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**New Institutional Economics, Governance and the Performance of
Water Institutions in India**

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**Vasant P. Gandhi
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Abstract

There has been substantial water resources development for agriculture in India but the emphasis has been mainly on the technical side - the building of the necessary institutions required for effective management of the resource has received little attention. Many believe that water resource management in India is heading for a crisis unless the institutions and related policies are rapidly transformed. In this light, the study examines key features of water institutions in India, applying new institutional economics fundamentals, as well as management theories of good governance. The study uses a survey of 29 water institutions and 450 farm households conducted across three states in India which face water scarcity and have attempted to address it through institutional efforts and innovations. The findings indicate and help identify important characteristics of institutional design for creating better institutions. Findings indicate that derived from new institutional economics fundamentals, the stress on features such as clear objectives, good interaction, adaptiveness, appropriateness of scale, and compliance ability are very important for institutional performance. They reduce transaction cost and promote cooperative solutions, which are key contributions of good institutions. Delivery of good governance by effective institutionalization of technical, organizational, and political rationalities are also very important. This requires empowerment of bodies such as the general body, chairman, managing committee and secretary in the institutions. The results bring out some significant associations and ways for enhancing institutional performance in water resource institutions in India.

Key words: water, institutions, resource management

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1. Introduction

There has been substantial focus on the development of water resources in India but the emphasis has been mainly on the technical side. The development of the necessary institutions required for effective management of the resource has received little attention. Institutions become essential for water given its nature, and water resource management in India is heading for a crisis unless policies and institutions are radically transformed (Saleth 1996, Vaidyanathan 1999, Brisco and Malik 2006). A substantial lack of understanding exists on how to design institutions for water in India (Brewer et.al. 1999, Saleth 1996, Gandhi 1998, Vaidyanathan 1999, Gandhi and Namboodiri 2002). The study has used new institutional economics fundamentals and management theories of governance to probe the behaviour and performance of local institutions in water resource management in three major states in India. It seeks to draw lessons and identify features that can be incorporated to make the institutions work better.

2. Conceptual Background

New institutional economics uses different approaches to understand the performance of institutions, (North 1997, Drobak and Nye 1997). Two important concepts among these are transaction costs and property rights. The principal premise is that the real costs of economic activities includes not only transformation costs but also transaction costs. Often, transaction costs are ignored, and when large, substantially reduce efficiency and effectiveness of economic activities. A major effect of good institutions is to reduce transaction costs. According to North (1997), the major challenge is to evolve institutions in which: (1) The transaction costs are minimized, (2) The incentives favour co-operative solution, in which cumulative experiences and collective learning are best utilised.

New institutional economics identifies formal institutions - which have their foundation in the laws and structures of organized society, as well as informal institutions which often spontaneously develop to address specific issues and problems in the society (Williamson 2000, Olson 2000, Picciotto 1995). It identifies macro level institutions: humanly devised rules or "rules of the game" that structure interactions (formal rules such as constitutions, laws and property rights, and informal rules such as traditions and codes of conduct), and micro level institutions, such as institutions of governance including markets or other modes of managing activities/ transactions and seeing activities/ economic activities through. The study focuses on micro level institutions in water resource management.

Based on these foundations of new institutional economics, and the study of the empirical literature which has followed (for example Ostrom 1992, Crase et.al. 2002, Herath 2002), Pagan (2003) has identified several characteristics that should be expected in effective water resource institutions. These are:

1. Clear Objectives: Good institutions show clear objectives and clarity of purpose. Clear objectives and their acceptance among stakeholders result in less conflict, greater congruence, and lower transaction cost.
2. Good Interaction: Good institutions show good internal interaction, bringing formal and informal rules together. This helps reduce transaction costs and promotes cooperative solutions. There is also good interaction with other institutions so that external transaction costs are reduced.
3. Adaptiveness: Facing change and variation in their internal and external environments, successful institutions demonstrate adaptiveness. Through this the institutions can sustain and grow keeping transaction costs low.
4. Appropriateness of Scale: Good institutions have the appropriate scale of size and scope. If too large, the transaction cost are too high. If too small, they have little control over their affairs and high external transaction costs.
5. Compliance Ability: Good institutions show ability to bring compliance. If the rules and processes of the institutions are not followed by large numbers, the institution ceases to be meaningful, and transaction cost too high.

