

## Using social marketing tools to increase fuel-efficient stove adoption for conservation of the golden snub-nosed monkey, Gansu Province, China

Amielle DeWan<sup>\*1</sup>, Kevin Green<sup>1</sup>, Xiaohong Li<sup>2</sup>, Daniel Hayden<sup>1</sup>

<sup>1</sup>Rare, 1310 N Courthouse Rd, Ste 110, Arlington, VA 22201, USA; <sup>2</sup>Gansu Province Tianshui Teacher's College, School of Chemistry and Life Science, Gansu Province, China, 741001

### SUMMARY

Fuel wood is a key source of energy for many families in developing areas of China. Fuel efficient stoves are often identified as a win-win solution for forest protections and public health/development in China and across the globe. However, the communication and connection between stoves and biodiversity conservation has been less clear, by both those who are promoting their use as well as those adopting the technology. Social marketing is the application of marketing principles used to sell products applied to “sell” ideas, attitudes, and behaviours to benefit the public good. The Campaign to Protect the Sichuan Golden Snub-nosed Monkey in the Yuhe Nature Reserve, Gansu Province, China, was initiated in 2008 in an effort to inspire communities to protect forest habitat in the reserve, and quickly adopt fuel-efficient stoves. Results of this study show significant increases in knowledge, attitudes, and interpersonal communication pre and post campaign (16 – 49 percentage points). Post-campaign (within 1 year) results concluded 28.0% and 43.1% of those surveyed within 1 year of and 2.5 years adopted the technology. For those households that adopted fuel-efficient stoves, consumption and gathering time were reduced by 40.1% and 38.2% respectively. Finally, preliminary research suggests that adoption of fuel-efficient stoves also lead to a reduction in forest destruction, with a 23.7 % reduction in the number of newly felled trees in areas where the stoves had been adopted by greater than half of the surrounding community. The results of this study suggest that social marketing can be an effective tool for improving community knowledge and attitudes, decreasing destructive behaviour, and reducing threats to biological important forests in China.

### BACKGROUND

Fuel wood is a key source of energy for many families in developing areas of China (Demurger and Fournier 2007). According to a recent review by Demurger and Fournier (2007), firewood and straw still account for two-thirds of rural household energy use, for both heating and cooking, in China (Jiang and O'Neill 2004). As such, wildlife species that rely on unfragmented forest areas may be negatively impacted by human activities and habitat loss. For example, Bearer *et al.* (2008) found that timber harvesting and fuelwood collection have significant impacts on forest habitat use by giant panda (*Ailuropoda melanoleuca*) that last decades after harvest activity.

International development organizations, like the Global Alliance for Clean Cookstoves, consider fuel-efficient stoves a win-win solution for forest protection and public health challenges. While, adoption rates of fuel efficient stoves have been associated with household income (wealth), stove efficiency, and fuelwood price (Amacher 1992) the connection between stoves and biodiversity conservation has been less clear. Given that economic and livelihood incentives are affected by numerous exogenous factors, it is not surprising that the connection between fuel efficient stoves and forest protection is tenuous at best.

The tools and theory for developing social marketing campaigns for wildlife conservation were developed and tested in the late 1970s with the Saint Lucia Parrot (Butler, 1988, Jenks *et al.* 2010). Butler (1988) used tactics from corporate

marketing to create a brand and local pride for the species. These techniques relied on the development of social marketing materials and communication tools such as billboards, posters, songs, and sermons, as well as the parrot as the flagship species or campaign mascot. Through training and partnerships, these approaches have been implemented to address biodiversity threats across the globe, and have been tested and refined based on quantitative impact assessments and the latest research from the social marketing literature (Jenks *et al.* 2010). Critical for testing and refining these tools is the creation of a campaign theory of change (see Conservation Measures Partnership 2009), which provides a template or hypothesis about how the action leads to changes in knowledge, attitudes, interpersonal communication, behavior change, threat reduction, and conservation results (Jenks *et al.* 2010, Figure 1).

Social marketing, or the application of marketing principles used to sell products applied to “sell” ideas, attitudes, and behaviours to benefit the public good (Weinreich 2010), has been identified as a potential tool for engaging communities on the adoption of fuel efficient stoves. Although social marketing tools may be effective for increasing the adoption rate of fuel-efficient stoves, these tools are often used to develop adoption strategies geared toward messages unrelated to conservation. Thus, social marketing with conservation objectives may offer a viable alternative for both increasing the speed of stove adoption as well as connecting communities more explicitly with long-term biodiversity outcomes. Rural Chinese communities exist at a critical intersection of carbon emissions, human health, and biodiversity conservation where social marketing may be effective for achieving multiple objectives.

