



FERTILITY MANAGEMENT

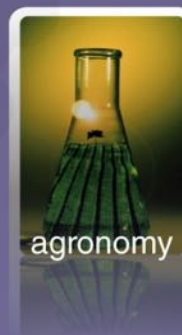
SPECIALTY CROPS PRODUCTION WORKSHOP

JUNE 2015



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SPECIALTY CROPS

Pitahaya / Olive / Wine Grape / Blueberry / Blackberry / Cherimoya

- **Soil requirements & Fertilizer plan**
- **Leaf sampling procedure & Reference values**
- **Nutrient management; basic guidelines**
- **Soil & Water analysis considerations**



Pitahaya

- Free draining, Sandy-Clay-Loam types
- pH: between 5.3 - 6.7
- High Organic Matter content (over 3%)



UCCE and AGQ Labs joined for a Project to study nutrient removal by fruit and nutrient content in plant tissue.

- 5 varieties to be tested
- Results available by October 2015



Pitahaya Fertilizer requirements

- Handful 14-14-14 every 3 months + Foliar sprays every 2 weeks
- Independent study (Nicaragua): 4 T/ha Organic matter + 187 N + 66 P + 198 K (Kg/ha)
- National Pintung University (Taiwan): 9 lb/plant steer manure every 4 months + 3.5 oz/plant (13-13-13)
- Department of Primary Industry, Fisheries and Mines (Australia)

•INTA (Colombia)

Tercer año en adelante	12-24-12 15-15-15	8.0 16.0	En círculo y tapado
Junio	12-24-12		
Agosto	15-15-15	16.0	
	12-24-12		
Octubre	Urea 46 %	16.0	En círculo y tapado.

	J	F	M	A	M	J	J	A	S	O	N	D
NPK				■				■				■
Dolomite		■				■				■		
Dynamic Lifter	■		■		■		■		■		■	
Mulch		■						■				

• It is proven that crop has fertilizer response. There are not enough studies yet.

• Soil and climate conditions make fertilizer management needed to be adjusted



Olive

- Good drainage (light texture)
- Drought resistant
- High salinity tolerant (up to 4 dS/m)
- pH: wide range, 5.5 - 8.5 (high lime)



Studies have shown correlation between certain nutrients and oil yield



Olive Fertilizer requirements

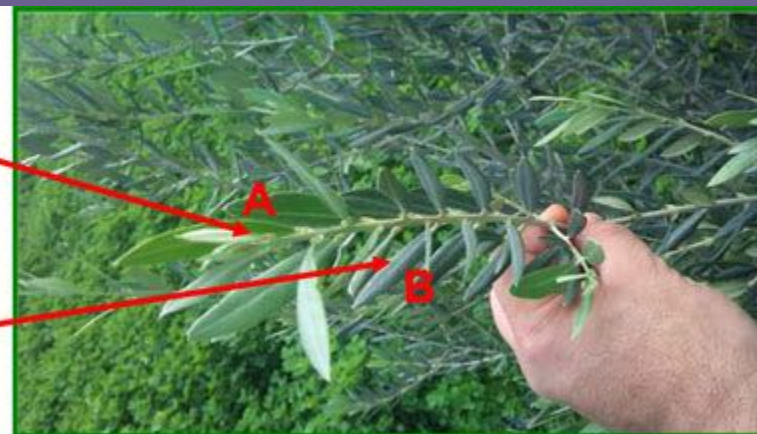
For a SHD 5,000-6,500 lbs/acre yield with 16-18% oil content;

- **Nitrogen** 50-60 lbs/acre (1.5-2.0% optimal range leaf analysis)
 - Timing: bloom & fruit set (excess may cause oil quality decline)
- **Phosphorus** 15-20 lbs/acre (0.1-0.3% optimal range leaf analysis)
 - Timing: root flush and throughout cycle
- **Potassium** 60-70 lbs/acre (0.8-1.0% optimal range leaf analysis)
 - Timing: fruit development

Leaf analysis: July; collect mature leaves from non bearing same year shoots (mid section growth)

Most recently matured leaf, current-season shoots. Note lighter color. **Take these.**

Note darker older leaf. It will not present an accurate assay of nutrient utilization.





