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**Introduction**

- Numerous empirical studies have examined growers’ preferences for contractual agreements
- Despite this wealth of research there is no general consensus regarding the role of growers’ risk aversion levels on the choice of contracts
- Three main possibilities have been suggested so far:
  1. Risk aversion is an important parameter in contract choice
  2. To a greater extent the transaction cost dictates the choice of contracts
  3. Both risk aversion levels and transaction cost influence contract choice

**Objective – Contribution**

- Objective: Investigate the role of growers’ risk aversion levels and of certification cost in the choice of marketing outlet
- Contribution: To the authors’ knowledge this is the first research endeavor that utilizes integer programming and biophysical simulation to model agricultural contract choices

**The Hypothetical Farm – Data Sources**

- The hypothetical farm of the study is located in Fayette County, KY. It is assumed to have 5 acres of cropland available to grow tomatoes and sweet corn
- Tomatoes and sweet corn prices are obtained from the Atlanta Agricultural Market Station (AMS)
- 38 years of yield data for tomatoes and sweet corn are obtained with the use of biophysical simulation modeling

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**Marketing Outlets**

A. Wholesale marketing only

- Limited legal requirements
- Greater flexibility regarding production timing

B. Combination of wholesale and marketing contracts for large size tomatoes

- A marketing contract is a written or oral agreement between a buyer and a grower that specifies a price mechanism, some quality and quantity requirements and penalties if the agreement is not satisfied
- Limits production timing flexibility
- Substantial legal requirements
- More stable prices → Secure income
- Three marketing contracts are examined in this study (Table 1)

**Economic Model**

- A combination of quadratic and integer programing formulation embodied in a mean – variance framework is utilized to achieve the study objectives
- Production and marketing decision variables are included in the model
- The following types of constraints are reflected on the formulation:
  1) Standard technical constraints,
  2) Boolean constraint conditions and
  3) Either or conditions:
- The objective of the model is the maximization of net returns above selected variable costs less the risk aversion coefficient multiplied by the variance of net returns
- The model is estimated for 9 risk aversion levels. The risk aversion levels are calculated following McCarl and Bessler approach (1989)

**Table 1: Contract Designs**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Contract 1</th>
<th>Contract 2</th>
<th>Contract 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Price ($/lb)</td>
<td>Price for late June-early July</td>
<td>0.62</td>
<td>0.68</td>
<td>0.74</td>
</tr>
<tr>
<td>Peak Price ($/lb)</td>
<td>Price for July-August</td>
<td>0.53</td>
<td>0.55</td>
<td>0.58</td>
</tr>
<tr>
<td>Late Price ($/lb)</td>
<td>Price for September -October</td>
<td>0.70</td>
<td>0.77</td>
<td>0.84</td>
</tr>
<tr>
<td>Early Volume (lbs/week)</td>
<td>Volume for late June-early July</td>
<td>323</td>
<td>353</td>
<td>382</td>
</tr>
<tr>
<td>Peak Volume (lbs/week)</td>
<td>Volume for July – August</td>
<td>735</td>
<td>809</td>
<td>882</td>
</tr>
<tr>
<td>Late Volume (lbs/week)</td>
<td>Volume for September -October</td>
<td>632</td>
<td>691</td>
<td>735</td>
</tr>
<tr>
<td>Penalties (% of price)</td>
<td>Price reduction if the agreement is not satisfied</td>
<td>5%</td>
<td>10%</td>
<td>15%</td>
</tr>
<tr>
<td>Certification Cost</td>
<td>3rd party audit cost</td>
<td>0</td>
<td>500</td>
<td>1000</td>
</tr>
</tbody>
</table>

**Results**

- Wholesale marketing is preferred over a combination of wholesale marketing and marketing contracts
- Risk aversion levels influence the choice of production practices but not the choice of marketing outlet
- All prices should be increased by 70% to make the combination of wholesale marketing and marketing contracts the selected option

**Conclusions**

- Choice of marketing outlet can substantially influence the economic returns for a fresh vegetable farm
- Marketing contracts have the potential to be an attractive option even for smaller farms
- There is great potential to use economic engineering and investigate the conditions that will make contracts the preferred marketing option at least for some group of growers

**References**