WFP-IRRI Joint Research Project

Investigating the Social Capital of Leadership and Reciprocity in Relation to the Bohol Irrigation System

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Abstract: Social capital research done by the International Rice Research Institute demonstrated the development of altruism through community cooperation during the JICA irrigation project in Bohol. This study acts as a follow-up to this discovery by endeavoring to find the method by which altruism was developed in Bohol. Reciprocity and leadership values are tested with a social questionnaire given to an irrigated sample set of farmers and a counterfactual rainfed group of farmers. Reciprocity and Leadership data is compared with previously gathered social game data. The results proved that neither reciprocity nor leadership were responsible for or even correlated with altruism development in Bohol. However, it was shown that the positive reciprocity value of the irrigated region was greater than the rainfed region indicating that a more positive attitude towards social interactions was adopted by irrigated farmers. It is important for international actors to consider the possibility of facilitating altruistic behaviors like positive reciprocity through community cooperation when designing their projects.

Key Words: Social Games, Behavioral Games, Reciprocity, Leadership, Altruism, Irrigation, Bohol, Philippines

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The Irrigated and Rainfed Farmers of Bohol

Personal Experience

My name is Jacob Solawetz and I am from Des Moines, Iowa, the home of the World Food Prize. I went through high school knowing that I wanted to participate in the World Food Prize youth institute. I originally heard about the Borlaug-Ruan Internship opportunity from my sister, a previous intern. She told me about a stellar opportunity to intern with the World Food Prize internationally. I began my journey towards the Borlaug-Ruan Internship by attending the Iowa Youth Institute in the spring of 2012. At the Iowa Youth Institute, I realized that not only was I interested in the internship but that I was fascinated with the whole mission of the World Food Prize. I met and spoke with many inspiring international leaders, who I would have never met anywhere else. I realized here and later at the World Food Prize Youth Institute in the fall that these were people shaping the course of human history and every one of them was contributing to the improvement of the international human condition. I wanted my life to emulate the success and altruism that I saw in these leaders and so I continued with the application process for the Borlaug-Ruan Internship.

I was accepted to participate in the internship program as the Borlaug-Ruan intern at the International Rice Research Institute in the Philippines. When I was given the news, I had almost no idea what that assignment meant for me other than I was excited to be abroad, on an adventure, and helping the world. I traveled alone to the Philippines and arrived a naïve 18 year old in Manila, Philippines in the summer of 2013. Manila is the capital of the Philippines and located on the northernmost island group called Luzon. I lived about two hours south of Manila in Los Baños. Los Baños could be thought of as a suburb, but in southern Luzon the metropolitan area runs together and municipal limits are vague. I quickly became acquainted with the area and discovered that although I was living in a bustling urban area, there was great natural beauty not beyond walking distance.

It certainly took me a while to acclimate to the exotic environment in which I found myself. I essentially knew no one on the IRRI campus but this situation quickly changed. I met my supervisor and co-workers and they took me on short trips to see the surrounding city of Los Baños. After a week, I acquired a Spanish roommate who rapidly became my best friend. I began meeting the other PhD students and post docs who were living, studying, and working at IRRI and before long I had a group of friends from aged 25-32 and from countries of Thailand to France.

It was not long before we were out exploring the vibrant Filipino culture. Filipinos love their food and I was able to enjoy many of their dishes including pork adobo, beef caldereta, and buko (coconut) pie. The Philippines was occupied by the Spanish from 16th century until the American takeover in 1898. As a result, the Filipino culture and language is of a native, Spanish and American blend. As an American, I was warmly welcomed in the Philippines. I was also extremely lucky due to the fact that the majority of Filipinos speak English as a second language. This meant I didn't have to learn a new language to be able to communicate with the locals. Public transport is extremely popular in the Philippines and I learned to navigate it in all forms from motorcycle to bus.

The International Rice Research Institute is located in Los Baños, Philippines about 2 hours away from Manila. Researchers, interns, and post docs travel from all over the world to work at IRRI. The mission of IRRI is to develop new rive varieties and crop management methods to help farmers improve their yields and quality of grain in an environmentally sustainable way. IRRI is broken into divisions of plant breeding, genetics, biotechnology and social sciences. I was assigned to work with the social science division.

The Social Science division conducts research related to the social impacts of food security and the assists with the social aspects of implementing large-scale agricultural projects. When I arrived, I was debriefed on the history of the Bohol Irrigation Project as it would be the topic of my research. Essentially, ten years ago, the Japan International Cooperation agency funded a large-scale irrigation project in Bohol Philippines. The island of Bohol is located in the Visayas island group. IRRI was assigned the task of analyzing the socioeconomic impact of this project. The Social Science Division of IRRI conducted social games and surveys to assess this impact in two areas of Bohol, the irrigated region and a counterfactual region that did not receive irrigation. The results of the study yielded the facts that not only were the irrigated farmers better off economically, but that irrigated farmers demonstrated an increase in altruistic behavior.

I was given the task of coming up with a project that would further the social capital findings of the previous round of experiments. I chose to investigate the method of altruism growth and hypothesized that it was the result of other measurable social capitals namely leadership and reciprocity. I then conducted a concentrated two weeks of research on the nature of leadership and reciprocity in communities and how they are measured. I used my research to develop two questionnaires and took them on site. I traveled through Bohol with two translators and our guide interviewing over 50 farmers. I returned to Luzon with a good amount of social capital data and began analyzing it for the rest of my stay. I provide the formal summary of my scientific work in the following report.

An Introduction to the Bohol Project

The following report is a continuation of the Bohol Project. The Bohol Project funded by the Japan International Cooperation Agency (JICA) includes the implementation of an irrigation system for rice farmers in Bohol and the analysis of the economic and social effects of the irrigation system. The Bohol Project analyzed the irrigation system's impact and makes recommendations for future sustainable irrigation systems.

