*Recent Developments in Hand Weeding Costs of Coastal Vegetables**

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Vegetable Crops – Weed Science
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University of California
Agriculture and Natural Resources

Questions for today…

What are weed management practices and costs?

How might new labor laws impact costs?

How might mechanization impact practices and costs?

Recent Central Coast Cost and Return Studies -

Production and harvest practices and costs

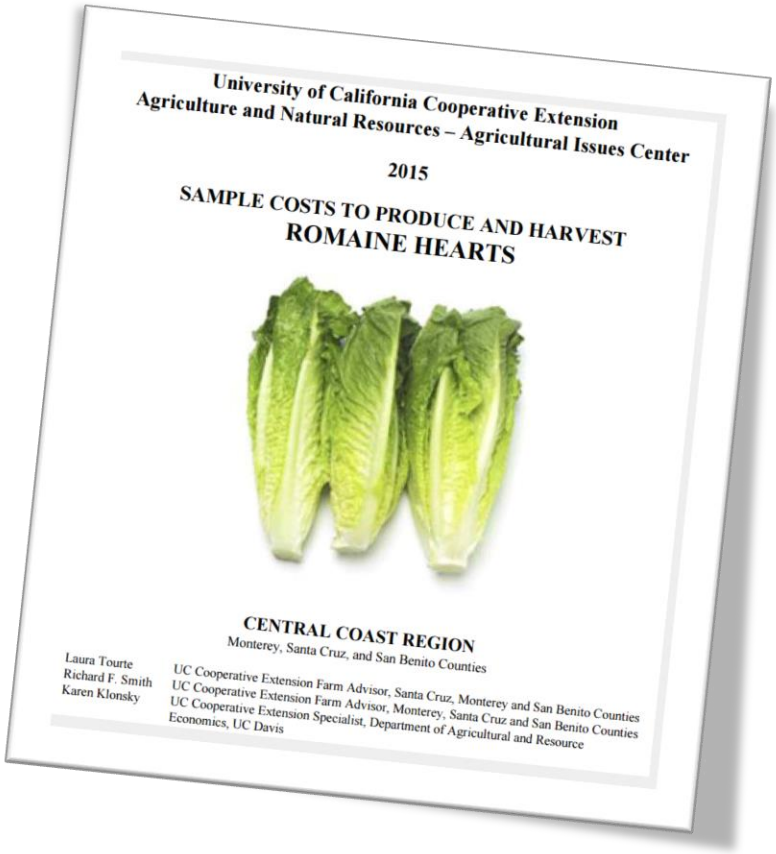
2015

- Romaine Hearts Lettuce
- Organic Spinach

In progress

- Iceberg Lettuce
- Broccoli

http://coststudies.ucdavis.edu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2015

SAMPLE COSTS TO PRODUCE AND HARVEST
ROMAINE HEARTS

CENTRAL COAST REGION
Monterey, Santa Cruz, and San Benito Counties

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*Study Labor Rates – 2010 and 2015**

Year	2010 ($/hour)	2015 ($/hour)	Percent Increase
Field labor (base wage)	8.50	**11.50**	35
Field labor with benefits† (wage + percent benefits)	11.40	**16.10**	41
Machine labor (base wage)	10.00	**15.50**	55
Machine labor with benefits (wage + percent benefits)	13.40	**21.70**	62

*** Source: UC Cooperative Extension Cost and Return Studies. http://coststudies.ucdavis.edu.**

† Benefits rates included in studies: 34% (2010) or 40% (2015).

Draft 2016 studies same base rates; 41% benefits.

*Production and Harvest Costs – 2015 Studies**

Romaine Hearts

Category	Cost ($/Acre)
Cultural	*2,874*
Business Overhead	1,771
Investment	324
Subtotal	**4,969**
Harvest	5,813
Total	**10,781**

Organic Spinach

Category	Cost ($/Acre)
Cultural	*4,336*
Business Overhead	1,261
Investment	219
Subtotal	**5,831**
Harvest	1,300
Total	**7,131**

Weed management included in cultural costs

* Source: UC Cooperative Extension Cost and Return Studies. http://coststudies.ucdavis.edu.

