International Journal of Agriculture Innovations and Research
Volume 5, Issue 5, ISSN (Online) 2319-1473
Manuscript Processing Details (dd/mm/yyyy) :
Received: 14/02/2017 | Accepted on : 20/02/2017 | Published : 03/03/2017

Development of Group Dynamism Index for Community Tank Irrigation Farmers

C Lawrence Prabu[1] and M Esakkimuthu[2]*
*Corresponding author email id: esakkimuthu418@yahoo.com

Abstract — **Group-dynamics of tank user farmers has been determined by three factors viz., group performance, group influential and group interaction factors. Among these factors, group performing factor accounted for the maximum percentage of the total variance on the overall group dynamics followed by group influential and group interactional factors.**

Keywords — **Group Dynamics, Cohesiveness, Community and Irrigation**

I. INTRODUCTION

Water crisis in India and this is becoming increasingly a serious issue. The management of water distribution across the vast areas of the country and among the millions of multiple users in a sustainable manner is becoming a major challenge. There is a serious problem in managing both surface water and ground water. Irrigation system in India is categorized as major, medium and minor irrigation works for administrative purpose. Major irrigation works are generally built on perennial rivers and constitute large dams and canals that irrigate areas of many thousand hectares. Medium irrigation works constitute reservoirs of run-off water or large tanks. Minor irrigation works include all surface and ground water sources. Each of these three types of irrigation sources evolved at different times in history to meet changing requirement of human beings. However irrigation from tank is comparatively old technology and it was common in Indian landscape but the recent trend shows a decline in tank irrigation system. There are variety of factors associated with the decline of tank irrigation systems viz., development of large-scale gravity irrigation systems, rapid spread of tube well technology and decline in traditions of community management. As a result, a large majority of the tanks in the southern and eastern parts of India suffer from inadequate management and maintenance, some have become dysfunctional while others are even obliterated. At the all India level, the area under tank irrigation declined from 4.6 mn ha to 3.3 mn ha (Narayanamoorthi, 2002 and Janakarajan 1996). In Tamil Nadu the contribution of tank irrigation declined from 40 per cent in 1955 to less than 25 per cent in 2000 (Balasubramanian and Selvaraj, 2004).

In this context, it is perceived that there is urgent need to establish community organization and formulate policy programmes for both participatory and collaborative mode of water resource management. The community approach in tank irrigation management ensures sustainable management of irrigation system and mutual understanding among people in water sharing and developing good personal relationship. It is also reported that community management of water resources had proven over time to be very successful and sustainable. This approach ensures its optimum utilization, conservation, and maximizes the benefits. Large numbers of such example are scattered throughout India (Bhavsar and Bhagale 2007).

Concept of group dynamics was first evolved by Kurt Levin in 1930s, who viewed the concept from the perspective of internal nature of group. It also critically analyse why they (groups) form, how they form, the structure of group, how they function and its effect on other group members, other groups and the organization. Group dynamics as a global or comprehensive term used to describe the nuances of group's operations. It encompasses the dynamics of interaction patterns within the group. The subtle and the not so-subtle pressures exerted by group members, the manner of arriving at decisions, how work gets done and members are met. In short, group dynamics represent the forces operating in groups, which have an impact on how members work together (Sekaran, 2010). This paper focus on study the group dynamics of community based tank user farmer groups in Tamil Nadu.

II. METHODOLOGY

The present study was conducted in Pudukkottai district of Tamilnadu, India. The study was focused on the tank irrigation management undertaken by the community. This district was purposively selected for the study because this is one of the districts in Tamil Nadu having higher number of Irrigation Tanks. For measurement of group dynamics an indicator was developed. Tank irrigation management is a collective operation, hence it is understood that development of group dynamics indicator is very essential to know the virtue of group function and it also throw light on group coordination and conflict.

A. Identification and Scrutiny of Indicators

Identification of indicators affecting the group dynamics was carried over through intensive analysis of literature and then further scrutiny was done by discussion with experts from the relevant field. Based on which eleven indicators were selected considering the situation existed in the group.

