

**The Malawi Project:  
From Conventional to Holistic Decision Making**

How the Cal Poly Malawi Appropriate Technologies Team, and other development groups, can use Holistic Management to aid developing countries in an effort towards a sustainable future.

A Senior Project  
presented to the Faculty of the Animal Science Department  
California Polytechnic State University, San Luis Obispo

Grace Wetmore  
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## Introduction

I have designed this report to evaluate the effectiveness and appropriateness of the Malawi Project, which is the focus of the Cal Poly Appropriate Technologies Team. In September 2008, I traveled with the Cal Poly Appropriate Technologies Team to the southern Africa nation of Malawi to research the possibilities of using the bicycle-powered water pump designed by our team. Our team formed in January 2008 when we met in an experimental course called UNIV X491- Appropriate Technologies for Impoverished Communities. In this class students formed groups and chose countries where local people live in poverty, then researched how their poverty could be alleviated. In order to choose a technology appropriate for their focus communities, student groups needed extensive knowledge of the physical and economic conditions of the country, the cultural customs, and community dynamics of the people. My group chose Malawi, Africa because 85% of the country's population live in rural communities and millions of people experience an annual season of hunger and starvation. Our team looked at human-powered water pumps as appropriate technology for irrigated agriculture as a way to improve food production and increase food security for Malawians.

After learning about the practice of Holistic Management from Professors Rob Rutherford and John Phillips in the AG 360 class at Cal Poly, I chose to use my experience with the Malawi Project to analyze how it could be managed holistically. Managing holistically has greater benefits for the environment and its people in the long run and considers all elements surrounding a group, business, industry, or individual person. I asked the question, "What if the Cal Poly Malawi Appropriate Technologies Team utilized Holistic Management in order to improve quality of life in Malawi, Africa?"

This report starts by applying the basics of Holistic Management to the Malawi Project and the Cal Poly Appropriate Technology Team. I'm writing this booklet to target development workers, such as the CP Malawi Team members, whose work it is to be with the people in the rural areas where problems are being experienced concerning the land and basic needs such as food and water. The holistic-goal is the backbone for managing holistically, and this report describes the process of forming a holistic-goal and reasons why each step is important. Since the Malawi Project stemmed out of the UNIV 491 class which focused on technologies, this booklet describes how other tools like animal impact or small living organisms can be used to alleviate the poverty issue. The Decision Tests, a characteristic of Holistic Management, is explained for some of the Malawi Team's actions. In addition, Holistic Financial Planning will be suggested to be beneficial for the team. This work has been done with my own research using resources such as Animal Science Professor Rob Rutherford from the Holistic Management class at Cal Poly, other resource management and conservation classes I've taken, Allan Savory's book *Holistic Management*, internet and literary sources, and my knowledge of the CP Malawi Appropriate Technologies Team, our projects, and our experiences in Malawi.

## **Part I. The Malawi Project using Conventional Decision Making**

### **Background Knowledge on the Republic of Malawi**



<http://www.lib.utexas.edu/maps/africa/malawi.jpg>

Population	<p>14,268,711 people (the CIA World Factbook accounts for the effects of AIDS). 85% of Malawians are rural, small plot (0.5 hectares) farmers. Such high population in a small country has led to limited farming land availability and forces farmers to continually use all of their land for crops. Without proper rest and replenishment of nutrients, the crop fields are experiencing decreasing quantity and quality of crops.</p> <p>Age Structure of Malawi: 45.8% age 0-14 years, 51.5% age 15-64 years, 2.7% age 65 or older.  Median age is 16.8 years.  Population growth rate: 2.388% (2009)  Birth rate: 41.79 births/1000 pop  Death rate: 17.89 deaths/1000 pop</p> <p>Note – birth rate is more than double the death rate which correlates with the issue of population growth and increased starvation in Malawi.</p>
Life Expectancy	<p>Entire population: 43.82 years  Male: 44.07 years  Female: 43.57 years (2009 est.)</p>
Fertility Rate	5.59 children born/woman (2009 est.)
Country	Approximately 21% of the country consists of Lake Malawi. Total size is

topography	<p>118480 Km<sup>2</sup> comprised of 28 regional districts.</p> <p>Cultivated Land: 34%</p> <p>Wild Pasture Lands: 20%</p> <p>Forest Land: 22%</p> <p>Bordered by Mozambique, Zambia, and Tanzania.</p> <p>Some mountains, but mostly hills and plateaus.</p>
Political System	Multiparty democracy comprised of Legislative, Judicial, and Executive branches.
Political History	<p>Malawi became an independent nation in 1964 after British control under the name of Nyasaland since 1891. For thirty years President Hastings Kamuzu Banda presided over one-party rule until 1994 when the first multiparty elections were held and a new constitution was established. In May 2004 the current President Bingu wa Mutharika started the Democratic Progressive Party (DPP) in 2005. Malawi has experienced economic improvement under Mutharika, however the DPP has not been able to pass substantial legislation because of “political deadlock in the legislature”.</p>
Average Family Size	5 people
Average Land Area per Family	1.5 hectares (approx. 3.7 acres)
Decision Making Groups	<p>The CIA World Factbook states the following ethnic groups exist in Malawi: Chewa, Nyanja, Tumbuka, Yao, Lomwe, Sena, Tonga, Ngoni, Ngonde, Asian, European</p> <p>Major Religious Groups: Christian 79.9%, Muslim 12.8%, other 3%, none 4.3% (1998 census)</p>
Deforestation issues	<p>According to a 2005 New York Times article, Malawi’s deforestation rate is 2.8% annually. This is equal to 200 square miles of forest. People in poverty feel they have no way to support their families so they cut trees to sell at roadside stands. Deforestation contributes to air and water pollution, soil erosion, drying of streams, and lowers the water table. Wood and charcoal are the most preferred form of cooking in Malawi, yet consumption of these fuels is more than the country can sustain.</p>

HIV/AIDS	Adult prevalence rate: 11.9% (2007 est.) People living with HIV/AIDS: 930,000 (2007 est.) Deaths: 68,000 (2007 est.) HIV/AIDS orphans: approx. 500,000
Climate	Sub-tropical November to May is the typical rainy season and the dry season lasts usually from May to November.
Climate Patterns	There is a significant connection between climate and food security, agriculture, and resources. (source: Action Aid <i>Climate change and smallholder farmers in Malawi</i> 2006)
Drought Cycles	Drought and flood are major issues in Malawi. The livelihoods of millions of people are deeply affected by these events, which have become more frequent and intense through global climate change. (source: Action Aid <i>Climate change and smallholder farmers in Malawi</i> 2006)
Issues	According to the CIA World Factbook, “population growth, increasing pressure on agricultural lands, corruption, and the spread of HIV/AIDS” are the biggest threats to Malawi. Other issues such as land degradation, deforestation, siltation of waters where fish spawn, deforestation, and water pollution from agricultural runoff, sewage, and industrial wastes are threatening Malawi’s wellbeing.

Sources: CIA World Factbook (<https://www.cia.gov/library/publications/the-world-factbook/geos/mi.html>), Food and Agriculture Organization of the United Nations, Plan USA ([www.planusa.org](http://www.planusa.org)), Action Aid *Climate change and smallholder farmers in Malawi* 2006, NY Times article *Malawi Is Burning, and Deforestation Erodes Economy* By Michael Wines 2005.

### Challenges in Malawi

As a group, the Cal Poly Appropriate Technologies Team researched extensively to identify and acknowledge the challenges to native people taking place in Malawi at the current time. Through their assessment, the following list was established before starting technology design to ensure all team members understood cultural, social, and other possible constraints facing a new technology.

- Access to technology- mechanized farming practices don’t exist now

- Cultural restrictions- dealing with clearly defined gender roles, whether women feel comfortable using bilge pump or any large or “un-feminine” technology. In terms of the micro business aspect- whether men will let women earn money -- Women empowerment being achieved despite these restrictions
- Cultural differences between regions
- Possible lack of capacity of the people- they are culturally attached to farm the way they have for centuries- planting after the 1<sup>st</sup> rain (obvious problem with rain not being consistent) also they never have varied their crops
- Land management practices – irrigation, crop rotation, contour ridging, and more have not been commonly practiced and contribute to soil degradation.
- Health problems- (HIV/AIDS, Malaria, malnutrition)- preventing people of working age from contributing
- The demand for many social services in urban Malawi- COMDEP will be challenged to introduce a program that extends services into the rural sectors of Malawi. (There’s limited housing, high unemployment rates, and high widow and orphan populations)
- The acceptance and support of micro enterprise- it is still relatively new in this region so it will be met with some resistance

**The problem the Malawi Team chose to focus on, why it was chosen, and the objective for addressing the problem**

Of the many problems that are experienced by impoverished people in Africa everyday, the Malawi Team decided to focus on food security and starvation in rural areas. The Team’s solution was comprised of a student designed and built bicycle-powered water pump, a water distribution system, and intercropping practices. The objective in addressing the problem of food security was to build a technology that was affordable, acceptable, and beneficial for rural people in Malawi.

