Paddy and Water Environment
https://doi.org/10.1007/s10333-018-0664-9

ARTICLE

Understanding the relationship between volunteers' motivations and learning outcomes of Citizen Science in rice ecosystems in the Northern Philippines

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Received: 28 July 2017 / Revised: 12 June 2018 / Accepted: 26 June 2018

Abstract

This study relies on the Flying Beauties Citizen Science project conducted in the Philippines to assess personal motivations and learning outcomes of volunteers who were involved in documenting butterflies and dragonflies in rice ecosystems. While evaluation of motivations of volunteers in Citizen Science is not new, at least in affluent western countries, little is done in investigating volunteers' motivations and learning outcomes of Citizen Science projects in low-income countries. Using surveys, we collected data from volunteers that were analysed qualitatively and quantitatively. We adopted a two stages evaluation format—before and after volunteers finished the project exercise. We compared pre-motivations to motivations attained and changes in level of knowledge before and after the project ended. We use Spearman's Rho, Kendall's Tau—nonparametric tests to draw correlations between variables. The results showed that key determinants that drove people to volunteer in the project were (a) learning about species and (b) being part of scientific research and the principal learning outcome was improved awareness about ecosystem functions of the species.

Keywords Citizen Science · Motivations · Learning outcomes · Ecosystem functions · Philippines

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s10333-018-0664-9) contains supplementary material, which is available to authorized users.

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Introduction

While there are various definitions of Citizen Science (CS), for the purpose of this study we defined it as the collaboration between scientists and volunteers to gather, analyse and interpret scientific data (Dickinson et al. 2010; Bonney et al. 2009; Wiggins and Crowston 2011). The involvement of volunteers in scientific research has eased data gathering (Cooper et al. 2007; Couvet et al. 2008), helped researchers to complete tasks on large spatio-temporal scales—hard to accomplish otherwise (Gommerman and Monroe 2012), promoted scientific adequacy, social legitimacy (Toomey and Domroese 2013) and enhanced public knowledge and interest in science (Jordan et al. 2011; Cohn 2008; Wright et al. 2015). CS has also made research more cost-effective (Jordan et al. 2012; Lawson et al. 2015). Rotman et al. (2012) showed that these benefits contributed to the increasing popularity of CS among researchers during the last decades. Despite the described benefits, CS is criticised for using volunteers for "free labour" and some studies raised concerns about the authenticity of data collected by non-scientists

(Swanson et al. 2016; Ralston and Rhoden 2005; Dickinson et al. 2010; Lin et al. 2015).

Though CS has a long history, studies on what motivates volunteers to join CS projects are limited (Raddick et al. 2013). This makes understanding of volunteers' motivations in CS an important element requiring further investigation. Furthermore, knowing these motivations and working with volunteers to achieve them is significant for recruiting and retaining volunteers and improving the quality of the data they collect (Bruyere and Rappe 2007). Raddick et al. (2013) showed that running successful CS projects also requires understanding of CS from the perspective of the volunteers. This includes benefits to volunteers themselves in terms of knowledge gains (Geoghegan et al. 2016; Bela et al. 2016).

The main challenges for evaluating motivations and learning outcomes of volunteers are the limited time researchers are prepared to devote to activities not directly linked to project results, and the lack of a clear evaluation plan. The involvement of volunteers with diverse interests and experiences also make evaluation of volunteers' motivation difficult (Dickinson et al. 2010). According to Phillips et al. (2014) and Haklay (2010), evaluations of CS require understanding of the social and cultural dimensions of the community involved, which often times researchers have little or no knowledge about.

The American Evaluation Association (2004) defines evaluation as the analysis of a programme or activity to determine its merit, worth, value or significance. Researchers have used various methods to measure efficiency, make cost–benefit analyses and gather baseline data (Bonney et al. 2009; Phillips et al. 2014; Wright et al. 2015). However, according to Bradford and Israel (2004), assessing volunteers' motivations can be useful to CS projects too, since highly motivated volunteers tend to produce better scientific data than less motivated ones.

To assess motivations of volunteers, Asghar (2015), Clary and Snyder (1999) and Esmond and Dunlop (2004) divided volunteers' motivations into broad categories including:

1. *Value*—the feeling of doing something worthwhile,
2. *Understanding*—seeking knowledge,
3. *Career*—improving job opportunities,
4. *Social motivations*—strengthening family or social ties.