Wine Grape

- Good drainage
- Capable of growing w/low fertility soils
- Vigor control (excessive growth)
- pH resistant (optimal 6.5 -7.5) (rootstock selection)
- Salinity tolerant (up to 2.5 dS/m) (rootstock selection)



Nutrient uptake (deficiencies) may have a huge impact in final fruit quality (wine source)



Wine Grape Fertilizer requirements

For a 2-4 tn/acre yield;

- **Nitrogen** 40-60 lbs/acre (2.1-2.5% optimal range leaf analysis)
 - Timing: throughout cycle but veraison (stop growth)
- **Phosphorus** 15-20 lbs/acre (0.15-0.40% optimal range leaf analysis)
 - Timing: 2/3 at root flush and end of cycle
- **Potassium** 65-90 lbs/acre (0.6-1.1% optimal range leaf analysis)
 - Timing: 70% before veraison

Leaf/petiole analysis: at bloom and veraison;
collect mature leaves opposite to cluster





Blueberry

- Good drainage, light soil
- High organic matter (2-5%) Mulch
- Acidic pH (5.0 -5.8)
- Sensitive to Chlorides and Sodium



Nitrogen uptake occurs in form of Ammonium exclusively.



Blueberry Fertilizer requirements

For a 20,000 – 24,000 lbs/acre yield;

- **Nitrogen** 125-175 lbs/acre (1.5-2.0% optimal range leaf analysis)
 - Timing: vegetative vs productive stages (N/K ratios)
- **Phosphorus** 40-60 lbs/acre (0.10-0.15% optimal range leaf analysis)
 - Timing: 2/3 at root flush and end of cycle
- **Potassium** 100-150 lbs/acre (0.6-1.0% optimal range leaf analysis)
 - Timing: 70% from bloom through harvest

Leaf analysis: collect most recent fully expanded leaves. 5 leaves from 10 plants randomly distributed throughout the field





Blackberry

- Well drained, sandy loam
- Medium organic matter (2-3%)
- Slightly acidic pH (5.8 -6.8)
- Sensitive to Chlorides and Sodium



Phenological cycle and cultural practices are KEY



Blackberry Fertilizer requirements

For a 20,000 – 25,000 lbs/acre yield;

- **Nitrogen** 150-175 lbs/acre (3.0-4.0% optimal range leaf analysis)
 - Timing: vegetative vs productive stages (N/K ratios)
- **Phosphorus** 60-80 lbs/acre (0.4-0.6% optimal range leaf analysis)
 - Timing: 2/3 at root flush and end of cycle
- **Potassium** 120-140 lbs/acre (1.0-1.5% optimal range leaf analysis)
 - Timing: 70% from bloom through harvest

Leaf analysis: collect most recent fully expanded leaves. 5 leaves from 10 plants randomly distributed throughout the field





Cherimoya

- Well drained, sandy loam
- Medium-High organic matter (3%)
- Wide pH range (6.2 -7.6)
- Sensitive to Chlorides and Sodium



Cherimoyas are shallow rooted and can absorb nutrients quickly. Yellow leaves may not indicate a need for fertilizer but may be a response to cold temperatures or to the soil being too dry or wet.



Cherimoya Fertilizer requirements

For a 7,500 – 10,000 lbs/acre yield;

- **Nitrogen** 125-150 lbs/acre (2.25-3.10% optimal range leaf analysis)
 - Timing: vegetative vs productive stages (N/K ratios)
- **Phosphorus** 50-75 lbs/acre (0.15-0.25% optimal range leaf analysis)
 - Timing: 2/3 at root flush and end of cycle
- **Potassium** 125-150 lbs/acre (1.0-2.0% optimal range leaf analysis)
 - Timing: 70% from bloom through harvest

Leaf analysis: collect most recent fully expanded leaves. 4 leaves from 8 plants randomly distributed throughout the field





NUTRIENT MANAGEMENT

- **ESSENTIAL MINERAL ELEMENTS:** in its absence the plant is unable to complete a normal life cycle and that the element is part of some essential plant constituent or metabolite

