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To cite this version:
Nicolas Brulard, Van-Dat Cung, Nicolas Catusse. Strategic and Tactical Urban Farm Design. FSD5 5th International Symposium for Farming Systems Design, Sep 2015, Montpellier, France. hal-01240450

HAL Id: hal-01240450
https://hal.archives-ouvertes.fr/hal-01240450
Submitted on 9 Dec 2015

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STRATEGIC AND TACTICAL URBAN FARM DESIGN

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Context and problem description
- Model to support decision in creating new urban farms and adapting existing peri-urban farms with viable business models
- Multi-techniques, multi-products and multi-clients systems producing perishable products on limited surfaces with expensive labor cost
- Considering fresh products perishability requires to include tactical scheduling decisions in our strategic sizing problem

MILP model structure
Objective:
\[
\max R = \sum_{\mathcal{P}} x_{\mathcal{P}}^D \cdot P_{\mathcal{P}}^D \cdot (1 - w_{\mathcal{P}}^D) \text{ Sales}
\]
\[
- \sum_{\mathcal{P}} (\alpha_{\mathcal{P}} + \alpha_{\mathcal{P}} \cdot \alpha_{\mathcal{P}} \cdot \alpha_{\mathcal{P}}) \cdot \sum_{i} A_{i} - C_{i}^L - \sum_{i} L_{T}^S + C_{i}^L + (L_{T}^S + L_{T}^S)
\]

Preprocessing and optimization

Data instances & computation times
- 5 to 9 sets of management practices, 1 or 2 products, 4 to 9 plots max, 1 or 2 clients.
- Optimal solution reached in 8 to 1100s (Cplex 12.6, Intel Core i7-4600U 2.10GHz proc, 8.0 Go of RAM).

Prospects
Model tested on real farm data (lettuce, strawberry and tomato farm)
- New formulation of lot sizing constraints and better optimization algorithms to speed up resolution
- Integration of multi-year strategic sizing, robust solutions.

Graphical representation of the results

Production of each set of management practices

Cumulated production and stocks
On-plot stocks and picked quantities

Required labor
Hired labor time
Tasks time
Monitoring time
Picking time

Different management practices can be needed to match these demands in fresh products.