Jordan et al. (2012) and Bela et al. (2016) introduced the assessment of learning outcomes at different levels of participants in CS projects, while the Phillips et al. (2014) developed 3 broad approaches to understanding learning outcomes that entail finding out (1) what the volunteers already know, (2) how they feel and (3) what they do with new knowledge gains. Similarly, the quality of data submitted for scientific research seems to be a reasonable proxy of learning outcomes (Jordan et al. 2012).

The geographic extension of CS from wealthy western countries to low-income countries in Asia, with distinct cultures and needs, makes the systematic evaluation of volunteers' motivations and learning outcomes a relevant scientific undertaking. Unlike in western—usually affluent—countries, where CS has long taken precedence (Haklay 2015), it is relatively new in Asia (Chatterjee 2008; Sharma 2008). Generally, CS projects started from 2008 in India, China, Malaysia, Taiwan and the Philippines (Inoguchi and Blondel 2012), which was attributed to advances in technology that enabled people to learn new skills (Kobori et al. 2015). However, despite the emergence of CS in Asia, public participation is low and data quality control is weak (Jian et al. 2014). Most CS in Asia focuses on surveying birds and targets volunteers that are mainly experienced birdwatchers. Recent studies, however, pointed out a diversification of CS in Asia, including the study of lantern flies in the Philippines by Constant and Alisto (2015) and butterflies in Malaysia by Wilson et al. (2015).

This study evaluates personal motivations and learning outcomes of volunteers of CS in a rural community in the Philippines. We defined personal motivations as factors that drive people to volunteer for CS projects and learning outcomes as the result of their involvement in a CS project in terms of changes in knowledge. Empirically, this study relied on the Flying Beauties project which engaged different groups of volunteers such as students, teachers, tour guides, tourists and farmers in taking pictures of butterflies and dragonflies in irrigated rice ecosystems.

The study answers the questions of what motivates these volunteers to join the CS project and how these motivation factors affect their learning outcomes. Surveys were used to collect data which were qualitatively and statically analysed.

The study area

Banaue is a small rural community, located in Ifugao province. The Ifugao people are a combination of tribes with distinct dialects. They are well-knitted communities where family ties are highly valued. The culture of the Ifugao is closely linked to rice cultivation. Socio-economically, the Ifugaos are categorized into two classes—elite class referred to as *Kadangyan* and the lower class called *Nawotwot*. There is no clear pattern to differentiate between these two, except the colour of their dress during religious and cultural rites. Also, while many *Kadangyans* are land owners, *Nawotwots* are landless and often work as labourers in the field in return for daily wages or bundles of rice at harvest.

While most Ifugaos are Catholic, certain pagan practices still exist among some of them. One of the visible signs of pagan traditions is the wooden carved rice God referred to as "Bulul", which is widely believed to protect the rice fields.

Banaue is famous for its rice terraces which is a major tourist attraction in the region (both national and international). The tourism economy is changing the socio-economic dynamics. Many *Kadangyans* who once were proud of the size of land for rice cultivation now buy properties to build tourism facilities, and *Nawotwots* work as woodcarvers. In fact, many people in Banaue now don't see farming as profitable and prefer working in the tourism sector as guides, woodcarvers and tricycle drivers, etc.

Banaue also has a history of ethno-ecological conservation practices (Acabado 2012; Araral 2013; Conklin 1980). The landscape is broadly categorized into distinct agro-ecological zones of human settlements (*poble*), primary forest (*muyung*) and terraces (*payoh*) (Butic and Ngidlo 2003; Acabado 2012; Magcale-Macandog et al. 2018). This distinct ecology was developed through a prolonged interaction between humans and nature (Cadalig-Madangeng 2015; Castonguay et al. 2016). However, recently, despite public programmes to encourage people to adopt management plans to conserve the agro-ecological zones, the region is experiencing increasing land cover change and terrace degradation as a result of shifts in economic activities from farming to tourism (Tilliger et al. 2015).

The Flying Beauties project description

The Flying Beauties project was conducted by the international scientific consortium "Land-use intensity and Ecological Engineering—Assessment Tools for risk and Opportunities in irrigated rice based production systems" (LEGATO; Settele et al. 2015, 2018). The main objective of the project was to engage volunteers to learn and improve their knowledge about ecosystem functions of species in a fun-way by taking pictures of specimens to be used to create inventory of species in the region. Different groups of volunteers were involved, whose role was mostly limited to "contributory" data collection (Bonney et al. 2009). Volunteers were recruited through a call for application posters, placed in strategic locations and public places in different *Barangays* (districts). Others were selected by the local coordination team based on their interest and their knowledge of the socio-economic structures of the Banaue society.