B. Relevancy rating of the indicators

The final inventory of indicators was subjected to relevancy rating among 30 judges. The judges were from the cadre of Professor, Associate and Assistant professor in the discipline of extension of Tamil Nadu Agricultural University and other state Agricultural Universities. The experts were requested to specify whether each of the identified indicators was found relevant and suitable for

inclusion to measure group dynamics. Then responses were obtained on a three point continuum viz., 'most relevant', 'relevant' and 'least relevant' frequencies and scored as 2, 1 and 0, respectively.

The responses thus received from the judges were analyzed and the relevancy weightage (RW) of i^{th} indicator (RWi) was worked out by using the following formula.

$$\text{Relevancy weightage (RW)} = \frac{\text{Most Relevant X 2 + Relevant X 1+ Not Relevant X 0}}{\text{Maximum Possible Score}}$$

Considering the relevancy weightage scores, the components were screened. Accordingly, components having relevancy weightage score ranging more than 0.75 alone were considered. Using this process, eight components were selected.

Table 1. List of Selected Group Dynamics Indicators with Their Relevancy Weightage

Indicators	Relevancy Weightage
Group cooperation	0.91
Decision making process	0.89
Group climate	0.83
Motivation	0.86
Group cohesiveness	0.89
Communication	0.88
Group behaviour	0.91
Leadership	0.90

Followed by identification of major indicators of group dynamics, sub indicators were identified for each of the major indicator.

C. Selection of Sub Indicators

Under each major indicator, sub indicators were identified based on perusal of literature and discussion with experts. The statements were framed on each sub indicators based on discussion with experts. The statements were edited based on 14 criteria suggested by Edward (1969). These statements were then subjected to scrutiny by an expert panel of judges to determine the relevancy. For this purpose, the statements were given to a panel of 30 judges and requested to indicate the appropriateness (relevancy) of each statement for inclusion in the scale. The responses were obtained on three point continuum viz., 'Most relevant', 'Relevant' and 'Not relevant', with scores of 2, 1 and 0 respectively. Based on judges responses, the relevancy weightages were worked out for the statements by using the formula stated above. Applying the criteria the statements having relevancy weightage more than 0.75 were selected.

D. Procedure for Group Dynamics Index Development

The finalized schedule with eight major and sub indicators was administered to the respondents who were asked to give their responses on a five point continuum scale viz., Most Prevalent (MTP), More Prevalent (MRP), Moderately Prevalent (MOP), Less Prevalent (LSP) and Least Prevalent (LTP) in their group for which the scores given were 5,4,3,2 and 1, respectively. Sub indicators were sequenced as per their weightage under major indicators.

E. Quantification of Indicators

Each indicator was measured by means of scoring procedure developed for the study. To evolve a composite group dynamics index and to derive meaningful conclusions, separate index was developed for each indicator. The procedure has been followed by Jebamary (2012) with necessary modification to apt for the study. The details of quantification of each indicator are furnished below.

F. Group Cooperation Index

It has been operationalized as to what extent resultant of the all the forces acting upon group members are mutually satisfying. It was assessed through five statements. Respondents were asked to rate the existing group cooperation against the statements and group cooperation index was worked out by using the following formula.

$$GCI = \frac{SGC\ xi}{TGC\ yi}$$

Where,

GCI = Group cooperation index

SGC xi = Secured score by an individual on group cooperation

TGC yi = Total possible score for an individual on group cooperation

Secured score was calculated by multiplying the weightage score with the respondents rating of the particular sub indicator in the continuum. For example, the statement, members meet on regular basis in group sequenced fourth in the group cooperation, therefore its weightage score is 1 and a particular respondent rated the indicator "more prevalent" category then its rating score would be 4.Thus the secured score is (4x1) for the i^{th} statement. By adding the secured score of each statement the total score secured by the individual on group cooperation was obtained.

Total possible score for group cooperation is arrived by adding total possible score of each sub-indicators [(4x5) + (3x5) + (2x5) + (1x5)]. By dividing the total secured score by total possible score, group co-operation index (GCI) was arrived for the particular respondent. The same procedure was followed to obtain other index too. Thus calculated GCI was used for further analysis.