We chose this problem to address in January 2008 because one of our team members had been to Malawi, had friends and contacts in the country, and she had seen the situation experienced by rural people there. Our team wanted to address the prevalence of starvation for the 85% of Malawi’s population that lives in rural villages as starvation is an annual experience for many and is affecting more people each year. We believed that since most farmers in Malawi only rely on the rains to irrigate their crops, bringing water to their fields through irrigation technologies will help them sustain crops year round and the annual hunger season will be reduced if proper maintenance and agricultural practices were maintained. We also hoped that our research in irrigation and agriculture would influence farmers to grow a greater variety of crops to both increase the fertility of the soil and provide venues for increased income by selling off-season vegetables at markets. We know that nutrient rich top soil in Malawi is depleted due in part to the common practice of burning their fields after each harvest. Frequent burning without adequate time for rejuvenation between burns causes great amounts of carbon and organic compounds to leave the soil in the form of smoke or dust. Burning of plant residue also depletes soil cover, which allows erosion of soil to increase dramatically. Without proper amounts of soil cover and nutrients, the soil is easily carried off the fields by water during the rainy season and by wind. Rain impact on uncovered soil can also cause soil capping,

creating a hard shell on the soil surface, which diminishes soil fertility immensely. This will lead to continual declines in crop quality and productivity unless actions are taken soon to enhance the health of crop fields to effectively increase food security for Malawian people.

### **The Malawi Team in Action**



CP Malawi Team in June, 2008

The Malawi Team got its start in the Appropriate Technologies for Impoverished Communities class at Cal Poly San Luis Obispo in January 2008. In that class the student members conducted research on projects done by other students, scientists and engineers to find inspiration for modifying or designing their own irrigation technology that was appropriate for rural, low income farmers. The team gathered information from journals, published books, literature searches, online databases, and from email and telephone conversations with connections in Malawi. They also collaborated with students from Washington State University who have been working on similar irrigation projects for rural Africa and who had traveled with their pump design to Malawi in March 2008. Throughout the Appropriate Technology classes, professors and guest speakers continually stressed the importance of physically going to the focus community to talk to the people and understand their situation, their needs, their culture, and the capacity of their environment. Designing technologies for impoverished nations requires accounting for severe physical and social constraints in order for a technology, or any change, to be accepted and practiced by the focus communities. The Cal Poly Malawi Appropriate Technologies Team worked on the development and design of their water pump system from January to June of 2008 with the hopes of traveling to Malawi to assess the environment and situation of the rural people in order to create a truly appropriate solution. Therefore, in June after their final presentation of their working pump design for the UNIV 392 class, the Malawi Team started raising money and making travel plans.

“The Cal Poly team felt an acute need to test a prototype pump using bicycle power in the country to determine if the design was acceptable and to see if women, the primary agricultural workers, would use the pump.” –Malawi Project Report - Fall 2008.

## The Final Pump Design – June 2008



Students in the Malawi Team gathered funding and support from the San Luis Obispo community, friends, family, and Cal Poly University departments on campus to send team members and their bike-powered water pump prototype to Malawi, Africa as an extension of the UNIV X491 and X492 classes they had taken together. From August 30 to September 15, 2008, five Cal Poly students and two Cal Poly faculty members represented the Cal Poly Malawi Appropriate Technologies Team and traveled to Malawi, Africa.

The Lilongwe and Mangochi regions were the two main locations of the Cal Poly Malawi Team's service learning trip. The Team traveled with local Malawian friends Enoch Phiri and Philip Kamangirah of COMDEP (Compassion Ministries Development Programmes), a non-governmental organization, to some of the most impoverished rural villages in Malawi. The CP Malawi Appropriate Technologies Team's trip in September 2008 focused on irrigation technologies in agriculture to address the starvation problem, the empowerment of women, and possibly improve economics and business for communities because agriculture is a large part of Malawi's economy and women represent 80% of the agricultural workers. The main components of the Cal Poly Malawi Team's actions during their visit were:



- Collaborations with the NGO Compassionate Ministries Development Programmes and the Malawi Ministry of Irrigation Services,
- Demonstrations of the bicycle-powered water pump with workshops for gaining feedback from local people, and
- Meetings with irrigation and anthropology specialists in the country.

The students and faculty from the Cal Poly Malawi Appropriate Technologies Team spent 10 days in Malawi. The initial few days of the visit were spent in the capital city of Lilongwe. The team's first action was meeting with the Malawian Ministry of Irrigation and traveling with their engineers to a nearby village site where the Ministry wanted our input and collaboration for agricultural problems being experienced by the local people.



CP students and faculty in Malawi with members and directors of COMDEP (Sept. 2008)  
Top left to right: Kaitlin Chandler, Gift Phiri, Lori Atwater, Phillip Kamangirah, Blayne Morgan, Grace Wetmore, Rod Hoadley. Front Row: Bridget Hill, Enoch Phiri, Dianne Long.

The main purpose of this trip was not to sell the bicycle-powered water pump as the end all solution. The bike-pump was demonstrated to see how Malawian's responded to it and for us to gather their ideas about changes or amendments to the bike-pump. We also wanted to know their thoughts for completely different water pump designs or inspirations for new and different ways to boost their local economies. An important reason for the Cal Poly Malawi Appropriate Technologies Team to spend time in Malawi was to gather knowledge of the environmental and social conditions in order to brainstorm more appropriate ways to help the local people.

On their first day in Malawi, the team members from Cal Poly met with the Malawian Ministry of Irrigation to develop solutions for stream flow problems at a small village called Chowuwa. The group from Cal Poly and their partners in COMDEP accompanied two irrigation engineers, Boydd Nkaka and Nicholas Ghari of the Ministry of Irrigation, to Chowuwa. The Ministry of Irrigation had designated ten hectares of farmland in the Chowuwa area for irrigation testing and studies. The CP Malawi team applied \$443 from the CASE grant they received toward the topographic survey and irrigation plans conducted by the Ministry of Irrigation. At that time in



September 2008, it was hoped that this work would be finished before the rainy season began in November, but the completion of the weir has been slow to progress.



A briefing at the Malawian Ministry of Irrigation



Presentation and discussion with all members of the Chowuwa community

The Cal Poly Malawi Appropriate Technologies Team visited the community at Kafita CCAP Church in Lilongwe. Funds from the CASE grant were used to hold a workshop for all who were interested, but specifically for women and youth. The goal was to boost the economic confidence in women and inspire new ideas for both agriculture and small business. There were over 100 people present, young and old. Kafita Presbyterian Ministry and COMDEP planned to develop small business opportunities in carpentry, handmade crafts, and soap making. It was suggested that the community use a micro bank to loan small sums of money to groups of people who could use the loan to start small businesses. After demonstrating the bike-powered pump, some new ideas were discussed including the use of a hand crank or treadle sewing machine to power the pump. The 2008 Malawi Team hopes that future groups from Cal Poly will continue to experiment with these ideas.



Presentations at the Kafita CCAP Church

Another trip the group from Cal Poly made while in Malawi was to a small, rural village outside of Lilongwe called Mpingu. Currently it is the primary focus of COMDEP. There are around 300 children in the village that, if they went to school, would have to walk about 12 kilometers. Members of COMDEP knew of this village with so many children who were not going to school because of the distance, and also so many of the children are orphans with little opportunity for education. COMDEP build a simple building for a school in Mpingu, but they are having trouble keeping a teacher there because they do not have running water or an adequate food supply.

Enock and Phillip of COMDEP gave the members of the CP Malawi Team a tour of the small village. COMDEP has been actively promoting the development of crop fields in Mpingu. They are utilizing dry land farming because there is enough water to grow crops during the dry season. This is very important because they are successfully growing extra food outside of the rainy season, which will help alleviate the hunger period which usually occurs during the rainy season.





Mpingu village children and school classroom

After touring the village and discussing crops, the elementary school, and the brick-making process utilized in the village, a community meeting was held to meet the students and faculty from Cal Poly and to hear about the bike pump. The bike pump was demonstrated and many village members were able to experience operating the pump. Unfortunately a pump could not be left with the village and there were also discussions about better pump designs. The necessity for drilling wells for clean drinking water was discussed as well, but the CP Malawi Team did not have the ability to provide assurance that a well would be dug. This village can use lots of help and many different projects could be implemented here.



Village members of Mpingu experiencing the bike-powered water pump

The students and faculty from Cal Poly also met with Total Land Care (TLC), an organization overseeing many irrigation projects in Malawi. The Cal Poly Malawi Team had been collaborating through e-mail with another student team at Washington State University who also focused on development in Malawi and visited the country with a water pump they designed for small scale rural farmers in March, 2008. The students at Washington State University were working under Trent Bunderson, the director of Total Land Care, and the Cal Poly Team was able to collaborate with him before their visit to Malawi. The Cal Poly Team was able to arrange a meeting with Trent Bunderson and his colleagues at Total Land Care in Lilongwe, Malawi. At this meeting, current and past issues about irrigation and pump manufacturing were discussed. The bike-powered water pump designed and built by the Cal Poly Team was left with Total Land Care so the prototype could be tested by irrigation experts.



