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Attributes of Farmers' Willingness in Participatory Irrigation Infrastructure Management

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Abstract

Pakistan is agro-based economy. Agriculture in Pakistan relies upon a vast network of canals that is said to be the world's largest contiguous irrigation system. However, over a period of time, the system is deteriorating and becoming hard for the government to coup up with its financial costs. This has led the government to decentralize the irrigation network by means of introducing participation based development programs in various regions to transfer canal ownership to the farm owners. Participation based development has been advocated for its potential to achieve community level success, and to empower the end-users. Participatory development approach has also proven to reduce the burden over public funds. Nevertheless, previous studies have shown that the willingness of the members (i.e., end users) to be the part of a participatory development program plays a vital role in securing success. Following this notion, this study attempts to understand the attributes of farmers' willingness in a provincial level participatory development program. This study identifies that 'willingness' of a farmer to participate is a dynamic process that extends far beyond farmers' mere agreement to the norms of project, but it further requires continued support and action throughout the project life. As a matter of fact, the willingness of farmers' depends upon a range of factors that are further influenced by cultural and geopolitical contexts. This research presents an abstract model indicating factors attributing farmer's willingness in pre-project commencement and during project execution. Unstructured interviews and a questionnaire survey are used to identify attributing factors and to develop willingness model. This paper concludes with a discussion over the role of willingness in achieving targets in case study project. This study will help academicians, researchers and policy makers with better understanding of the role of farmers' willingness in participatory development approach programs. Click here and insert your abstract text.

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1. Introduction

Agriculture plays a vital role in economic and socio-cultural domains of Pakistan. It is said that the majority of the working class population is directly or indirectly attached with agriculture and its associated industries [1]. Agriculture in Pakistan is augmented through the Indus river system, which is said to be the world largest contiguous irrigation system [2]. The Indus river system consists of three barrages, 14 canals. The total irrigation system, consisting of many distributaries and minor from main canals, is stretching over 64,000 km. Nevertheless, due to rapid growth in population that is further coupled with public sector inefficiencies and persisting corruption in government funds has left the existing irrigation infrastructure in a deteriorating condition that is not able to feed to all of the fertile lands. It is noted that persisting problems with the irrigation infrastructure are known since early 1980. Such problems are included financial gaps, poor water revenue collection from farm owners, lack of extended

infrastructures, vast inequalities in the distribution of canal water and consequent low agricultural productivity [3, 4, 5]. Nevertheless, the prevailing socio-culture trends and dominating political elements are also responsible for such a worsening situation. Historically, socially and politically dominated landowners are witnessed to bribe irrigation staff to draw water more than their allocated share; so as to increasing inequality and putting system at stress [3, 6, 7].

Facing such a complex problem that is interwoven with socio-cultural, geopolitical and economical domains has then paved a way for the policy shift to decentralize the existing irrigation infrastructure to a participatory-based system. Nevertheless, long before such a policy shift, the irrigation watercourses are historically being collectively operated through watercourse associations. The policy shift planned to disintegrate the government owned the irrigation system in to small autonomous units, which should be regulated by a provincial level agency. In the province of Sindh, such an agency is developing and known as Sindh Irrigation and Drainage Authority (SIDA).

The origin of SIDA was initiated in 1997 with the government's plan to rehabilitate the national irrigation infrastructure under the umbrella of 'National Drainage Program (NDP)'. The program was assisted by the World Bank and the Asian Development Bank. The reforms arose from the NDP included the transfer of the irrigation system from provincial irrigation departments to the multitier autonomous bodies consist of end-users (i.e., farmers) with clearly defined roles and responsibilities [8]. Consequently, the Provincial Irrigation Department Act (PID act 1997) was passed, in each province of Pakistan, to design legal and administrative frameworks to develop autonomous and financially self-reliant participatory irrigation management (PIM) based Area Water Boards (AWB). In the Sindh province, PIDA Act 1997 was further amended in the year 2000 to form the Sindh Water Management Ordinance (SWMO2000) [9]. The SWMO 2000 then led to the establishment of SIDA with its 3 incorporated AWBs. The SIDA then defined detailed functions and responsibilities of AWBs including tertiary watercourse associations. The three AWBs were built upon three canals, i.e., i. Ghotki Feeder (hereinafter described as 'north'); ii. Nara Canal (hereinafter described as 'center') and iii. Left Bank Canal (hereinafter described as 'tail'). The figure 1 shows the map of the Sindh province and three respective AWBs.