The CS was in the form of a photography contest in which volunteers uploaded pictures of specimens they took to the website: http://www.flying-beauties.org. The cameras provided by LEGATO were GPS-enabled to ensure the accuracy of the locations where specimens have been sighted. Volunteers were encouraged to take pictures in different agro-ecological zones, described in Fig. 1, to map species distributions. A total of 695 pictures (i.e. 557 butterflies and 138 dragonflies) were submitted, and 289 were considered good for scientific research. The selection of pictures suitable for scientific inventory was done by the scientists and assessed in relation to proximity of the object, resolution and clarity of photographs in revealing external features of the specimens. Between 100 and 120 species were recorded, of which around 25% of the species were known from Luzon. The pilot phase of the project was conducted from 15th June 2016 to 30th July 2016 and later extended to 4th December 2016.

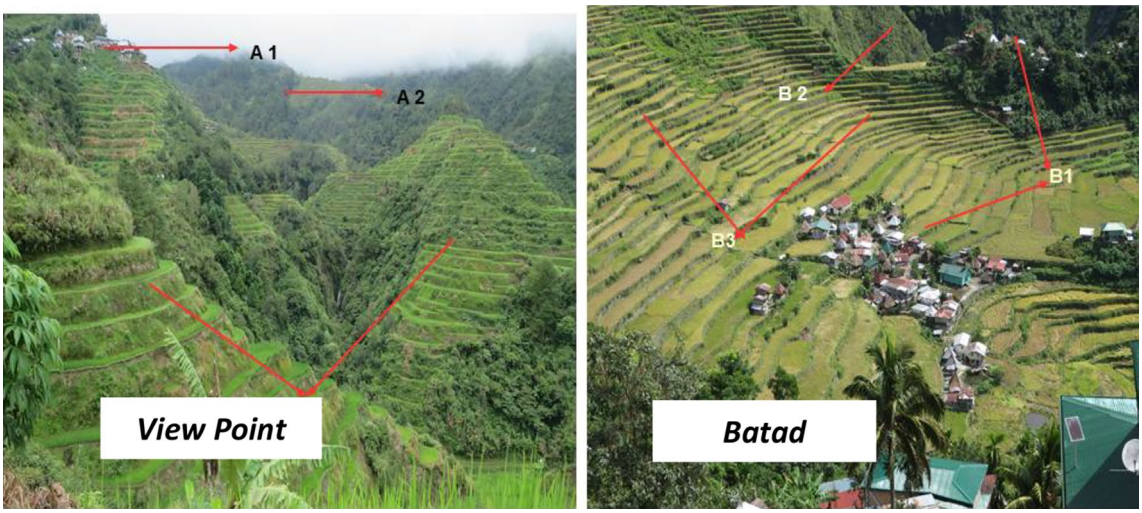


Fig. 1 Agro-ecological zones of Banaue Municipality (photographs: E. Dem). A1, B1 = *Poble* (settlement), A2, B2 = *Muyung* (forest), A3, B3 = *Payoh* (terraces)

Methods

This study adopted a formative and outcome-oriented type of evaluation (i.e. before and after volunteers joined the project exercise) to measure motivations and learning outcomes of volunteers of the pilot phase of the Flying Beauties project. All volunteers who used the cameras to take pictures of specimens and accepted to take part in the study were surveyed and broadly categorized as "users". Other people who did not take part in CS exercise, but have knowledge of Banaue socio-economics structures were also surveyed and referred to as "informants". However, since this group was not directly involved in CS exercise, it was agreed by consensus to remove them from the study and only focus on users.

The study objectives were aligned to the objectives of the project. We developed an evaluation flow chart (Fig. 2) to show this relationship. This was further elaborated using an evaluation framework (Table 1) that highlighted the sequence of evaluation steps.

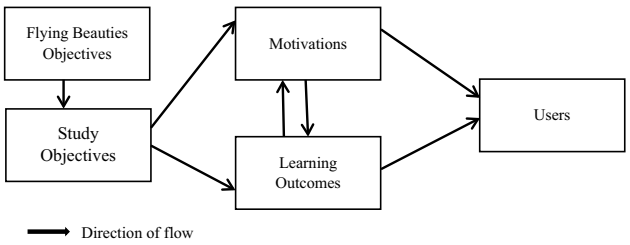


Fig. 2 Evaluation flow diagram. *Note*: Study objective aligned to project objective. Two key aspects assessed were motivations and learning outcomes of volunteers. These aspects were considered at two different levels: before and after finishing the project exercise

Each user was given a questionnaire before starting and another questionnaire after finishing the exercise. Each questionnaire had questions on demography, motivations and knowledge about the species. The "after" questionnaire had questions on whether or not their motivations were attained and whether or not there were any changes in their knowledge level (Appendix I). Each questionnaire included multiple choice questions, rating with Likert scales, two-option response and partially closed ending questions (Taylor-Powell 1998).