Meeting with Trent Bunderson at Total Land Care in Lilongwe

## 1. Making Decisions



Many decisions were made based on the criteria of the class, X491 and X492 Appropriate Technologies for Impoverished Communities. Especially in X492, a design class meant mostly for engineers, the team spent their time searching for and designing technologies to improve crop production. They were constantly calculating the costs of materials and the availability of supplies or tools because the cost needed to be as low as possible. The team's goals were to make a technology that would solve the food crisis, but would also empower the local people. It was not going to be just a charity event or donations of water pumps. We wanted the people to be able to buy the technology to give them a sense of ownership and responsibility. We also hoped for the possibility of producing pumps in the country and provide jobs and revenue for local people.



Malawi Team working on design projects in UNIV X492

Decisions were also made with the help of people in Malawi. The Cal Poly Malawi Team held frequent phone conversations with correspondents in Malawi as well as through email. Since January 2008, the Malawi Team has been in contact with Enoch Phiri and Philip Kamangirah of the Malawian non-governmental organization, COMDEP, for in-country information. They were also essential to the Cal Poly team during our visit in Malawi by arranging meetings, facilitating translations, providing transportation and local knowledge while they traveled with us throughout the Lilongwe and Mangochi regions.

Janet Norem was another great asset to the CP Malawi team. Cal Poly student and Malawi Team leader, Lori Atwater, knew Janet through a church in San Luis Obispo. Janet has a degree in agriculture and has spent most of the past 10 or so years in Malawi and Mozambique working to help native people improve their agricultural practices. The CP Malawi team was able to meet with Janet personally while she was in California for a few weeks and she was able to meet with the team in Malawi and aid them during the five hour journey from Lilongwe to the Mangochi region.

Also while the Malawi Team was in the rural Mangochi region of Malawi, we met with Charles Reed. Mr. Reed and his community development group called Partners for Holistic Development Collaboration invited the Cal Poly Malawi Team to his house to learn more about the culture and they gave a detailed anthropology lesson of Malawi. They taught the team from Cal Poly

how understanding the culture and how people think in Malawi, or any area, is essential to making appropriate solutions to their problems.

The Malawi Team also partnered with the Malawian Ministry of Irrigation to assist with irrigation projects in the rural Chowuwa region. Engineers Nicholas Siskaki and Boydd Mkaka of the Ministry of Irrigation traveled to the Chowuwa site with us where we discussed the agricultural problems experienced by the local people and solutions to these problems. The Ministry of Irrigation is starting land surveys for an irrigation plan using the funds from the CASE Foundation that were allotted to the Malawi Team's efforts in Malawi.

## **2. How the CP Malawi Team Determined the Appropriateness of Their Actions**

The Malawi Team members did research as quickly and extensively as they could within the deadlines for each 10 week quarter for UNIV X491 and X492. Using internet sources and personal connections, the team gathered ideas for pump designs or water distribution layouts and then tested each design against what we considered important criteria. These criteria included affordable and available parts, feasibility of the design, cultural acceptance, and comparison to traditional practices in Malawi. Although the treadle pump is common in southern Africa and even subsidized in a few places, it is still too expensive for some rural farmers. The team aimed to have a water distribution device as cheap as or cheaper than the treadle pump and with competitive flow rate (gal/min).

Although the Cal Poly Malawi Team was excited about their self-constructed bicycle-powered irrigation system and brought it to Malawi for demonstrations and feedback, we knew it probably was not the greatest technological solution to poor irrigation. From our justifications, compared to other pumps in Malawi our pump was:

1. Cheaper, probably \$10-20 to manufacture.
2. Easy to attach to a bicycle and to transport to agricultural fields.
3. Easy to use by both women and men, as other pumps can be challenging.
4. Could be manufactured and repaired in-country.

The Malawi Team's Project Goals - An Appropriate Water Distribution System for Malawi must:

1. Be human powered,
2. Have the ability to provide pressurized output for irrigation purposes,
3. Be culturally accepted,
4. Be economically viable for Malawians, and
5. Be locally available, maintainable, and repairable.

Throughout the UNIV classes at Cal Poly, the Malawi Team used these guidelines for designing their water pump. The group also considered various ways to distribute the water onto a crop field, but those studies during the school year in 2008, did not produce optimal results for implementing a distribution system in Malawi.

### **Lessons Learned From the Project and the Experience**

1. Don't "marry" your design
2. Talk to as many people as possible in the country
3. Don't lose sight of the original problem or our purpose
4. The appropriateness of a portable bike-powered water pump
5. So many factors go into poverty: economics, natural resources and ecosystems, the environment, technology, etc.

The CP Malawi Team was good about getting specific feed back about the pump they brought, but we were not good at examining and re-analyzing the problem or considering alternatives to their design. This bike-powered pump was only going to work well for small gardens, but instead of going back to the problem and re-assessing the pump design, the group found a niche for the bike pump, which is not going to solve the food security problem which they described in their primary objectives. The list above highlights important things that need to be done differently on the CP Team's next trip to Malawi because of what was learned on the 2008 trip. Hearing from the people is always going to give development workers a better idea about the problem and what the local people's needs are in order to help them solve the problem. Of course, after going to the country the group from Cal Poly brought back more project ideas than they started with, which can be positive, but also negative if they do not follow through on original goals.

To elaborate on number four above, the low pressure output by the small pump is not optimal and hardly feasible for large scale irrigation. Also, we knew many people in Malawi have bikes, but we did not anticipate how the vast majority of bikes are in bad condition. This is another reason to look at alternatives to the bike-powered pump design. In addition, we did not foresee that almost every bike would have a seat above the back tire for passengers, which makes the fold-up, portable design for the pump irrelevant and unusable.

The Cal Poly Malawi Team also learned that a little goes a long way in Malawi. The people there were extremely thankful for the group's presence and truly appreciated people coming to help them. However, there were many instances where we were expected to give a donation of either food or money. Most of the students and faculty traveling members of the CP Malawi Team did not expect this and were not capable of donating money. The main goal of this trip was for the students and faculty from Cal Poly to experience the situations in Malawi and to talk to local people about ideas for the future. The Malawi Team's goals also included establishing connections and relationships between Malawi and the University to expand resources for reducing poverty and improving sustainability in rural Africa.

### **The Malawi Team Now and For the Future**

Probably the most important part of the 2008 trip was making connections with people in the country. The Cal Poly Malawi Team has realized how important it is to establish the connection between Cal Poly and Malawi in order to create opportunities for students to use their creativity to help develop solutions to problems in the country. Malawians can benefit from the ingenuity and the technical capacity that Cal Poly students can bring.

Since returning from Malawi, the CP Malawi Appropriate Technologies Team has added many students to the team who are helping by writing grants, improving the pump design, and researching possibilities for distributing a good water pump in Malawi. After returning from Malawi in September 2008, the members of the Cal Poly team made a list of goals for the future:

- Establish relationships between Cal Poly and focus communities in Malawi
- Develop more appropriate solutions
- Continue working on an appropriate water pump and distribution
- Continue growth of the Malawi Appropriate Technology Team at Cal Poly for continued progress
- Plan and prepare for future trips back to Malawi

Students can and should involve themselves in real world experiences and thereby provide help in a place that needs it at the same time. The Cal Poly Malawi Appropriate Technologies Team feels this is the time to get students involved in international service and sustainability. Any student in any field should be able to participate in a project like this because everyone has ways to contribute.

The 2008 trip for the CP Malawi Team was the first of many, and as such, it was important to see the situations of the rural farmers and have discussions with the community members to have a better understanding and approach to solving the issues faced by the people of Malawi. The team now knows this specific bike-pump design that was brought with them is not the solution to poverty in Malawi, but it was important to go and hear ideas for improvement from the people as well as bring back more project ideas for the team to work with at Cal Poly.

## **Part II. The Malawi Project using Holistic Decision Making**

### **Background Knowledge**

Same information as previously stated under the conventional approach.

### **The Problem**

The Malawi Team seeks to address starvation, improve quality of life, and promote sustainability for rural farmers and their families in Malawi.

### **Key Concepts in Holistic Management**

#### **The Four Key Insights**

The essence of Holistic Management is the understanding of wholes within wholes, natural systems, and addressing the root causes of problems. When beginning to learn about Holistic Management it is important to start with the Four Key Insights. They are:

#### **1. Management Requires a Holistic Perspective**

It is imperative to manage holistically because the world we live in functions as wholes within wholes which are patterns of energy, matter, and life. We



cannot predict their qualities by examining or focusing on an isolated aspect of a whole. For example, a human being is a functioning whole but it is comprised of wholes within wholes (bodily systems, organs, cells) which work together to support overall life of the human.

## 2. The Brittleness Scale

The annual distribution of moisture and biological decay for a particular area defines brittleness. The degree of brittleness ranges on a one to ten scale, with rainforests ranking 1 and a desert ranking 10 on the brittleness scale. The brittleness scale is a helpful way to discern the brittleness of an area and how it will react when tools are applied (see Tools Available in Holistic Management).

## 3. Connection between Predator and Prey

Contrary to the belief that large numbers or herding animals destroyed the land, the health of brittle environments relies heavily on the presence of large, heavy animals moving in concentrated herds as they naturally do with the presence of a predator. The positive impact these animals have on the land is a crucial concept to understand for returning over-rested soils and plants to health.

