Shiraz University
Faculty of Agriculture

Ph.D. Thesis In Agricultural Extension And Education

Development of a Conceptual Framework for Agricultural Water Management Based on Governance Paradigm

By

Masoud Yazdanpanah

Supervised By

Dariush Hayati, Ph.D.
Gholam Hossein Zamani, Ph.D.

March 2012

IN THE NAME OF GOD

IN THE NAME OF GOD

DEVELOPMENT OF A CONCEPTUAL FRAMEWORK FOR AGRICULTURAL WATER MANAGEMENT BASED ON GOVERNANCE PARADIGM

BY:

MASOUD YAZDANPANAH

DISSERTATION

SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY (Ph.D.)

IN:

AGRICULTURAL EXTENSION AND EDUCATION
SHIRAZ UNIVERSITY
SHIRAZ, IRAN

EVALUATED AND APPROVED BY THE DISSERTATION COMMITTEE AS: **EXCELLENT**

……..……..	D. HAYATI, Ph.D., ASSOCIATE PROF. OF AGRICULTURAL EXTENSION AND EDUCATION (CHAIRMAN)
……..……..	GH.H. ZAMANI, Ph.D., PROF. OF AGRICULTURAL EXTENSION AND EDUCATION
……..……..	E. KARAMI, Ph.D., PROF. OF AGRICULTURAL EXTENSION AND EDUCATION
……..……..	A. R. SEPASKHAH, Ph.D., PROF. OF WATER ENGINEERING
……..……..	N. MONFARED, Ph.D., ASSOCIATE PROF. OF AGRICULTURAL EXTENSION AND EDUCATION

March 2012

This dissertation is dedicated to:

My family for their love and affection

and

Who gave me a new life with his/her death

ACKNOWLEDGEMENT

Making this dissertation was pleasant and interesting; I attribute the successful completion of this study to the support of various individuals and institutions whose contributions I would like to acknowledge. I hereby express my sincere gratitude to the following people. First of all, I would like to thank my supervisors at the department of agriculture extension and education, Shiraz University. Without them, the endeavour of conducting PhD research would not have been possible. Dr. Hayati has supervised my thesis for the last five years. I am grateful to him, for offering a very supportive working environment and for having great faith in my ideas and capabilities throughout the entire process – even during those times when I had difficulties seeing where the thesis was heading or whether real progress was actually being made

Thanks are also due to my second supervisor, Dr Zamani, especially for pushing me where my argumentation was weak or unclear, and challenging me to clarify my thought. I hope I have managed to root out the most glaring weaknesses. He gave, also, very useful suggestions and comments as a second supervisor in these years.

I would also like to thank the panel members (Dr. Karami, Dr. Sepaskhah and Dr. Monfared), who provided useful suggestions and comments throughout my study period. I am very grateful for sharing the history of the Cultural Theory with Thompson through the thesis. He, who initially introduced me to IIASA, has provided me with very warm support, especially towards the end of my PhD thesis. He has always given me warm encouragement, and checked through my writing very neatly. I am grateful to all the staff, colleague PhD and Ms Students at the department of agriculture extension and education, who gave me stimuli and encouragement on various occasions.

Finally, I would like to thank my friends and staff at IIASA and Austria (Dr Mostafavi), for warm encouragement and kind support throughout my study. This has been a wonderful journey, thanks to all those who have helped me, and I would like to thank them all.

Without all these people, I would not have completed the study at the Department.

ABSTRACT

DEVELOPMENT OF A CONCEPTUAL FRAMEWORK FOR AGRICULTURAL WATER MANAGEMENT BASED ON GOVERNANCE PARADIGM

By

MASOUD YAZDANPANAH

Water is a critical resource. It supports human life and culture, ecological functions and economic activities. However, in many developing nations the demand for water is increasing at rates which are outstripping traditional supply sources. This has lead water problems rise up in many parts of world.particulary in arid and semi arid regions

In the past, water problems are addressed through instrumental interventions, typically through engineering works or the measurement of biophysical or ecological indicators in isolation from their social context while water management is area of complexity, uncertainty, interdependence, multiple perspectives and controversy which labeled as resource dilemma. Understanding resource dilemmas as anthropogenic in nature gives rise to a need to better understand the coordination and governance of human affairs. As such this dissertation based on this water management characteristic tried to present a conceptual framework for sustainable water management based on governance paradigm. To reaching this goal, this dissertation has been organized into five phases. These sections follow a process of transition from government to governance as they seek to improve water management in Iran.