The Bohol Irrigation System (BIS) is located in the northeast region of the Bohol Island. The system is composed of three main dams including the Malinao Dam, Bayongan Dam, and Capayas Dam. The following research has been conducted in relation to only the Bayongan portion of the Bohol Irrigation system within one of the dam's three municipalities, San Miguel. The Bayongan portion of the BIS is a typical gravity irrigation system and consists of a reservoir dam, a main canal, secondary canals or laterals, turnouts, and finally farm ditches. In contrast to many irrigation methods in the rest of the country, all of the systems canals and laterals are lined with concrete and

operated via steel spindle gates and farm ditches are earth canals. The BIS began operating in San Miguel in 2008.[1]

The project is supervised, maintained, and managed by the National Irrigation Administration (NIA). The irrigated region is then divided into irrigators' associations (IAs) which consist of multiple turnout service areas (TSAs). The TSA consists of a group of farmers that share an irrigation gate. Through the structure of the TSA, farmers are enabled to cooperate on maintenance of their portion of the irrigation system and on proper distribution of water. Each TSA has a leader responsible for the coordination of group activities and supervision of the TSA. These leaders are an important focus of the following report.[2]

Because the project and following report are predominately sociological, it is necessary to provide some background on the social structure of the studied area in Bohol. Bohol is located in the Central Visayas where Cebuano is the most commonly spoken language and the Cebuano ethnic group is the second largest in the country after Tagalog. The social structure in Bohol is bilinear, i.e., kinships can be extended to both father's and mother's sides. The religion of the region is overwhelmingly Roman Catholic. Often times, relationships in rural areas operate under a patron-client mutualism in which a patron is expected to give earnings, help, or protection and the client returns labor or personal favors. The people of Bohol also believe that lacking *Utang na kabubut-on* (sense of indebtedness) is shameful. A receiver does not have to return favors immediately as long as they keep the feeling that they owe something.[3] They also practice *Makikiusa* which is a smooth interpersonal relationship by being united in a group. The most important form of lower government is the barangay which means village in the local language. Many informal norms and customs from old tradition still govern the behavior of the barangay's members. As a convention, each barangay is divided into seven separate puroks designed for the purpose of facilitating the distribution of information and the mobilization of local residents.

With some structural, geographic, and social foundation established we may proceed to investigate the methodology of the Bohol Project. In order to study the impact of the BIS, a counterfactual group of farmers was selected to study as a control group. From a macro view, the theoretical counterfactual farmer comes from a background "similar" to a farmer in the irrigated area. In the context of this project, that means the farmer comes from a region that shares the same potential for an irrigation project and for irrigation agricultural and socioeconomic factors. These criteria led the Bohol project to select an adjacent region to conduct identical studies in order to qualify the acquired data in the irrigated area. The counterfactual group is termed the "rainfed" group.

The Bohol study endeavored to record the economic impact of the irrigation system taking measurements of income, production, etc. Furthermore, the Bohol project then attempted to analyze the social effects of the irrigation project via various social measurements such as a social questionnaire and behavioral games. These social games focused on valuable social characteristics such as community, cooperation, and altruism. The altruism findings were quite salient and inspired the content of this study.[4]

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[1] Figure 1 illustrates a map of the irrigation network.
[2] In relation to the Leadership portion of the investigation
[3] This will prove important for the Reciprocity portion of the investigation
[4] *Impact*

The Importance of Studying Altruism

It is extremely important to analyze the reason behind studying an intangible social effect like altruism in relation to the irrigation project. It may seem sufficient to merely look at the economic effects of the irrigation project and make a judgment on its viability from there, but here we consider a few of the values for an altruism study in the Bohol Irrigation Project.

Community cooperation is extremely important to reaching the goal of food security. First of all, community altruism is important to assist agricultural communities in mitigating catastrophes via risk distribution. For example, if an altruistic community suffers a production deficit from flooding, fortunate members who avoided the flood would be willing to bail out the farmers in need. And perhaps the favor would be reciprocated say in times of a drought. Farmers can also take procedural risks that will ultimately lead to increased production such as trying a new type of fertilizer or hybrid seed.[5] Furthermore, it is important to have community cooperation when attempting to implement large-scale agricultural projects. The Bohol project itself is a perfect example. In order for the irrigation system to be effective, TSA members had to cooperate to maintain the system and this cooperation was predominantly altruistic.[6] And finally, when considering food security on the macro level, altruism is the single most effective force in catalyzing the equal distribution of food needed to feed the world.

So with the necessity of altruism in mind, we can investigate the importance of researching and documenting it in this specific case. The research of the Bohol project comes as a follow up for international non-profit investment from JICA, an international actor. So firstly, the findings of this study will serve as an opportunity for JICA to assess the impact their project has had for the farmers in Bohol. Furthermore, the study will ideally provide recommendation for further investment in irrigation projects internationally. International actors such as JICA will be able to observe the analysis done by the Bohol project in relation to irrigations systems and perhaps be inclined or disinclined to implement new projects. A specific example may be a future project for the counterfactual rainfed area studied in Bohol.

Background from *Neighborhood Effects on Social Behavior: The Case of Irrigated and Rainfed Farmers in Bohol, the Philippines*[7]

The following study relies heavily on the analysis done concerning the social behavior of irrigated and rainfed farmers in Bohol and it is necessary to first provide some background on applicable portions of this research.

[5] Foster, et al.
[6] Rosengrant, et al.
[7] This section of the report is copyrighted by Takuji W. Tsusaka, Kei Kajisa, Valerien O. Pede, and Keitaro Aoyagi.

