



Shiraz University
Faculty of Agriculture

PhD Dissertation in Agricultural Economics

**A SYSTEM APPROACH FOR ANALYZING ALTERNATIVE WATER
POLICIES ON ENHANCING IRRIGATION WATER DEMAND
MANAGEMENT IN DOROODZAN DAM IRRIGATED AREAS**

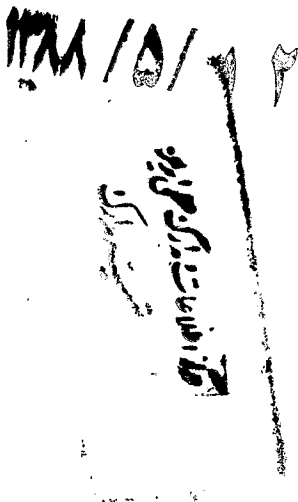
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In the Name of God

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ON ENHANCING IRRIGATION WATER DEMAND MANAGEMENT IN
DOROODZAN DAM IRRIGATED AREAS**

BY

SHAHROKH SHAJARI

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S. Shajari

ABSTRACT

A system approach for analyzing alternative water policies on enhancing irrigation water demand management in Doroodzan dam irrigated areas

BY

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One of the main purposes of this study is to simulate farmers' behavior and a spot market for irrigation water at both farm and basin levels in order to analyze the economic, social and environmental impacts of alternative water policies. Ranking alternative water policies (options) for improving system sustainability dimensions (Economic, Social and Environment) is another purpose of this study. With respect to above issues, the first main contribution of this study is developing a Modified Multi-Attribute Utility Technique (MMAUT) that corresponds to the first purpose. In addition, designing a Decision Support System (DSS), which adopts the DPSIR (Driving Force – Pressure – State – Impact - Response) framework and simulation model and therefore offers an analysis base of the economic, social and environmental effects of combined water pricing, water policy scenarios and other decision factors at both farm and basin levels to assist water authorities in the irrigation water demand management, is the second main contribution of this study. The developed methodology is empirically applied for the Doroodzan dam irrigated areas in Fars province in Southern Iran. Farm-level data were collected from a sample of 310 farms located in the mentioned area selected by a multi-stage cluster sampling and appropriate questionnaires completed through interviewing the farmers. In accordance with cluster analysis, nine groups of farmers or farm-types were recognized and analyzed by means of a unique model for each of these groups. The results reveal that although the Positive Mathematical Programming (PMP) approach performs well, it has limitations such as excluding crops that are not presented in the base year and therefore results perform in a poor prediction of the policy impact. The results show that the best prediction corresponds to Modified MAUF approach that performs well and yields satisfactory predictions and therefore, it is basis model for

analyzing in this study. Based on the main findings of this study, at the current water tariff, the risk-averse farmers (cluster 1) consumes a substantially higher volume of water (24208.31 m³/ha) than other clusters such as cluster 4 and 7 that consume the lower volume of water. Moreover, patterns of water consumption vary along the demand curves as a result of increases in the water price. However, it would be necessary to apply tariffs higher than threshold price in the elastic segment of water demand curve. Although enhancing irrigation water use efficiency scenario is expected to reduce irrigation water consumption by each crop, findings of this study indicate that it does not lead to reduction in total water consumption. Findings also indicate that water trade possibility in local water market increases water consumption at different price levels in most representative farms compare to current situation. Of course, such an institutional reform makes economic water use efficiencies far from its fully economic efficient compared with the current situation in most of representative farms. The results highlight the fact that alternative water policies each alone do not have suitable performance and need to be closely coordinated of the simultaneous application of all of them in order to meet the public policy objectives of water demand management in agriculture. Results obtained from the implementation of DSS indicate that integration across disciplines and communication between scientists and decision makers are beneficial in dealing with the complexity of local water use management problems. The results of options ranking, using different decision rules of suggested options in this study for most of representative farms, indicate that simultaneous application of all of alternative mentioned water policies together is preferred at both farm and basin levels. The findings reveal that although the scenario about objective of maximization of net social profits increases the total crops acreage and net social profits but it decreases irrigation water use compare to the current situation at basin level. In general, the results of the model at basin level refer to encouraging specialization and the re-allocation of resources towards those activities that reflect both basin's comparative advantage and maximization of net social profits.