In the first phase, we used two theories, plural rationality theory and Dahl democracy theory to understanding present situation in water management sector. The finding revealed that traditional water management was based on plural rationality and this cause water resource managed in a sustainable manner. In contrast in modern era water just managed by government in a closed hegemony

and other stakeholders don't participate in water management and this has lead a water crisis in Iran.

In second phase, based on the results of first phase, reflexive modernity from Frankfurt school, as a socio political theory for designing policy making in water management sector was chosen. In this phase, we investigative reflexive modernity in two aspects: normative and descriptive through a meta-analysis. Then we compare elements of reflexive modernity with first modernity in normative aspects. Then in descriptive aspects we compare it with elements of water management.

In the third phase, we investigated stakeholders' worldviews and behaviour regarding water and water conservation. As such, we applied planned behaviour theory to investigated attitude, intention and behaviour regarding water conservation. To achieving these goals, firstly we extended theoretical framework of theory and added three new constructs to the theory: self identity, moral norm and perceived risk. Furthermore, we added four worldviews from cultural theory to the planned behaviour theory.

In the fourth phase, base on our findings in former phases we developed and presented a conceptual framework for sustainable water governance and finally in fifth phase we shortly described agriculture extension duty in this framework.

Contents

Title **Page**

OVERVIEW 1

An overview on the dissertation.....2

Section 1: starts with a brief introduction to water management in Iran from history to modern era which analyze with cultural theory. 3

Section 2: outlines and describes the reflexive modernity as a formwork and a models for sustainable water management in Iran 4

Section 3: investigates stakeholder's attitudes, norms, intention and behavior toward water conservation. 4

Section 4: presents a conceptual framework for water governance 5

Section 5: provides a general overview of the extension system in governance 5

References:..... 5

SECTION ONE 6

Chapter 1:.....7

A new enemy at the gate: Tackling Iran's water super-srisis by way of a transition from government to governance 7

ABSTRACT 7

1-1-Introduction.....7

1-2-Getting rid of the woolines 9

1-3-Iran's traditional water management 12

1-4-How, then ere these there kinds of social capital realted?.....16

1-5-Iran's modern water management 19

1-6-Governance out;government in 21

1-7-Know your enemy 22

1-8-So, if the enemy is not what it used to be, does that make a deferences? 25

1-9-Conlusion 28

References .....**Error! Bookmark not defined.**

SECTION TWO 33

Chapter 2 34

Water management from tradition to second modernity: A sociological analysis of the water crisis in Iran 34

Abstract.....34

2-1-Introduction.....34

2-2-First Modernity and Second Modernity: A Comparison.....36

2-2-1-Ideology and goals.....37

2-2-2-Role of the state.....38

2-2-3-Role of science technology and expertise.....38

Contents

Title **Page**

2-2-4-Dealing with risk....39
2-2-5-View of the individual....40
2-2-6-View of nature....40
2-3-Case Study: Water Management in Iran....41
2-3-1-Changes in Paradigms: From tradition to modernity....42
2-3-2- Iran's modern water management paradigm....43
2-3-3-The crisis period due to the modernity paradigm:....45
2-4-Perspectives from a Reflexive Modernity Point of View....45
2-5-Conclusion....49
References:....50

SECTION THREE....57

Chapter3:....58
Investigating agricultural professionals' intentions and behaviours toward Water conservation: Using modified theory of planned behaviour....58
Abstract....58
3-1-Introduction....59
3-2-Theoretical Framework....61
3-3-Materials and Methods....64
3-3-1-Participants....64
3-3-2-Instrument and Variables Measured....64
3-4-Results....67
3-4-1-Descriptive Statistics....67
3-4-2-TPB revised model: Descriptive relationship between variables and comparing different groups....67
3-4-3-Drivers of attitude, moral norm, risk perception, perceived responsibility, intention, and behavior....70
3-4-3-1-Attitude toward water conservation....71
3-4-3-2- Moral norm regarding water conservation....71
3-4-3-3- Risk perception regarding water crisis....72
3-4-3-4- Intention regarding water conservation....73
3-4-3-4-1-Original TPB....73
3-4-3-4-2- Revised Model....74
3-4-3-5-Water conservation activities....75
3-4-3-5-1 Original Model....75
3-4-3-5-2- Revised TPB....76
3-5- Discussion....77
References....81