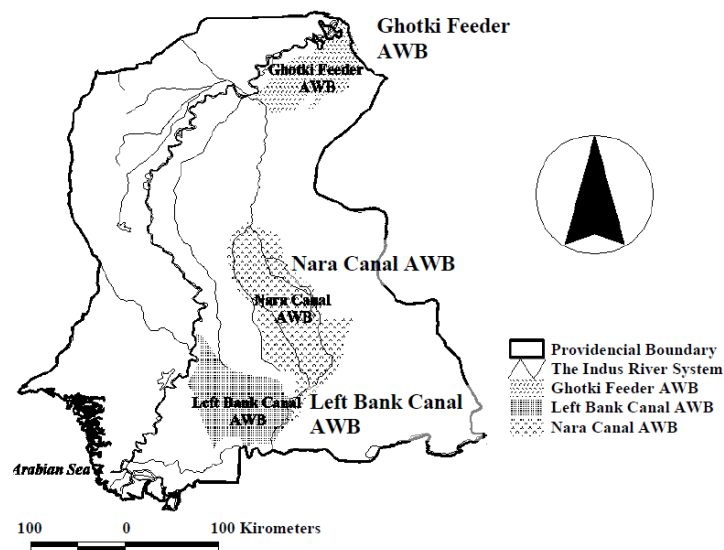


Fig. 1 Map of Sindh Province and SIDA's three Area Water Boards

1.1. Farmers' Willingness

The SIDA has been criticized by the farmers and media for not delivering anticipated contributions. It is also reported SIDA is also not able to increase the capacity of farmers especially in terms of their adherence to the new patterns of PIM as it is conceived at the inception of the SIDA. Previous researches [10] found numerous issues that are hindering the progress of SIDA, most of the issues are also confirmed by this study. Among such issues, one of the most prominent was the farmers' willingness to be the part of the program. Willingness not only meant to agree to participate, but to adhere all of the protocols and norms of the planned project.

The unstructured interviews conducted for this study has revealed that “willingness of farmers” is not a static factor that has been irrationally attempted to achieve by means of community mobilization and capacity building, rather it’s a continuous process that is only initiated with these two factors. As a matter of fact, the willingness is a continuous process that has to be initiated from the project conception to the project completion. Nevertheless, there are certain factors that abstractly define the willingness, out of which few are required to vitalize before a project is entering in the execution stage, while others are needed to be presented throughout a project lifetime. This study has found 10 attributing willingness factors, which are found necessary in a decentralized irrigation water distribution project of SIDA. Next paragraphs further define the identified factors.

2. Research Methodology

This research is based upon unstructured interviews with the stakeholders associated with the SIDA, i.e., SIDA staff and the farmers associate with AWBs. This study is accomplished in four parts; i.e., (i) review of open literature (ii) unstructured interviews with the stakeholders, (iii) questionnaire survey and (iv) data analysis and interpretation of results.

2.1. Literature Review

The open literature on policy issues in decentralizing irrigation infrastructure in Pakistan is referred to collect insights on functionality of SIDA. Along with policy issues, various research papers and other publications citing management issues in SIDA are also reviewed, out of which some have been cited in the introduction part of this paper.

2.2. Unstructured Interviews

The literature review is then followed by unstructured interviews with stakeholders that included SIDA officials, farmers and farm owners and the consultants. Nevertheless, such interviews were limited to the few numbers of the officials and farmers from different locations in the province. The unstructured interviews were consist of open end questions to gain more insights on the issues that were collected from the literature. Many key issues were highlighted, most importantly, it is highlighted that the new decentralized system has not fully adhered by all stakeholders; and people see the old government system more efficient.

2.3. Questionnaire Survey

The literature review and the unstructured interviews has then led to the revelation of issues and ideas that have impeded the adoption of participatory protocols of the newly decentralized irrigation system, out of which “willingness to participate” received high importance; and the similar is taken further to be researched for this study. The literature and unstructured interviews have resulted in specific factors attributing the willingness of farmers, based on which a questionnaire survey is conducted from all of the three AWBs. Identified factors are then presented to the respondents and are asked to rate it according to their satisfaction on a 9-point Likert scale. Figure 2 shows the 9-point Likert scale adopted for this research.

