DIFFUSION OF INNOVATION: SOLAR OVEN USE IN LESOTHO (AFRICA)

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ABSTRACT

This paper uses a previously published report coupled with recently collected empirical information on the diffusion of solar cookers among the Basotho of Lesotho. Drawing upon diffusion practice and theory, the authors cite several present-day instances where diffusion is taking place. The conclusion, however, is unfortunate, in that the outlook for the use of solar cookers and their effective diffusion in Lesotho is rather bleak.

INTRODUCTION

Once upon a time, perched atop the Drakensberg Mountains above the Republic of South Africa, there lay a tiny country called Lesotho. Lesotho was, and still is, inhabited by Basotho (singular "Mosotho") who farmed the mountainous terrain. One day, trekking over the crags, a group of foreigners arrived in the village of Thaba Tseka in the center of Lesotho. They carried with them forty-five odd-looking boxes which they said could use the light of the sun to cook food. The boxes were a gift for the people of Thaba Tseka.

We could write an essay about why the people of Thaba Tseka did not adopt the solar cookers brought to them by those well-meaning foreigners from the University of Cape Town. But we won't. Such an essay has already been written, in the form of a report by A. A. Eberhard[1]. Instead, we would like to take about twelve minutes of our allotted time to relate Bill's first-hand experiences in Lesotho, coupled with some marketing input from Roy. Our discussion will provide a limited analysis of key ideas from Eberhard's study concerning the diffusion of innovation and practices for solar cookers, as well as an analysis of those current diffusion efforts that we are aware of in Lesotho. Hopefully, we will then have three or four minutes to discuss your welcomed questions.

"Diffusion of Innovation: Solar Oven Use in Lesotho (Africa)." Grundy, William and Roy Grundy. *Advances in Solar Cooking: Proceedings of the 2nd International Conference on Solar Cooker Use and Technology.* Shyam S. Nandwani, ed. July 12-15, 1994. pp. 240-247.

UNIVERSITY OF CAPE TOWN REPORT

A. A. Eberhard reports that the Basotho of Thaba Tseka indicated that, since they already used fires to heat their homes, they preferred to cook over their fires rather than use the solar cookers. Thus, the first of five key characteristics that help to explain the rate of adoption of any innovation, as perceived by potential users, was negative. This first characteristic is "relative advantage," which means "the degree to which an innovation is perceived as better than the idea it supersedes." The remaining four characteristics which "past research indicates . . . are the most important characteristics of innovations in explaining the rate of adoption"[2] are

> **Compatibility** - the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of the potential adopters,
> **Complexity** - the degree to which an innovation is perceived as difficult to understand or use,
> **Trialability** - the degree to which an innovation may be experimented with on a limited basis, and
> **Observability** - the degree to which the results of an innovation are visible to others.[3]

For the Basotho of Thaba Tseka, any low tech innovation such as a solar cooker requires two categories of information: software and innovation-evaluation. Software information serves to reduce uncertainty about cause and effect relationships involved in such questions as whether the food gets cooked and how. Unfortunately, many of the Basotho don't have what is called "principles knowledge." Principles knowledge consists of the underlying ideas or concepts of how things function; for example, how germs spread and debilitate people, which underlies the need for vaccinations and latrines in village sanitation and health campaigns. Eberhard reported that "Despite a prevalence of clear skies there was widespread belief that the solar ovens would not work in the colder winter weather." The Basotho in the experimental group had little if any understanding of the basic principles of light waves and the capturing of infrared rays by the glass cover of the solar cooker. Nor did they understand how the insulated walls of the cooker diminished conduction and convection of the heat inside the unit.

Thus, change agents for the diffusion of solar cookers have to start the educational process at a much more primitive educational level than they at first might suspect. Innovation-evaluation information helps reduce uncertainty about an innovation's advantages and consequences. For instance, the leaders of a village might want to know what the women and children will do with their time as a consequence of not having as much work to do as a result of cooking the meals in a solar cooker. One Mosotho chief was very vocal about this possible dilemma in his village. Fortunately, another man suggested to him that the men could get even more work out of their wives, since the solar cookers would reduce the time the women spent cooking. The second man provided the chief with innovation-evaluation information about solar cookers.

SOLAR COOKER ADOPTION PROGRESS IN LESOTHO NOW

While there are isolated efforts on the part of some governmental aid organizations to convince rural Basotho to use solar cookers, there has been little advancement or residual effects of these funded efforts. However, one individual, Ivan Yaholnitsky, has

made some headway in Bethel, in southern Lesotho. His hands-on approach involves teaching women how to cook papa, a corn-based staple food, using a solar oven which is set on the metal rim of a tire. The tire rim allows the cooker to be rotated as the sun changes position. Perhaps you remember the photo in Solar Cooker International's fall 1993 edition of "Our Newsletter." It showed how the Basotho at Bethel are able to can tomatoes in an all-metal solar oven with a tilt and swivel stand "like an office chair." Very creative. Unfortunately, Ivan has not yet attained a critical mass of 15% to 20% of the local Basotho potential adopters of the innovation.