Contents

Title **Page**

Chapter 4: **85**

Improving the understanding of farmers intention and behavior regarding water conservation in Iran: Does the theory of planned behavior will help? 85

Abstract 85

4-1- Introduction 86

4-2- Literature review 87

4-2-1-. Water Conservation Approaches 87

4-2-2- Theory of Planned Behavior 89

4-3- Method 92

4-3-1- Participants and Study Area 92

4-3-2-. Instruments and Variables measured 93

4-4- Results 94

4-4-1- Confirmatory Factor Analysis 96

4-4-2- Hierarchical Cluster Analysis and Logistic regression 97

4-4-3-Multivariate Regression Models/ Structural Equation 100

4-5- Discussion 102

References 105

Chapter5: **112**

How different farmers think and behave regarding water issues? Application of cultural theory 112

Abstract 112

5-1-Introduction 113

5-2- Conceptual framework 114

5-2-1-Five, and Just Five, Ways of Organising 116

5-3--Iran ecological condition 121

5-4- Method 122

5-4-1- Participants 122

5-4-2-Instrument and variables measured 122

5-4-2-1-Survey 122

5-5- Results and discussion 124

5-5-1- Descriptive statistics 124

5-5-2- Descriptive, relationship between variables 124

5-5-3-Variables effects at framework with path analysis 126

5-5-4- Comparing different groups 127

5-6-Conclusion 127

Refrences: ..... **Error! Bookmark not defined.**

Contents

Title **Page**

Chapter 6: **133**

Introduction and application cultural theory in analysis of attitude and behavior toward water Resource conservation: The Case of Jahad-e Keshavarzi staff in Bushehr Province 133

Abstract 133

6-1-Introduction 134

6-2-Cultural theory 135

6-2-1-Research framework 137

6-3-Research method 138

6-3-1-Instrument and Variables Measured 139

6-4-Results 141

6-4-1-Descriptive Statistics 141

6-4-2-Drivers of risk perception: 142

6-4-3-Drivers of attitude 145

6-4-4-Drivers of behaviour 146

6-5-Discussion and conclusion 147

References: 149

Chapter 7: **152**

Water through the eyes of its Iranian users: Comparison Iranian farmers and agriculture professionals regarding water issues 152

Abstract 152

7-1- Introduction 152

7-2- Conceptual framework 154

7-2-1- Cultural theory 154

7-2-2- Theory of planned behaviour 155

7-3- Methods 156

7-3-1- Data collection and respondents 156

7-4- Results 158

7-4-1-Description of model components 158

7-4-2- Correlation Analysis 159

7-4-3- Determine of intention and behaviour regarding water conservation 163

7-4-3-1- Water conservation behaviour 164

7-4-3-2- Path analysis 165

7-5- Conclusion 167

References 169

SECTION FOUR **173**

Contents

Title **Page**

Chapter 8: **174**
Conceptualizing sustainable governance framework..... 174
8-1-Introduction..... 174
8-2- A Model of Water Governance..... **Error! Bookmark not defined.**
8-2-1-Starting conditions ..... **Error! Bookmark not defined.**
8-2-1-1- Process ..... **Error! Bookmark not defined.**
8-2-1-2- Face-to-Face Dialogue..... **Error! Bookmark not defined.**
8-2-1-3- Trust Building..... **Error! Bookmark not defined.**
8-2-1-4- Social learning ..... **Error! Bookmark not defined.**
8-2-1-5- Capacity building ..... **Error! Bookmark not defined.**
8-2-1-6- Networking..... **Error! Bookmark not defined.**
8-2-2- Intermediate out come ..... **Error! Bookmark not defined.**
8-2-2-1- Outcomes..... **Error! Bookmark not defined.**
8-3-Conclusion..... **Error! Bookmark not defined.**
References: ..... **Error! Bookmark not defined.**

SECTION FIVE..... ERROR! BOOKMARK NOT DEFINED.