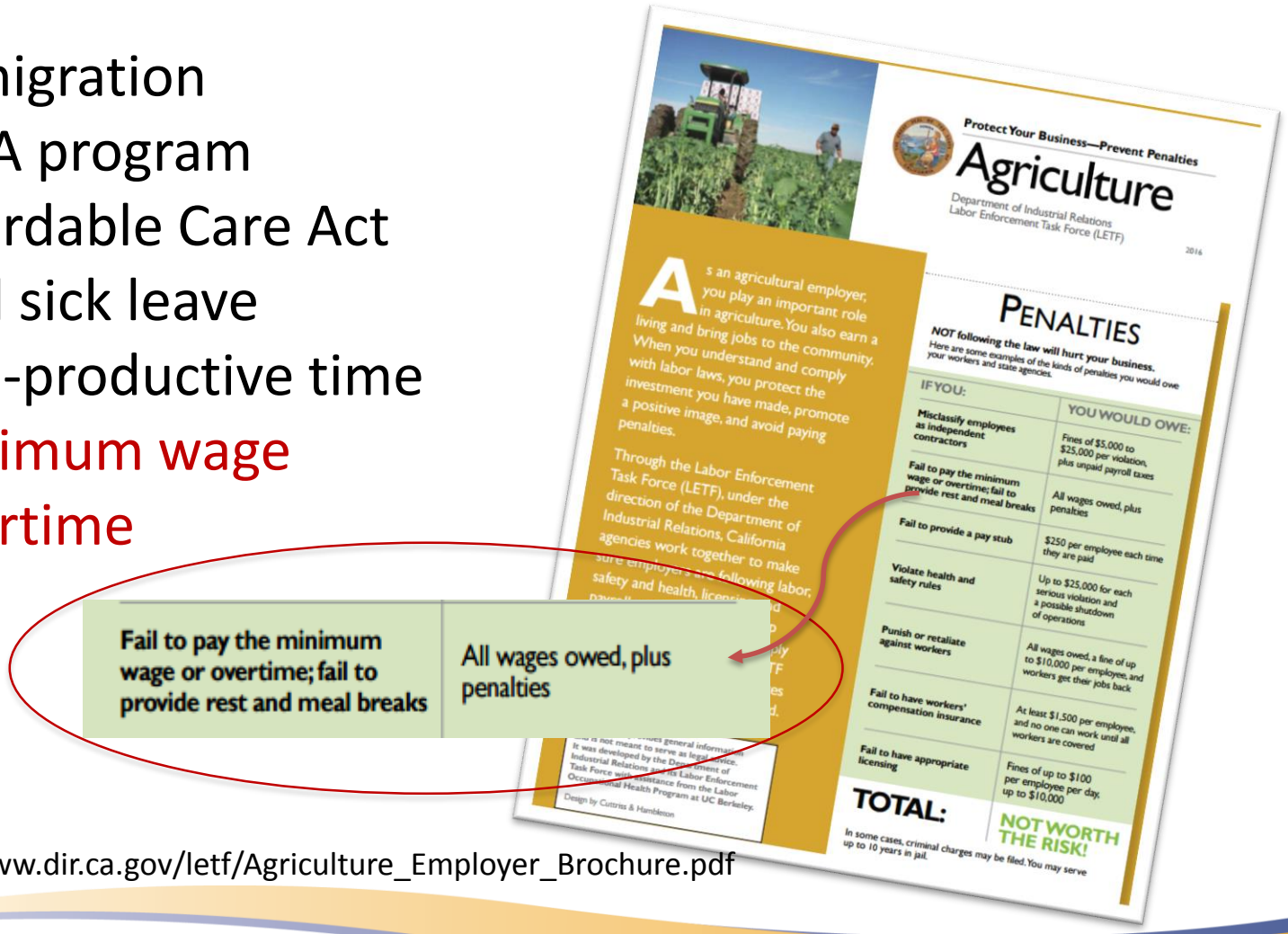
*Weed Management Practices & Costs 2015**

Practice	Romaine Hearts ($/acre)	Organic Spinach ($/acre)
Herbicide application	51	0
Mechanical cultivation	46	39
Hand weeding	153	440
Total weed mgt cost	***250***	***479***
Percent (of cultural costs)	9	11
Field+machine labor costs	***179***	***461***
Percent (of weed mgt cost)	72	96

* Source: UC Cooperative Extension Cost and Return Studies. http://coststudies.ucdavis.edu. Costs per acre include materials, equipment, and labor ($16.10/hr. field; $21.70/hr. machine).