G. Group Decision Making Behaviour Index

This has been operationally defined as the degree to which tank user farmers makes a decision with involvement of other group members, supports other members' decisions in consensus and feels the majority's decisions are valid in the tank irrigation management in decision making process. It was quantified through five statements. Responses were obtained from respondents and secured score and total possible score were calculated. The decision making behaviour index (GDI) was worked out by using the following formula.

$$GDI = \frac{SGD\ xi}{TGD\ yi}$$

Where,

GDI = Group decision making behaviour index
SGD xi = Secured score by an individual on group decision making behaviour
TGD yi = Total possible score for an individual on group decision making behaviour

The calculated GDI was used for further analysis.

H. Group Climate Index (GCI)

It was operationalized as the extent to which group members freely express their feelings, opinions and grievances etc., It was quantified through five statements. Responses were obtained from respondents and secured score and total possible score were calculated. The group climate index (GCI) was worked out by using the following formula.

$$GVI = \frac{SGC\ xi}{TGC\ yi}$$

Where,
GVI = Group value index
SGV xi = Secured score by an individual on group value
TGV yi = Total possible score for an individual on group climate

The calculated group value index was used for further analysis.

I. Group Motivation Index

Motivation has been defined as the forces that account for the arousal, selection, direction, and continuation of behaviour. It was quantified by set of five statements. Responses were obtained from respondents and secured score and total possible score were calculated. The motivation index was worked out by using the following formula.

$$GMI = \frac{SGM\ xi}{TGMyi}$$

Where,
GMI = Group motivation index
SGM xi =Secured score by an individual on group motivation
TGM yi = Total possible score for an individual on group motivation

The calculated group motivation index was used for further analysis.

J. Group Cohesiveness Index (GCI)

It has been operationalized as the activities or forces which acting on individual members to remain in the group. It was quantified by set of five statements. The group Cohesiveness index (GCI) was calculated by using the following formula.

$$GVI = \frac{SGC\ xi}{TGC\ yi}$$

Where,
GCI = Group cohesiveness index
SGC xi = Secured score by an individual on group cohesiveness
TGC yi = Total possible score for an individual on group cohesiveness

The calculated group cohesiveness index was used for further analysis.

K. Group Communication Index

It refers the nature of interaction existing among the members of tank user farmers. It was quantified through four statements. The group communication index (GCI) was calculated by using the following formula.

$$GCI = \frac{SGC\ xi}{TGC\ yi}$$

Where,
GCI = Group communication index
SGC xi = Secured score by an individual on group communication
TGC yi = Total possible score for an individual on group communication

The calculated group communication index was used for further analysis.

L. Group Behaviour Index

It is defined as the situations where people interact in larger or smaller groups. It was quantified five statements. The group behavior index (GBI) was worked out by using the following formula.

$$GBI = \frac{SGB\ xi}{TGB\ yi}$$

Where,
GBI = Group behaviour index
SGB xi = Secured score by an individual on group behaviour
TGB yi = Total possible score for an individual on group behaviour

The calculated group behaviour index was used for further analysis.

M. Group Leadership Index

It denotes traits, nature and quality of leader to influence the society. It was assessed through five statements with scoring pattern. The leadership behaviour index (GLI) was calculated by using the following formula.

$$GLI = \frac{SGL\ xi}{TGL\ yi}$$

Where,
GLI =Group leadership index
SGL xi=Secured score by an individual on group leadership
TGL yi = Total possible score for an individual on group leadership

The calculated group leadership index was used for further analysis.