A consent statement was placed at the top of each questionnaire. Parents of users below 18 years were given a copy of the consent letter to sign and return. Following standard procedures of Calinescu and Schouten (2016) and Fowler (2002), the Likert-scale questions were placed immediately after the consent statement, followed by multiple choice questions, and then the open-ended questions. The questions on demographics were placed at the bottom of the questionnaires.

Responses from the ordinal and categorical questions were analysed with descriptive statistics, using Microsoft Excel and IBM SPSS Statistics 21.0, while the open-ended questions were analysed qualitatively, following the method of King et al. (2000). We compared pre-motivations before starting the exercise, and motivations attained at the end of the exercise. We used a nonparametric test (Spearman's Rho, Kendall's Tau) to draw correlations between motivations attained and changes in knowledge to key variables such as gender, age and education levels of users.

Table 1 Evaluation framework

CS project objectives	Study objectives	Key aspects evaluated	Data gathering method	Questions (Q)	
				Evaluation stages	
				Before	After
To engage people to observe the beauty of nature	To understand why volunteers opted to join the project exercise	Motivations	Survey	Q1, Q2	Q15, Q16
To raise awareness of ecosystem functions of the species	To assess volunteers' perception of species before and after joining the project.	Learning outcomes	Survey	Q3, Q4	Q17, Q20
To share knowledge of the species in a fun-way	To assess possible changes in the perception of volunteers as a result of their participation in the project	Learning outcomes	Survey	Q5, Q6, Q7, Q8	Q18, Q19, Q23
To engage volunteers to collect scientific data for the inventory of species	To assess whether or not motivations of volunteers had impact on the data they provided	Learning outcomes	Survey	Q8, QS9, Q10	Q21, Q22

Results

Socio-demographics distribution

A total of 34 users were surveyed of which 26 completed both stages of the evaluation. Eight users, mainly tourists, didn't complete the after evaluation, which was due to having left Banaue before the exercise ended. A consensus was reached to remove these users as well from the analysis, since their motivations attained and changes in knowledge could not be assessed. The socio-demographics of 26 users are summarized in Table 2. Most users belonged to the younger generation (age 11–30). Men and women were near-equally represented, though no preference was given to gender. All users have formal education, with few having reach university level. Users represented 9 of the 18 *Barangays* (districts) of Banaue Municipality (Fig. 3).

Motivations attained

From the list of possible motivation factors, the ones selected most by users in the before and after questionnaires were (1) learning about species, (2) being part of

Table 2 Users' socio-demographics distribution

Users	Gender		Age range				Education level		
	Men	Women	11–20	21–30	31–40	40 above	Secondary	College	University
Total	18	14	20	3	1	2	23	1	2

