

Evaluation of Automation for Florida Citrus Packinghouses

- W. M. Miller, Univ. of Florida-CREC
- **Automation**- controlled operation of an apparatus, process or system by mechanical or electronic devices taking the place of human organs of observation, effort or decision

Automation assessment (Fruit grading example)

- Economic
- **Better product**
- **Competitive advantage**

Manual Grading Costs

$$YCE = NG * HR * (RH + 1.5 * OH) + OC + PC * NG * 1.5$$

YCE- yearly cost estimate
 NG- number of graders
 HR- hourly wage rate, grader
 RH, OH- regular and overtime hour(s)
 OC- overhead charge, % of total wage
 PC- processing cost per grader

Automatic Grading Costs

$$YCE = CC + MC + OS - MS - PLS$$

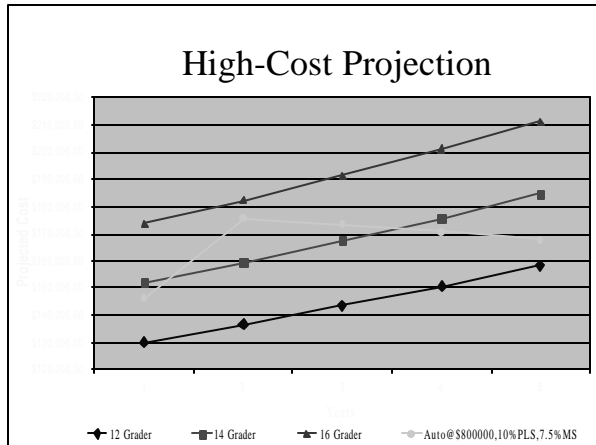
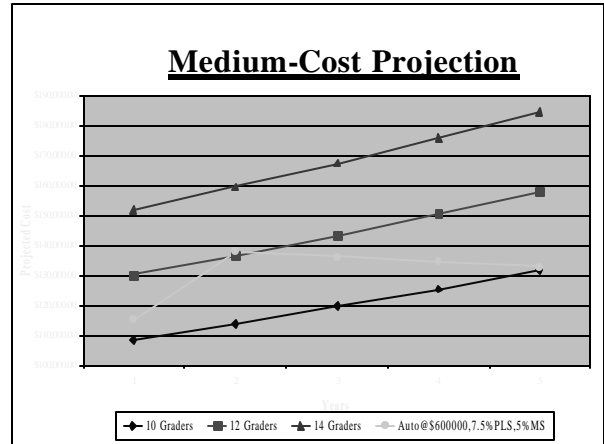
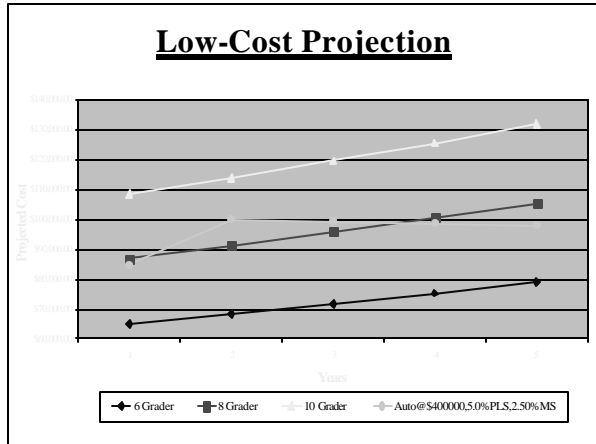
YCE- yearly cost estimate
 CC- capital costs
 MC- maintenance costs, % of capital costs
 OS- operator's salary, plus overhead
 MS- materials savings; e.g. wax and fungicide
 PLS- productivity labor savings; reduction % of hourly labor charge

Economic Assumptions

<u>Variable</u>	<u>Estimate</u>
Capital	\$400,000-800,000
Cost Projection Period	5 yr.
Overhead Charge	15 %
Hourly Wage Rate	\$ 6.00
Interest Rate	7 %
Maint. Charge, 2-5 yr.	4 % of capital costs
Materials Savings	2.5 – 7.5 %

Economic Assumptions(2)

<u>Variable</u>	<u>Estimate</u>
Grader Reduction	6 – 16 persons
Operator Salary	\$20,500
Overtime Hours	300 hr
Packing Output	1.2 million cartons
Personnel Charge	\$100
Productivity Labor Savings	5 – 10 %
Regular Hours	1100 hr

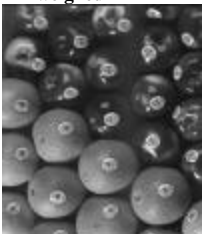
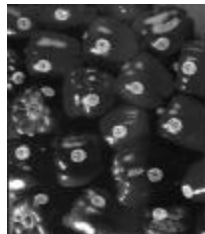


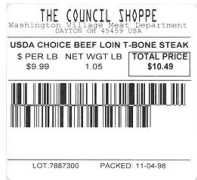
- ### Opportunities for automation
- Packing (more standardization would be helpful)
 - Data collection/documentation (traceability, JIT, HAACP, ISO9000 series, GAP, GMP)
 - Enhancements (internal fruit quality, system integration[grove to consumer])

RSS-14 Stacked Omnidirectional Each(or Bulk) Point of Sale Identification

PLU number remains on Sticker

- each or
- weighed



LOT:7887300 PACKED: 11-04-98

(01)90614141000015 (3202)000105 (3922)001049 (13)981104 (10)7887300 (YY)001

↑

UCC/EAN-14
PRODUCT ID
required

↑

NET WEIGHT (lb)
required

↑

EXTENDED PRICE*
best practice

↑

PACK DATE BATCH/LOT
best practice

↑

BATCH/LOT
best practice

↑

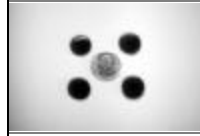
ISO CURRENCY ID*
optional

*APPLICATION IDENTIFIER NOT YET DEFINED

RFID Technologies

- Main processor chip, antenna, power source, reader(interrogator)
- Passive devices: range ~ 1 m
- Active devices: range ~30 m
- Integrate with other sensing: temperature, humidity, gas levels, GPS data, other tags

RFID Tags



Automation a Benefit, not Burden to Packinghouse Management

- Production Schedule (Fruit/Materials/People)
- Process (Application)
- Product (Internal/External Quality)
- Personnel
- Automation (An additional facet but should reduce workload of the 4 P's above)

Benefits of Automation

- Reduced Labor
- Better Quality Control and Product Matching with Customer
- More Uniform and Enhanced Production
- Tracking Records
- Food Safety Requirements
- Packinghouse to Packinghouse Uniformity

The Future

- **How much automation?**
- **What will the impetus for more automation? (labor availability/cost, product uniformity, food safety)**
- **How to manage competitive advantage through automation?**