FACILITY DESIGN FOR MANGO DISTRIBUTION CENTER AND LOGISTICS IN CHACHOENGSAO PROVINCE

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ABSTRACT
This paper presents the design of mango distribution center and logistic in Chachoengsao province, using Richard Muther’s method. The research involved identification of characteristic and quantitative data, activity determination, activity flow analysis, relationship diagram, space requirement, and plant facility. The result showed that the mango distribution center and logistic should be consisted of the followings; receiving mangoes from farmers, classifying size and inspecting quality, weighing, packaging, storing, preparing for delivery, and processing documents. The total area was 4800 m², including areas for loading, receiving, selecting and checking, weighing, storing, preparing for delivery, equipment room, and office, all in the same building.

KEYWORDS
Distribution Center, Mango, Chachoengsao

1. Introduction
Mango was an economic fruit of Chachoengsao province. There were a lot of mango farming areas and productivity in Chachoengsao, with the total mango farming area was 91,287 rai. Mango was produced for both import and export. Main destinations were Japan, Singapore, Malaysia, Vietnam. While logistics management enhances value and effectiveness of operations and service [1], mango supply chain within provincial area was still distant from fully practice such logistics activities. Therefore, this research aimed to design a distribution center and logistics activities, in order that total production cost could be reduced. Approaching this with logistics perspective would enhance farmers’ competitiveness and that of their supply chain.

2. Research Methodology
The study was undertaken by adopting Richard Muther’s method [2]. This meant specifying characteristics and data, identifying relations between activities, analyzing workflow, identifying space required, identifying relations between area usage. With this approach, activities concerned for mango distribution were first identified, and their sequence was analysed as shown in Figure 1 below.

<table>
<thead>
<tr>
<th>DIST</th>
<th>TIME</th>
<th>CHART SYMBOLS</th>
<th>PROCESS DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>○ ○ ○ ○ ○ ○ ○</td>
<td>Transport mangoes from farms to Distribution Center</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● ● ● ● ● ● ●</td>
<td>Receiving mangoes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● ● ● ● ● ● ●</td>
<td>Unloading mangoes from trucks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>○ ○ ○ ○ ○ ○ ○</td>
<td>Transport mangoes to checking area</td>
</tr>
<tr>
<td></td>
<td></td>
<td>○ ○ ● ● ● ● ●</td>
<td>Size classification and quality check</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● ● ● ● ● ● ●</td>
<td>Weighing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● ● ● ● ● ● ●</td>
<td>Packaging</td>
</tr>
<tr>
<td></td>
<td></td>
<td>○ ○ ○ ○ ○ ○ ○</td>
<td>Transport to the cool storage room</td>
</tr>
<tr>
<td></td>
<td></td>
<td>○ ○ ● ● ● ● ●</td>
<td>Store</td>
</tr>
<tr>
<td></td>
<td></td>
<td>○ ○ ○ ○ ○ ○ ○</td>
<td>Transport from the cool storage room</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● ● ● ● ● ● ●</td>
<td>Delivery Preparation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● ● ● ● ● ● ●</td>
<td>Loading to trucks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>○ ○ ○ ○ ○ ○ ○</td>
<td>Delivery</td>
</tr>
</tbody>
</table>

SUMMARY
Operations  6
Transportations  5
Inspections  1
Delays  1
Storages  1

Figure 1: Activity Flow Chart

Activity Relationship
Activities required for mango distribution were directly and indirectly related. There were six degrees of relation; A represents highest degree of relation, activities should be close together, E represents high degree of relation, I represents normal degree of relation, O represents low degree of relation, U represents lowest degree of relation, and X represents activities separating away from another. The activity relationship can be shown in Figure 2 below.
From the information in Figure 2, it can be seen that some activities were highly related, and thus should be designated close to one another. For instance, transporting, loading, checking and weighing should be close together due to their subsequent procedures. Using the relationship diagram, class-A-related activities should be placed next to one another. Lower-prioritized activities then could surround class-A activities.

This information was further linked together by using a relationship diagram, as shown in Figure 3 below.
Distribution Center

Mongkhon et al. [3] study the preferred location of the distribution center in Chachoengsao was derived by using Center of Gravity model, shown below;

\[
S_j = \alpha \left[ \sum_{j=1}^{n} \left( \frac{1}{c_j} \right) \right]^{-1} + (1 - \alpha) \left[ \frac{S_j}{\sum_{j=1}^{n} S_j} \right]
\]

They found that, among four possible locations, the most economically suitable location of mango distribution center was in Tambon Samet-Nua, Chachoengsao.

Along with above considerations, the mango distribution center was designed to enable all logistics activities to be carried out under one roof. Floor plan was divided into the following areas; loading dock, receiving area, checking and weighing area, packaging area, preparing delivery, loading dock, with a cool storage room. Future expansion had also been taken into consideration, e.g. chemical testing and drying processes.

3. Conclusion

To design layout in distribution facility, one must take into account how activities could be related together. This would significantly enhance effectiveness of operations. This study focused on identifying and designing logistics activities in a mango distribution center located in Chachoengsao province. It highlighted eleven activities and proposed a single layout. While the result was practical and economical for local mango farmers, it nonetheless carried an assumption of preferred location of mango distribution center from previous study [2]. This study also employed characteristics of mango production in Chachoengsao, which might not be applicable to other province and other types of products.

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References