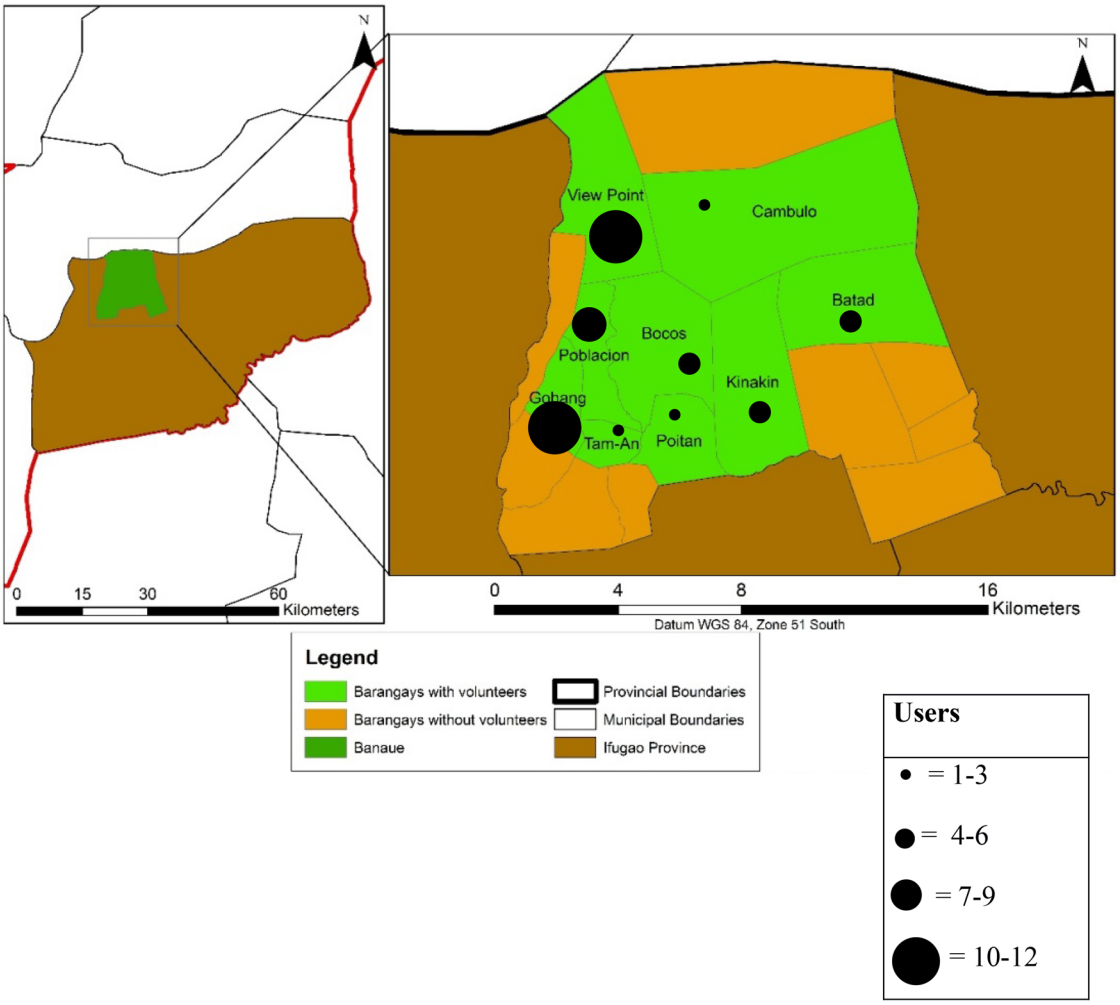


Fig. 3 Distribution of users per Barangay (analysed with PhilGIS 2014). *Source*: http://www.philgis.org/freegisdata.htm; http://www.legato-data.net/legato/

scientific research and (3) showing talents. There were also a significant number of users who indicated they were motivated to learn about the functions of the species. The motivation factor "win a prize" was among the least frequently mentioned. Our observation, however, revealed that some users were motivated by the chance to get compensation for participating in the project. Under the option "other", which allowed users to write possible motivation factors which were not in the list, improving knowledge in biology and learning about research methods topped the list. Learning about the impacts of species in rice crops also appeared frequently. Still, others were motivated to promote social well-being.

The comparison of the pre-motivations with motivations attained showed that motivation factors such as "show my talent", "useful to my career" and "use cameras" appear more frequently, while being part of a scientific research and motivation factors listed under "other" appear less frequently (Table 3). We calculated the difference (in percentage) between the pre-motivation mentioned in the before evaluation, and the mentioning as satisfactorily attained by users in the after evaluation. A slight decrease in the difference of the motivation factor "learn about species" was registered, while motivations such as the "use of cameras" experienced remarkable increase.

Learning outcomes

The main learning outcomes of users were increased awareness about the importance of the species (i.e. ecosystem functions). We defined learning outcomes as the changes in the level of understanding of species by users after their participation in the project exercise. We used Likert scales ranked from strongly disagree to strongly agree (as summarized in Fig. 4); "they make rice fields beautiful" (i.e. aesthetic value) for instance showed fewer "strongly agree" statements in the before evaluation than in after evaluation, likewise "they control damaging species in the field" (i.e. regulation). The statement, "I have no idea about their importance" received fewer "strong disagree" by users in the before evaluation than in after survey. This means, fewer users agreed they had no idea about the importance of the species at the end of the exercise.

Comparing the knowledge levels of users before and after participation in the project exercise revealed that the majority of users had limited knowledge about the species, for instance, their role in controlling damaging species in the field, except 2 users, who were farmers. We assumed this was as result of their experience working in the field as described in previous studies by Castonguay et al. (2016). Some users also mentioned some species were used as food (i.e. provisioning) in the after questionnaire. However, the importance of the species to tourism was rarely mentioned by most users.