N. Group Dynamics Index (GDI)

Group dynamics index was arrived by adding the score of each indicator *viz*., group cooperation, group decision making, group climate, motivation, cohesiveness, communication, group behavior and leadership. The group dynamics index was calculated by adopting the following formula.

$$GDI = \frac{(I_{1x} + I_{2x} + I_{3x} + \ldots\ldots\ldots\ldots I_{8x})}{(I_{1y} + I_{2y} + I_{3y} + \ldots\ldots\ldots\ldots I_{8y})}$$

Where,

GDI- Group dynamics index
I_{1x} - Total score obtained by 1st indicator
I_{9x} - Total score obtained by 8th indicator
I_{1y} - Total maximum possible score for 1st indicator
I_{9y} - Total maximum possible score for 8th indicator

Based on calculated composite group dynamics index the respondents were classified into three categories *viz*., low, medium and high. Furthermore it was used for other statistical analysis.

III. Results and Discussion

A. Analysis of Group Dynamics Index of Tank User Farmers

Group dynamics responses for the identified eight indicators as mentioned in the research methodology chapter were obtained from tank user farmers on five point continuum. From the obtained scores, indicator-wise indexes were worked out. The results are presented in Table 2.

Table 2. Indicator Wise Group Dynamics Index

Indicators	Mean score
Group cooperation Index	0.86
Group decision making Index	0.67
Group climate Index	0.87
Group motivation Index	0.66
Group cohesiveness Index	0.79
Group communication Index	0.82
Group behaviour Index	0.67
Group Leadership Index	0.83
Overall Group Dynamics Mean Index	0.78

B. Group Cooperation Index

Group cooperation index contributes highly (0.86) as all the forces acting upon group members are mutually satisfying. During the survey, it was observed that tank user farmers were cooperatively involved in tank irrigation management activities, conducting meeting and preparation of scheduling of irrigation. From the interaction held with the farmers, it was observed that tank user farmers were respect the Village head or President of Panchayat Union who is responsible for the implementation of tank management activity.

C. Group Decision Making Index

It could be observed from Table 2 that group decision making had (0.67) index value. During the survey, it was observed that decisions are taken in meetings where representatives of all the families are present and there was a mutual understanding between leaders and members, therefore the decision taken by the authority was accepted by the members of the group.

D. Group Climate Index

Further perusal of Table 2 revealed that group climate had 0.87 index value. It was observed that there is openness in the group activity and members can freely express his/her views and opinions in the meeting. There was transparency in sharing information about scheduling of irrigation, auction of trees in the tank, treasury activity. This might have paved the way for a good group climate.

E. Group Motivation Index

It could be seen from the Table 2, motivation index score was low among the tank user farmers (0.66) compared with other group dynamics index indicators. It was reported in this study that majority of the tank user farmers were having medium level of organizational participation and extension agency contact this might have resulted with the low group motivation index value.

F. Group Cohesiveness Index

From the Table 2 it could be observed that group cohesiveness had (0.79) index value. The tank user farmers are more or less belongs to the same geographical area and they mutually depends on each other therefore they are adhering with the rules and regulation of the system and attracted to stay together in tank irrigation management activities.

G. Group Communication Index

Tank user farmers exhibited group communication index score (0.82). In this study majority of the respondents were middle and old age category so it is good trend of sharing their experiences. The major types of communication take place among the members were announcement in villages and through word of mouth i.e. face to face contact since they are living in a same geographical area.

H. Group Leadership Index

From Table 2 it could be further inferred that tank user members exhibited more leadership behaviour (0.83). It was observed that leader of the group is either Village elder or elected member of Local Self Government and the leaders involves all the members of a group in a decision making activity.

I. Group Behaviour Index

Table 2 further depicts that tank user farmers exhibited a score of 0.67 for group behaviour. It was already explained that members were participating in the meeting and cooperate with leaders in decision making activity. The overall analysis indicated that the indicator of group dynamics of tank user farmers (at a given point of time) did exist among the member in varied dimension as per their perceived rating.

J. Grouping of Indicators

To study the group dynamic index, eight major indicators were taken into the consideration. In this section, Principle component analysis (PCA) and factor analysis (with varimax rotation) were used to group the indicators into factors based on the communalities observed.

K. Principle Component Analysis of Indicators towards Group Dynamics

Principle component analysis was carried out with all the indicators and the results furnished in Table 3.