Chapter 9: ..... Error! Bookmark not defined.
The role of extension service in governance paradigm ..... **Error! Bookmark not defined.**
9-1-Introduction..... **Error! Bookmark not defined.**
9-2- Agriculture extension: a brief review..... **Error! Bookmark not defined.**
References: ..... **Error! Bookmark not defined.**

APENDIX **212**

Tables Page

Chapter 2.

Table 2. 1. Comparison key features between First and Second Modernity theories. ...39
Table 2. 2. elements of different water paradigm mnagement ...52

Chapter 3.

Table 3. 1. Items used to assess the myths of nature ...70
Table 3. 2. Relationship between variables ...72
Table 3. 3. Comparison mean of risk perception, moral norm, and intention toward water conservation in male and female. ...73
Table 3. 4. Comparison mean of attitude toward water conservation in different education group ...73
Table 3. 5. Step-wise multiple regression of variables on attitude regarding water conservation ...74
Table 3. 6. summary statistics for stepwise regression of variables on attitude regarding water conservation ...74
Table 3. 7. Step-wise multiple regression of variables on moral norm regarding water conservation ...75
Table 3. 8. Summary statistics for step-wise regression of variables on moral norm regarding water conservation ...75
Table 3. 9. Step-wise multiple regression of variables on risk perception regarding water conservation ...76
Table 3. 10. Summary statistics for step-wise regression of variables on risk perception regarding water conservation ...76
Table 3. 11. Stepwise multiple regression of variables on intention regarding water conservation ...77
Table 3. 12. Summary statistics for stepwise regression of variables on intention regarding water conservation ...77
Table 3. 13. Step-wise multiple regression of variables on intention regarding water conservation regarding water conservation ...78
Table 3. 14. Summary statistics for step-wise regression of variables on intention regarding water conservation ...78
Table 3. 15. Stepwise multiple regression of variables on behavior regarding water conservation ...79
Table 3. 16. Summary statistics for stepwise regression on behavior regarding water conservation ...79
Table 3. 17. Step-wise multiple regression of variables on water conservation activities ...80

Tables Page

Table 3. 18. Summary statistics for step-wise regression of variables on water conservation activities 80

Chapter 4.

Table 4. 1. Survey questions, reliability coefficients and factor loadigs. 99
Table 4. 2. Correlation of proposed latent variables within a confirmatory factor analysis. 101
Table 4. 3. Logistic regression results. 103
Table 4. 4. Regression coefficients of the Path Analysis 106

Chapter 5.

Table 5. 1. Items used to assess the myths of nature 130
Table 5. 2. Relationship between variables 131
Table 5. 3. Comparison means of the research variables among farmers with access to different water sources. 133

Chapter 6.

Table 6. 1. numbers of items and reliability of variables 144
Table 6. 2. Theoritical framwork 146
Table 6. 3. Descriptive results of variables 147
Table 6. 4. correlation between myths of nature 150
Table 6. 5. correlation matrix between variables 150
Table 6. 6. Step-wise multiple regression of variables on risk perception 151
Table 6. 7. Summary statistics for step-wise regression of variables on risk perception regarding water conservation 151
Table 6. 8. Step-wise multiple regression of variables on attitude regarding water conservation 152
Table 6. 9. Summary statistics for step-wise regression of variables on attitude regarding water conservation 152
Table 6. 10. Step-wise multiple regression of variables on behaviour regarding water conservation 153
Table 6. 11. Summary statistics for step-wise regression of variables on behaviour regarding water conservation 153

Chapter 7.