Labor Challenges: Availability and Higher Costs

- Immigration
- H-2A program
- Affordable Care Act
- Paid sick leave
- Non-productive time
- Minimum wage
- Overtime



http://www.dir.ca.gov/letf/Agriculture_Employer_Brochure.pdf

*Minimum Wage Law (SB 3): Phase-In Schedule**

Date	$/hour - 26 or more employees	$/hour – 25 or fewer employees
Current	10.00	10.00
Jan 1 2017	10.50	10.00
Jan 1 2018	11.00	10.50
Jan 1 2019	12.00	11.00
Jan 1 2020	13.00	12.00
Jan 1 2021	14.00	13.00
Jan 1 2022	**15.00**	14.00
Jan 1 2023	15.00	**15.00**

* Source: California Legislative Information Senate Bill No. 3.
Notes: Governor may suspend increase in years with budget crises.
In 2024 minimum wage will increase with inflation.
Less than 5% of affected workers are in agriculture.
(UC Berkeley Labor Center – March 2016).

*Projection of weed management costs with increase in minimum wage - example**

	2015	2022	Difference
Field labor ($/hour)†	11.50	15.00	$ 3.50
Machine labor ($/hour)	15.50	20.15	$ 4.65
Labor cost ($/acre) – romaine hearts	179	233	$ 54.00
Labor cost ($/acre) – organic spinach	461	599	$ 138.00

* Exercise projecting 30% increase for field labor and similar increase for machine labor, using 2015 UC Cooperative Extension Cost and Return Studies http://coststudies.ucdavis.edu.

† Hourly wage figures do not include a benefits package.

*Overtime Law: AB 1066 – Phase-In Schedule**

Date	Hours/day 26 or more employees	Hours/week 26 or more employees	Hours/day 25 or fewer employees	Hours/week 25 or fewer employees
Current	10.0	60	10.0	60
Jan 1 2017	10.0	60	10.0	60
Jan 1 2018	10.0	60	10.0	60
Jan 1 2019	**9.5**	**55**	10.0	60
Jan 1 2020	9.0	50	10.0	60
Jan 1 2021	8.5	45	10.0	60
Jan 1 2022	**8.0**	**40**	**9.5**	**55**
Jan 1 2023	8.0	40	9.0	50
Jan 1 2024	8.0	40	8.5	45
Jan 1 2025	8.0	40	**8.0**	**40**

Start 26 or more

Start 25 or less

* California Legislative Information Assembly Bill No. 1066.
Law includes provisions for different overtime compensation and days of rest.

*Average hours per week for U.S. hired farm workers**

	April 2015	July 2015	October 2015	January 2016	Overtime hours†
U.S.	40	41	42	39	
California	42	44	44	41	1-4
Arizona	<----------46-47---------->				

* Source: Martin, P.L. Labor cost challenges facing California agriculture, ARE Update 20(1), using limited data from USDA's Farm Labor Report. Caveats: CA average hours/week includes long-season and livestock workers; data does not include workers from farm labor contractors.

† For CA if AB 1066 were in place during this time period.

*Considerations**

- Overtime law most likely to affect irrigators and equipment operators because of nature of work.
- Slowdown in Mexico – U.S. migration since recession; few newcomers.
- Labor availability constrained – many employers likely to improve efficiency in scheduling or pay overtime rather than try to recruit and train additional workers.
- Many new workers are H-2A guest workers.

* Source: Martin, P.L. Labor cost challenges facing California agriculture. ARE Update 20(1). http://giannini.ucop.edu/publications/are-update/.

*4-S Responses to Higher Wages**

Satisfy – retain workers through added benefits or bonuses

Stretch – workforce with mechanical aids[5]

Substitution – replace workers with machines

Supplement – current workers with H-2A guest workers

Are there additional S's to consider?

***Shift* – shift to alternative crops that require less labor ??**

***Shrink* – production acreage and/or operation ??**

* Source: Martin, P.L. Labor cost challenges facing California agriculture. ARE Update 20(1). http://giannini.ucop.edu/publications/are-update/.

Mechanization as substitute for labor

- Successfully developed and introduced for some crops over time.
- Mechanization in fresh market crops has not been as straightforward.
  - Quality attributes of fresh products.
  - Labor availability and cost.
  - Investment cost.
- Recent developments in planting, thinning, weed management (and harvest).

Mechanized Thinning, Weeding, Planting - Examples

Blue River Technology
Automated Thinning

Steketee

THE ROBOVATOR

Automated
Weeding

Plant Tape
Automated Transplanting

Why Mechanize? (Incentives)

- Labor constraints
- Higher cost labor
- Reduced herbicide use/access
- Gains in knowledge/skills
- Opportunity for business and workers

Why Not Mechanize? (Drawbacks)

- Investment cost
- Knowledge/training needs
- Change of practices/production
- Level of "comfort" with technology and change

"Mechanization is a process, not an event"

Phil Martin – Professor Emeritus, UC Davis

Weed Management Mechanization Projects

Past: Machine Assisted Inter- and Intra-row Cultivators

- Reduced hand weeding times (in many cases)
- Higher rate of precision in transplanted crops
- Lower yield with less precision
- Net returns to growers inconsistent

Present: Automated Weed/Crop Differentiation

- Evaluation of potential investment cost
- Evaluation of operational cost
- Evaluation of yield and net returns to growers

The process continues….