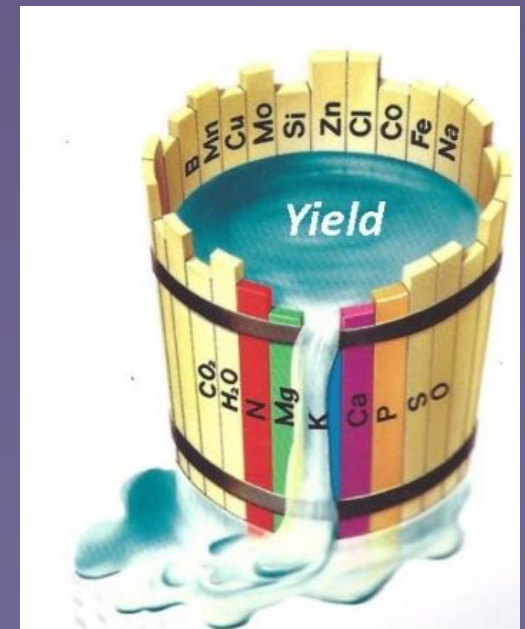
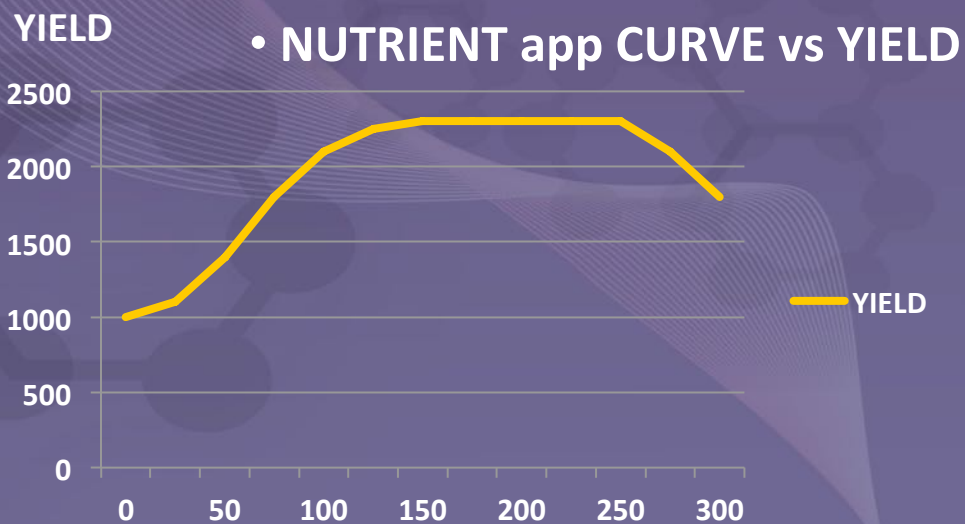
Primary Macronutrients: N, P, K

Secondary Macronutrients: Ca, Mg, S

Micronutrients: B, Fe, Mn, Cu, Zn, Mo

Others in study: Si, Na, Cl, Ni...

- **LIEBIG'S LAW OF THE MINIMUM**





• EVALUATE FERTILIZER NEEDS

Extractions (minerals in fruit removed + biomass growth –stems, roots-): Lab analysis

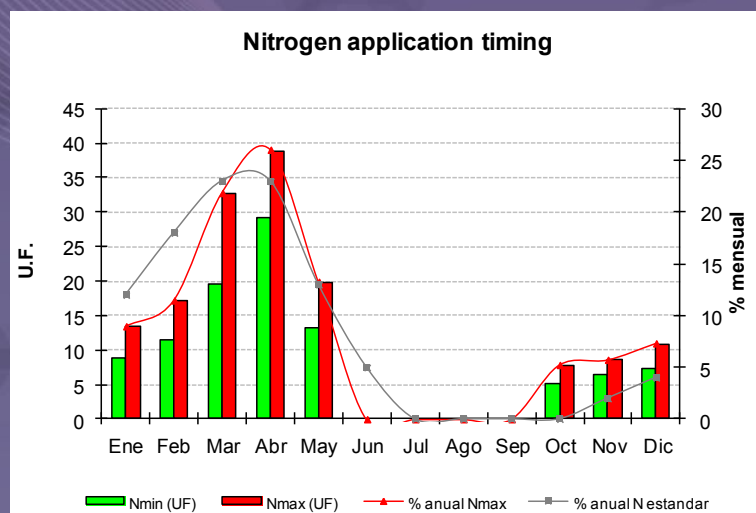
Phenological stages require different amount of nutrients (dose): Nutritional Monitoring

Type of fertilizers used and interaction

Soil and water contribution

Efficiency of application and absorption: Monitore nutrient levels in plant tissue

