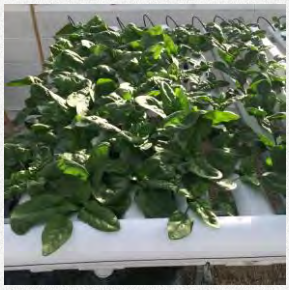
Year Round Hydroponic Production of Greenhouse-grown Greens





Arkansas Hydroponic Lettuce Protocol

- Leach rockwool with a pH-adjusted water.
- Leach Oasis with water.
- Some water Oasis /rockwool with 0.5 mS/cm fertilizer solution before sowing.

- Temperature = 65°F (night) and 68°F (day)
- Relative humidity = 60% - 70%
- Ambient late fall – mid-spring light levels
- Begin irrigation with 1.0 mS/cm and 5.9 pH fertilizer solution immediately.
- Irrigation frequency depends on temperature.

- At 2-leaf stage move to nursery or at 4-leaf stage move to final production (deep flow runs, shallow aggregate beds or NFT)
- Maintain nutrient solution at 1.2 mS/cm (summer) – 1.4 to 1.5 mS/cm (late fall/winter/early spring) and pH of 5.9.
- Conduct partial solution replacement after several weeks depending on tank size.

- Optimal temperature is 65ºF in day 62ºF at night. Nutrient solution not higher than 70ºF (21 C).
- Relative humidity = < 70%
- Maintain good air movement in greenhouse with low profile HAF fans or vertical fans.
- Ambient late fall – mid-spring light levels and seasonal DLI (5.0 -12.5)

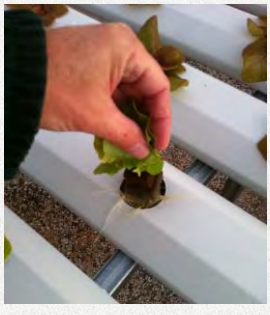
Crop Spacing

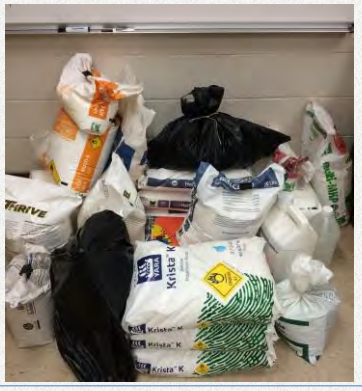
- 8-inch centers in shallow aggregate beds and deep flow
- 8 inches in line and 8 inches across centers in NFT
- Spacing must change depending on light levels (increase under low light).

Crop Scheduling

- Very dependent on DLI, temperature and cultivar.
- Generally, 2 - 4 weeks for germination/seedling development and 4 - 6 weeks for growth to final product.

- Cease and Milstop for Powdery mildew
- Monitor for thrips and aphids
- Poor coloration might occur under polycarbonate bi-wall panels





Example Fertilizer Solutions for Greenhouse Hydroponic Lettuce Production [z]

	Resh, 1993	Resh web	Morgan, 2000	Arkansas formula[y]
NO_3^-	165	165	120 - 170	169
NH_4^+	25	15	0	9
P	50	50	35 - 65	50
K	210	210	120 - 240	212
Ca	200	190	180 - 220	193
Mg	40	45	45 - 55	45
S	113	113	30 - 70	75
Fe	5	4	3 - 5	4
Mn	0.5	0.5	2 - 3	0.5
Cu	0.1	0.1	0.06 – 1.0	0.1
Zn	0.1	0.1	0.06 – 1.0	0.1
B	0.5	0.5	0.7 – 0.9	0.5
Mo	0.05	0.05	-	0.05
Cl	-	-	-	10
Na	-	-	< 55	11

[z] Values are in parts-per-million. [y] EC = 1.8 mmho/cm and pH of 6.1

Arkansas/Evans Lettuce Greens Formulation (15 L of 100X concentrate)

Fertilizer	Tank A	Tank B
Calcium nitrate	1350 g	
Potassium nitrate	450 g	
Fe-DTPA (11% Fe)	61.6 g	
Monopotassium phosphate		330 g
Potassium sulfate		115.5 g
Magnesium sulfate heptahydrate		645 g
Manganese sulfate heptahydrate		4.65 g
Copper sulfate pentahydrate		0.585 g
Zinc sulfate		0.264 g
Boric acid		4.11 g
Ammonium molybdate		0.17 g
When diluted produces a solution with an EC of about 1.8 mS/cm and a pH of about 6.1.		

pH Management

- Citric acid
- Phosphoric acid
- Nitric acid
- Sulfuric acid (concentrated or 1N)
- Potassium hydroxide or potassium bicarbonate

Cultivars for Greenhouse Production

Best for Beginners

- Adriana*
- Nancy
- Rex*
- Skyphos

- Dark Red Lollo Rossa*
- Lollo Rossa

- Helvius*
- Salvius
- Winter Density
- Red Rosie*

- Red Sails
- Vulcan
- Teide

- Rouxai*
- Oscarde*
- Panisse*

- Salanova types*

Basil

- Increase iron in fertilizer 25% - 50% depending on light level and growth rate.
- Increase E.C. to 1.6 – 1.8 mS/cm under higher light levels.
- May be grown alongside lettuce but optimal temperatures are higher.
- Use multispeed cell oasis or rockwool and plant 2 – 3 seed per cell.

Questions ?