane	67
Sugarbeet	60
Onions	59
Tobacco	12
TOTAL	**11,709**

ORCHARDS	
Product	Acreage (1,000 ha)
Pistachios	440
Grapes	260
Dates	239
Apples & Pears	219
Citrus	205
Stone Fruits	86
Walnut	45
Olives	7
TOTAL	**1,501**

VEGETABLES	
Product	Acreage (1,000 ha)
Tomatoes	147
Watermelon	119
Cucumber	82
Melon	78
TOTAL	**426**