\* To whom correspondence should be addressed: [adewan@rareconservation.org](mailto:adewan@rareconservation.org)



**Figure 1.** The fundamental theory of change for a social marketing, or Pride campaign, based on the stages of behaviour change models (Prochaska, DiClemente, & Norcross, 1992; Vaughan and Rogers 2000; Jenks *et al.* 2001), where K (Knowledge): the Pride campaign increases cognitive knowledge/awareness of the issues; A (Attitude): the Pride campaign improves environmental attitudes; IC (Interpersonal communication): the Pride campaign promotes interpersonal communication with peers and trusted opinion leaders, or to seek additional information to validate their new knowledge and attitudes; BR (Barrier removal): Pride campaigns identify what barriers exist to behaviour change and form partnerships with organizations that have particular expertise in that area; BC (Behaviour change) Pride promotes alternative behaviours for segmented target audience(s) in order to reduce threats; TR (Threat reduction): reduction of the main threat(s) to the conservation target; CR (Conservation result): conservation result that the campaign plans to achieve. Each theory of change is tailored to a specific campaign, and the changes needed in a specific target audience to achieve conservation results.

## ACTION

In 2004, the Yuhe Reserve in Gansu province in northwest China was established as a biodiversity corridor between the Qinling and Minshan mountain ranges (Li, 2010). This biologically rich region hosts a number of critically endangered wildlife. Although parts of the region are protected by the creation of the reserve, communities rely heavily on fuelwood consumption from the forest as their primary source of energy (Li 2011). Although assessing and quantifying the impacts of rural wood fuel use on deforestation are debated (see Arnold *et al.* 2003) these activities can have significant direct and indirect impacts on forest integrity and biodiversity, from cutting of young trees and burning as well as increased access and degradation from grazing livestock or increasing access by poachers.

The golden snub-nosed monkey (*Rhinopithecus roxellana roxellana*) is a primate endemic to the temperate, forested portions of western Sichuan, southern Gansu, and southern Shaanxi provinces (Yongcheng and Richardson 2008, Kirkpatrick *et al.* 2010). According to Li (2004), this species strongly prefers primary (undisturbed) forest, suggesting that disturbance or other human induced modifications may negatively impact habitat preferences or selection. In addition,



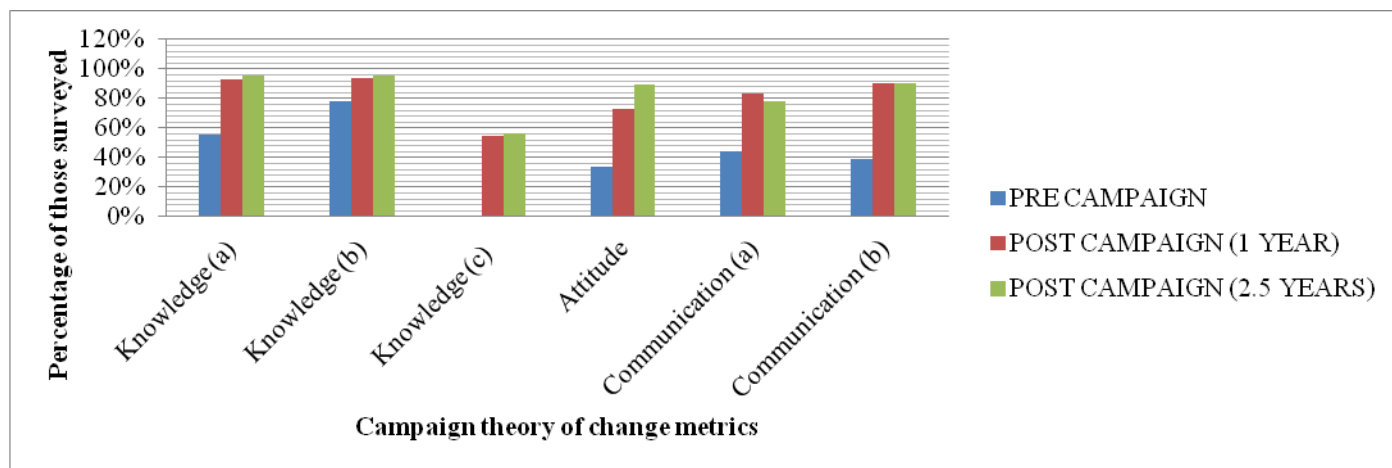
**Figure 2.** Image of a 2011 calendar using social marketing tools that promote the benefits of fuel-efficient stoves.

