Labor and Technology Change in the Nursery Industry

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U.S. Nursery Industry

Product sales of $6.6 billion

- 58% production in top 5 states
- Top 3 states: CA—$1,689 million, FL—$848 million, OR—$758 million

Demand for nursery products is commercial, municipal, residential

- Construction
- Maintenance

Buyers of nursery products

- Retail nurseries
- Garden centers, department stores
- Landscape suppliers, landscapers
- Others (e.g., other production nurseries, municipalities, residential customers)

Objectives

The nursery industry depends on inexpensive labor, for which it competes with the construction industry.

Pressures to mechanize stem from both the expectation and the risk of declining labor availability.

To understand these impending innovations, we need a model of how new technologies substitute for labor skill, as well as for labor quantity.

Methods

- Literature review of capital and labor, as well as capital and skill trade-offs
- Case studies of three production nurseries in Oregon
- Key-informant interviews of industry stakeholders

Technology Change & Impact

Stylized model of trade-off among capital, low-skill labor, and high-skill labor.

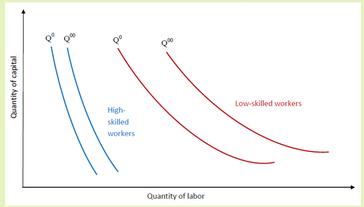
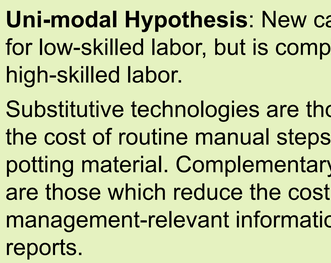


Fig. 1. Shifts in capital-labor tradeoffs when new technology is introduced. Skill improvements shift K, L isoquants inward (Nursery output $Q^{00} > Q^{0}$). Capital substitutes more strongly for low-skilled than for high-skilled labor.

Uni-modal Hypothesis: New capital substitutes for low-skilled labor, but is complementary with high-skilled labor.

Substitutive technologies are those which reduce the cost of routine manual steps like reaching for potting material. Complementary technologies are those which reduce the cost of such management-relevant information as inventory reports.



Overhead irrigation
Photo by Vera Bitsch

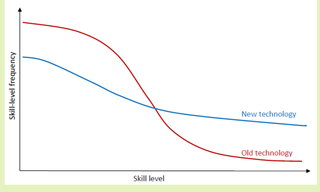


Fig. 2. Unimodal skill distribution shift. New technology flattens the nursery skill distribution.

Drip irrigation
Photo by Vera Bitsch

Bi-modal Hypothesis: New capital substitutes for mid-skilled labor, but is complementary with low-skilled and – especially – high-skilled labor.

Here, technology reduces the relative cost of routine cognitive steps characteristic of mid-skill work.

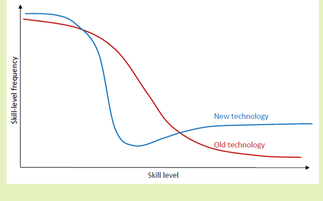


Fig. 3. Bimodal skill distribution shift. New technology reduces the relative demand for mid-skill skills.

Mechanization in Agriculture

Early examples are grain and root-vegetable harvesting, e.g., sugar beets, potatoes.

The end of the Bracero "guest worker" program, 1964, led to a push toward specialty crop harvest mechanization, e.g., processing tomatoes, tart cherries, and prunes.

Public funding came almost to a halt in the 1980s and 1990s due to controversy.

Since 2008, renewed funding through specialty crop grants; current projects under leadership at Carnegie Mellon and Washington State Universities.

Oregon Labor Developments

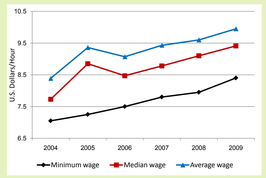


Fig. 4. Rising minimum wage corresponds with Oregon farm labor wage increases (Bitsch; OR Employment Department).

Oregon's agricultural wage was $11.61 in 2009 (NASS), among the highest in U.S.

More workers are employed for longer periods; short-term employment falling (Ag Census).

61% of farm workers are unauthorized,19% are newcomers (≤1 year); for 92%, Spanish is the main language (NAWS, Western States).

99% of Oregon farm workers live off-farm, 51.8% in "substandard" housing (Holden et al.).

Nursery Production in Oregon

Typical nursery has 200 – 400 differentiated products.

Advantages: Climate, water availability.

Disadvantages: Labor costs, distances to major consumer centers.

Conclusions

As capital costs decline and wage growth is expected to persist, pressure continues for capital intensification in the now labor-intensive nursery sector.

But capitalization is complicated by nursery product variety. It is complicated also by rising buyer power, boosting the pressure for higher product quality and lower price.

The rate and pattern of labor substitution will depend on:

- Signs of changes in low-skilled labor supply, and
- Relative costs of new technologies that substitute for routine manual and cognitive tasks.

Hand irrigation
Photo by Vera Bitsch

Regardless of such patterns, nurseries will seek long-term employment relationships to compensate for rising training costs.

Nursery size and market opportunities will affect the development of a labor-intensity differentiated industry.

Acknowledgments

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For Further Information

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Labor consists of **people** with needs: *"Automation? Depends how it's applied. It frightens me if it puts me out on the street. It doesn't frighten me if it shortens my work week. You read that little thing: what are you going to do when this computer replaces you? … I want milk for my kids and beer for me. Machines can either liberate man or enslave 'im, because they're pretty neutral. It's man who has the bias to put the thing one place or another."* Mike Lefevre, Worker, Cicero/Illinois, cited in Working by S. Terkel, 1970.