In addition to the economic data collected by the Bohol Project, a behavioral study was conducted to elicit altruism and community contribution in the irrigated and rainfed areas of Bohol. The study strived to look for relations between the behaviors of individuals to the behaviors of their neighbors by posing some interesting hypotheses and the two most relevant are listed here:

H1) *Social behaviors of individual farmers are influenced by their neighbors' social behaviors and personal attributes.*

H2) *Neighborhood effects on social behaviors, particularly contribution to public goods, augment in the irrigated area vis-à-vis in the rain-fed area.*

The study conducted a number of social capital games that yielded some very interesting results.[8] All of the games involved a monetary incentive to participate in the games. The first social game was the dictator game. In the game, participants were distributed randomly into either recipients or allocators. Allocators were given an endowment of P100 and the choice to transfer a portion of their endowment to recipients who had hitherto received nothing. The quantity of the allocator's transfers was recorded.[9] The second game was the Ultimatum Game in which P100 was given to each pair of two participants. One participant is given the power to offer a division of the money and the other the power to accept or reject the division. In the case of a rejection, neither participant receives any of the P100. Fair offers are a sign of altruism. The amount offered by the first participant was recorded.[10]

The third game was the Trust Game Sender in which one participant is given P100 and the option to send it to a partner. If the original player chooses to send the money the partner receives P300 and then the option to return a portion or all of the P100 to the original player. The portion returned was recorded. The fourth game was the donation game and relatively simple compared to the other games. The participant was given P100 and the option to transfer any portion of it to another group of participants to be shared equally among them. The amount transferred was recorded. The fifth game was the Public goods game in which one participant was given P100 and the option to invest in a group. All investments were doubled and shared equally among the group. The amount invested was recorded. The second round of the public goods game added the option for group members to send an unhappy face for P1 to a member of the group that did not make a satisfactory investment. Again, in the second round, the amount invested was recorded.[11]

In order to analyze the results of the game data, the study then endeavored to establish four types of neighborhood categories for game interactions: (a) plot neighborhood for irrigated farmers, (b) plot neighborhood for rainfed farmers, (c) residential neighborhood for irrigated farmers, and (d) residential neighborhood for rainfed farmers. Plot neighbors have adjacent fields and residential neighbors have adjacent homes. Threshold distance was used to distribute farmers into each category.

[8] Tsusaka et al.
[9] Bekkers
[10] Rotemburg
[11] Tsusaka, et al.

Once the data was collected relating to spatial relations and game results, a number of theoretical explanations for the results were provided in analysis. The dictator game yielded results that show transfer rates are higher for irrigated farmers among residential and plot neighbors. This suggests the one farmer's altruistic behavior positively influences the altruism of his/her neighbor. It was further predicted that since irrigation projects introduce the need for community cooperation, this participation spills over to create social norms based on cooperation such as altruism. The positive effect is higher among residential neighbors than plot neighbors, which suggests altruistic actions are more associated with daily activities. It was expected and detected that the endogenous social effect of spatial relation did not exist for the rainfed area.

The first round of the public goods game did not show any endogenous social effect for any of the four groups of farmer relations. The strongest relation found in the public goods game data is a positive correlation with transfer rate and age. Because investment is time sensitive, it would make sense to posit that as a farmer ages he becomes more aware of the benefits of investment. Furthermore, land holding size has a positive effect on transfers for irrigated farmers and a negative effect for rainfed farmers. This suggests that the incentive for community investment in rainfed areas is relatively low and in irrigated areas it is relatively high due to farmers' experience with the irrigation project.

In the second round of the public goods game the contributory behavior of farmers was expected to manifest. The results clearly confirmed this hypothesis. Farmers with experience in community collective actions gave more to the group or individual when given the opportunity. Furthermore, plot neighbors had a very strong and positive correlation with contributory behavior. This indicates that community members with experience in collective actions tend to align their contribution level with one another. Thus contributory behavior becomes homogeneous throughout the community. In general, it suggests farmer's tendency to emulate others and an emergence of social norms. The other altruism games were not included in the analysis of this study.

In conclusion, it appeared that external factors did little to influence the direction of the data. It was safe too conclude that both of the relevant hypotheses could be accepted. The first hypothesis is accepted on the grounds that if irrigation is available, there is a demonstrated increase in community cooperation. The second hypothesis is accepted on the basis that farmer proximity did show a positive correlation with the resulting game values. The second hypothesis seems to be the most remarkable fact and has influenced the bulk of the following study.[12]

Introduction of Hypotheses

The previous study provoked my curiosity in a number of ways. It was inquisitive to consider the method by which the demonstrated increase in altruism came about. A main component of the previous study was the creation of a social norm and the method by which this norm arose was never investigated; it seemed to simply appear. Of course, there was the explanation that cooperation on the irrigation system caused the increase in

[12] Tsusaka, et al.

altruistic behavior, but it wasn't clear how this contributed. At the same time, there were many hints in the report at how the social norm may have come to exist in the irrigated area. The confirmation of the second hypothesis dealing with spatial relationships provided the catalyst for my theories on the mode of social change for the irrigated area, which was exemplified by the first hypothesis.

The interpretation of the dictator game and the public goods game led to my theoretical development of a first explanation of reciprocity for the vector of social change in the irrigated area. The data indicated that neighbors' altruistic behavior influenced farmers' altruism positively in the irrigated area; i.e. farmers were more willing to contribute when their neighbors were also contributing more. This appeared to be less of altruism in the traditional selfless sense and more of a reciprocal transaction. Again, the data indicated the creation of a social norm in the irrigated area. It seemed that this social norm of altruism didn't arise out of a sense of self-giving, but rather because personal experience gave the farmers intuition that their cooperation with the community would be rewarding.

The public goods game further solidified my original intuitions from the dictator game and gave more insight into the creation of the social norm. The first round of the public goods game showed higher transfers from large landholders in the irrigated area and lower transfers from large landholders in the rainfed area. It was hypothesized that this was due to a personal incentive for investment for irrigated farmers with large landholdings. I hypothesized one step further that this incentive was rooted in reciprocity and which was perhaps responsible or partially responsible for all correlations including the one demonstrated by landholdings. The second round of the public goods game provided insight into the method by which the social norm was established. It was seen that in the presence of sanctioning and punishment, the altruistic tendencies of the irrigated area manifested themselves in the data. This provided an explanation in which reciprocity was cultivated and practiced; i.e. good behaviors are rewarded and bad behaviors are punished. I hypothesized that irrigated farmers were more accustomed to this type of social interaction and therefore it showed in the results of their social game data. All of these findings led me to propose the following hypothesis.