Apart from these, another construct which appears relevant, emerges from the management theory of organizational design (Nystrom and Starbuck 1981, Groth 1999, Ackroyd 2002). This states that good governance in organizations/ institutions comprises of addressing at least three important rationalities:

1. Technical Rationality: Dealing with efficiency: Good institutions achieve efficient conversion of inputs into outputs. This requires good/ appropriate technology and productive efficiency.
2. Organizational Rationality: Dealing with coordination: Division of labor and specialization for efficiency leads to a large number activities. The effective coordination across these activities becomes crucial for overall institutional performance.
3. Political Rationality: Dealing with justice: Most large institutions require substantial human/ people interaction and involvement. In this, the addressing of the issues/ perceptions of fairness and justice become very important for sustainability and performance.

The study was designed to examine the importance of these fundamentals in the performance of water institutions and to empirically test their relevance.

3. Data

A primary survey of water institutions and beneficiaries was conducted in the major states of Gujarat, Maharashtra and Andhra Pradesh in India which all face water scarcity and have attempted to address this through different means including institutional efforts and innovations. In Gujarat, these include canal cooperatives, tube-well co-operatives, tube-well partnerships and check-dam groups. Maharashtra has a history of evolving farmer irrigation co-operatives to manage the distribution of canal water, and lifting water from rivers. Andhra Pradesh has had a massive government program to form water user associations to bring a participative approach to the management of canal and village tank (small reservoir) water.

The institutions were studied through detailed institutional as well as household questionnaires which were designed based on the conceptual frameworks presented above. 29 local water institutions and 450 beneficiary households were covered, see Table 1. The survey was done in the 2004-2005 cropping year.

Table 1: Sampling Plan: Number of Households					
Sr. No.	Kind of Local Water Institution	Gujarat	Maharashtra	Andhra Pradesh	Total
1	Canal co-operatives	50	100	0	150
2	Water users associations	0	0	100	100
3	Tube-well co-operatives	40	0	0	40
4	Tube-well partnerships	60	0	0	60
5	Check-dam groups	100	0	0	100
	Total	250	100	100	450

4. Performance of the Water Institutions

Research indicates that to address the emerging crisis in water resource management in India, water institutions must address major challenges of: scarcity (efficiency), equity, environment, and financial viability in water resource management (Gandhi and Namboodiri 2002). Objective evaluation of the performance on these counts is, however, difficult given the non-availability of specific historical data. Information on alternative measures of performance was collected and Table 2 provides summarizes the responses. Results indicate positive impact on efficiency indicators such as timely and adequate water availability, change to high value crops and better maintenance. Positive impacts are also indicated for equity, social cohesion and empowerment. There is,

however, considerable variation in the responses. Responses on other performance measures were also collected but are not shown for want of space.

Table 2: What has been the Impact of the Institution on the following? (percent)					
Particulars	Highly Positive	Positive	No Impact	Negative	Highly negative
	5	4	3	2	1
A. Efficiency					
1. Timely water availability	24.9	36.4	37.3	0.2	1.1
2. Adequate water availability	22.9	36.7	18.7	11.8	10.0
3. Change in cropping pattern in favour of high value crops	31.6	25.3	42.4	0.0	0.2
4. Better Maintenance of irrigation structure	19.8	28.0	43.1	6.4	2.7
B. Equity					
1. Equitable distribution of water	27.1	32.9	39.3	0.4	0.2
2. Empowerment of farmers to manage irrigation systems	32.7	37.6	20.4	6.7	2.7
C. Social Cohesion and Empowerment					
1. Beginning of a sense of ownership by farmers	45.8	24.4	29.1	0.4	0.2
2. Resolution of disputes and dealing with offenses	20.7	45.1	33.8	0.0	0.2
D. Other					
1. Price/ cost of water	21.6	30.7	46.9	0.2	0.7
2. Diversification of cropping pattern	29.8	22.9	46.7	0.2	0.4
3. Choice in deciding irrigation timings	3.1	19.8	76.7	0.0	0.4

Table 3 below gives the overall assessment of the respondents on the performance/ success of the institution, and its financial health. A range of different responses emerge.