Table 3. Eigen values for group dynamics indicators

Factor	Eigen values	Percentage of variance	Cumulative per cent of variance
I	1.996	24.948	24.948
II	1.668	20.851	45.799
II	1.220	15.246	61.045
IV	0.949	11.863	72.909
V	0.809	10.114	83.022
VI	0.684	8.551	91.573
VII	0.523	6.539	98.111
VIII	0.151	1.889	100.00

Accordingly Table 3 could provide details of Eigen values and percentage of variance explained by the components. The components which have more than one Eigen value were selected. Thus, from the eight components, three factors were extracted and these factors together explained a total variance of 61.045 per cent towards group-dynamics. Therefore it could be concluded that first three factors which have more than one Eigen value are contributing 61.045 per cent variation towards group-dynamics.

L. Rotated Factor (Varimax) Matrix of each Indicators

The results of principle component analysis clearly indicated that there were three factors that explained the maximum variation (61.045%) in group-dynamics. Further, the findings on factor loading of each indicator under three factors was analyzed and furnished in Table 4.

Table 4. Rotated Factor (Varimax) Matrix of each indicators

Group dynamic indicators	Factors		
	1	2	3
Group cooperation	0.544	0.319	-0.193
Group decision making	0.889	-0.281	0.070
Group climate	0.035	0.679	0.022
Group motivation	0.123	0.833	-0.095
Group cohesiveness	0.004	0.087	0.812
Group communication	0.078	-0.055	0.692
Group behaviour	0.906	0.004	0.174
Group leadership	-0.182	0.648	0.181
Eigen values	1.996	1.668	1.220
Per cent of variation explained	24.948	20.851	15.246
Cumulative % variation explained	24.948	45.799	61.045

From Table 4, each factor column was scanned for identifying the indicators which are more significantly correlated with the particular factor. Thus, from each factor column, the indicators having a factor loading of more than 0.5 were selected and mentioned in Table 5.

Table 5. Factors Wise Indicators with Factor Loading

Factors	Group dynamics indicators	Factor loadings
Factor 1	Group cooperation	0.544
	Group decision making	0.889
	Group behaviour	0.906
Factor 2	Group climate	0.679
	Group motivation	0.833
	Group leadership	0.648
Factor 3	Group cohesiveness	0.812
	Group communication	0.692

The data in Table 5 further revealed the grouping of indicators under each factor with their factor loadings.

Factor-I

This factor has been identified as 'Prime factor' as it explained 24.948 per cent of variation in group-dynamics. From the Table 5, it could be inferred that under factor 1, group behavior influencing the group-dynamics into greater extent with the highest factor loading of 0.906 followed by group decision making 0.889 and group cooperation (0.544). Since, these factors primarily deal with behaviour, decision making activity and cooperation of the individual, it has been termed as 'Group performing factor'.

From field observation and interaction held with respondents, it was understood that all the farmers believed in the concept of 'Union is Strength' which led to the good cooperation among the farmers. Since the majority of the tank user farmers depend on tank irrigation for farming they work together in tank rehabilitation activity and scheduling of irrigation from tank. Further, it was observed that decision making was done in a democratic way by including all the head of the family members. These activities might have inculcated the good morale and group behaviour among tank user farmers.

These discussions coincided with the research findings of Sakthivadivel *et al.* (2004) who reported that all major decisions regarding tank irrigation were taken in a meeting where representatives of all the families are present.

Factor-II

Among the total variation of 61.045 per cent, the second factor alone explained the group-dynamics variation to the extent of 20.851 per cent. Thus, factors 1 and 2 together contributed 45.799 per cent variation in group-dynamics (Table 5). From the results, it could be concluded that group motivation influencing group dynamics into greater extent with the highest factor loading of (0.833) whereas group climate (0.679) and group leadership value (0.648) have been found to manipulate the group-dynamics almost equally and hence it has been named as 'Group influential factor'.

It was observed from the study area that the leader was the elected member of Village Panchayat or village elder, therefore he knows about the people of particular area and he could influence the member to get involve in tank irrigation management activities. This might be the reason for this factor contributed in group dynamics of tank user

farmers.