## 4. Overgrazing Depends on Time Not Number of Animals

The belief in the past has been that the number of animals in an area contributes to overgrazing and trampling. However, the true critical relationship between grazing animals and the land is time. The amount of time that soils and plants are exposed to animals is the key factor in the improvement or degradation of the ecosystem's health. This is very important for management because the length of time the animals are allowed to stay in an area and how long before they can return to that area must be well planned and understood.

These are important concepts to understand, especially when making managerial decisions involving land. For development workers, such as CP Malawi Team members, who travel to areas they are not familiar with, the Four Key Insights are critical tools for understanding the environment. When the Key Insights are understood, together, they help us see why certain lands are deteriorating and how to create more sustainable lands.

## **The Four Ecosystem Processes**

In essence, the careful observation and understanding of the functionality of the four ecosystem processes in Malawi, along with the four key insights, will provide answers to what is the true root cause of the starvation problem. By understanding ecosystem processes functioning and how they intricately overlap, the weak areas can be found and appropriate solutions can be implemented (see Table 1 below). The ecosystem processes are extremely complex and we continue to learn more about each one. Oftentimes if a problem traces back to the environment, it can be related to all of the four ecosystem processes. When thinking holistically we can see that the systems in the environment relate to the systems in our bodies, our social systems, our cultural systems, and the other biological systems (animals) with which we share the environment. Sometimes

the connections are hard to grasp, but with patience and critical thinking we can see that almost everything is connected through the four ecosystem processes.

Table 1 - Summary of the Four Ecosystem Processes

Community Dynamics	The constant development and variation of relationships between plants, animals, and microorganisms in the environment. This is the most critical ecosystem process to maintain as it has the greatest influence on the three other processes. Successful community dynamics are seen in ecosystems with high biodiversity and complexity within the plant and animal relationships, leading to stable, healthy, and productive environments. Succession (evolution of an area from bare ground to abundance of plants and animals) is seen in ecosystems with functioning community dynamics.
Solar Energy Flow	Solar energy flow relates to the conversion of energy from the sun into forms that all organisms require to survive. Therefore, all organisms rely on plants to convert sunlight (root form of all energy) into edible products through photosynthesis. Solar energy flow can be enhanced by increasing the time and rate that plants can grow, the leaf area of plants, and the plant density in an area.
Mineral Cycle	Proper mineral nutrients within the soil contribute to healthy soil quality, bountiful microorganism populations, and the flow of energy through healthy vegetation (sun > plants > food products). Underground organisms rely on nutrient cycling from decomposed plant and animal products, while organisms above ground get their essential mineral nutrients by relying on healthy plants to obtain the nutrients from the soil.
Water Cycle	Soil components such as clay, silt, and sand greatly affect the water cycle. Water is essential for quality soil and maintaining life for all organisms, but plants, animals, microorganisms and the soil contribute to the ability of water to sustain life in an environment. The water cycle decreases in effectiveness as biodiversity and environmental complexity decrease. Soil cover and healthy root systems help stabilize soil, prevent soil capping, decrease erosion, and allow the soil to absorb water.

References: Savory, Allan – 1999. Holistic Management course at California Polytechnic State University, 2008.

All of nature's biological systems function through these four processes. Each one affects the others and humans have a huge potential for impacting, altering, or devastating these intricate systems. Whenever we make decisions we must consider the ecosystem processes because we will only be hurting ourselves in the long run if we harm them. The ecosystem processes sustain our lives and the soil surface is vital to enhancing and maintaining these processes. It is crucial that our management ensures soil cover because bare soil is the most harmful condition for the environment and the livelihood of all organisms.

### **The Holistic-Goal – An Essential Tool for Effective Decision Making**

The Malawi Team has not yet created a holistic-goal. To make a holistic-goal, the Malawi Team needs to:

First: Define the whole under management, which is comprised of

- a. Decision Makers
- b. Resource Base
- c. Money

Second: Create holistic-goal including

- a. Statement of Purpose
- b. Quality of Life
- c. Forms of Production
- d. Future Resource Base

#### 1. The Malawi Team Whole Under Management

The whole under management is a description of the decision makers and the people affected by their decisions. Decision makers are those with veto power, making daily decisions, and who are involved in setting the holistic-goal. The whole under management also includes people and resources which influence the decision makers, but which also are affected by the actions taken by the decision makers. Since the Cal Poly Malawi team will change every year because it is a student organization, the primary decision makers can be stated as a general term, such as “student team members”. For a specific year or time, the names of primary decision makers should be entered.

Some wholes under management include secondary decision makers or “supporting cast”. This section includes part time employees, volunteers, and so on. However, the Malawi Team does not have an applicable supporting cast because supporters outside of the team are part of the resource base.

This booklet is aimed towards the Cal Poly Malawi team. It focuses on their whole under management, thus the people of Malawi are part of the resource base and are affected by the team’s decisions. The Malawi Team must also consider the effects their decisions or actions will have on California Polytechnic State University, San Luis Obispo. If the CP Malawi Team chooses to help the Malawian people establish their own whole under management and holistic-goal, then the CP Malawi Team would be part of the Malawian people’s resource base. The team at Cal Poly needs to remember that if they want to be part of the communities in Malawi in the future they must especially be critical about the last decision testing guideline, which will be discussed later in this book.

From my own knowledge and experience with the Malawi Team, here is what I would expect the whole under management and holistic-goal to be for the Malawi Team for the 2008 year:

**The Whole Under Management****The Decision Makers**

- Primary (for 2008)
  - Lori Atwater – Cal Poly student: General Engineering
  - Pete Schwartz – Cal Poly faculty: Physics
  - Dianne Long – Cal Poly faculty (retired): Political Science
  - Rod Hoadley – Cal Poly faculty: Industrial Engineering
  - Blayne Morgan – Cal Poly student: Environ. Engineering
  - Bridget Hill - Cal Poly graduate: Earth Science
  - Kaitlin Chandler - Cal Poly graduate: Social Science
  - Grace Wetmore - Cal Poly student: Animal Science

**Resource Base**

- Other Cal Poly faculty
- Other Cal Poly student team members
- Cal Poly facilities
- Ingenuity of brilliant minds
- Partners in Malawi: COMDEP, Ministry of Irrigation, Trent Bunderson and Total Land Care (TLC), Kafita Church members, other community members, Janet Norem (friend living in Malawi)
- Malawi Team supporters such as those who made donations, those who helped our team travel, etc.
- The Malawian people and their communities

**Money**

- Donations from family and friends
- Cal Poly departments' donations
- Fundraising
- Grant money

It is important to define the whole under management. Decision makers will be better able to manage the whole they are managing once they've defined it and have it visualized on paper. Most importantly, it sets limits to decision making and gives managers a better idea of their jurisdiction. When decision makers know the areas they influence, it's more possible for managers to focus on those areas and not to waste time or energy on things they don't have control over. For example, a manager can control when and where a meeting will be, but they cannot control the cost of gas required to get there. An established whole under management gives decision makers a written version of influential people, resources, and money available to work with and to help move the whole towards its shared vision.

## 2. Malawi Team holistic-goal

### a. Statement of Purpose

The Malawi Team was formed with specific purposes in mind. Through their growth as a team over the past year and from the bonds formed between the Malawi Team and people in Malawi during their service-learning trip in September 2008, the Cal Poly Malawi Appropriate Technologies Team has become morally obligated to uphold their purposes and their relationships.

The statement of purpose is not a mission statement, but needs to simply state what the Malawi Team came together to accomplish. Why was the Malawi Team created?

Under holistic decision making, the following is an example of what the Malawi Team's statement of purpose would include:

“The Cal Poly Malawi Appropriate Technologies Team exists to use the creativity, ingenuity, and innovation of students and faculty at Cal Poly University to alleviate poverty and starvation in Malawi.”

The statement of purpose is important for an entity like the Cal Poly Malawi Team because it clarifies why they were formed. Including this in the holistic-goal will help ensure they don't lose sight of their purpose. The statement of purpose also distinguishes this group and its principles from other group efforts.

#### b. Quality of Life Statement

For the Malawi Team to create an appropriate quality of life statement, the decision makers need consensus on what they value and desire in the whole under management. The question to consider for creating the quality of life statement is “how does the group want to be, based on their most deeply held values?” The decision makers will express what they are striving for and what motivates them in this section. Quality of life is driven by what the decision makers want to feel and think, the feelings and thoughts that create the ideal life. This includes short term and long term desires and why they are important.

According to Allan Savory in *Holistic Management – a New Framework for Decision Making* (1999), areas the Malawi Team should consider when making their quality of life statement are:

- Economic Well-Being
- Relationships
- Challenge and Growth
- Purpose and Contribution

As a member of the Cal Poly Malawi Team, I would include more areas such as:

- Education
- Community
- Financial Stability

- Health and Safety
- Social/Cultural Harmony
- Ecosystem Processes Functioning

Under holistic decision making, an example of what the Malawi Team's quality of life would include is as follows:

#### **Quality of Life**

- We value the ideas of our team members, and put the best ideas into action.
- Strong, positive, and supportive relationships among team members and contacts in Malawi.
- Our team is compassionate, productive, diverse and forward thinking.
- Our team is relaxed and fun.
- Safety and good health for all team members as we travel abroad.
- Our team members have healthy minds, bodies, and lifestyles.
- Our group is financially secure and owes no debts.