Table 3 Differences between pre-motivations and motivations attained. (Color table online)

Motivations	Differences (%)		Change (C)	Category
	(A) Pre-motivation	(B) Motivation attained		
Learn about the species	92.3	80.8	–	Learning
Being part of studies	57.7	0.0	– –	Learning
Show my talents	34.6	76.9	++	Social
Useful for my career	34.6	50.0	++	Career
Connect with friends	26.9	34.6	+	Social
They are beautiful	19.2	11,5	–	Value
Help research	15.4	19.2	=	Value
Win a price	7.7	3.9	=	Remuneration
Use cameras	3.9	38.5	++	Learning
Support community	0.0	0.0	=	Value
Other	23.1	7.7	– –	N/A

Legend

	Negative
	Very Negative
	Very Positive
	Positive
	Neutral

Differences calculated as the percentage of respondents per motivation in the "before" questionnaire (A) and in the percentage of respondents per motivations attained in the "after" questionnaire (B), for users. Results of the respondents of the "before" questionnaire are similar ± 10% to (A), except for motivations related to academic studies and aesthetics. The difference between (B) and (A) helps to assess changes in motivation over the course of the exercise (C), and it is represented as: ++, – – (positive or negative difference above 15%); +, – (positive or negative difference ranges between 5 and 15%), = (difference below 5%)

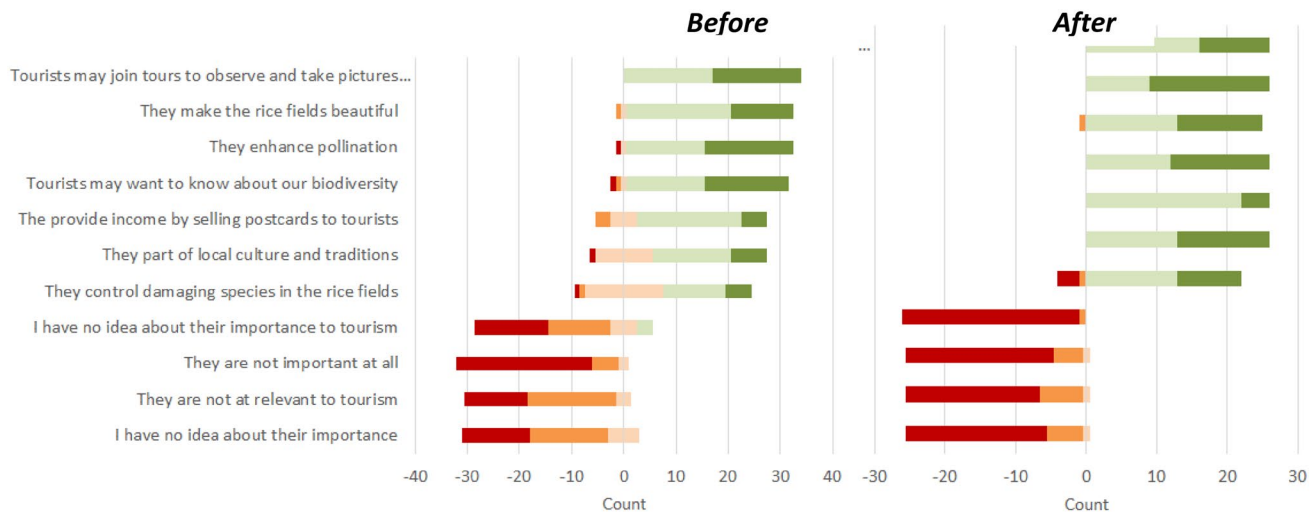


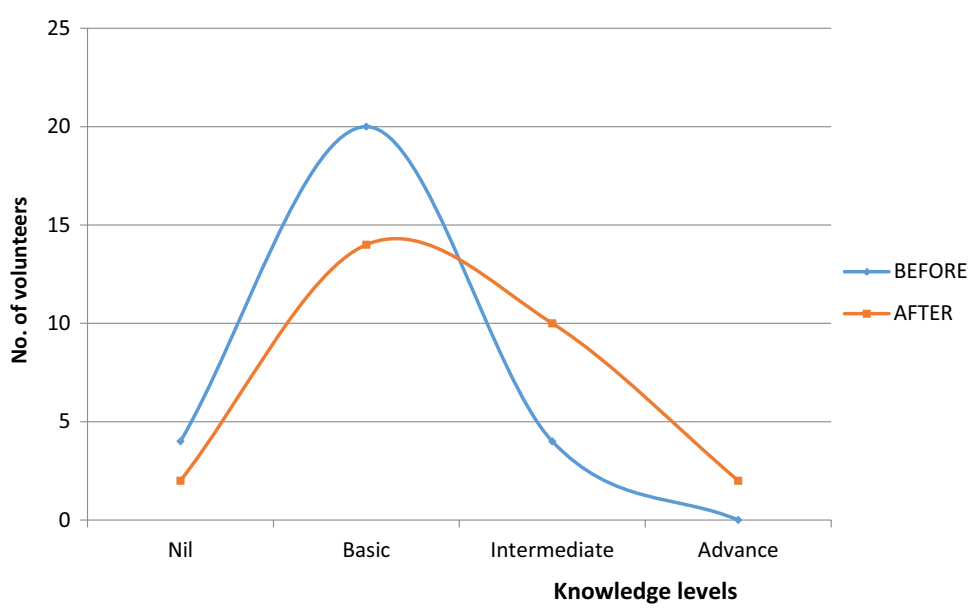
Fig. 4 Changes in knowledge levels of users about ecosystem functions of the species. *Note*: Colour code: red (strongly disagree); orange (disagree); beige (neutral), light green (agree), dark green (strongly agree) (0 = neutral, − = dissatisfied, + = satisfied). (Color figure online)

