**Algebraic Model: -**

*Parameters (Inputs):*

$$i ϵ 1,2,3 \left( i: Extracted lard oil, lean pork, dish\right)$$

$$j ϵ 1,2 \left( j: White pig, black pig\right)$$

$$A\_{ij} : Units of product i produced from one unit of pig j$$

$$C\_{i} : Units of product i used to produce one unit of dish$$

$$P\_{j} : Processing cost of j$$

$$Q\_{i} : Quality level of each unit of product i$$

$$Q : Average quality level on units sold ;7$$

$$R\_{i} : Selling price of each unit of product i$$

$$M\_{i} : Maximum selling units of product i $$

*Decision Variables:*

$$x\_{j} :Units of j used in the process $$

*Calculated Variables:*

$$S\_{i}=\left( \sum\_{j=1}^{3}A\_{ij}\*x\_{j}\right) for iϵ\left\{1,2,3\right\} Products produced in step 1$$

$$T\_{i}=\left( C\_{i}\*x\_{j}\right) for iϵ\left\{1,2,3\right\} and j=3\left(dish\right) Products used to produce dish$$

$$U\_{i}=\left( S\_{i}- T\_{j}\right) for iϵ\left\{1,2,3\right\} Units of product i sold$$

*Objective:*

$$Maximize total profit=[\sum\_{i=1}^{3}\left(U\_{i}\*R\_{i}\right)] -[ \sum\_{j=1}^{3}\left(x\_{j}\*P\_{j}\right) ]$$

*Constraints:*

$$x\_{ij}\geq 0; \left(1\right) Non Negative constraint$$

$$U\_{i}\leq M\_{i} for iϵ\left\{1,2,3\right\} \left(2\right) Maximum selling units constraint$$

$$\sum\_{i=1}^{3}(U\_{i}\*Q\_{i}) \geq (\sum\_{i=1}^{3}U\_{i})\*Q ; \left(3\right) Average quality level constraint$$