Writing down what the team desires and values will make them more likely to achieve those desires and values.

#### c. Forms of Production

For this section of the holistic-goal, it is important for the Malawi Team to consider what they will have to do or create in order to achieve the quality of life they desire. Decision makers forming this holistic-goal will discuss what needs to be produced for quality of life to be attainable, but they will not include "how to's" in the forms of production section. "How to's" can create limitations in management and reaching goals.

The following list is an example of what the CP Malawi Team's forms of production section would look like:

**Forms of Production**

- Time for planning, research, and testing of our work.
  - Honesty, trust, and communication.
  - Collaboration, open-mindedness, and motivation
  - Awareness of the environment and what the ecosystems require in order to function optimally.
  - Extensive research, experience, and understanding of the land, people, and cultures in Malawi.
  - Motivation and hard work.
  - Time for relaxation and recreation.
  - Opportunities to travel and share our research with Malawians, and to work with them in their communities.
- 
- Monetary and emotional support from California Polytechnic University, the local San Luis Obispo community, friends and family.
  - Funds for travel expenses through team fundraising.

It is important to describe the basic ways to create the quality of life desired to have a good idea of how to achieve and maintain that quality of life. Forms of production should encompass all that is stated in the quality of life section.

d. Future Resource Base

The Cal Poly Malawi Team must consider what the long-term needs are for the success of their project to last for years. The decision makers will ask themselves, “What do the conditions have to be well into the future to sustain our quality of life?” The main parts of the future resource base are 1) how the decision makers are perceived 2) the conditions of the environment and community. This includes how the resource base must be many years ahead to sustain the quality of life described by the decision makers.

The future resource base for the Cal Poly Malawi Team could be described as the following:

### **Future Resource Base**

- People: The CP Malawi Team will be viewed as honest, dependable, influential, and environmentally and culturally aware. We are known for providing appropriate solutions to people experiencing hunger and poverty.
- Land and community in Malawi: The land in Malawi will be productive and healthy, with functioning ecosystem processes and high biodiversity. Soil will be conserved and highly fertile to sustain crops and grazing fields for large animals. There will also be plenty of healthy woodlands and grasslands to provide sustainable habitats for wildlife, which will also stop conflicts between humans and wildlife. The air will be clear and clean. Water in streams and lakes will be clean and rainwater will be efficiently used and saved for times of drought. There will also be services in nearby villages to aid rural communities if supplies or counseling is needed. Villages will also have schools, security, and health care available to the community members.
- Land and community in San Luis Obispo, CA: The land in San Luis Obispo will include all that was stated above for Malawi. The city will not be over developed with excessive stores and buildings. There is plenty of open space and trees throughout the city. The community in San Luis Obispo which surrounds the CP Malawi Team is supportive of their actions and contributes their ideas for sustainable development. The CP Malawi Team and their financial donors have a great relationship and feel closely connected in their efforts to improve quality of life.

Note: Most future resource base sections include only one “land and community”. However, since the CP Malawi Team can be considered a part of the Malawian community and the San Luis Obispo community, both were included in this case. The CP Malawi Team’s main land and community is San Luis Obispo because that is where they are based.

Writing down a future resource base is a crucial step in forming the holistic-goal because usually actions need to be taken now in order to achieve what’s desired in the future. For the CP Malawi team, they should behave now in a way that will cause people to perceive them the way they want people to in the future. They have to make the right decisions now to manage the land so it is how they desire it to be in the future. They also need to make decisions that will help create the community or services that they want available in the future.

The statement of purpose, quality of life statement, forms of production, and future resource base described in the holistic-goal are



constant reminders of what the Cal Poly Malawi Team strives for in everything they do. The holistic-goal is an essential reference for their desires for the future of Malawi. The holistic-goal for the Malawi Team will have a statement of purpose because it is an organization of people formed for a purpose and with obligations, not just an individual person. The statement of purpose will help the Malawi Team stay focused on their specific purpose and remind them to stay on track. Having a holistic-goal will help the Malawi Team function together more productively and positively as a group of people because after going through the process of making the holistic-goal, the end product is a common goal shared by everyone. It is also essential to plan the goal before manipulating the land in order to make sure the actions being taken are only to enhance the environment and bring the Malawi Team towards their holistic-goal.

When the holistic-goal is completed, it is a good idea to put it all together so that it visually encompasses all parts. Make sure all the decision makers have a copy and keep it somewhere where it will be seen often so the holistic-goal can be a constant guide whenever decisions are made. Remember, the holistic-goal is a guiding light to focus your direction.

The entire holistic-goal for the CP Malawi Team:

### **Holistic-Goal for the Cal Poly Malawi Appropriate Technologies Team**

“The Cal Poly Malawi Appropriate Technologies Team exists to use the creativity, ingenuity, and innovation of students and faculty at Cal Poly University to alleviate poverty and starvation in Malawi.”

### **Quality of Life**

- We value the ideas of our team members, and try to put the best ideas into action.
- Strong, positive, and supportive relationships among team members and contacts in Malawi.
- Our team is compassionate, productive, diverse and forward thinking.
- Our team is relaxed and fun.
- Safety and good health for all team members as we travel abroad.
- Our team members have healthy minds, bodies, and lifestyles.
- Our group is financially secure and owes no debts.

### **Forms of Production**

- Time for planning, research, and testing of our work.
- Honesty, trust, and communication.
- Collaboration, open-mindedness, and motivation
- Awareness of the environment and what the ecosystems require in order to function optimally.
- Extensive research, experience, and understanding of the land, people, and cultures in Malawi.
- Motivation and hard work.
- Time for relaxation and recreation.
- Opportunities to travel and share our research with Malawians, and to work with them in their communities.
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Instead of a list format, using creativity to display the holistic-goal may help to visualize its roll in bringing the decision makers towards the quality of life they desire and the importance of using it for every decision. Different cultures usually have different ways of conveying or visualizing concepts so having an open mind and employing creativity into the layout of the holistic-goal or whole under management can really make a difference in how well people understand the idea and remember the concepts. Many times people respond much better to pictorial or diagram representations. Pictorial representations provide the best visual of how concepts in holistic management are connected and are easy to understand.

### **Help the Local Malawians Create Their Own Holistic-Goal**

To create an effective, lasting shift towards sustainable land in Malawi, the people in the country need to continually implement holistic approaches. Malawian people could be encouraged to form their own holistic-goal with the help of development workers who understand the process and concepts. The holistic-goal would also be helpful to village people for its use as a monitoring tool when the Cal Poly Malawi Team is back in the United States or other development workers are elsewhere. Enhancing the local people's knowledge about managing the health of their land and the importance of maintaining functionality in the ecosystem processes is a critical step at this point. The people in the community must grasp the concept that their human bodies are systems which are sustained by a greater system, which is the Earth, and more directly, the land and environments surrounding their community.

Through this understanding and through writing a holistic-goal, a greater and more positive change is more likely to occur.

It would be good to give an example of what the holistic-goal might look like for a Malawian village. However, it is not appropriate to write a holistic-goal for a person, group, or organization unless you are a part of the decision makers. Remember that Holistic Management is about wholes within wholes. Christine Jost, a Certified Educator in Holistic Management and working for the International Livestock Research Institute in Kenya said, “Wholes have within and around them greater and lesser wholes. It is also possible that there are separate wholes that overlap at times.” The Cal Poly Malawi Appropriate Technologies Team is a development group that overlaps with groups of people in Malawi because of the work they want to do. The wholes of the CP Malawi team and Malawian villages overlap at times. As an exercise, the CP Malawi team can imagine being part of a Malawian village and decide that their quality of life might include financial security, enough basic resources to sustain each village member, healthy members of the community, good health care, education for children and productive village members. This could be different for every village. It is important not to write a holistic-goal for someone else because it could contain biases or block the creative thoughts of the actual decision makers. Nonetheless, it would be helpful to those who are writing one for the first time to have guidance from a person with experience in Holistic Management and creating a holistic-goal.

### **How to solve the problem: Address the root cause of the problem**

One of the most important factors in Holistic Management is that identifying and addressing the true cause of a problem is the best way to make lasting, effective change to improve the land and move the whole under management towards a holistic-goal.

It is not always easy to know the root cause of a problem, and it may take a few different approaches before actions taken by the decision makers have the desired effect. With Holistic Management, it is important to always have the holistic-goal in mind when making decisions and when deciding what types of actions to take to get closer to that goal. In order to achieve a sustainable future for any whole, the root cause of a problem must be addressed in a way that makes sustainability possible.