Asking users to rate their knowledge levels before and after their participation in the project showed slight changes in their knowledge level. Statistical results revealed a significant reduction of users with no knowledge about the species. As shown in Fig. 5, the number of users with nil knowledge dropped from 4 to 2, the number of users with basic knowledge from 20 to 14, while the number of users with advanced knowledge increased from 0 to 2.

Motivations and learning outcomes correlations

The Spearman's Rho, Kendall's Tau's nonparametric correlation test showed that the change in the level of motivations realized in terms of recognition is negatively associated with perceived knowledge ($\tau_b = -0.407$, $p = 0.022$), and as the user originally declared that butterflies and dragonflies were less important, the perceive knowledge is larger ($\tau_b = 0.420$, $p = 0.021$). Likewise, when the motivation was related to education levels of the users, the perceive changes in knowledge is negatively correlated with the original level of interest ($\tau_b = -0.386$, $p = 0.038$) and positively correlated with the change in this motivation ($\tau_b = -0.386$, $p = 0.038$). Obviously, there was a correlation between changes in knowledge and the originally perceived knowledge level ($\tau_b = -0.453$, $p = 0.0148$) and the final perceived knowledge levels ($\tau_b = -0.801$,

Fig. 5 Knowledge gains of users between before and after participation in the project exercise



$p = 0.000$). Note that the absolute value of coefficients of the latter is nearly twice as high as the former.

The test also showed that men tended to perceive greater motivations attained, related to career and learning about species. Knowledge in species functions increases or decreases with age and education level. High education level, for instance, seemed to be positively associated with interest to join the project exercise as a way to promote social well-being (Table 4). The variables associated with each type of motivation were diverse, and there was no clear pattern in terms of motivation factors or intensity of change between the pre-motivations and the perceived attainment of motivation factors. It is worth mentioning that remuneration as a motivation factor did not seem to be associated with any of the listed variables.

Using a rank variable: women = 1, men = 2, men were more positively associated with perceive knowledge increase ($\tau_b = 0.418$, $p = 0.024$). In fact, changes in knowledge differ considerably between men and women. At the end of the exercise, only one out of 14 women users perceived positive changes in knowledge, and 5 perceived negative changes in knowledge. Meanwhile, 5 out of 12 men users showed perceived positive changes in knowledge and mostly considerable increase in knowledge, and only one suggests negative changes in knowledge.

Discussion and conclusions

This study contributed in disentangling the complexity of assessing motivations and learning outcomes of volunteers of CS in low-income communities. Motivating factors of volunteers concluded from this study corroborated previous studies by Wright et al. (2015), Asghar (2015) and Clary and Snyder (1999). However, our assessment of learning outcomes showed results which are different from Jordan et al. (2012) and Bela et al. (2016), as shown in Table 4. Using Spearman's Rho Kendall's Tau correlation test led to conclusions that highly motivated users, for example, learned faster in using the cameras and in taking high-quality pictures of specimens as mentioned by Bradford and Israel (2004), who argued that highly motivated volunteers produce quality scientific data in CS than less motivated ones.

Analysis of different groups of users led to variability of results on motivation factors, especially on remuneration and wining a prize. We found that while these factors were not mentioned in the questionnaires as reasons for joining project exercise, some users asked to have been given the cameras or laptops when the project ended. From this, we conclude that while users might have various motivations for participating in project, including helping science (Clary and Snyder 1999; Esmond and Dunlop 2004), the opportunity to get some form of compensation was an essential factor that drove some users to join the exercise. Though we could not ascertain why these users did not mentioned this in the questionnaires, it was assumed to be due to socio-cultural influence that made them to shy away from asking to be paid for participating in the project exercise.

