

Economic Impact of Technology Adoption Among Horticulture Firms

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1. This socioeconomic (SEC) project is a part of a research program currently being undertaken by the Mississippi Agricultural and Forestry Experiment Station (MAFES) and the U.S. Department of Labor (DOL) entitled Enhancing Labor Performance of the Green Industry in the Gulf South. The overall goal of this SEC project is to develop a socioeconomic profile of horticulture workers and to evaluate the impact of automation or mechanization on their employment, earnings, safety, skill-levels, and retention rates. The nursery automation index (NAI) is a measure of the average level of automation or mechanization (AVELOAM) currently being practiced in each nursery or greenhouse. In this paper, the AVELOAM (0-100 percent scale) was estimated from the individual percentage scales reported in each of the tasks performed by each participating nursery or greenhouse. In order to evaluate the impact of mechanization or automation on the annual output of horticulture products, workers' employment, earnings, safety, skill-levels, and retention rates, the following empirical models were used:

o Annual gross sales:	salesyr3	c	aveloam	acreprod	year2	nuronly	ghonly	peracreuse	fte	Eqn. 1,
o Annual employment:	fte	c	aveloam	acreprod	year2	nuronly	ghonly	peracreuse		Eqn. 2,
o Annual workers' earnings:	totlabcost	c	aveloam	acreprod	year2	nuronly	ghonly	peracreuse	fte	Eqn. 3,
o Workers' skills:	workskill	c	aveloam	acreprod	year2	nuronly	ghonly	peracreuse	fte	Eqn. 4,
o Workers' safety:	manhrllost	c	aveloam	acreprod	year2	nuronly	ghonly	peracreuse	fte	Eqn. 5,
o Workers' retention rates:	powreturn	c	aveloam	acreprod	year2	nuronly	ghonly	peracreuse	fte	Eqn. 6,

where:

o salesyr3	= mid-point of the annual gross sales group reported (\$/year),	c	= constant term,
o fte	= total full-time equivalent workers (no./year),	totlabcost	= total labor costs (\$/year),
o workskill	= percent of new workers hired with basic horticultural skills (%),		
o manhrllost	= total number of man-hours lost due to work-related injuries (h/year),		
o powreturn	= percent of workers who were employed in the same firm last year (%),		
o acreprod	= number of acres under production,	year2	= number of years since establishment,
o nuronly	= dummy variable representing nursery only, and	ghonly	= dummy variable representing greenhouse only.

2. Equations 1-6 were estimated by using the Tobit method due to the limited range of values of some of the variables used in estimation. A total of 87 Nursery Automation Survey Forms (NASF) were completed from personal interviews with horticulture firms randomly selected in Mississippi, Louisiana and Alabama. The 87 nurseries included in the survey reported a total of 1,804 acres or an average of 21 acres per nursery. Preliminary Tobit regression results suggested some insights on the size and direction (**enhancing, limiting or neutral**) of the influences exerted by the level of mechanization or automation on the key dependent variables under consideration:

o Annual output or sales of horticulture products

- o 1% increase in the level of mechanization or automation was associated with a \$3,384/year rise in gross output or sales (enhancing)
- o Marginal contribution of an additional fulltime-equivalent worker to gross output or sales = \$69,513/year (enhancing)
- o Marginal contribution of one more acre placed under production = \$1,207/year (enhancing)

o Annual employment

- o Level of mechanization or automation showed neutral effect
- o One more acre placed under production would require additional 0.1 FTE worker/year (enhancing)
- o Nursery only required 5.8 less FTE workers/year (limiting) while greenhouse only required 2.8 less FTE workers/year (limiting)

o Annual workers' earnings

- o A 1% rise in the level of mechanization or automation would raise earnings by \$1,629/year (enhancing)
- o Hiring of one more FTE worker would raise earnings by \$18,455/year (enhancing)
- o One more acre placed under production would raise earnings by \$842/year (enhancing)

o Workers' skills

- o Level of mechanization or automation showed neutral effect
- o Nursery only and greenhouse only would require higher percent of new workers with basic horticultural skills (enhancing)

o Workers safety

- o Level of mechanization or automation showed neutral effect
- o One more FTE worker was associated with 9.8 more h/year lost due to work-related injuries
- o One more acre placed under production was associated with 0.4 more h/year lost due to work-related injuries
- o Nursery only reported 74 more h/year lost due to work-related injuries

o Workers' retention rates

- o Level of mechanization or automation showed neutral effect