### **Tools Available in Holistic Management**

In Alan Savory's book he describes 8 tools humans can use in management. They are human creativity, technology, fire, rest, grazing, animal impact, living organisms, and money & labor. Human creativity and money & labor are always used in conjunction with the other tools. Human creativity is the most important tool because the ingenuity and ideas of the decision makers have the potential to utilize other tools to their advantage, to create sustainable systems, and to reach their holistic-goal. Living organisms is a tool that must be used carefully because of its intimate relation with the community dynamics in the area. For example, the tool of living organisms can include introducing new insects to help reduce

pest insects, but managers must be careful that the new insects do not disrupt the community dynamics and monitoring is critical to make sure the new organisms are not negatively affecting the environment. It is important to use the appropriate tool to manage the ecosystem processes towards sustainability and biodiversity, and definitely away from bare ground.

Human creativity stems from brainstorming and just letting ideas flow before narrowing them down to a realistic list. In February 2009, the Cal Poly Malawi Team had a meeting which included brainstorming ideas and motivations for the near future. The following includes their notes about the actions they want to pursue:

Our focus will be appropriate technology/sustainable design. We have 3 projects plus the green building design for Lori Atwater's land.

1. Bike Powered Water Pump. Demonstrate redesign by IME and UNIV 492 students. Assess local factory production and distribution of the pump for small scale irrigation. (Chawuwa and Namwera-impacts 20 villages)
2. Permanent Weir for Gravity-Fed Irrigation. Follow-up on topographic survey by the Ministry of Irrigation & Water Development designed to replace a weir built by villagers, which causes environmental damage. Collect information for design of permanent dam. (Chawuwa-irrigation of 40 acres impacts 6 villages)
3. Drinking Water for 9 Villages. Work with government officials to identify the appropriate Malawian contractor for drilling and installation of 9 hand pumps. Each of the hand pumps costs about \$1000 to install.
4. Continue research on additional projects in consideration: rainwater harvesting, brick compress and medical devices. Build prototypes for testing.

Brainstorming is an important tool that utilizes the creativity of the decision makers. Whenever a problem needs solving or a change needs to be made, a brainstorming session involving the primary and sometimes secondary decision makers is an important event in Holistic Management. In the brainstorming session, decision makers should take down all mental barriers and let their imaginations go, get creative, and any and all ideas should be written down. After all ideas are written down, the decision makers look back through the list and decide on a few that seem the most appropriate or that have the most potential to help them get closer to their goals. Then those actions or ideas are taken through the 7 Decision Testing Guidelines to see which action is the most appropriate solution.



CP Malawi Team demonstrating the bike-powered water pump and collaborating with members of the community at Kafita CCAP Church in Malawi, Sept. 2008



CP Malawi Team surveying crop land at the Mpingu village, Malawi, Sept. 2008



### Testing Guidelines for Appropriate Decision Making

Projects that seem appropriate should be evaluated using the 7 Decision Testing Guidelines to make sure the project will lead towards the holistic-goal. Table 2 below is an example of the steps taken in Decision Testing between a few possible solutions. In the book *Holistic Management – A New Framework for Decision Making*, Allan Savory describes in detail the parameters and rules to consider during the decision testing process. The Decision Testing questions are in the left hand column.

**Notes for all alternatives to consider:**

Remember the Quality of Life described in the holistic-goal!!

Question to be tested (action proposed)	Alternative A	Alternative B	Alternative C
What action should be taken to address the starvation problem in Malawi?	Bike-powered water pump	Permanent Weir	Rainwater Harvesting
<b>1. Cause and Effect:</b> Are these decisions being made as a result of a problem? Does the action address the problem or a symptom?	The “problem” the team wants to address is starvation. However, starvation is a <u>symptom</u> of a deeper problem within the ecosystem processes. Before moving on to question 2, at least one of the alternatives needs to address the problem, especially the root cause of the problem. In this case, the root cause of the problem is within the water cycle most likely.		

So, in terms of Holistic Management, since none of the above alternatives passed the first testing question, this is where the decision makers would stop and brainstorm about what the true cause may be. One of the best ways to do this type of brainstorming is to “ask the 5 why’s” which means asking “why” after each response to the question. For example, if someone has a headache and they want to fix it, they may think the headache is the problem and take some medications to stop the headache. This is not a long term solution because pills for headache pains only relieve a symptom of the real problem. The person should ask themselves why do they have a headache and then continue to ask “why” after as many responses as they can. It may look something like this:

“Why do I have this headache?”

“I’m tired.”

“Why am I tired?”

“I’ve been looking at my computer screen for too long.”

“Why have I been doing that?”

“I put off my homework and have to do it all now.”

“Why did I do that?”

“Because I wanted to go to the beach yesterday, to the movies the day before, and my friend’s house the day before that....”

In this situation with the person with a headache, they find out after using “the 5 why’s” that their headache is a symptom that stems from procrastinating on their homework and not managing their time well for work and play. Using “the 5 why’s” helps them identify the true cause of their problem and allows them to use the appropriate solution.

For this case, the starvation problem in Malawi is being addressed. First, ask the question, “Why is there starvation in Malawi?” and the decision makers may answer “Lack of water,” or “Lack of money,” or something else. Next they will ask “why is there lack of money or water?” and as they continue to ask “why” after each response, after 5 times they will be much closer to addressing the root cause of the problem.

According to Alan Savory, decision makers who are involved in managing land and are trying to solve a problem they’re experiencing on the land should examine the four ecosystem processes first for an answer, especially community dynamics (276). He suggests researching what tools have been used on the land in the past because the state of the ecosystem processes is a result of how those tools were applied.

After deeper investigations into the causes of starvation, the ecosystem processes functioning are the areas that need to be addressed. With the environment of Malawi being on the more-brittle end of the brittleness scale, many circumstances point to the water cycle as being the first ecosystem process to address. However, the water cycle is probably suffering because community dynamics is not fully functional. The four ecosystem processes are all connected and intertwined with each other, and if there are problems in one process it can cause problems in the others. The complexity of the four ecosystem processes and how they intertwine can be hard to grasp, but with time, patience, experience, and practice it becomes easier. If the root cause of the problem is not addressed, the problem and its symptom will persist.

From personal experience with the Malawi Appropriate Technologies Team and the classes at Cal Poly, my brainstorming as to what could be the root cause of the problem looks something like this:

What is the ROOT CAUSE of this problem?

Starvation is actually a symptom of a larger, root cause. What could that be?

Possibilities of the root cause of decreased food production:

- Loss of quality top soil for productive agriculture due, possibly, but not limited, to:



1. Deforestation
2. Burning agriculture fields post harvest for many years (cultural)
3. Infertile soils due to burning too often and deforestation
4. Water cycle is not functioning well
5. Inappropriate farming practices
  - a. Continually only planting corn depletes soil of nutrients
    - implement companion planting or crop rotation or both
  - b. Annual burning of crop residues on agriculture fields also is depleting soil nutrients.
    - researchers have found that ancient Amazon cultures (added) charcoal from burned plant material into the topsoil of their land, and today those areas still have rich, dark, fertile soil. This practice could potentially help improve soils in Malawi.

For the purpose of this project, which is to demonstrate the appropriateness of holistic management techniques for the Cal Poly Malawi Team, the alternatives from the previous page will be used to explain how to take ideas through the decision testing guidelines. Therefore, the following example works if we decided lack of water was the problem and we are comparing the bike-powered water pump, a permanent weir, and rainwater harvesting to decide which will bring us closer to our holistic-goal. In reality, like the above example states, the decision makers should brainstorm for ideas that address the root cause of the issue.

Question to be tested (action proposed)	Alternative A	Alternative B	Alternative C
What action should be taken to address the starvation problem in Malawi?	Bike-powered water pump	Permanent Weir	Rainwater Harvesting
1. Cause and Effect: a. Are these decisions being made as a result of what is <i>perceived</i> to be a problem?	Yes, the problem is lack of water.	Yes, same as A	Yes, same as A
b. Will the actions/decisions I am choosing between address the problem or the symptom?	Problem*	Problem*	Problem*
	* Remember, lack of water is not the actual root cause of the problem, however it will be used here as an example to demonstrate using the decision testing guidelines.		