Extremely Dissatisfied (1)	Very Dissatisfied (2)	Moderately Dissatisfied (3)	Slightly Dissatisfied (4)	Neither satisfied or Dissatisfied (5)	Slightly Satisfied (6)	Moderately Satisfied (7)	Very Satisfied (8)	Extremely Satisfied (9)
0	0	0	0	0	0	0	0	0

Fig. 2 The 9-Point Likert Scale used to collect responses

2.4. Data Analysis

Table 1 shows the respondents demographics. For the ease of understanding, the respondents are divided according to their associated region; i.e., North, Center and Tail area. The river Indus enters in to the Sindh province

from north and then flow from the center it meets with the Arabian Sea in the south. It has been noted historically that as the Indus river flows towards its tail end, the water quantity decreases and consequently tail regions receives relatively low quantities of water in comparison to the north and center regions. Therefore, such division will help us in understanding the responses with respect to the usual availability of water.

The questionnaire data is then analyzed through IBM's Software Package for Social Scientist (SPSS V.20). Frequency analysis and weighted mean score rankings [11] are then performed to confide responses and to indicate stakeholders' perception over identified willingness attribute. It is found that respondents of different locations have quite a varying view, which is discussed in detail in the following section.

Table 1 Respondents' demographics

	Location			Total
	Center	North	Tail	
Farmer	12	26	16	54
SIDA	7	4	3	14
Total	19	30	19	71

Table 2 Identified attributes of farmers' willingness and general mean scores of each location

Sr#	Willingness Attributes	Project Location		
		North	Center	Tail
Pre-Project Execution				
1	Proper identification of incentives for the farmers	7.1	6.6	3.9
2	Capacity building efforts by the SIDA	5.5	4.4	3.5
3	Level of trust between SIDA staff and members of Water users Association	5.7	6.3	5.7
4	Farmers' willingness to be a part of the project	7.6	7.7	7.5
During and after project execution				
5	Trusted and efficient leadership of AWB	7.2	6.9	6.7
6	Legal and financial consultations of farmers by the SIDA staff	5.0	5.9	3.9
7	Project cost incentive relationship	7.2	7.1	6.6
8	Efficiency of the constructed Works	8.3	5.6	5.6
9	Collective efforts of member of AWB	7.2	6.0	6.4
10	Available conflict resolution mechanisms	5.7	5.6	3.9

3. Discussions and interpretation or questionnaire survey results

Table 2 shows the list of identified factors, with their generalized weighted means for each location..It is evident from the table 2 that there is a difference of opinion on the willingness attribute across the province, and similar is the reason that all regions different in terms of achieved progress. It is also to be noted that the tail region has the least weighted mean scores. A similar trend is found when collected data is segregated with respect to different stakeholders, i.e., farmer, SIDA officials and the consultants. Table 4 shows the weighted mean scores of different stakeholders across the three regions.

3.1 Proper identification of incentives for the framers

The biggest incentive for a farmer to be a part of SIDA is to receive a fair share of water, which might have been uncertain under the public ownership of the irrigation infrastructure. Nevertheless, apart from a fair share other incentives, such as empowerment and improved infrastructure etc., must be identified and communicated to the

prospect participant farmers. The knowledge of incentives drives the farmers to join the program and make them an active member of a participatory-based system. Lack of identification and knowledge of incentives may not only lead to a hindered project speed but also led participants reluctant to provide their potential input. Similar is the case of SIDA in the tail region, where general scores are observed as low as 3.9; while specifically farmers' score is even lower at 3.1. On the contrary, SIDA official and the consultants are more confident with the score of 8.3. Such a contrasting results shows that there is a gap between farmers and SIDA in understanding of incentives. Or alternatively the new decentralized system has failed to deliver incentives to the farmers in the tail region. In the northern and the center region, the farmers are however moderately and slightly satisfied, which is probably due to the relatively higher quantity of water available in the region. In both, north and central regions, the SIDA officials are scoring almost similar to their counterparts, i.e., farmers.