Since it was reported that leaders are elected members or village elders and try to involve all the members in decision making activity and providing comfortable environment in expressing views and opinions of other members these three factors might have inter linked and contributed in group dynamics index of tank user farmers.

Factor-III

It could be further seen from the Table 5, that among indicators, group cohesiveness (0.812) and group communication (0.692) have been observed to have grouped under factor III. Among these, group cohesiveness had high factor loadings.

The members of the study were reported to be medium and old age category therefore easier interaction and smoother communication among members were noticed. Since they are living in a particular locality, they had frequent face to face contact which might have influenced greater cohesiveness among tank user farmers. Cohesiveness is an important factor to make the member remain in the group in such a way the communication also an important indicator to strengthen the group activity and influencing group cohesiveness in a greater extent among the tank user farmers, hence this factor has been named as 'Group interaction factor'.

Table 6. Indicators explained by all the five factors

Group-dynamics indicators	Loadings	Communality (h^2)
Group decision making	0.889	0.874
Group behaviour	0.906	0.850
Group motivation	0.833	0.718
Group cohesiveness	0.812	0.667
Group communication	0.692	0.489
Group leadership	0.648	0.486
Group climate	0.679	0.463
Group cooperation	0.544	0.336

Cursory view of the Table 6 revealed that the indicators namely group decision making (0.874) and group behaviour (0.850) have more communality (h^2) value hence they have been ranked as I and II followed by group motivation, group cohesiveness, group communication, group leadership, group climate and group cooperation has the communality values 0.718, 0.667, 0.489, 0.486, 0.463, 0.336 respectively.

IV. Conclusion

Group-dynamics of tank user farmers has been determined by three factors viz., group performance, group influential and group interaction factors. Among these factors, group performing factor accounted for the maximum percentage of the total variance on the overall group-dynamics followed by group influential and group interactional factors. The indicators namely group decision making (0.874) and group behaviour (0.850) have more communality (h^2) value hence they have been ranking followed by group motivation, group cohesiveness, group communication, group leadership, group climate and group cooperation has the communality values 0.718, 0.667, 0.489, 0.486, 0.463, 0.336 respectively.

References

[1] Ann-Marie, N and Strazzabosco, J. 2009. Group Dynamics and Team Building, Hemophilia organization development (4),1-2.

[2] Balasubramanian, K and Selvaraj, S. 2004. Tank degradation and Poverty reduction, In: The Importance of Common Property Resources in sustaining the Rural Poor, SANDEE Policy Brief (24), 11-13.

[3] Bhavsar, C, and Bhalge, P. 2007. Fruits of participatory irrigation management, The 4th Asian regional conference and 10th International seminar on participatory irrigation management, Tehran-Iran, May 2-5, 2007.

[4] Edwards, A.L. 1969. Techniques of attitude scale construction. Vakils, Feffer and Simmons Private Limited, Bombay.

[5] Janakarajan, S. 1996. Note on Irrigation Experience of Tamil Nadu, Proceedings of the Seminar on Conservation and Development of Tank Irrigation for Livelihood Promotion, July 12, Madurai, Conservation and Development Forum Gainesville, USA.

[6] Jebamary, K. 2012. Impact of dynamics of self-help group on rural women empowerment- A critical analysis: A Case Study. Ph.D Thesis, TNAU, Coimbatore, 95-97.

[7] Narayanamoorthi, A. 2002. Indian Irrigation: Five Decades of Development', Water Resources Journal, ESCAP (212), 12p.

[8] Sekaran, U. 2010. Organizational Behaviour - Text and Cases. Tata McGraw Hills Publishing Company Limited, New Delhi.

[9] Stoel, L. 2002. Retail Cooperatives: Group size, group identification, communication frequency and relationship effectiveness. International Journal of Retail & Distribution Management, Vol. 30 (1), 51-60.

Authors' Profiles

Dr. C Lawrence Prabu,
Extension Education Institute, Rajendranagar, Hyderabad, India

Dr. M Esakkimuthu,
Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India.