Hypothesis One: The implementation of the irrigation system in Bohol has increased the resident farmers' desires for reciprocity in their social interactions. Furthermore, the demonstrated increase in altruism is a result of strengthened reciprocity.

The reciprocity hypothesis seemed viable from a purely theoretical approach as well. The human tendency to reciprocate is one of the most agreed upon social theories. Many economic systems operate on the basis of reciprocity. Theory seems to agree with the data in that it would be expected for a community with greater experience in close cooperation in economics to have a greater existence of reciprocity. My belief was that this reciprocity would manifest itself in the altruism game data as well as in a new reciprocity questionnaire designed and conducted by myself in order to test my first hypothesis.

The second hypothesis arose less out of curiosity and more from necessity. Due to the brevity of my stay, I was to only interview leaders when conducting my surveys in Bohol.[13] Rather than interviewing these leaders about generic topics, it seemed appropriate to assess them on material relevant to their position, which meant leadership. Of course, this assessment would not have been forced, but fortunately the previous study provided some interesting implications as to the influence of leadership in the development of altruism in the irrigated area.

The proposed development of a social norm in the dictator game suggested the potential for leadership in the irrigated area. I hypothesized that certain influential leaders may be important to the adaptation of an altruistic attitude to social interactions at the community level. The second round of the public goods game provided more support for the leadership hypothesis. The demonstrated differences between the irrigated and rainfed cases was a result of sanctioning and I posited that in order for such sanctioning to happen in the daily life of the community, a trend would have to be established by a leader. When a leading individual begins to support good actions and sanction bad actions, then again the social norm is created and the community functions as it did in the second round of the public goods games. These suppositions led me to propose the following hypothesis.

Hypothesis Two: Community action related to the irrigation project in Bohol has strengthened the leadership roles of key individuals in the irrigated communities. Furthermore, the leadership of these individuals has been pivotal in the community's adaptation of more altruistic behavior.

The leadership hypothesis also seems to make sense on a theoretical level in that within a background of reciprocity, leadership acts as a vector of altruism promotion in the way that once a leader steps forward and begins to make selfless actions, the initiative is contagious and individuals reciprocate these selfless actions for the betterment of the community. It could also be expected that these leaders would be inclined to selfless action because they had already previously taken up selfless roles as TSA captains. The TSA captain works for the betterment of the community's irrigation potential and not for himself.

Development of the Reciprocity and Leadership Questionnaires

The development of the social questionnaire for the evaluation of leadership and reciprocity in Bohol was largely based on two main studies, The Personal Norm of Reciprocity[14] and The 21 Irrefutable Laws of Leadership[15]. Both of these studies contained a thorough explanation of the social capital of interest and the development of

[13] It will be seen that I was able to gain some leeway in this expectation for the reciprocity survey.
[14] Perugini, et al.
[15] Maxwell

a questionnaire for evaluation. Rather than inventing an arbitrary questionnaire, these methods were borrowed for the collection of data. The relevant components of the two studies are summarized in the following section.

The Personal Norm of Reciprocity endeavors to inquire into the nature of reciprocity and how its internalization moves from the community to the individual. The study suggest that after sufficient social exposure an individual develops a norm of reciprocity that dictates him/her to reward those who have helped him/her in the past and punish those who have been detrimental. It follows that once the personal norm has been internalized, the individual will follow this line of action whether they are observed or not and whether such action benefits them or not. Achieving reciprocity becomes a goal in itself and does not need external incentives to justify its pursuit.

Although this norm of reciprocity operates on the community and cultural level, it manifests visible variations in each individual. While investigating the possibility of measuring the personal inclination to reciprocate, the study makes three major distinctions in the definition of reciprocity. First there is a significant difference between an individual's beliefs concerning how reciprocity should function in their lives and how they actually respond in a situation where there is an opportunity to reciprocate. Furthermore, the types of reciprocating situations can be broken down into the categories of negative reciprocation and positive reciprocation. An individual with a tendency for negative reciprocity will desire, when harmed, to punish the harmful action. On the other hand, an individual with a tendency for positive reciprocity will desire, when helped, to reward the helpful action. In both cases, the possibility of personal cost does not effect the individuals desire to reciprocate. So in the creation of the questionnaire, three categories of reciprocity were investigated: beliefs in reciprocity, positive reciprocity, and negative reciprocity.

The questionnaire was developed from an original pool of 116 questions designed to test the various aspects of reciprocity. Each question followed a similar format of "if A does B to me, then I will do C to A" with C being of relatively equal magnitude to B. Furthermore, the examples in the questions always involved a cost for reciprocating in order to avoid confusing the reciprocating action with a reward external to the goal of reciprocity. Also, the example in the question was phrased without involving personal relationships. The original pool of questions was tested on experimental groups in the United Kingdom and Italy and reduced to its current form. The tests verified that each section accurately reflected what the individuals really believed and acted.[16]

The leadership questionnaire was developed and adopted from The 21 Irrefutable Laws of Leadership. Unlike the reciprocity questionnaire, the leadership questionnaire was not scientifically tested and attenuated. The qualities of a good leader are not nearly as amenable as the tendency to reciprocate. The 21 Irrefutable Laws of Leadership is a psychological attempt speculating on the necessary components of leadership. The Laws are listed below to frame the aim of the leadership questionnaire.

1) Leadership ability determines a person's level of effectiveness in their workplace and daily lives.
2) Leadership is derived from influence that is earned.

[16] For much greater detail on the selection of questionnaire questions, I refer readers to the "Personal Norm of Reciprocity" article.