Kirkpatrick (1995) suggests that suitable snub-nosed monkey habitat under protection accounts for less than 5% of the total distribution range.

**Social marketing:** The Campaign to Protect the Sichuan Golden Snub-nosed Monkey in the Yuhe Nature Reserve, Gansu Province, China, was initiated in 2008 in an effort to inspire communities to protect forest habitat in the reserve, and quickly adopt fuel-efficient stoves (Li, 2010). The golden monkey was identified as a flagship species and mascot for the campaign to instill pride as a driving force for quickly changing behaviors. Messages were created using a variety of formats, including posters, calendars, and a telefilm that promoted the benefits of fuel efficient stoves (see calendar, Figure 2). Consistent with best practices for testing and evaluating impact, the campaign's theory of change identified the key shifts needed for the community to adopt stoves and commit to forest protection (Table 1).

**Impact Assessment:** Standard sociological surveys were conducted pre (2008) and post campaign (2010) to evaluate whether significant shifts in community knowledge, attitudes, and discussions were affected by campaign activities. An additional survey was conducted in 2011 to identify and longer term shifts as the campaign continued. Door to door surveys were conducted using a stratified random sampling design with sample sizes estimated using 95% confidence level, 5% confidence intervals (n=400). Survey questions were designed to test key attributes in the campaign theory of change. Additional surveys were conducted at a comparison site, to evaluate whether any shifts could be causally attributed to Pride (n=300). SurveyPro (Apian 2003) software was used to evaluate whether shifts in key factors were significant (Chi-square). Survey data were tested to ensure data were comparable on key demographic factors (e.g. age, education).

Fuelwood consumption and time spent gathering fuelwood was estimated based on stove adoption and associated decreases in fuel needs, as well as monitoring a random selection of farmer households (n = 22). The fuel-wood saving effect of the fuel-efficient stove was tested in three target areas; Shijiaba, Zhaoqianba and Yangba. Sixteen fuel-efficient stoves and Tiger Stoves were selected randomly to test the fuel-wood consumption when boiling 5kg cold water under the same conditions (cold stoves and oak fuel wood). Fuel wood and water were weighed, then the water was boiled, and the



**Figure 3.** Results from sociological surveys conducted in communities across the campaign area where campaign theory of change metrics represent the following: Knowledge (a); villagers who know the advantages of fuel efficient stoves; Knowledge (b); villagers who know that overconsumption of fuel wood is leading to the destruction of the forest; Knowledge (c) villagers who know that over-consumption of fuel wood is leading to the national park's decline; Attitude; villagers who would like to pay for the building of fuel efficient stoves; Communication (a); villagers who talked about forest conservation; Communication (b); villagers who have talked about the benefits of efficient stoves. All differences pre and post campaign (1 year) were significant (Chi-square significant at the 95% confidence level or higher).

remaining fuel wood was weighed to estimate fuel-wood consumption.

Forest destruction and fuelwood collection were monitored in forested areas near three types of villages: where greater than 50% use of fuel efficient stoves ( $n=6$ ), less than 50% use of fuel efficient stoves ( $n=6$ ), and no efficient fuel stoves ( $n=6$ ) are used. Fixed sampling lines were set around the villages with a 10m×10m fixed quadrat set on the sampling lines every 50m rising in altitude. The varieties, quantities, volume and canopy density of trees, storage of fuel wood on sampling lines, signs of human activities and wood cutting outside quadrats were recorded. Final measuring indexes are quantity preservation rate, biodiversity index and forest growing stock.

## CONSEQUENCES

**Shifts in community knowledge and attitudes:** Baseline values pre-campaign suggested that key areas of knowledge were high, including the potential benefits of a fuel efficient stove as well as the fuelwood collection impacts on forest

destruction (range 56-78%). None the less there were significant increases in knowledge, attitudes towards adopting fuel efficient stoves, and interpersonal communication pre and post campaign (1 year) (range 16-49 percentage points) (Figure 3). knowledge and attitudes stayed at the same level or slightly greater after 2.5 years of the campaign, while communication about the benefits of stoves slipped slightly. Comparison sites surveys suggested that the shifts in community knowledge, attitudes, and communication observed at the campaign site could be attributed to the campaign (Table 2).