Table 3: Overall assessment of the performance/success, and financial health of the institution by the respondents		
Success of the institution		
Success	Rating	%
Very successful	4	16.7
Successful	3	26.0
Satisfactory	2	44.9
Poor	1	12.4
Total		100.0

Financial health of the Institution		
Financial Health	Rating	%
Very strong	4	3.3
Strong	3	3.8
Satisfactory	2	75.8
Poor	1	17.1
Total		100.0

5. Results of Bivariate Analysis

Bivariate statistical analysis is first used to examine the association of different features of the institutions, with institutional performance. This has been done through the Analysis of Variance (ANOVA) framework. The findings are presented in terms of the mean values of each group and the statistical significance of the difference across the means. For institutional performance the opinion of the respondents on the overall success of the institution (ranging from 4 to 1) has been used.

5.1 Governance

In local institutions, the technical rationality is typically delivered by the secretary/ staff, the organizational rationality by the Managing Committee, and the political rationality by the Chairman and the General Body. The delivery of the respective governance by each is measured by the reported activity level. The activity level of the general body is found to be strongly associated with institutional performance – the more active the better the performance, . The activity levels of the chairmen, managing committees and secretaries are strongly associated with success. These indicate the relevance of the different rationalities. The results also indicate that where the management and the secretary have the expertise in delivering their rationality, the performance is significantly better. The results show that if the organization is created by the government, and the rules are determined by the government, then there is a significant reduction in success. Thus, direct government involvement does reduces chances of institutional success. (See Tables 4 to 6)

Table 4: Governance: Relationship between activity level and institutional performance						
	None	Passive	Active	Very Active	F-Statistic	Statistical Significance
	Performance – Mean					
General Body ¹	1.26	1.48	2.26	2.58	60.96	***
Chairman	1.86	1.47	2.78	2.85	64.89	***
Managing Committee	1.88	1.50	2.78	2.87	64.45	***

Secretary	1.80	1.75	3.05	2.73	85.64	***
*Significant at 10 percent; ** Significant at 5 percent; *** Significant at 1 percent, ns Not Significant. ¹ excludes the check-dam sample since it did not have a functional general body at the time of survey.						

Table 5: Governance: Relationship between expertise and institutional performance							
	Strongly Disagree	Dis-agree	Partially Agree/ Disagree	Agree	Strongly Agree	F-Statistic	Stat. Signi.
	Performance - Mean						
Management has the expertise to do a good job	2.03	1.65	1.84	2.95	3.41	77.28	***
The staff have the necessary expertise to do a good job	1.47	1.22	2.67	2.40	2.88	47.20	***

Table 6: Governance: Relationship between role of government and institutional performance							
	Strongly Disagree	Dis-agree	Partially Agree/ Disagree	Agree	Strongly Agree	F-Statistic	Statistical Significance
	Performance - Mean						
The organisation has been created by the government	2.36	2.52	3.46	1.67	1.47	153.50	***
The rules of the organisation are mainly determined by the government and not the members.	2.70	2.79	2.32	1.61	1.45	46.77	***

5.2 New Institutional Economics

The association between performance and clear objectives as well as success and good interaction are examined below (Tables 7 and 8). Results indicate the existence of clear objectives and their being clear to all members are strongly associated with institutional success. The regular pursuit of plans to achieve objectives also shows a similar strong association with performance. Good interaction between the members and between the management and members are positively associated with success.

Table 7: New Institutional Economics: Relationship between clear objectives and institutional performance							
	Strongly Disagree	Dis-agree	Partially Agree/ Disagree	Agree	Strongly Agree	F-Stat.	Statistical Significance
	Performance - Mean						
This organisation has a clear set of objectives / purpose.	1.23	1.33	1.50	2.44	2.99	42.29	***

The objectives of this organisation are clear to all members of the organization	1.36	2.00	1.65	2.56	3.14	57.10	***
The institution pursues and regularly makes plans towards achievement of these objectives ¹	1.91	1.58	1.87	2.65	2.60	27.39	***
¹ excludes the check-dam sample since its activity is largely one time and not regular.							