Table 7. 1. comparison means of myths of nature between farmers and professionals 165
Table 7. 2. comparison means of TPB variables between farmers and professional 165
Table 7. 3. Relationship between variables for professionals 168
Table 7. 4. Relationship between variables for farmers 169

Tables **Page**

Table 7. 5. Step-wise multiple regression of variables on intention regarding water conservation for professionals 170
Table 7. 6. Summary statistics for step-wise regression of variables on intention regarding water conservation for professionals 170
Table 7. 7. Step-wise multiple regression of variables on intention regarding water conservation for farmers 170
Table 7. 8. Summary statistics for step-wise regression of variables on intention regarding water conservation for farmers 171
Table 7. 9. Step-wise multiple regression of variables on water conservation behaviour for professionals 171
Table 7. 10. Summary statistics for step-wise regression of variables on water conservation behaviour for professionals 171
Table 7. 11. Step-wise multiple regression of variables on water conservation behaviour for farmers 172
Table 7. 12. Summary statistics for step-wise regression of variables on water conservation behaviour for farmers 172
Table 7. 13. Path coefficients of the SEM for professionals 173
Table 7. 14. Path coefficients of the SEM for farmers 174

Figures and Graphs Page

Chapter 1.

Figure 1. 1. The Four Ways of Organising That Are Predicted By The Theory of Plural Rationality 12

Figure 1. 2. The Full Triangular Interplay of the Three "Active" Solidarities 27

Chapter 2.

Figure 2. 1. Process based decision making approach. Source: Adapted from Hochrainer (2011) 50

Chapter 3.

Figure 3. 1. Theoretical framework of the research 68

Chapter 4.

Figure 4. 1. Conceptual Model Framework to be tested based on TRA and TPB 93

Figure 4. 2. Location of study site in Iran 97

Figure 4. 3. Histogram of Behavior and corresponding grouping based on hierarchical cluster analysis. 102

Figure 4. 4. Model to be tested 105

Chapter 5.

Figure 5. 1. Cultural theory (Thompson et al., 1990) 124

Figure 5. 2. Theoretical framework of the research 127

Figure 5. 3. Location of study site in Iran 129

Figure 5. 4. Path estimates of research framework 132

Chapter 6.

Figure 6. 1. Cultural theory 143

Chapter 7.

Figure 7. 1. Direct effect on professional' intention and behaviour regarding water conservation 173

Figure 7. 2. Direct effect on experts' intention and behaviour regarding water conservation 173

Figure 7. 3. Direct effect on farmers' intention and behaviour regarding water conservation 174

Chapter 8.

Figure 8. 1. Governance framwork. 188

Overview

An overview on the dissertation

Water is a unique natural resource with intriguing qualities; it is weak but at the same time very strong, it can be still or turbulent, it invokes spiritual reflections and rituals, but on a scientific level is the main source of oxygen and carbohydrates, both essential for maintaining life on earth (Stikker, 1998; Narasimhan, 2008). There is no substitute for water. It is the most vital component of the earth system: about 70% of the world's surface consists of water. Nearly 70% of worldwide fresh water resources are used in agriculture and water comprises roughly 70% of the human body (Stikker, 1998). The availability of clean fresh water is one of the most basic conditions for achieving sustainable development in the 21st century.

In the second half of the 20th Century we have observed a rapidly growing scarcity of fresh water with all its attendant stress. In Iran over the past four decades, farmers (and others who are close to the land) have watched water tables drop as one well after another has dried up and as formerly fertile lands have been forced out of productive use. With ecosystem services increasingly undermined by the loss of ecosystem functions, there is a broad consensus that Iran faces a serious and growing water crisis. This crisis exacerbated by severe recent droughts, has resulted in much of Iran's land ceasing to be productive. Though Iran has always had cycles of drought, a major World Bank report (Balali et al., 2009) confirms that this is different. Iran faces, not a periodic dry spell, but a severe water crisis, made even worse by recent high rates of population growth. Climate change, which it is estimated will reduce the per capita availability of water by a half by 2050, is, you could say, the icing on top of the catastrophic cake. The crisis is thus all set to turn into a super-crisis, with ever more land being taken out of production over the coming decades (Balali et al., 2009). That Iran now seems unable to cope with such a historically familiar reality suggests that something has been lost by its abandoning of traditional practices for modern ones.