3) Successful leaders develop their leading abilities continuously.
4) Good leaders have a clear plan for navigation and prepare before taking the group into action.
5) True leaders serve and consistently improve the lives of the people they lead.
6) Trust is the foundation of leadership.
7) People naturally follow leaders that they respect.
8) Often, great leaders are able to follow their intuition to make correct decisions.
9) Leaders attract people with qualities similar to themselves.
10) Before asking for a commitment to the group, leaders establish a personal connection with those they lead.
11) A leader's potential is determined by the influence of those closest to him/her.
12) Good leaders are secure in their position and often delegate important leadership opportunities to others.
13) Leaders are always aware that they are setting an example for those they lead.
14) In order to gain commitment to the group and vision, leaders know that they must first prove themselves capable to lead.
15) Leaders are unwilling to accept defeat and will always look for a way for the group to win.
16) It is important for leaders to utilize momentum to complete tasks.
17) Leaders understand that activity is not necessarily accomplishment.
18) Leaders know that they must sacrifice in order to reach their full potential as leaders.
19) Timing is often the difference between success and failure for a group in an endeavor.
20) Great leaders promote the development of leadership qualities in those they lead.
21) A leader's lasting value is measured by succession.

Methodology, Research, and Implementation of the Questionnaire in Bohol

After completing this research, the questionnaires were already largely complete; however, there are a few important changes to be noted. For the reciprocity questionnaire, the 2nd and 9th question in the beliefs in reciprocity section were removed due to regional irrelevance. Also, the word "tourist" in question 7 was changed to stranger. In the positive reciprocity section the horse race was changed to a cock fight.[17] The rest of the reciprocity survey was left unaltered. The leadership survey was reduced from 63 questions to 55 in order to keep survey material relevant to the lives of farmers in Bohol. Some wording was also changed for a smoother translation to the local dialect, but otherwise, the leadership questionnaire was also left largely in its original state.

[17] The cock fight question was arguably the best question for eliciting the farmers' true thoughts about reciprocity.

The questionnaires were then translated into Tagalog, the most common dialect in the Philippines.[18] Much attention was paid to the wording of the possible answers. It was important to directly translate the words such as "true" and "false" (for the reciprocity survey) and "never", "rarely", "occasionally", and "always" (for the leadership survey). With the implementation of the questionnaires in mind, a few preliminaries were added to the beginning of each set of questions. For the leadership questionnaire, it was important to receive answers based on how the farmers would actually act as opposed to how they thought they should act. Before the delivery of both surveys, it was also stressed that there was no right or wrong answer to the questions.

Due to time constraints, the sample set of farmers consisted of twenty farmers from the rainfed barangay Humay-Humay and twenty from the irrigated barangay Bayongan. In Bohol, Humay-Humay is located in the municipality of Ubay and Bayongan is in the municipality of San Miguel. Five of the twenty farmers in each barangay were selected to take the leadership questionnaire. In order to qualify for the leadership survey, the farmer needed to occupy a community leadership role such as a TSA captain or a barangay leader. In the irrigated area, the TSA captains were already listed and we selected them from this list. In the rainfed area, it was more difficult to locate the leaders and was mostly done through dialogue with the locals. Leaders were identified by themselves as well as by community members.

In the field, farmers were located according to their availability. Due to the short notice of the experience, there was not adequate time to organize a collective meeting or survey session, so each farmer was approached individually. Although this was not time efficient, it had a number of benefits. The farmers were very open to sharing their information and appreciated our effort to come to them. It made the survey experience much more personal and it seemed that most farmers really gave the questions thought before answering. Also, the data was not affected by a group mentality that might have emerged in a collective survey situation. This was certainly important because the surveys relied heavily on individual traits and opinions.

The surveys were translated from English and delivered to each farmer in Tagalog. Many farmers from Bohol understand Tagalog, but the local dialect is Visaya. For clarification purposes, a second translator was present for a further translation into Visaya. Often times, in addition to the survey question, a relevant example was provided for the farmer's understanding. These examples were discussed and agreed upon before heading to the field by the interviewing team.

It was the original intention to find farmers that had a farmer ID indicating they were already a part of the Bohol Projects study. However, the door to door method of finding farmers did not always produce farmers that had a farmer ID. Furthermore, not all of the farmers with a farmer ID had participated in the social games. After these deficits, ten farmers from each barangay qualified for the comparison of reciprocity data to the social games. For the leadership data, four irrigated farmers and three rainfed farmers qualified for the comparison to social games data.

[18] Translation credit to Dehner De Leon and Esther Marciano

Analysis of Data

After the data was collected, it was then transposed to an excel format for manipulation. For the analysis of the hypothesis, a number of tests were done to analyze the data.

For the leadership hypothesis, the rainfed sample consisted of five farmers and the irrigated four.[19] For each question four points were available. An answer of "always" received four points, "occasionally" three, "rarely" two, and "never" one. Fifty-five questions were available so therefore each farmer received a leadership score out of 220 possible points. Finally, the leadership difference of the two barangays was calculated by taking the average leadership score for the rainfed and irrigated samples. Leadership score totals and averages are shown in table 1.

It can already be seen that the leadership hypothesis is denied on the basis that the rainfed leadership average is higher than the irrigated average. However, it was necessary to test these results for significance. A T-test was used to determine whether the data differed from a random distribution from the null hypothesis.[20] For the purposes of this study, the null hypothesis assumed that leadership scores in the rainfed area would be equal to scores in the irrigated area. Before running the T-test, an F-test was taken to determine whether the data showed unequal or equal variation. Because the variation was unequal, a T-test for unequal sample sizes and unequal variance was run for a significance value of 5% or p=.05. The results of the T-test showed that there was no significant difference between the results of the two samples in the leadership survey.[21]

Although the results did not show any significant difference, a correlation between the leadership scores and the social game scores was assessed to determine the validity of the experiment in the first place.[22] The assumption was that if the total data set of leadership data did not show a good correlation with the corresponding social game data then the leadership survey would not be a good explanation for altruism development in the first place. It was found that the leadership scores had a moderate correlation of .35 with the social game data. It is important to note that for the selected individuals with corollary social game data the average of the social game scores was higher for the rainfed area than for the irrigated area. This would suggest that leadership scores do indeed relate to altruism game values and furthermore, that the sample set was not a valid cross section of individuals for the study related to the larger Bohol project.