Table 3 Weighted mean scores of different stakeholders across the three regions

Sr#	Factors	Location of the Project						Consultant
		North		Center		Tail		
		Farmer	SIDA	Farmer	SIDA	Farmer	SIDA	
Pre-Project Execution								
1	Proper identification of incentives for the farmers	7.0	7.3	6.2	6.7	3.1	8.3	8.3
2	Capacity building efforts by the SIDA	5.2	7.5	3.0	5.0	2.7	7.7	8.3
3	Level of trust between NPIW staff and members of Water users Association	5.6	6.3	6.0	6.0	5.2	8.7	8.0
4	Farmers' willingness to be a part of the project	7.7	6.7	7.9	7.3	7.4	8.0	8.0
During and after project execution								
5	Trusted and efficient leadership of SIDA	7.3	6.3	6.7	6.3	6.6	7.0	9.0
6	Legal and financial consultations of farmers by the SIDA staff	4.7	7.0	5.1	6.0	3.3	7.0	8.7
7	Project cost incentive relationship	7.2	7.0	7.2	6.5	6.4	7.3	8.0
8	Efficiency of the constructed Works	8.3	8.5	5.5	4.4	5.1	8.7	8.7
9	Collective efforts of member of AWB	7.3	6.3	5.3	6.0	6.4	6.7	8.7
10	Available conflict resolution mechanisms	5.5	7.0	5.1	6.0	3.4	7.0	7.0

3.2 Capacity building efforts

Policy makers develop a set of project protocol, i.e., rules of conduct, and then social organizers extend it to the community to enhance their capacity of understanding participatory based system that is planned to implemented [12]. The ref [12] further emphasizes, from his experience of a famous participatory based development project in Karachi Sindh, on 'social infrastructure building' before inviting community to participate in a project. Initiating project without confirming that the community has sufficiently adhere the concept may led to no or skeptical participation; which may further lead to a non-cohesive participant behavior. Such a situation is observed while conducting interviews and questionnaire survey for this study. It is noted that at many places, especially in the tail regions, the farmers are unaware of the true means of the "participatory based system". As a matter of fact, capacity building effort receives one of the least scores, for both general and group- wise, among ten willingness attributes. However, table 3 shows that SIDA officials are quite confident about their efforts on "capacity building", which demarcates another gap between SIDA and farmers.

3.3 Level of trust between farmers and SIDA Staff

Trust is factor that builds faith of the community on the project and on the promoting agency itself. The faith then drives positive energy in farmers, which can lead to participate with their full potential. The unstructured interviews and the survey have reflected almost similar perception from farmers and SIDA officials across the locations. The

scores have shown that both farmers and SIDA staff have not fully developed the trust over each other. Such lack of trust may be attributed to the traditional role of irrigation staff and the uncertainties associated with the availability of the water. It is also to be noted that such lack of trust can also attributed to the historical role of irrigation staff that is highly influenced by the socio-political pressures to favor selected ones only; and most notably the persisting notion of high rates of corruption [10].

3.4 Farmers' willingness to be a part of the project

Farmers' willingness is a prime factor that is derived based on the three factors discussed earlier. Such dependence is confirmed through the interviews from the farmers throughout the studied locations. The knowledge of the participation incentives, full knowledge of working protocols and trust on the fellow farmers and the government agency staff let farmers participated with full motivation and energy. Confirming to the three factors can alone lead farmer to engage in the program till the end. Among general scores, all of the three locations have scored it 7.5 and above. In the group-wise scores, groups from all locations have scored 7.4 and above except SIDA staff in the north has rated it as 6.7, which is indicating slightly lower rate of farmers' agreement to participate. Lack of farmers' willingness can be attributed to the farmers' low scores of 'capacity building efforts' and 'level of trust' in the same region. However, on the contrary, the center region has depicted high scores from both farmers and the SIDA staff, while having very low scores of capacity building. This can be due to the fact that the center region has a higher literacy rate and therefore farmers there are more educated and have prior knowledge and incentives associated with the participation based development; and therefore higher rate of farmers' willingness is observed.