Table of Contents

| Title | Page |
|--------------------------------------------------------------------------------|------|
| CHAPTER 1 | 1 |
| Introduction | 1 |
| 1.1. Statement of the Research Problem | 1 |
| 1.2. Focus of this study | 3 |
| 1.3. Main Questions | 6 |
| 1.4. Research Objectives | 7 |
| 1.5. Research Hypotheses | 7 |
| 1.6. The Plan of Presentation | 8 |
| CHAPTER 2 | 9 |
| Basic Concepts and Theoretical Development | 9 |
| 2.1. Water demand management decisions as governance | 9 |
| 2.1.1. Alternatives approaches for dealing with water allocation problem | 10 |
| 2.1.1.1. Price mechanism for irrigation water | 10 |
| 2.1.1.1.1. Irrigation water pricing in practice | 13 |
| 2.1.1.1.1.1. Full-cost pricing | 13 |
| 2.1.1.1.1.2. Efficient Pricing | 13 |
| 2.1.1.1.1.3. Market-based Methods | 14 |
| 2.1.1.2. Theoretical and potential for water markets and trade of water rights | 15 |
| 2.2. System approaches and simulation modeling | 18 |
| 2.2.1. Network Analysis, Creative System Modeling and Decision Support | 20 |

| Title | Page |
|-------------------------------------------------------------|-----------|
| 2.2.1.1. NetSyMoD approach: main aims and features | 20 |
| 2.2.1.1.1. Public participation | 21 |
| 2.2.1.1.2. Role of end-users | 21 |
| 2.2.1.1.3. Main phases of NetSyMoD | 22 |
| 2.2.1.1.3.1. Actor' analysis | 23 |
| 2.2.1.1.3.2. Problem analysis | 23 |
| 2.2.1.1.3.3. Creative System Modeling | 23 |
| 2.2.1.1.3.4. Decision Support System design | 24 |
| 2.2.1.1.3.4.1. Concept of Decision Support System | 24 |
| 2.2.1.1.3.4.2. The DSS for farmers | 25 |
| 2.2.1.1.3.4.3. DSS for IWRM | 27 |
| 2.2.1.1.3.5. Policy evaluation | 29 |
| 2.2.1.1.3.6. Actions and monitoring | 29 |
| 2.2.2. Introduction to the multi-criteria decision aid | 30 |
| 2.2.3. Multi-criteria decision analysis | 31 |
| 2.2.3.1. Basic steps of multi-criteria decision analysis | 31 |
| 2.2.4. The use of models for agricultural policy analysis | 36 |
| CHAPTER 3 | 40 |
| Methodology and Data | 40 |
| 3.1. Conflicting objectives and Multiple-Criteria approach | 42 |
| 3.1.1. The use of models for agricultural policy analysis | 43 |
| 3.1.1.1. Multi-Attribute Utility Function (MAUF) approach | 43 |
| 3.1.2. Objective weighting and utility function elicitation | 52 |
| 3.1.3. Positive mathematical programming (PMP) | 53 |
| 3.1.4. Introducing modified MAUF | 53 |
| 3.2. Modeling irrigation water market at basin level | 55 |
| 3.3. Modeling of farm types | 59 |
| 3.4. Validation of models | 59 |
| 3.5. Scenario simulations and generating scenarios | 59 |

| Title | Page |
|-------------------------------------------------------------------------------|------|
| 3.6. Aggregation bias problem | 61 |
| 3.7. Indicators or attributes | 63 |
| 3.8. A dynamic Decision Support System within the DPSIR framework: mDSS4.1 | 65 |
| 3.8.1. Conceptual phase: problem exploration | 66 |
| 3.8.2. Design phase: option definition and modeling | 66 |
| 3.8.3. Choice phase: Multi-criteria decision analysis | 67 |
| 3.8.3.1. Standardizing the Analysis Matrix | 68 |
| 3.8.3.2. Modeling value function | 69 |
| 3.8.3.3. Modeling criteria weights | 70 |
| 3.8.3.4. Decision rules | 72 |
| 3.8.3.4.1. Simple Additive Weighting (SAW) | 72 |
| 3.8.3.4.2. Order Weighting Average (OWA) | 73 |
| 3.8.3.4.3. Ideal Point Methods (TOPSIS) | 74 |
| 3.8.3.4.4. ELECTRE | 75 |
| 3.8.3.5. Sustainability chart | 76 |
| 3.8.3.6. Sensitivity Analysis | 77 |
| 3.8.3.7. Most Critical Criterion | 78 |
| 3.8.3.8. Tornado Diagram | 78 |
| 3.8.3.9. Group decision making – aggregation of group members’ preferences | 81 |
| 3.8.3.9.1. Compromising criteria weights | 82 |
| 3.8.3.9.2. Compromising the final solution | 82 |
| 3.8.3.9.2.1. Individual ranking | 83 |
| 3.8.3.9.2.2. Group ranking – Borda rule | 83 |
| 3.8.3.9.2.3. Alternative group ranking | 84 |
| 3.9. Simulation model at basin level | 85 |
| 3.9.1. The measures of comparative advantage | 85 |
| 3.9.2. Objective Functions | 87 |
| 3.9.3. Constraints | 87 |