The data from the reciprocity questionnaire was also transformed to excel and analyzed. For each question an answer of "true" was recorded as one point and an answer of "false" was recorded as zero points. The beliefs section had seven possible points, the positive reciprocity section had nine, and the negative reciprocity section had nine for a total of 26 possible points. Each farmer's answers were totaled and the barangay aggregate score was calculated for each of the individual sections as well as the overall reciprocity score. Again, the expected results were denied; the rainfed barangay scored

[19] One of the irrigated surveys was thrown out because halfway through the questionnaire the farmer indicated that he was not the right subject for the leadership evaluation.
[20] TTEST
[21] Student's t-Test
[22] Stockburger

higher overall on the reciprocity questionnaire than the irrigated barangay. Using the same T-testing process these results were tested for significance.

It was found that none of the differences in the categories of reciprocity total, positive reciprocity, or negative reciprocity were significant with p=.05. However, it is interesting to report that the positive reciprocity value was higher among irrigated farmers while the negative reciprocity value was higher among rainfed farmers.

The reciprocity data was also tested for a correlation with the social games data under the assumption that a strong correlation would prove the validity the reciprocity survey for investigating the increase in altruism in the irrigated region. The social game total for the irrigated farmer sample set was higher than that of the rainfed sample set. This was good indication that the sample set of farmers was a good match for the testing of reciprocity in relation to altruism. However, when the correlation was tested between the social game scores and the reciprocity data, negative correlations were found for all three categories of reciprocity. The correlation value for negative reciprocity scores, total reciprocity scores, and positive reciprocity scores was respectively -.33, -.26, and an insignificant -.06. It is interesting to note the descending order in these scores, which may suggest positive reciprocity as the better indication of altruism.

Finally, in order to explain the unexpected results of the data a few exploratory tests were ran with the survey data in relation to previously gathered demographic information. For each of the sample sets of farmers, the survey score was compared with the farmers' age and their education. Education was calculated in years of school attended.

For the leadership survey, all nine farmers were available with comparable demographic data. When the demographic data was evaluated, the irrigated farmer sample set had an average age of 43.8, and the rainfed farmer sample set had an average age of 53.8. The average irrigated education 8.25 years and the average rainfed education was 8.5 years. In the correlation test, it was found that the age correlated with leadership with a value of -.34 and that education correlated with leadership with a value of -.07.

For the reciprocity survey, 16 irrigated farmers and 19 rainfed farmers had demographic data available for comparison. The average age in the irrigated sample set was 49 years old and the average in the rainfed sample set was 55.6 years old. The average education in the irrigated sample set was 6.5 years and in the rainfed sample set, 7.05 years. The moderately significant correlations worth reporting are that of education and reciprocity score total (-.33), age and positive reciprocity (-.24), age and negative reciprocity (.22), and education and negative reciprocity (-.37). It appears that as people age they tend to favor negative reciprocation over positive and as education increases negative reciprocation is avoided.

Summary of Findings

The leadership data effectively denies the original hypothesis on the grounds that the rainfed sample set has a higher leadership score than the irrigated sample set. It can be assumed that in the Bohol region, there is not a strong connection between leadership development and the development of altruism. However, when viewing these results, it's important to consider that the demonstrated sample set of farmers was not viable in the

regard that the irrigated sample set did not show a greater social game average than the rainfed sample set. There was a moderate correlation between the social game scores and leadership scores for the entire sample set. This may be because individuals with altruistic tendencies make better leaders. This agrees with many of the arguments in the 21 Irrefutable Laws of Leadership.

The attempts to explain the leadership survey results with the demographic data were largely ineffective. In fact, the demographic data suggested that the data should have trended in the hypothesized direction. Age had a negative correlation with the leadership score and the rainfed farmers averaged a much higher age than the irrigated farmers. The correlation between education and leadership wasn't strong enough to be considered.

In relation to the Bohol project in general, we can speculate as to the reason behind the results of the data. It may be that the community action surrounding the maintenance of irrigation canals actually reduces the need for leadership. Perhaps the process of cooperating on irrigation projects increases individual identification and social equalization. Furthermore, the leadership was largely conducted based on individuals' perception of themselves. It could be that in the irrigated area, farmers displayed greater humility and honesty in self-reflection when answering the leadership survey.

The overall reciprocity score also denied the proposed hypothesis. However, the data still shows many interesting results for consideration. The irrigated sample set shows a higher degree of positive reciprocity while the rainfed sample shows a higher degree of negative reciprocity. This fact is reassuring for the previous altruism study because positive reciprocity often appears in close relation with altruism.[23] This relationship also explains the results of the data. It would be expected that more altruistic areas would tend to reciprocate positively and avoid reciprocating negatively. This supposition was also displayed in the descending correlation between social game scores and reciprocity survey categories of positive reciprocity, reciprocity totals, and negative reciprocity. The nature of positive reciprocity into relation to altruism should have been taken into consideration during the design of the reciprocity questionnaire. Also perhaps a more accurate hypothesis could have been constructed for the study of the creation of altruism via positive reciprocity in the irrigated area.

Concluding Remarks

Although we didn't discover the exact means of development of altruism in the area the fact remains that altruism was encouraged in the irrigated area. The results from the social games were confirmed by the demonstrated difference in positive and negative reciprocities between the two farmer groups. It was seen that the positive attitude of farmers improved in the irrigated area. These farmers appear to be more willing to help those who help them and less inclined to harm those who harm them. This change in the irrigated social norm is a good basis for the continuation of community cooperation. New

[23] Perugini, et al.

projects in the irrigated area from international organizations will operate with greater efficiency. Certainly, an attitude of cooperation and social development has been established in the irrigated area. This should act as incentive for projects in the irrigated area because projects will find it easier to be successful, and also for similar irrigation projects in the rainfed area because international organizations should desire to establish the same sort of social norm of community cooperation and improvement in the rainfed area. All of these incentives come on top of the hard evidence that the irrigation project was an economic success for irrigated farmers.