During registration, many users admitted that though they saw the call for participation to the CS exercise, they would not have joined if they had not been asked to do so by their friends, parents or teachers. For instance, in one of the open-ended questions, a user wrote, "I think the programme is good, but I might not have registered if my brother did not ask me to do so". This was not surprising, considering the social structures of Banaue in which family relations and seniority by age are highly respected. We believe these might have played a part in shaping personal motivations of users as previously argued by Phillips et al. (2014) and Haklay (2010).

Measuring learning outcomes was considered separately for each user (Bela et al. 2016), since they had different levels of knowledge and experience. This included taking each user as an individual requiring unique pace to take part in the research. In finding out what each user already knew (Phillips et al. 2014), it was deemed relevant to assess both their traditional and scientific knowledge about the species.

It is without doubt that the advent of CS has eased the work of researchers especially in high income countries. In the case of Banaue, although recruiting volunteers was easy, engaging them in CS research for long period might be challenging. This was because; apart from overlapping motivation factors of users, the effects of socio-economic and cultural values on volunteers made the assessment of their motivations too complex. This however, we assume can be made easier if researchers can include studies of the socio-cultural dynamics of the community in CS planning.

It is also important that CS researchers targeting low-income communities to consider socio-economic well-being of the community which can include compensating volunteers for the time they devote to the project. We understand that these may pose challenges for CS projects running on low budget; however, it could be helpful in keeping volunteers in the project for the time needed to collect the relevant scientific data.

Finally, considering each volunteer as an individual learner, it is important to create space for each volunteer to learn. This can be time consuming for researchers, but it might be important to ensure the quality of the data provided by volunteers. From the experience of this study, this goes beyond simply conducting surveys to establishing close interactions with volunteers.

Table 4 Summary of results from the correlation tests (Spearman's Rho, Kendall's Tau). (Color table online)

Rank variables with significant association with differences between motivations attained and original motivation, per category	Social		Career	Learning			Rem.	Value			
	Show my talent (2-1)	Connect with friends (2-1)	Career opportunities (2-1)	Use cameras (2-1)	Learn about environment (2-1)	Part of my studies (2-1)	Prize (2-1)	Help research (2-1)	Help community (2-1)	Beautiful species (2-1)	Overall achievements (2-1)
Demographic											
Age (1)						+ (*)				– (*)	
Gender (W=1, M=2) (1)			+ (*)			+ (*)					
Education level (1)						+ (*)			– – (**)	– (*)	
Types of motivation											
Career opportunities (1)					+ (*)					+ (*)	
Career opportunities (2)				– (*)							
Career opportunities (2-1)						+ (*)				– (*)	
Help research (2-1)											+ + (**)
Prize (1)		– (*)							– – (**)	– (*)	
Learn about environment [a]		+ (*)							+ + (**)	+ (*)	
Learn about environment (2-1)		– (*)									+ (*)
Beautiful species (2-1)			– (*)			– (*)					
Connect with friends (2-1)					– (*)						
Part of my studies (1)			– (*)							+ (*)	
Part of my studies (2-1)			+ (*)							– (*)	
Overall achievements (2-1)					+ (*)			+ + (**)			
Importance of the species											
Culture and traditions (1)						– (*)					
Income from postcards (1)	+ (*)										
Income from postcards (2)									– (*)		
Not important (1)		+ (*)			– – (**)						
Not relevant for tourism (1)			+ (*)								
Logistics and commitment											
Prior experience (1)				+ (*)						+ (*)	
Skills using tools (1)	+ (*)	– (*)									
Expected time commitment (1)		+ (*)									
Time committed (2)									+ (*)	+ (*)	
Level of satisfaction											
Access to tools (2)				– (*)	+ (*)				+ + (**)		
Team support (2)				– (*)					+ + (*)		
Recognition of contribution (2)						– – (**)				+ (*)	
Winners' selection (2)										+ (*)	
Learning											
Knowledge level (1)			– (*)								
Knowledge gain (2-1)						+ (*)					

(1) Data from the "before" questionnaire ($n=34$); (2) data from the "after" questionnaire ($n=26$); (2-1) change between both periods ($n=26$)

*Significant correlation at 0.05 level (two-tailed); *significant correlation at 0.01 level (two-tailed). Absolute value of correlation coefficient < 0.5 indicated as – or + depending on sign; absolute value of correlation coefficient – 0.5 indicated as – or ++ depending on sign

[a]Data from a question on motivations

Acknowledgements The study was funded by the German Ministry of Research and Education BMBF and conducted within the LEGATO Project (Funding No. 01LL0917A; www.legato-project.net). The authors are grateful to Jimmy Cabbigat, Abner Ulat and Joseph Bumakel for the logistical support.

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