**Behaviour change and stove adoption:** Pre campaign baseline surveys suggest that only 12% of the target communities were using fuel-efficient stoves. Post-campaign (within 1 year) results concluded 28.0% of those surveyed had adopted the technology. Post-campaign results within 2.5 years demonstrated even more impact, with 43.1% of households reporting using fuel-efficient stoves (Chi square significant at 99% confidence level).

**Table 1.** The detailed Theory of Change for the Yuhe Nature Reserve Pride campaign, outlining the campaign objectives along all components: Knowledge, Attitude, Interpersonal Communication, Barrier Removal, Behavior Change, Threat Reduction and ultimately, Conservation Result.

Knowledge	Pride Campaign increases community residents' awareness of the environment issue of fuel-wood felling, the health issue of using traditional stoves and the benefits of fuel-efficient stoves.
Attitudes	Pride Campaign increases communities' willingness in using fuel-efficient stoves. Campaign improves communities' identification in adopting measures to reduce fuel-wood felling.
Interpersonal communications	Pride campaign stimulates discussions among target audiences about fuel-efficient stoves and environment protection.
Barrier removal	Cooperative partners technically support community in building fuel-efficient stoves. Pride Campaign provides subsidies for fuel-efficient stoves.
Behaviour change	Community residents utilize fuel-efficient stoves in their daily lives.
Threat reduction	The community fuel-wood consumption starts to decline.
Conservation results	By October 2015, the biodiversity and forest quality of Yuhe Reserve will improve significantly (compared to pre-project, the biodiversity index will rise and the forest growing stock is increasing).



**Fuelwood consumption and forest impacts:** Average fuel-wood consumption for each fuel-efficient stove was 0.76kg, while the average for conventional (Tiger) Stove was 1.71kg. Therefore fuel-efficient stoves used 66% less wood, saving 0.95kg fuel wood. Monitoring of household fuelwood use confirmed this efficiency, with average household fuelwood consumption 40.1% less for fuel-efficient compared to conventional stoves. Gathering time for fuel wood was reduced by 38.2%. Forest monitoring revealed a 23.7% reduction in fuel wood felling in forests surrounding villages where fuel-efficient stoves were used in place of conventional stoves (29 stumps as opposed to 38).

## DISCUSSION

The results from this study suggest that social marketing techniques can be an effective and powerful tool for fostering acceptance and adoption of fuel-efficient stoves, and lead to a reduction in destructive fuel-wood collection in nearby forests. The impact of this campaign on key enabling conditions for behaviour change suggest that it was particularly successful in increasing knowledge, attitudes, and interpersonal communication within just 1 year of campaign implementation. Additional forest and fuelwood use monitoring also suggests that the campaign was able to decrease destructive forest practices as well as reduce the direct consumption of fuelwood. Although these results only reflect 1-2 years of data collection,

it is encouraging to note that knowledge, and attitudes remained stable over this time period. Interpersonal communication, or discussion among peers and opinion leaders to validate new knowledge and attitudes, has been identified as a critical component in fostering and maintaining changes in behavior (Vaughan and Rogers 2000). Future campaign activities will likely need to continue to maintain knowledge, and attitudes, but explicitly focus on enhancing discussion among peers about the benefits of using stoves as well as the importance of conserving healthy forests. This action is focused more explicitly on a product with multiple benefits (fuel-efficient stoves). It would be interesting to test whether this type of social marketing campaign is more effective than those with less tangible benefits (e.g. private land certification; see Green *et al.* this issue).

Finally, one of the critical elements of the structure of this

**Table 2.** Shifts in knowledge, attitudes, and interpersonal communication (See Figure 3) as measured at a comparison site. Percentage point differences were negligible, and suggest that observed increases at the campaign site can be attributed to the campaign.

	Comparison Pre-campaign (n=300)	Comparison Post-campaign (n=300)
Knowledge (a)	56.0%	57.1%
Knowledge (b)	67.3%	64.3%
Knowledge (c)	2.0%	2.1%
Attitude	56.0%	57.1%
Interpersonal communication (a)	67.3%	64.3%
Interpersonal communication (b)	56.0%	57.1%

campaign is the ability to test a hypothesis about how changes in audience knowledge, attitudes, and communication influence behaviour change and the reduction of threats to biodiversity. Few education or outreach campaigns explicitly document or test an explicit theory of change. The approaches detailed here, including a specific theory of change, quantitative surveys, and the use of comparison sites, provide a valuable framework for understanding the impacts of social marketing or other types of outreach activities on target communities.