It is probable that the positive effect of the irrigation project can be created from any social project that encourages community cooperation. International actors should remember this fact when designing their projects. Rather than an approach that operates in the short term or via individual action, projects should trend towards the use of long-term action that requires community involvement and cooperation, because long term community cooperation will most likely facilitate the development of valuable social capital such as positive reciprocity and altruism.

Due to the time constraints of my stay in the Philippines, it is certain that this study is far from complete. Further research could search for a great sample set of farmers in the irrigated and rainfed areas. Perhaps after further tests, the true social norm may emerge related to reciprocity and leadership. However, the results of this study do not show anything promising for future research regarding reciprocity and leadership. A new study might look at other methods for the development of altruism. It could be that a personality trait such as altruism is too complicated to be significantly affected by any one type of social norm. In this case, a broader study could be implemented for looking at the various ways altruism is created and manifested in the irrigated area.

Personal Impact

This project was my first experience with systematic sociology. In high school, I had studied and read a good deal about psychology. I was familiar with correlation experiments in relation to social data, but I was not aware of how they actually operated. The beginning of this experience was great for the development of my researching capability. I was given a very large project and expected to design an experiment from previous work done by sociologists here at IRRI. I spent much time and effort researching the project and designating my interest.

The project was also my first real scientific experience designing and testing a hypothesis. It was difficult for me at first to translate my interest into a concrete hypothesis that could be tested and subsequently verified or denied. The analysis of the data taught me that my hypothesis should have been more carefully constructed. When researching reciprocity, I should have sensed the difficulty to test reciprocity values in general when a more specific approach would have been preferable.

For the first time, I conducted social surveys. I had never designed a questionnaire before and my experience taught me how to carefully pick questions. My trip to Bohol was amazing for me intellectually. I was surrounded by a whole new culture and way of life in the agricultural areas where the survey was conducted. On top of this difference, I was analyzing the culture and social structure for a scientific study. This was a lot to take

in, but with the help of my interviewing team, the experience was extremely successful. I learned certain tricks related to social surveys such as telling the interviewee that there is not a right or wrong answer. I learned during the survey that each word in the questionnaire is important because it is multiplied each time the survey is conducted. I realized that in order to extract the truth about the studied social condition, each question must be constructed meticulously to avoid confusion or misunderstandings. For example, I especially had trouble with one of my questions that involved a double negative. I found that the vast majority of the farmers were very open to being interviewed and a lot of my fears about approaching them randomly were quelled.

I was introduced to the world of Excel when analyzing the data quantifiably. I had very limited Excel experience and the first day I spent typing the data, I had to spend a good deal of time on YouTube learning "the basics of Excel." I also learned some advanced formulas that Excel offers when testing for significance of the data such as the F-Test, T-Test, and Correlation. Additionally, I learned during the analysis experience the interconnectedness of all social capital values. It seems like everything has the potential to be related. It is also important to consider that when a correlation is found it can be completely random and furthermore, this correlation doesn't necessarily mean causation.

The report portion of my study was also extremely transformative for me. I have never composed a scientific report before and it was a great experience to learn how to include and construct each portion of the report in a systematic order. I realized in reading other reports how important it was to give a detailed recount of the research process and findings. Although I knew exactly how everything was conducted, the reader is not enough to already be privy to that knowledge so it is important that the report provides it.

This was my first experience living away from home alone and I learned how to take care of many simple things that I took for granted when I was living at home. For a few examples, I had to manage my own funds, watch out for myself, and plan my own tourism experiences. I feel much more capable as an individual than when I first arrived in the Philippines. I discovered many things about the Filipino culture ranging from the natural beauty of its beaches to the industrial truths of the Jeepney. I can honestly not wait to return to the Philippines some time for further touring or perhaps continued work. I am extremely grateful for the opportunity to study at IRRI and travel to the Philippines.

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Figure 1: Map of Bayongan system

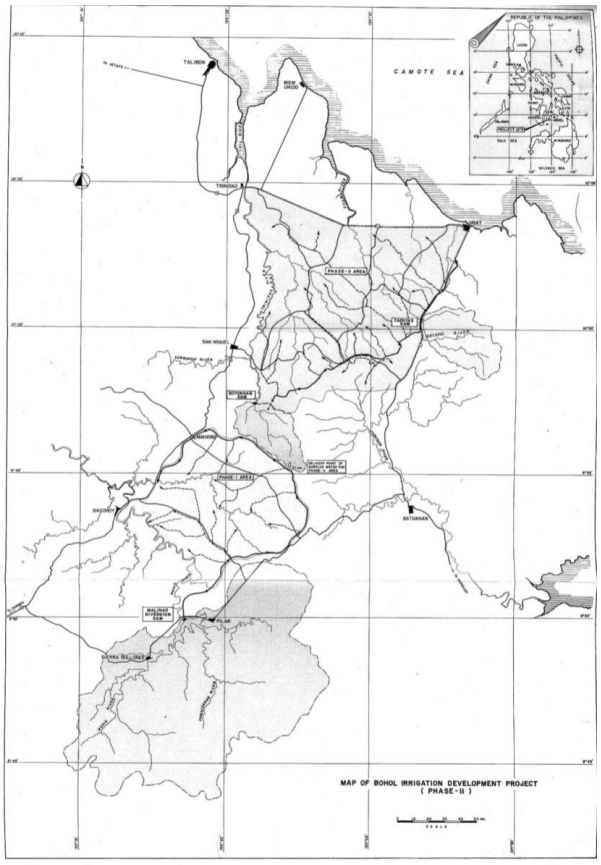

Table 1: Leadership Totals

Farmer	Leadership Score			
Irrigated 1	199		**Irrigated Average**	**202.75**
Irrigated 2	202			
Irrigated 3	199			
Irrigated 4	211			
Rainfed 1	210		**Rainfed Average**	**205**
Rainfed 2	210			
Rainfed 3	201			
Rainfed 4	201			
Rainfed 5	203			