<p><b>2. Weak Link</b></p> <p><b>Social:</b> Will these actions create a weak link in the “chain of actions” leading towards the holistic-goal due to prevailing attitudes or beliefs? How will other people be affected? Will conflicts rise between people in the decision makers and the resource base of my holistic-goal?</p> <p><b>Biological:</b> Does this action address the weakest point in an organism’s life cycle?</p> <p><b>Financial:</b> Does this action address the weakest link in the chain of production? Chain of production includes Resource Conversion, Product Conversion, and Marketing.</p>	<p>If this action blocks progress towards the holistic-goal, then it fails this test, unless there is a plan for relieving the block.</p> <p>In Malawi in 2008, when most people saw the pump they were excited and wanted one of their own. They also got more ideas about different pump methods. It could just be a start to more brainstorming.</p> <p>PASS</p> <p>Not Applicable</p> <p>Yes, this action addresses the weakest link in the village peoples’ production chain because more water to their crops will increase their yield. Their work is part of the Resource Conversion link in production.</p>	<p>The people in the Chawuwa area (at least from our observations at the village meeting) want the weir fixed to hold more water for their crops.</p> <p>PASS</p> <p>Not Applicable</p> <p>Same</p>	<p>Since irrigation is not common, the suggestion of catching and saving rainwater will probably be accepted well. Malawians we met in 2008 were welcoming of ideas and seemed willing to try anything... but we must be careful: remember appropriateness!</p> <p>PASS</p> <p>Same</p>

The Biological Weak Link Test is only used when dealing with the life cycle of a living

If they can’t grow food products because of lack of water, then resource conversion is the weak link in the chain of production

Note:

**Resource Conversion** = the conversion of raw materials into product. Example: sunlight -> food, lumber, animals...

**Product Conversion** = the products from Resource Conversion are converted into a marketable form

**Marketing** = also money conversion

<p><b>3. Marginal Reaction:</b></p> <p>Which alternative provides the greatest return for the energy put in? This energy includes money and labor (time). Consider which options provide the biggest “bang for the buck”, meaning the best progress towards the future resource base. Think about the effects of each option over time and if it will continually require inputs to get water to people over many years.</p>	<p>Some money and continual labor to upkeep each bike pump 1</p>	<p>Expensive and labor intensive 3</p>	<p>Some money and labor. Needs more research about cost and availability of materials. 2</p>
<p><b>4. Gross Profit Analysis:</b></p> <p>Which enterprise contributes the most to providing income for a business?</p>	<p>These are not enterprises (income generating activities) they are things or actions aimed at helping a community.</p>		
<p><b>5. Energy/Money</b></p> <p><b>Source:</b> When non-human energy is needed (such as electricity), identify where it comes from and make sure it does not clash with Quality of Life and other statements in the holistic-goal. Is the energy and money proposed for the alternatives derived from the most appropriate source?</p>	<p>The bike pump can use any bike, and is made from scrap metals. The drill pump, the component that creates the suction to move water, is manufactured by a company and must be ordered or bought at a hardware store. Grant money and team member donations have paid for the bike pumps created at Cal Poly in 2008. The frame that attaches the pump to the bike is welded together using electricity. At Cal Poly this electricity is supplied by PG&amp;E, which uses electricity created mostly by natural gas and nuclear.</p>	<p>The permanent weir requires a lot of input in both energy and money. Monetary funding for building a new weir to replace the old, degrading one in Chawuwa would come from grants or donations. Those funds need to cover ground surveys and construction plans before the weir can be built. The CP Malawi Team does not know all the details of building a weir in Malawi, but we assume materials such as concrete, wood, and other tools will be used. These materials can be found in the country but</p>	<p>Energy for rainwater harvesting equipment would probably come from manufacturing plants that construct large water containers or materials which can hold and protect water for long amounts of time. The machines that make these products probably run on electricity from power plants with natural gas, nuclear, or coal energy. Money for these products would come from grants or donations to the CP team. The sources of energy and</p>

<p><b>Use:</b> Determine the pattern of use for the money and/or energy. Will using energy and/or money from this source require continual use or is it a one time use? Will using this energy or money for the proposed alternatives bring Decision Makers closer to their holistic-goal? Are there requirements attached to these sources that conflict with the values of the Decision Makers and the resource base?</p>	<p>Welding energy in Malawi most likely comes from a power plant, potentially coal powered.</p>	<p>would probably be transported to the site by vehicle.</p>	<p>money for this alternative are not in line with the all the values of the CP team.</p>
<p><b>6. Sustainability</b></p> <p>Will this action lead towards the future resource base? Remember to consider all parts of the future resource base described in the holistic-goal.</p>	<p>A water pump to bring more water to crops would be great, but check the four ecosystem processes. Water is not the only thing lacking in the ecosystem processes of many areas in Malawi. This water pump may help partially to get towards the future resource base described in the holistic-goal, but other tools should be used as well. Malawian people will be trained to maintain and use the water pump and they we be responsible for it. Is it appropriate and will farmers use it after the Malawi Team has returned to</p>	<p>Similar to the response for the bike pump, the permanent weir will help bring water to crops but this will partially help restore the ecosystem processes. Soil erosion is a big problem, so tools that help conserve and cover the soil will help along with increasing water in the soil. Replacing the old weir will be beneficial, but it will not change the way the land is handled. People will probably continue farming the way they have been.</p>	<p>Again, harvesting rainfall will partially lead towards the future resource base. It will only help improve the ecosystem processes if used in conjunction with other tools to improve the soil quality, soil cover, and community dynamics. After helping to create and install rain harvesting devices, the Malawian villagers will be responsible for upkeep and maintenance of water tanks. Water storage, if done correctly, will improve quality of life for villagers by</p>

	California?		improving health of people and providing irrigation to crops
	<p>Each of these options will help lead towards the future resource base, but only if used with other tools to restore the ecosystem processes. If only these options are used on the land, they could create bigger problems rather than improving the land. Also, the Malawi Team needs to be sure these technologies are appropriate for the village community and do not create conflicts between community members or between the village and the Malawi Team. Must preserve how the decision makers are perceived and the condition of the community.</p>		
<b>7. Society and Culture</b> How do the Decision Makers <i>feel</i> about this alternative/action? Is this going to fulfill the quality of life they described in their holistic-goal? Will this action adversely affect others around them?	The Decision Makers don't feel as good as hoped. The pump should be more efficient and pump more water. An improved bike pump is desired, but keeping the cost down is hard at this time. No, it won't fulfill the Quality of Life statements in the holistic-goal, but no, it does not adversely affect others.	Decision Makers don't feel too good about this alternative. Reliability is uncertain for getting the permanent weir constructed. Some grant money was given in 2008 to the Ministry of Irrigation, but results as to how that money was used are unclear. Decision Makers don't feel very great about this. No, this does not adversely affect other people.	Decision Makers feel pretty good about rainwater catchments and are confident in its potential. However, cost is so far a big barrier. It would help lead towards the holistic-goal and would not adversely affect others.

**Why these seven steps are important:**

The decision testing guidelines put into perspective the appropriateness of an action or decision and helps the decision makers select only for actions which address the root cause of the problem. At almost every step the decision makers are reminded to remember parts of their holistic-goal, which helps them select for the action which will bring them closer to that goal. Thus, the main reason for running each decision through the seven decision testing guidelines is to ensure the actions taken lead the whole under management towards their holistic-goal.

### **Take Strides Towards the Holistic-Goal with Actions Which Pass Through the 7 Decision Testing Guidelines**

The holistic-goal is something to always be striving for, to always make improvements towards that goal. The best way to move towards the holistic-goal is to take actions that address the root cause of problems that exist or to visualize ahead and take preventative steps to avoid problems. Given the situations in Malawi, the CP Malawi Team should concentrate on the most relevant underlying causes of the problems they want to alleviate. They should do this as fast as possible because symptoms, such as starvation or illness, will be alleviated most effectively this way.

The hardest part of addressing problems in Malawi might be cultural challenges, especially when a solution is needed immediately. In 2008, the CP Malawi Team observed how most Malawians expect generous donations from westerners. The team did not have any spare money to give away and it was hard to convey to the Malawians who expected us to hand them cash, that monetary donations were not the reason for the CP Malawi Team to travel to Malawi. The Cal Poly students and staff wanted to make use of their time, labor, experiences, pump-development, and some funds to specifically address and affect the lack of irrigation in Malawi. Encompassing cultural differences into the 7 Decision Testing Guidelines can be challenging, especially for development workers who have not been to the focus community. However, sensitivity to cultural differences is a major part of development work in a country foreign to your own. Paul Polak, author of *Out Of Poverty*, reminds us that “practical problem solving” begins with going to where the problems are, talking to the people who have the problem, and listening to what they say about it (2008, 13-15). By physically witnessing the situations and by conversing with the people who deal with the problem, development teams will gain a much greater understanding of the problem and how to deal with it. The local people probably have good ideas about how to solve the problem, and their ideas are important and should be taken to consideration.

Remember the future resource base. The development team wants the community to feel positively about the development team and the projects they undertook. Also, development workers such as the Cal Poly Malawi Team need to always remind themselves that their goal is to help alleviate the suffering in the focus communities. With the complexity of natural environments and the interwoven ecosystem

processes, it is quite a reality that no one tool or combination of tools is the best or worst at any given time. This is why I have written this small book. It is my attempt to give development workers the basic understanding of “wholes within wholes” which connect all people, plants, and animals on this Earth, and to think about problems in a holistic way. This understanding of natural systems will give us the ability to make better decisions and to live in and with other natural systems in a sustainable way.

### **Holistic Financial Planning**

In order for the CP Malawi Team, other development groups, or any group working towards a common goal to have overall success with their projects they need to manage the funds that support those projects in an effective manner. With a holistic approach, financial decisions are equally important to ecological, community, or any other decisions.

Holistic financial planning involves gathering the decision makers together once a year to brainstorm about ways to reduce maintenance expenses. Every few years the organization should brainstorm for new ways to generate income through new enterprises. The goal financially is for the development group like the CP Malawi Team to aim for profits which could be used to invest in their work, new enterprises, and so on. The Allan Savory Center for Holistic Management has many publications and documents, including worksheets and spreadsheets, designed specifically for the Financial Planning process. Also, in Allan Savory’s book *Holistic Management – A New Framework for Decision Making*, he describes the “sessions” of financial planning, how to create the financial plan, and monitoring the plan. Financial planning is done a few months before the start of a new fiscal year in order to be prepared. For the purposes of this document to introduce holistic management to development workers, the process and importance of financial planning will be simply outlined.