Table 8: New Institutional Economics: Relationship between good interaction and institutional performance							
	Strongly Disagree	Dis-agree	Partially Agree/ Disagree	Agree	Strongly Agree	F-Stat.	Statistical Significance
	Performance - Mean						
There is good interaction between the members of the institution	1.00	1.59	1.67	2.39	2.93	24.01	***
There is good interaction between the management and the members	1.35	1.58	1.86	2.37	3.02	30.83	***
There is good interaction between the institution and the government	1.88	2.04	3.03	2.74	3.22	67.16	***
There is good leadership to facilitate, improve and guide the interaction	1.35	1.57	2.34	2.75	2.95	45.71	***
This organisation helps members to settle disputes	2.34	3.41	2.53	2.13	2.53	18.53	***

Tables 9 to 11 given below examine the association of institutional performance with the characteristics of adaptability, scale and compliance. The results indicate that where the rules of the organization are very rigid, the chances of success are significantly reduced. Clear mechanisms for changing the rules and the authority to change the rules lead to greater success. Appropriate scale and systems of the institutions lead to substantially greater success in institutions. The results indicate that the appropriate handling of higher level issues, by higher level institutions is of the greatest importance in the matter of scale. Where members are willing to follow the rules of the organization, the chances of success are substantially increased. Where compliance to the rules is sufficient, the performance is better.

Table 9: New Institutional Economics: Relationship between adaptiveness and institutional performance							
	Strongly Disagree	Dis-agree	Partially Agree/ Disagree	Agree	Strongly Agree	F-Stat.	Statistical Significance
	Performance - Mean						
The rules and systems of the organization are very rigid	2.40	3.04	1.92	2.03	2.56	24.74	***
There are clear mechanisms for changing the rules of this organisation if the need arises	1.41	1.75	1.93	2.66	3.31	67.59	***
The management has the authority to adapt the rules and systems	1.88	1.61	1.80	2.85	3.09	67.15	***
There is a regular review of the rules and systems of the institution	2.41	2.67	2.45	2.55	2.44	1.00	ns

Table 10: New Institutional Economics: Relationship between scale and institutional performance							
	Strongly Disagree	Dis-agree	Partially Agree/ Disagree	Agree	Strongly Agree	F-Stat.	Statistical Significance
	Performance - Mean						
The scale of the institution is appropriate for efficient management	1.19	1.50	1.65	2.52	3.03	54.37	***
The systems of the institution are appropriate for the scale of operation	1.25	1.55	1.57	2.64	3.05	53.73	***
The higher level issues are appropriately addressed by higher level institutions	1.93	2.11	2.56	3.52	3.41	88.40	***

Table 11: New Institutional Economics: Relationship between compliance and institutional performance							
	Strongly Disagree	Dis-agree	Partially Agree/ Disagree	Agree	Strongly Agree	F-Stat.	Statistical Significance
	Performance - Mean						

Members are aware of and willingly follow the rules set down by this organisation	1.37	1.55	1.68	2.57	3.25	70.15	***
The institution uses its powers to bring compliance	1.39	2.25	2.47	2.73	2.96	50.69	***
The compliance to the rules is sufficient	1.86	1.88	3.22	2.79	3.09	65.44	***

6. Results of Multivariate Analysis

Next, a multivariate approach is used which can load several explanatory factors together in a model equation. The performance indicators are range-bound with values such as from 1 to 4 and 1 to 5, the TOBIT model is used to study the behavior of institutional performance. Various measures of institutional performance were used as the dependent variable including overall rating of institutional performance, and those addressing scarcity (efficiency), equity, environment, financial strength, and development.

The model used 19 explanatory variables including dummies to separate groundwater and check-dam institutions. The explanatory variables were selected after taking into account the theory, the framework, and the results of several rounds of factor and correlation analysis to identify independent factors (Table 12). Given the nature of the data, it was not possible to eliminate multicollinearity entirely, and the results may be interpreted appropriately considering the limitations - some signs may be incorrect and some significances low because of this.