*For Discussion Purposes Only: DRAFT Minimum Wage and Overtime PROJECTIONS / ESTIMATES**

Table 1. Minimum Wage increases by year for farms with 26 or more employees†

Year	2016	2017 (proj)	2018 (proj)	2019 (proj)	2020 (proj)	2021 (proj)	2022 (proj)
Min Wage (from - to in $/hr)	$10.00	$10.00-$10.50	$10.50-$11.00	$11.00-$12.00	$12.00-$13.00	$13.00-$14.00	$14.00-$15.00
Difference/hour ($)	na	$0.50	$0.50	$1.00	$1.00	$1.00	$1.00
Min Wage Increase (%)	na	5%	4.8%	9%	8.33%	7.7%	7.1%
Field Labor (base in $/hr)‡	$11.50	$12.08	$12.65	$13.79	$14.94	$16.09	$17.24
Equip Labor (base in $/hr)‡	$15.50	$16.28	$17.06	$18.59	$20.14	$21.69	$23.23
Field Labor (w/41% benefits in $/hr)‡	$16.22	$17.03	$17.84	$19.45	$21.07	$22.69	$24.30
Equip Labor (w/41% benefits in $/hr)‡	$21.86	$22.95	$24.05	$26.21	$28.40	$30.58	$32.76

* Projection/estimate is one (of many) possible scenarios for labor/increased costs for agriculture.

† Source: CA Legislative Information Senate Bill No. 3

‡ Exercise using baseline wage and benefits rates from DRAFT 2016 UC Cooperative Extension studies for iceberg lettuce and broccoli, and the same percent increase as for minimum wage.

*For Discussion Purposes Only: DRAFT Minimum Wage and Overtime PROJECTIONS / ESTIMATES**

Table 2. Minimum Wage and Overtime projections for farms with 26 or more employees†

Year	2016‡	2017 (proj)	2018 (proj)	2019 (proj)	2020 (proj)	2021 (proj)	2022 (proj)
Field Labor (base in $/hr)	$11.50	$12.08	$12.65	$13.79	$14.94	$16.09	$17.24
OT (hrs/wk)	0	0	0	5	10	15	20
OT Labor (1.5X in $/hr)	$0.00	$0.00	$0.00	$20.69	$22.41	$24.14	$25.85
Est Increase/wk ($)	$0.00	$0.00	$0.00	$103.45	$224.14	$362.09	$517.07
Equip Labor (base in $/hr)	$15.50	$16.28	$17.06	$18.59	$20.14	$21.69	$23.23
OT (hrs/wk)	0	0	0	5	10	15	20
OT Labor (1.5X in $/hour)	$0.00	$0.00	$0.00	$27.89	$30.21	$32.54	$34.85
Est Increase/wk ($)	$0.00	$0.00	$0.00	$139.43	$302.10	$488.04	$696.92

Year	2016‡	2017 (proj)	2018 (proj)	2019 (proj)	2020 (proj)	2021 (proj)	2022 (proj)
Field Labor (w/41% benefits in $/hr)	$16.22	$17.03	$17.84	$19.45	$21.07	$22.69	$24.30
OT (hrs/wk)	0	0	0	5	10	15	20
OT Labor (1.5X in $/hr)	$0.00	$0.00	$0.00	$29.17	$31.60	$34.04	$36.45
Est Increase/wk ($)	$0.00	$0.00	$0.00	$145.87	$316.03	$510.55	$729.07
Equip Labor (w/41% benefits in $/hr)	$21.86	$22.95	$24.05	$26.21	$28.40	$30.58	$32.76
OT (hrs/wk)	0	0	0	5	10	15	20
OT Labor (1.5X in $/hour)	$0.00	$0.00	$0.00	$39.32	$42.60	$45.88	$49.13
Est Increase/wk ($)	$0.00	$0.00	$0.00	$196.60	$425.96	$688.14	$982.66

* Projections/estimates assume a 60-hour work week and are one (of many) possible scenarios for labor/increased costs for agriculture

† Source: CA Legislative Information Senate Bill No. 3 and Assembly Bill No. 1066

‡ Exercise using baseline wages and benefits from DRAFT 2016 UC Cooperative Extension studies for iceberg lettuce and broccoli and one possible scenario for increase to MW and OT.

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