#### **A. Initial Planning Discussions**

The gatherings before creating the new annual financial plan make sure all factors involving the plan are discussed and managed. This is also the time for brainstorming with new ideas and when decisions are tested. In these first meetings, numbers for income and expenses are kept in separate documents to avoid problems that occur when using one document for all figures.

- a. Review the progress over the past year.
  - Is there anything stopping progress?
  - Is your organization’s progress unfavorably affected by any other reason?
  - Examine the gross profits of current projects. Gross profit is income minus direct costs. Are they as expected?
- b. Optional or periodical brainstorming session for new sources of income every 4-5 years.
  - Take new ideas for enterprises through the Decision Testing Guidelines
- c. Calculate gross profits for each enterprise (source of income) and discuss which will be continued, if new enterprises should be added or replace unproductive ones.

- d. Find the “weakest link” in each enterprise’s chain of production and discuss how to deal with it. Addressing the weak link is the best way to increase profit.
- e. Create a rough outline of expenses. It is a good idea to allocate expenses into three groups, according to Allan Savory. These groups are 1) “wealth-generating” which addresses a weak link or other problems slowing or stopping progress, 2) “inescapable” meaning these expenses must be paid because of moral or legal obligation, and 3) “maintenance” which includes overhead and direct expenses for each enterprise. This action allows for clarification of expenses that may not have been clear in the earlier discussions.
- f. Discuss how to diminish expenses, especially by focusing on maintenance expenses. This creates more opportunities for profit.

#### B. Craft Your Financial Plan

In this session, the different sheets for income and expenses will be combined and totaled in a spreadsheet. The goal is to maximize income, plan profit, and control expenses to maintain current operations and for creating new income.

- a. Plan for income so you have an approximation of what money you have to run your operation.
- b. Plan for profit in order to know the maximum expenses your organization can withstand. The Allan Savory Center for Holistic Management states, “the amount left over after you’ve subtracted profit from planned income, is what you have to allocate to expenses.” In order to re-invest in actions moving you towards your holistic-goal, profit is essential.
- c. Plan for expenses. You can use ideas from brainstorming sessions to reduce expenses. You can also eliminate wealth-generating expenses that have little return. This is also an important time to plan for debt payments if you have a debt to be repaid.
- d. Evaluate your plan by checking for mistakes and making sure your plan is profitable.

#### C. Monitor Your Financial Plan

- a. Evaluate your funds each month. This way you can see, month by month, if what you planned for is actually happening.
- b. Make adjustments and organize your plan to keep it on track. Reality hardly ever agrees with what we plan for. Be sure to keep adjustments within budget categories, not across different categories.
- c. If major changes occur, a new plan can be formed.

Development groups like the Cal Poly Malawi Team are probably more similar to non-profit organizations than businesses, but money is still a major factor in the feasibility of projects. It is incredibly important for the organization to keep track of where money comes from and where it goes. People can easily get frustrated when it comes to finances, so keeping it organized can help ease tension among group members and keep good relationships. Remember, for development groups to be effective, they must spend time in the focus community and this always means travel expenses are involved. Whether expenses for travel will be covered by a grant or



from individual donations, it is critical to prepare for all expected and unexpected costs. Traveling to another country can have some unanticipated surprises so it is good to be prepared and to have money available.

### **Monitoring the Outcome**

Monitoring helps ensure that the desired result is achieved. When a plan or a decision is made, it is important to determine what must be monitored to make sure the plan is progressing as expected or the correct decision was chosen. Deviations from the plan can be found and corrected more easily when high-quality monitoring is utilized in management. In his book, Allan Savory says a plan becomes “plan-monitor-control-replan”, which is the “feedback loop”, and that monitoring is a “continuous effort” done to make what we want a reality. Monitoring should be done for any type of management, but especially for biological management, financial checks, and new technologies.

Often the hardest part is identifying the right indicators to monitor. Obviously if a problem persists after a plan has been implemented to address the problem, the plan does not address the root cause of that problem, and controlling and re-planning should be done. When using tools such as fire, rest, grazing, etc., it’s important to decide what aspects to monitor that will give early feedback of any unfavorable changes. Monitoring indicators are easier to perceive when you know exactly what you want to achieve. Many times you will have to consider how to gather the feedback from indicators in an appropriate way, such as questionnaires when your plan involves people or biological samples for testing when your plan intimately involves the environment.

This section will simply outline some of the important things to remember for monitoring, but there are many resources for planning and monitoring through the Allan Savory Center for Holistic Management. Monitoring and making use of the “feedback loop” is the best form of positive and proactive management. Through monitoring, deviations from the plan are found early and can then be controlled or re-planning can be done. Financial monitoring should be done every month to compare actual funds to what was planned. When a plan or decision involves the environment it’s important to “*always assume you could be wrong*” (Savory, 339) because the complexity of nature is very hard to comprehend. Always evaluate the four ecosystem processes and keep a watch on the soil surface as it is one of the best and earliest indicators of change. Important indicators to watch at the soil surface are plant spacing, soil density, soil litter cover, activity of insects, water runoff, and many more. When dealing with a new technology in an environment, take great detail to ensure it does not adversely affect critical life forms as they inevitably lead back to the four ecosystem processes. Remember that you are monitoring in order to guide progress towards your holistic-goal.

## **Sustainability is a Reality in Malawi**

Balance and harmony among the four Ecosystem Processes are key to longevity, stability, and productivity in the land. The land is healthy when the Water Cycle, Mineral Cycle, Energy Flow, and Community Dynamics are woven together by supporting and relying on each other. To truly manage our lands so they can produce crops which sustain our lives over time, we must understand the balance between the Ecosystem Processes and work to maintain the harmony between them in order to have long term sustainability for all organisms. We need to recognize weak areas, or weak links, suppressing the functioning of the Ecosystem Processes to prevent detrimental effects to our environment that we rely on for everything.

When it comes to the Cal Poly Appropriate Technologies team and the people and communities they are working with in Malawi, Africa, there are some cultural barriers that must be overcome. The same case exists for nations all around the world. All people understand that land provides life sustaining food. Therefore it will be easy to show people the relationship between the health of their bodies and the health of the land. All of humanity relies on the energy from the sun that is captured by plants and converted into forms we can utilize, but many people may not understand what the land requires to produce vegetation in the long run. Once every person deeply understands the four ecosystem processes and how and why they are intricately connected, we must be able to make the right decisions and use the right tools for maintaining stable, functioning environments that promote the health and longevity of all organisms. The ecosystem processes are working together in every organism. From humans to sea urchins, the four ecosystem processes provide the flow of energy and nutrients required for survival. Without proper functioning of these dynamic systems, long-term survival is unlikely. Those of us who understand the flow and connectivity between the ecosystem processes need to teach others to create and maintain sustainability in their own lands. We will teach each other to address the root cause of a problem, rather than symptoms that only prolong detrimental effects to the environment. The Cal Poly Appropriate Technologies Team has previously focused on developing technologies (manmade products) to address symptoms of the root problem. From now on we will strive to find the weak links in the ecosystem processes functioning and address those areas first to more appropriately address the starvation issues in Malawi. Starvation has been a consequence of a poorly functioning environment, probably due to a weak link that interconnects each of the ecosystem processes.

The people the Cal Poly Appropriate Technologies Team met in Malawi in September 2008 were very accepting and appreciative of our presence. They also understand how much they rely on natural resources for their everyday lives. I think it will be easy to teach them to manage the land in slightly different ways that ensure long term productivity and health of the environment. Rural Malawians who live closely with the land can easily see the connection between the health of their bodies and their communities to the health of the land. It's crucial for them to remember that they cannot have one without the other. Once they understand the ecosystem processes functioning, they will strive to enhance the functioning of their environment and its ecosystems. They will also be

continually learning from their land from monitoring the ecosystem processes, and then they will be able to make appropriate decisions and use the right tools to enhance the stability and productivity of the land.



Author's Note:

There are many factors to consider and delicately approach when tackling a problem like poverty in a foreign country. Through the Malawi Project, from my experience in the summer of 2008, and from all I've learned about appropriate technologies, sustainability, and the impacts of humans on the Earth, I realize that in order to protect the environment and wildlife, humans have to change and think about the future and the consequences of our actions.

**Thank you**

I don't know how to show all my appreciation to all the people who have helped me grow in the area of environmental awareness and holistic thinking. I feel like I have been blessed and I have learned so much in a short period of time. Special thanks to Professor Rob Rutherford, my teacher, mentor, and advisor for this project. Without his guidance I could not have done this work. Special thanks also to Christine Jost, an educator in holistic management who currently works in Kenya, Africa. She generously helped me formulate this booklet and coached me in many specific areas of holistic management, even though we were almost 10,000 miles apart. To all the amazing people associated with the Cal Poly Malawi Team, you have truly changed my life for the good and I will never forget the adventures we had. To all my friends and family who have been so supportive and uplifting, I don't know what I would do without you and you mean the world to me.

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