People, however, disagree as to the cause (or causes) of that crisis. Some pin the water shortage (or water stress, to use the currently fashionable term) on population growth, others on the increased per capita demand as the population's living standards rise, still others on industrialization and urbanization, and yet others on climate change. Of course, these causes are not mutually exclusive – it could be a combination of some or all of them – but, whatever the chosen

permutation, it is water scarcity that is at the root of it all: a diagnosis that is not shared by those farmers (and others who are land-close) who see it as the direct consequence of taking out more water than is coming in. In other words, for those latter, it is the making scarce of water that is the trouble; if it wasn't scarce there couldn't be any competitive deepening. It is this "voice", so the proponents of governance would argue, that needs to be both heard and responded to.

For as long as that voice is excluded, the focus on scarcity will narrow the search to just technical solutions and rule out any consideration of behavioral change. As Molle et al (2008) have pointed out when they talk to farmers about water they talk about social issues. Water, for these farmers, is a "total social fact" The paradox – and it is an increasingly apparent paradox – is that social processes such as these, being the dynamic outcomes of a multiplicity of activities, are inherently unplannable; yet they are being tackled by means of planned interventions (Rist et al., 2007). These planned interventions – the hydraulic mission, as it is now called – are based fairly and squarely on prescriptive management: the sort of decision making that you get when hierarchy and individualism come together and, in the process, exclude egalitarianism (and, for good measure, do away with hierarchy at the micro-level: the village). This is the sort of decision making we are calling government. Governance, by contrast, being more plural and more "two-way" (and more distributed across scale levels), is a way of living with, and making the most of, the unplannable (Thompson and Trisoglio, 1997). This means that, the sooner we make the transition from government to governance – the sooner, that is, we move towards clumsy institution – the more chance there is of averting the super-crisis.

This dissertation will focus on the transition from government to governance in water management section. This dissertation has been organized into five sections and 9 chapters. These chapters follow a process of transition from government to governance as they seek to improve water management in Iran. The sections outlined below will provide a brief overview of the different chapters included in this dissertation.

Section 1: Starts with a brief introduction to water management in Iran from history to modern era which analyze with cultural theory.

A wide range of solutions have been developed and implemented to manage water management in Iran, but to date no conceptual framework has been found to guide the realization of these often conflicting objectives. This chapter presents clumsy solution, analyzing the challenges of providing a conceptual framework for sustainable water management. For this reason we describe a brief history of water management in Iran. Our argument will be that the pre-modern centuries

were characterised by governance whilst the modern has been characterised by government. Governance is more plural and more "two-way" along all the relationships comprising that plurality, than is government. Modernity, in consequence, lacks the requisite variety, and it is that needs to be restored. We are not advocating a return to how things were, technologically and socially, in the Middle Ages. Rather, we will need to draw on neo-Durkheimian social theory. It provides us with a set of hypotheses about the particular patterns of social relations that, in instituting shared voluntary restraint, give rise to plenitude and keep scarcity at bay. We then note how the attributes of this theory are fulfilled in the water management issue.

Section 2: Outlines and describes the reflexive modernity as a formwork and a models for sustainable water management in Iran

This chapter presents reflexive modernity theory and compares it to first modernity, analyzing the challenges of providing a conceptual framework for sustainable water management. The purpose of this chapter is to use the case of Iran to examine the basic premises of the theories of modernity and reflexive modernity regarding water development policies in order to provide a conceptual framework for sustainability. Debates showed that water management content and compilation process have almost all characteristics of the main elements of reflexive modernity. Moreover, results from related studies indicate that using the elements of the reflexive modernity paradigm in water management have enhanced the problem solving in this area. This is just the main goal in the philosophy of reflexive modernity paradigm.

Section 3: Investigates stakeholder's attitudes, norms, intention and behavior toward water conservation.

Despite the increasing importance of water conservation across the world, there is very little understanding about the psychosocial variables that predict people's water conservational behaviour. This study used modified model of the Theory of Planned Behaviour (TPB), including the additional variables of moral norm, self-identity and subjective myths of the nature as general beliefs, to predict intentions and behaviour regarding water conservation through a random sample of agricultural professionals (n= 80) and farmers (n= 350) using survey method in Bushehr Province. Findings revealed that the modified theory of TPB can better prediction intention and behaviour regarding water conservation. This section contain 5 chapters.