AGRICULTURAL ECONOMICS 7123
OPERATIONS RESEARCH METHODS IN AGRICULTURAL ECONOMICS
EXAM 1 – REVIEW – FALL 2004

(1) Origins of Operations Research
- beginnings in military operations
- factors influencing growth - George Dantzig (1947) & computer revolution

(2) Nature of Operations Research
- involves research on operations; resembles research conducted in scientific fields; has a broad viewpoint; attempts to find a best solution

(3) Operations Research Modeling Approach
- steps in the O.R. modeling approach
- 3 fundamental concerns when forming operations research models
  (decisions, constraints, objectives)
- terminology
  (a) optimization models
  (b) feasible solutions vs. optimal solutions
  (c) sensitivity analysis
  (d) model validation
  (e) model enrichment
  (f) tractability vs. validity
  (g) algorithms
  (h) descriptive vs. prescriptive models
  (i) numerical search, heuristic optimization, and exact optimization
  (j) deterministic vs. stochastic models

(4) Linear Programming Models
- model formulation
  (decision variables, objective function, functional constraints, nonnegativity constraints)
- possible solution cases and which ones indicate problems
- relationship between optimal solutions and corner point feasible (CPF) solutions
- assumptions of linear programming
- transfer rows and accounting activities
- typical L.P. models
  (a) product mix
  (b) resource allocation
  (c) blending
  (d) operations planning
  (e) shift scheduling
  (primary decision variables, objective function form, typical functional constraints)

(5) Simplex Method
- converting mathematical model to augmented form
  (adding slack, surplus, artificial variables)
- identify current nonbasis variable to enter basis and its value
- identify current basis variable to leave basis and its value

(6) Sensitivity Analysis
- what is sensitivity analysis and why is it important
- sensitivity analysis of objective function and right hand sides (optimal vs. feasible)
- general relationships between the optimal objective function solution value and changes in functional constraints and objective function

(7) Interpretation of SAS output
- objective function value, decision variable values, slack / surplus variable values, reduced costs
- sensitivity analysis results