

1. INTRODUCTION

1-1. Why Systems Approach?

Agricultural sector is a large, complex, diversified system compared to other sectors as industrial one.

Characteristic points of it are;

- 1) using biological materials which have un-unified properties chemically and physically,
- 2) in diversified soils or fields,
- 3) being affected by climate conditions which human beings can not control,
- 4) closed cyclic system.

1-2. What is Systems Approach?

1-2-1. What is system in systems engineering?

- 1) Elements more than two,
- 2) Within certain range,
- 3) Relationship each other among them,
- 4) Unified organization,
- 5) To have objectives estimated with measurable function.

1-2-2. Systems Engineering

Systems Engineering is most powerful scientific technology, to analyze the system systematically and to design the total system effectively.

1-3. How to Systems Approach?

1-3-1. Modeling of system

- a) Physical model (hardware)
- b) Mathematical model by computer programming (software)
- c) Dynamic model (function of time), b) Analytic model (LP, DP etc.)

1-3-2. Set objective function of system

1-3-3. Simulation: like as experiment

1-3-4. Optimization variables

1-4. Example 1: Optimization of Farm System

1-4-1. Make objective function of farm system best

$$B = k1 * Y1 + k2 * Y2 + k3 * Y3 + k4 * Y4 + k5 * Y5 + k6 * Y6 + k7 * Y7$$

Eq. 1-4-1

where,

Symbol	Term	unit
B	Total benefit	-
Y1	Economical profit	\$
Y2	Ecological pollution	kg
Y3	Human health	J
Y4	Energy consumption	J
Y5	Cultural evaluation	-
Y6	Social evaluation	-
Y7	Political evaluation	-
k1-k7	Coefficient of Yi = wi/Yib	
wi	Weight	

Refer to SA-Ex6.xls

- a) Ecological evaluation by CO2 gas generation

Example at [FM-plan-original.xls]:(E-3.Ene-summary)

- b) Human healthy evaluation by RMR

Example at [FM-plan-original.xls]:(W-2.RMR-analysis)

1-5. Example 2: Farm system model and simulation

Refer to [FM-R-Phil-Simulation.xls]

1-5-1. Discuss on Total Profit

Discuss on Total Profit (PR) at sheet of [Summary of system]

Example: PR = Total sales (PS) – Total cost (TC) = \$288

1-5-2. Simulation

Modify several data and see Total Profit etc.

return to [SA06-01.doc](#)

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