PCA/CCA will help putting together Fertilization program





SOIL ANALYSIS AND AMENDMENTS

Simple random pattern

0-12" or 0-18"

12 soil cores

Uniformity

1lb/sample

Sealable plastic bag

PHYSICAL PROPERTIES

GRANULOMETRY (PEC-018)	Clay (%):	20
	Silt (%):	20
	Sand (%):	60
	TEXTURE (U.S.D.A. Clasification):	Sandy Clay Loam

Chemical Properties

			<u>REFERENCE VALUES</u>		
<i>pH (Extract 1/2,5 H2O)</i> (PEC-001)	6,89		6,5	-	7,5
<i>E.C. 20°C (Extract 1/5 H2O)</i> (PEC-002)	122,7 $\mu\text{S}/\text{cm}$				400
<i>Potenciometry (titration)</i>					
<i>ACTIVE LIME (% CaCO3)</i> (PEC-014)	<0,50 %		1	-	4
<i>ORGANIC MATTER (Walkley-Black)</i> (PEC-013)	1,28 %		2	-	3
<i>TOTAL NITROGEN (Dum)</i> (PEC-034)	742,6 mg/Kg		1000	-	1500
<i>Spectrophotometry U.V./VIS.</i>					
* Available PHOSPHOROUS (PEC-009)	12,46		20	-	40
BORON (PEC-005)	2,58 mg/Kg			-	
<i>Optical Emission Spectr. (ICP-OES)</i>					
<i>Extraction NH4Ac 1N, pH SOIL</i>					
* Available CALCIUM (PEC-009)	15,73 meq/Kg				
* Available MAGNESIUM (PEC-009)	7,15 meq/Kg				
* Available POTASSIUM (PEC-009)	0,38 meq/Kg				
* Available SODIUM (PEC-009)	1,15 meq/Kg				
<i>Extraction DTPA</i>					
* IRON (PEC-009)	27,57 mg/Kg				
* MANGANESE (PEC-009)	20,15 mg/Kg				
* COPPER (PEC-009)	<2,5 mg/Kg				
* ZINC (PEC-009)	<2,5 mg/Kg				



Tested by AGQ Labs



WATER ANALYSIS

ANALYTICAL REPORT - WATER

Sampling Location:	Start Date:	03/20/2015	Client Code:	102892
Sampled By: Client	Finalized Date:	03/23/2015	Contract:	US15-0007-AGR
Description:	EAST RANCH - WATER QUALITY RECYCLED		Third party client:	

ANALYTICAL RESULTS

Parameter	Result	Units	Result	Units	SOP	Technique	Uncert
Chemical Properties							
Electrical Conductivity (E.C.)	1281	µS/cm a 25°C	1,28	mS/cm a 25°C	PECUSA-002	Potentiometry	-
pH	8,49				PECUSA-001	Potentiometry	-
* TDS	< 1,00	g/L			PECUSA-037	Calculated	-
Anions							
Alkalinity	232	mg/L	3,81	meq/L	PEUSA-336	Cont Flow Analysis	-
Chlorides	106	mg/L	2,98	meq/L	PEUSA-336	Cont Flow Analysis	-
Nitrates	18,4	mg/L	0,30	meq/L	PEUSA-336	Cont Flow Analysis	-
Sulphates	255	mg/L	5,30	meq/L	PECUSA-009	ICP-OES	-
Cations							
Calcium	93,8	mg/L	4,68	meq/L	PECUSA-009	ICP-OES	-
Magnesium	53,1	mg/L	4,37	meq/L	PECUSA-009	ICP-OES	-
Potassium	16,0	mg/L	0,41	meq/L	PECUSA-009	ICP-OES	-
Sodium	160	mg/L	6,95	meq/L	PECUSA-009	ICP-OES	-
Trace Elements							
Boron	0,46	mg/L			PECUSA-009	ICP-OES	-
Copper	< 0,05	mg/L			PECUSA-009	ICP-OES	-
Iron	0,07	mg/L			PECUSA-009	ICP-OES	-
Manganese	< 0,05	mg/L			PECUSA-009	ICP-OES	-
Zinc	< 0,05	mg/L			PECUSA-009	ICP-OES	-

Before filters

Let system run for 30'

125ml/sample

Inert plastic bottle



Spectrometry with Continuous Flow Analyzer (CFA)



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Cromatography (HPLC)





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