3.5 Trusted and efficient leadership of AWB

Trusted leadership definitely takes the association to a successful and smooth operation; and enforces farmers' willingness to be an active part of the project. The high scores on 'trusted and efficient leadership of AWB' have shown that this attribute is sufficiently presented across all regions, with a slight deferment. The north has depicted highest mean scores of 7.2, with 6.9 and 6.7 for center and tail regions respectively. In the group-wise scores, the tail farmers has demonstrated relatively higher mean scores of 6.6, with 6.3 score for both the north and center region. It shows that farmers at the tail region have better cohesion, irrespective of other difficulties, such as low water availability.

3.6 Legal and financial consultations of farmers by the NPIW staff

The ref. [13] found that effective transfer of operation rights to the farmers requires continuous support. It becomes necessary to provide guidance to the participant farmers to deal with legal and most notably financial matters on running and managing farmer organization and AWB under the newly decentralized system. This study finds that at many places the AWB members still lacks the necessary knowledge about running financial matters, especially when bringing balance between the revenue collection and performing operational and management tasks. Similar is the reason that this particular attribute has received one of the least general mean scores of 5, 5.9 and 3 for north, center and tail regions respectively. The lowest general mean scores of 3 by the tail region indicates a dire gap of legal and financial support. The gap is also evident from the group-wise mean scores, where a notable difference is noted between the farmers' and SIDA staffs' scores in all of the three regions. The largest difference is observed at the tail region, where farmers have scored 3.3 and SIDA staff has scored 7. Unaware of financial knowledge and support has identified as a potential factor causing deterrence in farmers to bring in full potential to the project, as it induces uncertainty and doubts on the participatory system.

3.7 Project cost incentive relationship

A positive relation between the cost paying and incentive receiving is mandatory for active participation of the farmers. This particular willingness attribute is usually a part of project design, which is also often compromised due to program implementation inefficiencies, socio-political pressure and ground realities; such as it was the case in SIDA. In spite of the evidences in open literature [10], the respondents from the north and the center has mean scored 7, and the tail region has scored 6.6. Quite similar trend is reflected by the stakeholders in the group-wise scores. This indicates that the participant farmers are satisfied to some extent with payoff of their participation.

3.8 Efficiency of the constructed works

Satisfaction with the development works and the resultant efficiency provides the participant farmers with trust in collective efforts and in the efficiency of the program, which assures their active participation in the project. Among all three regions, north has scored the highest with 8.3; while the center and tail regions have reflected relatively lower scores of 5.6. In the group-wise scores, the farmers have reflected even lower with 5.5 and 5.3 for the center and the tail region respectively; which is indicating their relative dissatisfaction with the development works. The SIDA staff in the center region has almost similar scores as farmers, while in the tail region SIDA has scored quite high as 8.7, which indicates another gap between the partners.

3.9 Collective efforts of member of FO and AWB to achieve targets

Collective effort is the prime notion based on which the whole concept of participatory irrigation management rests. Collective efforts of the members not only bring cohesiveness to the members but also greatly influence the pace of project to attain the targets. Collective efforts are refereeing that every member is willing to provide the required share of input to the project, which if some members are not willing to will have a team breaking reaction. In this study, the north region has depicted the highest mean score of 7, with scores of 6 and 6.4 for center and tail regions respectively. In northern region, the farmers are found surer about their collective efforts than to SIDA parts. In center region, the farmers have depicted the lowest scores of 5.3, which indicate cohesiveness problem among the AWB members.

3.10 Available conflict resolution mechanisms

Sindh is province where quarrels based on political affiliations and or on tribal association are common, especially in rural areas. The establishment of SIDA has then attempted to combine participants which are already in quarrels, or at least have grudges against other participants. The ref [14] reported that majority of quarrel in rural areas of Pakistan starts from the arguments over sharing irrigation water. In such a dilemma, the availability of rigorous conflict resolution mechanism is inevitable. The SWMO act (2000) provides a framework for conflict resolution among members of AWB. In this study the farmers have rated the existing system very poor with the scores of 5.5, 5.1 and 3.4 for north, center and tail regions respectively. On the contrary, the SIDA staff and the consultants have rated it as satisfactory with the lowest score of 6 and highest score of 7.