Table 12: Explanatory Variables	
Variable	Variable Description
x1	Intercept
x2	General Body Active
x3	Managing Committee Active
x4	Secretary Active
x5	The organization has been created by the government
x6	The rules of the organization are mainly determined by the government and not the members
x7	Management has the expertise to do a good job.
x8	The objectives of this organization are clear to all members of the organization.
x9	The institution pursues and regularly makes plans towards achievement of these objectives
x10	There is good interaction between the members of the institution
x11	There is good leadership to facilitate, improve and guide the

	interaction
x12	There are clear mechanisms for changing the rules of this organization if the need arises.
x13	The management has the authority to adapt the rules and systems
x14	The scale of the institution is appropriate for efficient management
x15	The higher level issues are appropriately addressed by higher level institutions
x16	The institution uses its powers to bring compliance
x17	The compliance to the rules is sufficient
x18	Check Dam Dummy
x19	Groundwater Dummy

The results of the TOBIT model estimation with the dependent variable as different measures of performance including overall institutional performance or success (rating), increase in irrigated area, and pricing according to scarcity, are presented in Table 13. The performance is found positively related to general body and managing committee activity and management expertise, indicating the importance of addressing political and organizational rationality. The results indicate that if the institution regularly pursues plans to achieve objectives, the success is significantly improved. If the organization has been created by the government and the rules are determined by the government the chances of success are indicated to be significantly reduced. Where the institution uses its powers to bring compliance, the chances of success are significantly better.

The results on increasing irrigated area indicate that managing committee being active, good leadership, and sufficient compliance to the rules, emerge as significant and positively related to increase in irrigated area. Organization being created by the government is found to be negatively related. The results on pricing of water according to scarcity, an important indicator of the water institutions treating water as a valuable and scarce resource, indicate that this is positively associated with good interaction between the members, clear mechanisms for changing rules, higher level issues being dealt with by higher level institutions, and the compliance to the rules.

Table 13 : Tobit Regression Results I				
	Explanatory Variables	Dependent Variables		
		Institutional Performance or Success	Increase in Irrigated Area	Pricing of Water According to Scarcity
		Parameter estimates and significance		
	x1	1.420091***	4.076893*	1.410308
	x2	0.250914***	-0.069159	-0.066155
	x3	0.187092**	0.265481***	0.099475
	x4	-0.287871***	-0.04304	-0.015379
	x5	-0.149422***	-0.25024***	-0.139544
	x6	-0.08607	-0.057786	-0.118937
	x7	0.234816***	0.084181	0.101575

	x8	0.100343	-0.20820***	-0.255083
	x9	0.268053***	-0.080258	-0.237644**
	x10	-0.063359	-0.003387	0.475615***
	x11	-0.169503***	0.239415***	0.211716
	x12	-0.001211	-0.007377	0.29315**
	x13	-0.090217	0.099452	-0.097824
	x14	-0.170791***	-0.145137**	-0.333062***
	x15	0.068449	0.076801	0.432666***
	x16	0.163848***	0.03968	-0.254228**
	x17	0.002516	0.111427*	0.417881***
	x18	2.08165***	0.445611	-9.007202
	x19	0.260732	0.215121	-0.416754
	N=450			
*Significant at 10 percent; ** Significant at 5 percent; *** Significant at 1 percent				

Results in Table 14 on another measure of performance: better maintenance which is an important indicator on addressing scarcity, indicate that this is positively associated with general body activity, clear objectives, regular making of plans to achieve objectives, and higher level issues appropriately addressed by higher level institutions. Results on equity: having rules for equitable distribution of water, indicate that this is positively associated with objectives of the organization being clear, good interaction between members, and institution using its powers to bring compliance. It is found to be negatively associated with creation of the institution by the government. Results on the equity achieved within the structure indicate that this is positively associated with managing committee activity, and compliance to the rules, indicating the importance of organizational rationality and of compliance. It is found negatively associated with the creation of the organization by the government, but rules being determined by the government has a positive impact on equity, indicating a notable role of the government in achieving better equity.