ADOPTER CATEGORIES AND THE S-SHAPED DIFFUSION CURVE

Not everyone adopts innovations at the same rate. Rather, people adopt in a time sequence that classifies them into five ideal categories. Those categories, with their associated descriptions, are Innovators (venturesome), Early Adopters (respectable), Early Majority (deliberate), Late Majority (skeptical) and Laggards (traditional). These five categories of adopters form a bell-shaped frequency curve. If the frequency curve is converted to a cumulative curve showing adopter distribution, we then get a classical, S-shaped curve (cf. Appendix, fig. 1). In doing so, we have a very useful curve for showing just when a diffusion of innovation, such as a solar cooker, will take off. "The area of the S-shaped diffusion curve after about 15 percent and up to 20 to 25 percent adoption is the heart of the diffusion process. After that point, it is probably impossible to stop further diffusion of an innovation, even if one wishes to do so"[4]. Here, we are talking about a spontaneous action (diffusion), and not a directed action (dissemination).

A COMMENDABLE MODEL

Probably the best model for what is being done now in Lesotho is Anthony Scott's school, in his home alongside his general store in Mpharane, in the south of Lesotho (cf. Appendix, fig. 2). Anthony aims his current efforts at a target market which we shall dub the "wanna-be's." For purposes of this discussion, the wanna-be's are the ones who, like most people in any country, want to be richer, want to belong to the upper class. They don't want to spend money on kerosene if they can avoid it, since even that small expenditure, on the order of R20 ($6) per month, is a real cost to many families in Lesotho.

The wanna-be's are the type of people with whom Bill spent most of his time in Lesotho. They are fairly open to new ideas. Certainly the notion of progress is not as strong among the students and teachers of Mt. Tabor, the rural high school where he taught, as among their counterparts in Machabeng, the international school in the country's capital, Maseru. However, almost all of the students at Mt. Tabor unflinchingly considered development – that is, Westernization – in any form to be an improvement.

Along with the wanna-be target market, Anthony Scott is counting on the pedagogy of Basotho teaching Basotho, coupled with an increasingly sophisticated array of solar energy devices. In diffusion jargon, this set of interrelated products is called a technology cluster. Thus, Anthony might begin with solar dryers and cookers, and then move up to solar stills, cookers equipped with compound parabolic concentrators, and photovoltaic panels for the generation of direct current electricity from sunlight. Anthony has

previously developed a solar cooker made of wood, sheet metal and glass which will withstand Lesotho's harsh, windy climate. That model costs R180 (US $60). His indoor cooker with a compound parabolic concentrator will cost on the order of R1000 (US $300). Like Ivan, Anthony has not yet attained the critical mass of 15% to 20% of the target market in his area; however, after the early adopters use their solar cookers successfully for a year or so, he hopes to have people on the fringes of the target market, the early majority, emulate the early adopters and network with them. This networking is at the heart of the diffusion process.

BRIEF OVERVIEW OF NETWORKS

How, then, do we stimulate networking? Communication networks consist of interconnected individuals who are linked to one another by patterned flows of information. These patterned flows have a degree of structure, stability and predictability. The structure consists of cliques, each consisting of very similar people. The connections between cliques subsist in one or more individuals who serve as "bridge ties" between two cliques with dissimilar social status, norms and values. Granovetter calls this phenomenon "the strength of weak ties," meaning the informational strength of a weak bridge or network connection[5]. Looking at figure 3 in the Appendix, we see that the bridge tie A-B is a weak tie that connects clique I, which we will imagine to be of a higher social status than clique II. The A-B bridge is strong in its ability to carry information between the two unlike cliques, thereby playing a crucial role in the diffusion of innovation.

AGENTS VS. AIDES

Key to the "strength of weak ties" idea is the function of the change agent or, preferably, a change aide. The Peace Corps and SCI use change agents to help bring about the diffusion of solar cookers in various parts of the world. Often the change agent is an outsider who is not of the same class and does not hold the same norms as the client or adoptee. Often the diffusion process works much better if the agent can train a local person as an aide to plug into various cliques and thereby decrease the differences between the aide and the adopter. This facilitates a smoother "bridge tie."

Anthony Scott is a good example of an aide. Anthony was born in Lesotho. He is a strong proponent of solar energy use in Lesotho. Yet, in the few hours in which Bill met him, Anthony repeatedly claimed that solar cookers will not, cannot be diffused in Lesotho by foreigners. The problem is particularly acute for people who come to Lesotho for a brief stint of a few months or a year or two. The need for solar cookers must be real for the Basotho, and the innovation must be diffused by a person whom they consider to be one of their own, rather than by well-meaning agents from outside organizations.

CONCLUSION

This paper points to several projects that have already targeted people who were thought to need and want solar cookers the most, the rural women and the wanna-be's. A brief review of past and present projects and the application of diffusion theory has failed to show much hope for the diffusion of this innovation – solar cookers in present day Lesotho. Because the diffusion of innovation is a cooperative process, the people

of Thaba Tseka will not adopt solar cookers until a suitable change aide, with a bridge tie into their clique, convinces them that sunlight can, indeed, cook their food.

REFERENCES

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2 Rogers, Everett M. *Diffusion of Innovations, Third Edition*. New York: The Free Press, 1983. p. 16.

3 Ibid, p. 15.

4 Ibid. p. 245.

5 Granovetter, Mark S. "The Strength of Weak Ties." *American Journal of Sociology*. 78:1360-1380. 1973.