| Title | Page |
|--------------------------------------------------------------------------------------------|-----------|
| 3.9.3.1. Water allocation availability | 87 |
| 3.9.3.2. Surface water allocation availability | 88 |
| 3.9.3.3. Ground water allocation availability for each month | 88 |
| 3.9.3.4. Area availability to total area | 88 |
| 3.9.3.5. Environmental Flow Target | 88 |
| 3.10.1. Description of area | 89 |
| 3.10.2. Data specification and sources | 92 |
| CHAPTER 4 | 94 |
| Results and Discussion | 94 |
| 4.1. Descriptive statistics and specifications | 94 |
| 4.2. Elicitation of the Multi-Attribute Utility Function (MAUF) | 97 |
| 4.3. Evaluation of accuracy of the model simulation and prediction | 98 |
| 4.4. Scenario simulations and effects of alternative policies on different indicators | 99 |
| 4.4.1. Effects of alternative policies on different indicators in representative farm No.1 | 100 |
| 4.4.2. Effects of alternative policies on different indicators in representative farm No.2 | 108 |
| 4.4.3. Effects of alternative policies on different indicators in representative farm No.3 | 116 |
| 4.4.4. Effects of alternative policies on different indicators in representative farm No.4 | 125 |
| 4.4.5. Effects of alternative policies on different indicators in representative farm No.5 | 133 |
| 4.4.6. Effects of alternative policies on different indicators in representative farm No.6 | 142 |
| 4.4.7. Effects of alternative policies on different indicators in representative farm No.7 | 150 |

| Title | Page |
|----------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 4.4.8. Effects of alternative policies on different indicators in representative farm No.8 | 158 |
| 4.4.9. Effects of alternative policies on different indicators in representative farm No.9 | 167 |
| 4.5. Water demand functions | 176 |
| 4.6. The impacts of the scenarios and the improvement of sustainability aspects of selected irrigated farming systems (results of the dynamic DSS) | 183 |
| 4.6.1. Modeling the conceptual relationship according to the DPSIR framework | 183 |
| 4.6.2. Results of multi-criteria decision and final choice in selected farming systems | 185 |
| 4.6.2.1. Representative farm No.1 | 185 |
| 4.6.2.2. Representative farm No.2 | 193 |
| 4.6.2.3. Representative farm No.3 | 200 |
| 4.6.2.4. Representative farm No.4 | 207 |
| 4.6.2.5. Representative farm No.5 | 214 |
| 4.6.2.6. Representative farm No.6 | 221 |
| 4.6.2.7. Representative farm No.7 | 228 |
| 4.6.2.8. Representative farm No.8 | 235 |
| 4.6.2.9. Representative farm No.9 | 242 |
| 4.6.2.10. Aggregation of the results in different farming systems and final choice in the basin level | 250 |
| 4.7. Results of the simulation model at basin level | 251 |
| 4.7.1. Results of comparative advantage indices at basin level | 251 |
| 4.7.2. Performances of the alternative options at basin level | 252 |
| 4.7.3. Impacts of alternative options on indicators at basin level | 255 |
| CHAPTER 5 | 257 |
| Conclusion and policy implication | 257 |
| 5.1. Overview of the study | 257 |

| Title | Page |
|----------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 5.2. Policy implication | 264 |
| 5.3. Limitations of research | 268 |
| 5.4. Recommendations for further research | 268 |
| References | 270 |
| Appendices | 282 |
| Appendix 1: Consistency test of reciprocal matrix of pairwise comparison | 282 |
| Appendix 2: A simple example of Aggregation using simple additive weighting decision method of two options and three criteria | 284 |
| Appendix 3: A simple example of Aggregation using the order weighting averaging of two options and three criteria | 285 |
| Appendix 4: Characteristics of selected sets of order weights distribution | 286 |
| Appendix 5: A simple example of two options and three criteria with already weighted performances to aggregation using the TOPSIS decision methods | 287 |
| Appendix 6: Terms and algorithms of ELECTRE III | 288 |
| Appendix 7: Steps of estimate the critical criterion | 290 |
| Appendix 8: A simple example for Group Ranking | 294 |