## ACKNOWLEDGEMENTS

We thank Longyu Environment Conservation for their support and funding for Rare Longyu Pride campaign. We would also like to thank the Gansu Yuhe Provincial Nature Reserve Management Bureau and surrounding communities for participating in this study. Specifically we would like to thank Jing Lizhong (from LEC), Xie Tianyu (volunteer) and Zhang Jun (from Yuhe Reserve). We would also like to thank Claire Austin for her enthusiastic support on this manuscript. Finally, we'd like to thank Shiyang Li at Rare China for her support and insight on key campaign decisions.

## REFERENCES

- Amacher, G.S., Hyde, W.F. & Joshee, B.R. (1992) The Adoption of consumption technologies under uncertainty: a case of improved stoves in Nepal. *Journal of Economic Development*, **17**, 93-105.
- Apian. (2003) *SurveyPro 3.0*, release 2001, Windows 95/98/NT/2000/ME.
- Arnold, M., Köhlin, G., Persson, R., & Shepherd, G. (2003) Fuelwood revisited: what has changed in the last decade? *CIFOR Occasional Paper*, **39**, 1-35.
- Bearer, S., Linderman, M., Huang, J., An, L., He, G., & Liu, J. (2008) Effects of fuelwood collection and timber harvesting on Giant panda habitat use. *Biological Conservation*, **141**, 385-393.
- Butler, P.J. (1988) *Saint Vincent parrot (Amazona guildingii) - the road to recovery*. RARE Center for Tropical Bird Conservation.
- The Conservation Measures Partnership. *Open Standards for the Practice of Conservation*. (2007) [http://www.conservationmeasures.org/wp-content/uploads/2010/04/CMP\\_Open\\_Standards\\_Version\\_2.0.pdf](http://www.conservationmeasures.org/wp-content/uploads/2010/04/CMP_Open_Standards_Version_2.0.pdf). (accessed 9 June 2012)
- Demurger, S. and Fournier, F. (2007) *Rural poverty and fuelwood consumption: Evidence from Labagoumen Township (China)*. Report prepared for French National Centre for Scientific Research (CNRS), 1-31.
- Green, K., DeWan, A., Balcázar Arias, A., and Hayden, D. (2012) Driving adoption of payments for ecosystem services through social marketing: Evidence from Veracruz, Mexico. Special Issue: Behaviour Change, *Conservation Evidence*, **9**, 20-24.
- Jenks, B., Vaughan, P.W. & Butler, P.J. (2010) The evolution of Rare Pride: using evaluation to drive adaptive management in a biodiversity conservation organization. *Evaluation and Program Planning*, **33**, 186-190.

- Jiang, L. & O'Neill, B.C. (2004) The energy transition in rural China. *International Journal of Global Energy Issues*, **21**, 2-26.
- Kirkpatrick, R.C. (1995) The natural history and conservation of the snub-nosed monkeys (genus *Rhinopithecus*). *Biological Conservation*, **72**, 363-369.
- Kirkpatrick, R.C. (2010) Snub-nosed monkeys: multilevel societies across varied environments. *Evolutionary Anthropology*, **19**, 98-113.
- Li, X. (2011) *Rare Alumni Follow-up Report: Reducing Threats to Forest in Gansu Yuhe Nature Reserve* (Unpublished manuscript).  
<http://www.rareplanet.org/en/node/20489>. (accessed 9 June 2012)
- Li, X. (2010) *Rare Pride Campaign Final Report: Campaign for Sustainable Forest Use Yuhe Nature Reserve, Gansu Province* (Unpublished manuscript).  
<http://www.rareplanet.org/en/node/20484?type=campaign>. (accessed 9 June 2012)
- Li, Y (2004) The effect of forest clear-cutting on habitat use in Sichuan snub-nosed monkey in Shennongjia Nature Reserve, China. *Primates*, **45**, 69-72.
- Prochaska, J. O., DiClemente, C. C., & Norcross, J. C. (1992) In search of how people change: applications to addictive behaviors. *American Psychologist*, **47**, 1102-1114.
- Vaughan, P. W. & Rogers, E. M. (2000) A staged model of communication effects: Evidence from an entertainment-education radio drama in Tanzania. *The Journal of Health Communication*, **5**, 203-227.
- Weinreich, N.K. (2010) *Hands on social marketing: a step-by-step guide to designing change for good*. Thousand Oaks, CA: SAGE Publications.
- Timmins, R.J., Richardson, M., Chhangani, A. & Yongcheng, L. (2008) *Macaca mulatta*. In: IUCN 2012. IUCN Red List of Threatened Species, 2012.2.  
<http://www.iucnredlist.org/>. (accessed 2 April 2012).