4. Conclusion

This study has attempted to analyze farmers' willingness to be the part of SIDA. A total of 10 attributes of willingness has been identified; for which responses indicating their satisfaction, from the farmers and the SIDA staff are collected. A wide gap is observed for almost each of the identified willingness attribute. SIDA staff from all locations has reflected their satisfaction with a varying degree, while the consultants have also shown their satisfaction on all willingness attributes, but with quite higher ratings of 'very' and 'extremely' satisfied. It should be noted at none place the SIDA staff has reflected 'extremely satisfied' for willingness attributing factors. For most of the factors their satisfaction is between 'slightly satisfied' and 'very satisfied'.

Among farmers, the northern region has reflected the highest rates of satisfaction, which shows their promising willingness to participate. The majority of their low mean scores are nearer to the neutral state, such as 4.7 for 'legal and financial consultation by the SIDA staff', and 5.2 for the 'capacity building efforts by the SIDA staff'. The farmers at the center and the tail region have reflected relatively lower satisfaction. Majority of their means scores have merely crossed the 'moderately satisfied'. The farmers at tail end have responded the lowest means scores, such as 3.1 for the 'proper identification of incentives' and 3.3 for 'legal and financial consultation by the SIDA staff'. This has shown that there is dire to need to fill in the gaps between farmers and the SIDA staff. Special reforms and efforts are mandatory to bring in the farmers at tail end and to focus their issues. It is highly recommended that capacity building efforts and the financial consultation of the farmers must be strengthening with new protocols.

References

- [1] Pakistan Bureau of Statistics, Agriculture statistics, 2018. <<http://www.pbs.gov.pk/content/agriculture-statistics>> accessed February 15,2018.
- [2] Inspirich, Indus Basin – The Largest Irrigation System of the World (2013) <<http://inspirich.com/indus-basin-largest-irrigation-system>> accessed February 15,2018
- [3] Nagrah, A., Chaudhry, A.M. and Giordano, M., Collective action in decentralized irrigation systems: Evidence from Pakistan. *World Development*, 84, pp.282-298, 2016.
- [4] Murgai, R., Ali, M., & Byerlee, D. Productivity growth and sustainability in post–Green Revolution agriculture: the case of the Indian and Pakistan Punjab. *The World Bank Research Observer*, 16 (2), 199–218. 2001.
- [5] Yu, Winston., Yang, Yi.-Chen., Savitsky, Andre., Alford, Donald., Brown, Casey., Wescoat, James., ... Robinson, Sherman. *The Indus Basin of Pakistan: The impacts of climate risks on water and agriculture*. Washington, DC: World Bank. 2013
- [6] Mustafa, D. Colonial law, contemporary water issues in Pakistan. *Political Geography*, 20(7), 817–837, 2013. 2001.
- [7] Rinaudo, J. D. Corruption and allocation of water: The case of public irrigation in Pakistan. *Water Policy*, 4(5), 405–422. 2002.
- [8] Memon, J.A. and Mari, F.M.Factors Influencing Equity in Farmer-managed Irrigation Distribution in Sindh, Pakistan. *International Journal of Environmental and Rural Development*, 5(1), pp.26-31. 2014.
- [9] Sindh Water Management Ordinance, 2000 <http://sida.org.pk/download/swmo_2002_English.pdf> accessed February 20, 2018.
- [10] Indus Consortium, Water governance in Punjab and Sind: A research report. 2015. <http://www.indusconsortium.pk/wp-content/uploads/2016/04/Research-study-on-irrigation-water-governance-Pakistan1.pdf>
- [11] Zhang, X. and Ali Soomro, M., Failure path analysis with respect to private sector partners in transportation public-private partnerships. *Journal of Management in Engineering*, 32(1), p.04015031. 2010.
- [12] Hassan, A., *Participatory Development*, Oxford University Press. 2010.
- [13] Memon, J.A. and Mustafa, U., Emerging issues in the implementation of Irrigation and Drainage sector reforms in Sindh Province of Pakistan. In 28th AGM & Conference of PSDE Pakistan Institute of Development Economics. Islamabad, Pakistan. 2012.
- [14] Merrey, D.J., *The sociology of warabandi: A case study from Pakistan*. *Irrigation Management in Pakistan: Four Papers by DJ Merry and J Wolf*, IIMI Research Paper, (4), pp.44-61. 1986