List of Tables

| Title of Table | Page |
|----------------------------------------------------------------------------------------------------------------------------------------------------|------|
| Table 3-1) Alternative scenarios (options) | 61 |
| Table 3-2) Indicators | 63 |
| Table 3-3) The behavior of the generated numerical weights depending on the parameter p of the rank component method | 70 |
| Table 3-4) Example of pairwise comparison: (I) Scale for pairwise comparison; (II) pairwise comparison matrix between 4 criteria (C_1 - C_4) | 71 |
| Table 3-5) The mDSS decision approaches (decision rules and approaches to sensitivity analysis) and their basic characteristics | 80 |
| Table 3-6) Policy analysis matrix | 86 |
| Table 4-1) Descriptive statistics and specification of each group of farmers | 95 |
| Table 4-2) Different weight of attributes for each group of farmers | 98 |
| Table 4-3) Results of different indicators for increasing irrigation water price in representative farm No.1 | 104 |
| Table 4-4) Results of different indicators due to the application of scenarios in representative farm No.1 | 105 |
| Table 4-5) Results of different indicators due to the application of integrated scenarios in representative farm No.1 | 107 |
| Table 4-6) Results of different indicators for increasing irrigation water price in representative farm No. 2 | 111 |
| Table 4-7) Results of different indicators due to the application of scenarios in representative farm No.2 | 113 |

| Title of Table | Page |
|---------------------------------------------------------------------------------------------------------------------------------|------|
| Table 4-8) Results of different indicators due to the application of integrated scenarios in representative farm No. 2 | 115 |
| Table 4-9) Results of different indicators for increasing irrigation water price in representative farm No.3 | 120 |
| Table 4-10) Results of different indicators due to the application of scenarios in representative farm No.3 | 122 |
| Table 4-11) Results of different indicators due to the application of integrated scenarios in representative farm No.3 | 124 |
| Table 4-12) Results of different indicators for increasing irrigation water price in representative farm No.4 | 129 |
| Table 4-13) Results of different indicators due to the application of scenarios in representative farm No.4 | 130 |
| Table 4-14) Results of different indicators that are due to the application of integrated scenarios in representative farm No.4 | 132 |
| Table 4-15) Results of different indicators for increasing irrigation water price in representative farm No.5 | 137 |
| Table 4-16) Results of different indicators due to the application of scenarios in representative farm No.5 | 139 |
| Table 4-17) Results of different indicators due to the application of integrated scenarios in representative farm No.5 | 141 |
| Table 4-18) Results of different indicators for increasing irrigation water price in representative farm No.6 | 145 |
| Table 4-19) Results of different indicators due to the application of scenarios in representative farm No.6 | 147 |
| Table 4-20) Results of different indicators due to the application of integrated scenarios in representative farm No.6 | 149 |
| Table 4-21) Results of different indicators for increasing irrigation water price in representative farm No.7 | 153 |

| Title of Table | Page |
|-----------------------------------------------------------------------------------------------------------------------------------------|------|
| Table 4-22) Results of different indicators due to the application of scenarios in representative farm No.7 | 155 |
| Table 4-23) Results of different indicators due to the application of integrated scenarios in representative farm No.7 | 157 |
| Table 4-24) Results of different indicators for increasing irrigation water price in representative farm No.8 | 162 |
| Table 4-25) Results of different indicators due to the application of scenarios in representative farm No.8 | 164 |
| Table 4-26) Results of different indicators due to the application of integrated scenarios in representative farm No.8 | 166 |
| Table 4-27) Results of different indicators for increasing irrigation water price in representative farm No.9 | 171 |
| Table 4-28) Results of different indicators due to the application of scenarios in representative farm No.9 | 173 |
| Table 4-29) Results of different indicators due to the application of integrated scenarios in representative farm No.9 | 175 |
| Table 4-30) Irrigation water demand at the current tariff for each homogenous group | 176 |
| Table 4-31) Analysis matrix of representative farm No.1 | 188 |
| Table 4-32) Evaluation matrix of representative farm No.1 | 189 |
| Table 4-33) Results of options order (compromising final solution) using different grouping ranking rules for representative farm No.1 | 192 |
| Table 4-34) Analysis matrix of representative farm No.2 | 195 |
| Table 4-35) Evaluation matrix of representative farm No. 2 | 196 |
| Table 4-36) Results of options order (compromising final solution) using different grouping ranking rules for representative farm No. 2 | 199 |
| Table 4-37) Analysis matrix of representative farm No.3 | 202 |
| Table 4-38) Evaluation matrix of representative farm No. 3 | 203 |