Table 2: Correlation of Leadership and Game Scores

F-Test for Leadership		
	199	*210*
Mean	204	203.75
Variance	39	18.25
Observations	3	4
df	2	3
F	2.13699	
P(F<=f) one-tail	0.26486	
F Critical one-tail	9.55209	
unequal variation		

T-Test for Leadership		
	Variable 1	*Variable 2*
Mean	202.75	205
Variance	32.25	21.5
Observations	4	5
Hypothesized Mean D	0	
df	6	
t Stat	-0.63993	
P(T<=t) one-tail	0.27293	
t Critical one-tail	1.94318	
P(T<=t) two-tail	0.54587	
t Critical two-tail	2.44691	

Irrigated Farmer 1	199	1565		Correlation Value	**0.350534**
Irrigated Farmer 2	202	1340			
Irrigated Farmer 3	199	1810		Irrigated Game Average	**1618.75**
Irrigated Farmer 4	211	1760		Rainfed Game Average	**1620**
Rainfed Farmer 1	210	1760			
Rainfed Farmer 2	201	1360			
Rainfed Farmer 3	201	1740			

Table 3: F-Test and T-Test for Reciprocity Data

F-Test Postive Reciprocity

	Variable 1	*Variable 2*
Mean	8.45	8.175
Variance	0.5763158	0.770395
Observatio	20	20
df	19	19
F	0.7480786	
P(F<=f) or	0.266564	
F Critical o	0.4612011	

equal varience

F-Test Negative Reciprocity

	Variable 1	*Variable 2*
Mean	3.6	4
Variance	8.147368	3.684211
Observatio	20	20
df	19	19
F	2.211429	
P(F<=f) or	0.045922	
F Critical o	2.168252	

equal varience

T-Test Postive Reciprocity

	Variable 1	*Variable 2*
Mean	8.45	8.175
Variance	0.5763158	0.770395
Observatio	20	20
Pooled Var	0.6733553	
Hypothesiz	0	
df	38	
t Stat	1.0597674	
P(T<=t) on	0.1479702	
t Critical or	1.6859545	
P(T<=t) tw	0.2959403	
t Critical tw	2.0243941	

T-Test Negative Reciprocity

	Variable 1	*Variable 2*
Mean	3.6	4
Variance	8.147368	3.684211
Observatio	20	20
Pooled Var	5.915789	
Hypothesiz	0	
df	38	
t Stat	-0.52006	
P(T<=t) on	0.303019	
t Critical or	1.685954	
P(T<=t) tw	0.606038	
t Critical tw	2.024394	

F-Test Reciprocity Totals

	Variable	*Variable 2*
Mean	18.38	18.425
Variance	13.34	5.875658
Observations	20	20
df	19	19
F	2.27	
P(F<=f) one-tail	0.041	
F Critical one-tail	2.168	

equal variance

T-Test Reciprocity Totals

	Variable	*Variable 2*
Mean	18.38	18.425
Variance	13.34	5.875658
Observations	20	20
Pooled Variance	9.607	
Hypothesized Mean Difference	0	
df	38	
t Stat	-0.05	
P(T<=t) one-tail	0.48	
t Critical one-tail	1.686	
P(T<=t) two-tail	0.96	
t Critical two-tail	2.024	

Table 4: Reciprocity Totals

	Reciprocity Total	Beliefs Total	Postivie Total	Negative Total
Irrigated Farmer 1	19	7	9	3
Irrigated Farmer 2	20	7	9	4
Irrigated Farmer 3	24	6	9	9
Irrigated Farmer 4	22	7	9	6
Irrigated Farmer 5	22	6	9	7
Irrigated Farmer 6	18	6	8	4
Irrigated Farmer 7	17	6	9	2
Irrigated Farmer 8	14	6	8	0
Irrigated Farmer 9	14	4	8	2
Irrigated Farmer 10	15	6	8	1
Irrigated Farmer 11	25	7	9	9
Irrigated Farmer 12	22	7	9	6
Irrigated Farmer 13	14	7	7	0
Irrigated Farmer 14	14	5	9	0
Irrigated Farmer 15	19	7	9	3
Irrigated Farmer 16	20	6	8	6
Irrigated Farmer 17	20	7	9	4
Irrigated Farmer 18	15.5	6.5	7	2
Irrigated Farmer 19	13	6	7	0
Irrigated Farmer 20	20	7	9	4
Irrigated Total	367.5	126.5	169	72
Rainfed Farmer 1	15	7	8	0
Rainfed Farmer 2	20	7	9	4
Rainfed Farmer 3	19	5	9	5
Rainfed Farmer 4	17	7	7	3
Rainfed Farmer 5	15	5	6	4
Rainfed Farmer 6	21	6	9	6
Rainfed Farmer 7	15	6	8	1
Rainfed Farmer 8	21	7	9	5
Rainfed Farmer 9	19	6	8	5
Rainfed Farmer 10	20	7	8	5
Rainfed Farmer 11	17	5	7	5
Rainfed Farmer 12	19	7	9	3
Rainfed Farmer 13	16	5	8	3
Rainfed Farmer 14	18	7	9	2
Rainfed Farmer 15	17	6	8	3
Rainfed Farmer 16	19	7	7	5
Rainfed Farmer 17	25	7	9	9
Rainfed Farmer 18	18	6	9	3
Rainfed Farmer 19	19.5	7	8.5	4
Rainfed Farmer 20	18	5	8	5
Rainfed Total	368.5	125	163.5	80

Photos