Table 14: Tobit Regression Results II				
	Explanatory Variables	Dependent Variables		
		Better Maintenance	Having Rules for Equitable Water Distribution	Equity achieved within the structure
		Parameter estimates and significance		
	x1	2.184783	0.865103	2.691568***
	x2	0.161418*	-0.053271	0.128444
	x3	-0.070948	0.035073	0.172179**
	x4	-0.042258	0.144124	0.008209
	x5	0.035662	-0.280849***	-0.244929***
	x6	-0.008707	0.05329	0.165364***
	x7	0.260157***	-0.086964	-0.014157
	x8	0.148892**	0.246791**	-0.153588**
	x9	0.308167***	0.075920	0.014838
	x10	-0.005304	0.578960***	0.013341

	x11	-0.232613	-0.108166	0.056266
	x12	-0.014414	-0.075976	0.089766
	x13	0.040387	0.189608*	-0.002157
	x14	-0.057051	-0.104382	-0.026575
	x15	0.274928***	-0.039760	0.046489
	x16	-0.395888***	0.252684**	0.010793
	x17	0.024219	-0.008054	0.199314***
	x18	0.401172	-10.952037	1.090317**
	x19	3.273710***	0.822417	1.048941***
	N=450			
*Significant at 10 percent; ** Significant at 5 percent; *** Significant at 1 percent				

Results in Table 15 on the institutions performing activities to reduce environmental harm indicate that this is positively associated with clear mechanisms for changing rules, good interaction between members of the institution, higher level issues appropriately addressed by higher level institutions and compliance to the rules. It is found negatively associated with creation by the government. Results on the financial viability of the institution indicate that this is positively associated with management expertise, regular planning to achieve objectives, good interaction between members, management having authority to adapt rules, and higher level issues dealt with by higher level institutions. It is found negatively associated with creation by the government. Results on the impact on the village as a whole indicate that this is positively associated with clear mechanisms for changing the rules, and compliance to the rules. It is negatively associated with the organization creation by the government.

Results on the impact of labor and wage earners (the poor), important for poverty alleviation, indicate that this is positively associated with general body being active, secretary being active, management having the expertise, management having the authority to adapt rules, and the institution using its powers to bring compliance.

Table 15: Tobit Regression Results III					
	Explanatory Variables	Dependent Variables			
		Activities to reduce environmental harm	Institution is financially viable	Impact on the whole Village	Impact on Labor and Wage Earners
		Parameter Estimates and Significance			
	x1	1.013432	1.983687***	2.438957***	2.724603***
	x2	-0.227194*	-0.080576	0.113985	0.111588*
	x3	-0.013498	0.065312	0.085222	-0.088264
	x4	-0.103777	-0.126746	-0.003935	0.152946*
	x5	-0.162456**	-0.30127***	-0.186443**	-0.033801
	x6	0.037021	0.055063	0.110334	-0.041491
	x7	0.256080***	0.170645***	-0.002147	0.127217***
	x8	0.073119	0.002937	-0.064158	-0.143711***
	x9	0.007371	0.290509***	0.080999	-0.060217

	x10	0.302305***	0.387007***	0.075067	0.032975
	x11	-0.072640	-0.166068**	0.089606	0.020929
	x12	0.163347	-0.019349	0.211390**	-0.058104
	x13	-0.012764	0.141572*	-0.016034	0.150765***
	x14	-0.235257***	-0.334343	0.029707	0.010978
	x15	0.471946***	0.473933***	0.029610	0.074944
	x16	-0.371419***	-0.060407	-0.222861**	0.088943*
	x17	0.253350***	0.037992	0.265635***	0.029809
	x18	1.100617*	-0.021508	3.104188***	0.120237
	x19	1.098932**	1.120363***	0.942875*	1.460313***
	N=450				
*Significant at 10 percent; ** Significant at 5 percent; *** Significant at 1 percent					

7. Concluding Observations

Water resource management is crucial for Indian agriculture and inadequate development of water institutions is a major concern. The study has sought to examine the nature and performance of local institutions in water resource management in India, using the new institutional economics framework, and theories of good governance emerging from management sciences. The results indicate and identify some important features of institutional design covering structures, processes and systems for creating successful water institutions. As derived from new institutional economics fundamentals, the stress on features such as clear objectives, good interaction, adaptiveness, appropriateness of scale, and compliance ability are found to be critical for institutional performance - they reduce transaction costs and promote cooperative solutions. Further, delivery of good governance by effectively addressing the three institutional rationalities: technical, organizational, and political through bodies such as the general body, chairman, managing committee, and secretary, emerge as critical determinants of institutional performance. The results show the importance of implementation of some of these sound institutional features for enhancing the performance of water institutions in India.

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