| Title of Table | Page |
|-----------------------------------------------------------------------------------------------------------------------------------------|------|
| Table 4-39) Results of options order (compromising final solution) using different grouping ranking rules for representative farm No. 3 | 206 |
| Table 4-40) Analysis matrix of representative farm No.4 | 209 |
| Table 4-41) Evaluation matrix of representative farm No. 4 | 210 |
| Table 4-42) Results of options order (compromising final solution) using different grouping ranking rules for representative farm No. 4 | 213 |
| Table 4-43) Analysis matrix of representative farm No.5 | 216 |
| Table 4-44) Evaluation matrix of representative farm No. 5 | 217 |
| Table 4-45) Results of options order (compromising final solution) using different grouping ranking rules for representative farm No. 5 | 220 |
| Table 4-46) Analysis matrix of representative farm No.6 | 223 |
| Table 4-47) Evaluation matrix of representative farm No. 6 | 224 |
| Table 4-48) Results of options order (compromising final solution) using different grouping ranking rules for representative farm No. 6 | 227 |
| Table 4-49) Analysis matrix of representative farm No.7 | 230 |
| Table 4-50) Evaluation matrix of representative farm No. 7 | 231 |
| Table 4-51) Results of options order (compromising final solution) using different grouping ranking rules for representative farm No. 7 | 234 |
| Table 4-52) Analysis matrix of representative farm No.8 | 237 |
| Table 4-53) Evaluation matrix of representative farm No. 8 | 238 |
| Table 4-54) Results of options order (compromising final solution) using different grouping ranking rules for representative farm No. 8 | 241 |
| Table 4-55) Analysis matrix of representative farm No.9 | 245 |
| Table 4-56) Evaluation matrix of representative farm No. 9 | 246 |
| Table 4-57) Results of options order (compromising final solution) using different grouping ranking rules for representative farm No. 9 | 249 |
| Table 4-58) Results of options order (compromising final solution) using different rules in basin level | 250 |

| Title of Table | Page |
|------------------------------------------------------------------------------------------------------------------------|------|
| Table 4-59) Results of comparative advantage indices and private income at basin level | 251 |
| Table 4-60) Information and results of current cropping pattern and net social profits at basin level | 252 |
| Table 4-61) Change in cropping pattern and net social profits due to maximization of rural employment at basin level | 253 |
| Table 4-62) Change in cropping pattern and net social profits due to maximization of net social profits at basin level | 254 |
| Table 4-63) Results of indicators at Kor river basin level | 255 |
| Table A.1) Random consistency indices for different number of criteria (n) | 280 |
| Table A.2) Aggregation using simple additive weighting decision method | 281 |
| Table A.3) Aggregation using the order weighting averaging | 282 |
| Table A.4) Characteristics of selected sets of order weights distribution | 283 |
| Table A.5) Aggregation using the TOPSIS decision methods | 284 |
| Table A.6) The distances from the positive and negative ideal solutions as well as the final aggregation | 284 |

List of Figures

| Title of Figure | Page |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| Figure 2-1: The main phases of NetSyMoD | 22 |
| Figure 2-2: The basic steps of the MCA that can be implemented in the DSS | 32 |
| Figure 2-3: a) The DPSIR framework, a common conceptual that allows the end user to conceptualize and structure the decision situation according to the cause-effect relationships b) Levels of intervention ranging from policy makers to local management authorities | 35 |
| Figure 3-1: Methodology diagram | 41 |
| Figure 3-2: Systematic approach supporting the mDSS, based on Simons' phases of decision process | 65 |
| Figure 3-3: Some kinds of value function: (a) linear; (b) j-shaped; (c) Sigmoidal; (d) user defined | 69 |
| Figure 3-4: Sustainability charts | 77 |
| Figure 3-5: The tornado diagram showing the differences in total performance of two options obtained by varying of criteria weights | 79 |
| Figure 3-6: Doroodzan river basin in Southern Iran | 90 |
| Figure 4-1: Irrigation water demand curve of representative farm No.1 | 177 |
| Figure 4-2: Irrigation water demand curve of representative farm No.2 | 178 |
| Figure 4-3: Irrigation water demand curve of representative farm No.3 | 178 |
| Figure 4-4: Irrigation water demand curve of representative farm No.4 | 179 |
| Figure 4-5: Irrigation water demand curve of representative farm No.5 | 179 |
| Figure 4-6: Irrigation water demand curve of representative farm No.6 | 180 |
| Figure 4-7: Irrigation water demand curve of representative farm No.7 | 180 |