# Permaculture Adoption Among Malawian Farmers: A Positive Deviance Inquiry

Hope Thornton
PIM 65

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Advisor: Dr. James Levinson

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## ABBREVIATIONS

| | |
|---|---|
| CBO | Community Based Organization |
| CGIAR | Consultative Group on International Agricultural Research |
| INGO | International Non Government Organization |
| FAO | Food and Agriculture Organization of the United Nations |
| FAST | Food Access Survey Tool |
| FNS | Food and Nutrition Security |
| FNSS | Food and Nutrition Security Score |
| MoAFS | Ministry of Agriculture and Food Security |
| MoEST | Ministry of Education, Science & Technology |
| MoH | Ministry of Health |
| NEF | Never Ending Food |
| NGO | Non Governmental Organization |
| PDA | Positive Deviance Approach |
| PDI | Positive Deviance Inquiry |
| PNM | Permaculture Network in Malawi |
| UNDP | United Nations Development Program |
| USAID | United States Agency for International Development |

# ABSTRACT

Malawi is a country rich in underutilized natural resources, which could be used to reduce household food and nutrition insecurity in the country. The burgeoning Permaculture community in Malawi, including officials in the Ministry of Education, Science and Technology, is seeking, through Permaculture, to make better use of resources and assets that already Malawi already possesses. Despite the growing numbers of Permaculture practitioners, however, little is known about the influences that affect farmers' decisions to adopt or not to adopt. This positive deviance inquiry seeks to inform the Permaculture community of the constraints and barriers to Permaculture practice, the coping strategies adopters employ and the benefits adopters receive. The data analysis indicates that Permaculture adoption is associated with age and land ownership but not with income or years of education. Quantitative and qualitative data shows that food and nutrition security scores are associated with Permaculture adoption scores, weakly with acres owned and not with income. Such findings are contrary to contemporary thought on yield-improving techniques and increased household food security, and suggest that farmers who adopt Permaculture, despite limited income, land holdings, or education have both increased their yields and improved their food and nutrition security.

## ACKNOWLEDGMENTS

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Additionally, I want to thank all of the participants, many of whom have given me permission to list their names. I would like for all those who read this to know who has contributed to the continuing discussion of sustainable agriculture in Malawi. In no particular order, they are: Jefferson Kahinja, Virginia White, Patuma Green, Joseph Zamawa, Jeoffrey Bauleni, Crak Phiri, Ethel Khatumba, “Pastor Chawawa”, Michael Pipe, Yanjanani Sapemba, Seba Banda, Clifford Madise, Mary Kalumbi, Margaret Thengu, Steven & Grace Chikoti, Victor Yonasoni, Wyson Mponda, Simon Saka, Isaac Chirwa, Nelson Esau, James Chirwa, Esnart Billy, Angela Isaac, Nesiter Kaniya, Patricia Muleka, Zione Mauel, and one the participant who asked to remain anonymous.

# INTRODUCTION

## I. BACKGROUND

Malawi has experienced relative political stability, has not, in recent decades, experienced major war or tribal clashes, and it is rich with under-utilized natural resources. With such attributes, including over 600 documented edible localized and indigenous foods (Nordin, 2005; Williamson, 2005; Hirt & M'Pia, 2001, FAO 1988), the world's ninth largest lake, several substantial rivers, and a twelve-month growing season, the problem of food and nutrition insecurity might not be expected to affect Malawians. But in reality, food insecurity and malnutrition are major constraints to national development (Banda, 2005). Every year Malawi ranks amongst the world's poorest countries according to the UNDP Human Development Index. Jeffrey Sachs opens *The End of Poverty (2005)* with a description of Malawi using a label that he and Carol Bellamy, then of UNICEF, coined: "The Perfect Storm". He writes that this storm "brings together climactic disaster, impoverishment, the AIDS pandemic, and the long-standing burdens of malaria, schistosomiasis, and other diseases" (2005, p. 10). Sachs sharply criticizes the international donor community for failing to provide the requested funds and support that could have prevented the worst of the storm and reduced much of resulting suffering. "In the face of this horrific maelstrom, the world community has so far displayed a fair bit of hand-wringing and even some high minded rhetoric, but precious little action" (Sachs, 2005, p. 10). Sachs has lobbied Britain and the World Bank on behalf of fertilizer subsidies in Malawi and has encouraged others who come from countries who have already "climbed the ladder of development" take on the burden of helping the poorest of the poor to escape from the cycle of extreme poverty through provision of agricultural inputs and government subsidies. But Malawi

is not a resource-deprived country and Sachs and the school of high-external-input development may have missed the mark.

Contemporary agricultural practices combined with increasing land pressure have left Malawi's soil eroded and unhealthy, its forests degraded, and the land prone to drought and flooding, contributing further to food and nutrition insecurity. It is in this context that Permaculture, the subject matter of this paper, offers such potential as means to help address these problems and properly utilize existing agricultural resources. Local, national, and international organizations, including various Ministries of the Malawian government recognize the immediate and long-term economic, social, and environmental effects of malnutrition and hunger (Banda, 2005) and are involved in a range of inter-sectoral initiatives to arrest food and nutrition insecurity. The bleak outlook offered by Sachs and other international organizations is not a result of lack of resources but rather a failure to recognize and utilize the valuable resources and assets that Malawi already possesses.

Development initiatives, especially those related to food and nutrition, typically rely on a "needs based" approach which employ scientific methods and dialogue to identify what a community lacks (or needs) to improve living conditions. Such initiatives often fail because what is "needed" is impossible for the local population to obtain- or maintain, after an intervention or initiative has ended (Lapping, Marsh, Rosenbaum, Swedenburg, Sternin, Sternin, & Schroeder, 2002). By contrast, Positive Deviance is an "assets-based" approach to inquiry that focuses on identifying what resources communities are already using to improve livelihoods and overcome barriers. Therefore, Positive Deviance solutions have the potential to be more sustainable than solutions that are externally driven and supported by external resources such as aid and policy conditionality (Ochieng, 2006).

This Positive Deviance Inquiry addresses a central issue now facing Malawian agriculture, i.e. the adoption by farmers of sustainable agriculture practices. It does so by examining the agricultural practices of 27 Malawian farmers who have been exposed to Permaculture Nutrition and Design. Using quantitative and qualitative methods, this inquiry identifies Permaculture adapters (positive deviants) and examines the factors and farmer characteristics associated with such adoption. The purpose of the inquiry is, specifically, to inform and better target Permaculture training in Malawi, and more broadly, to provide insights relating to the transfer/adoption of alternative agricultural practices in developing countries. The study also examines household food security in Malawi and the extent to which it is affected by the adoption of Permaculture practices.

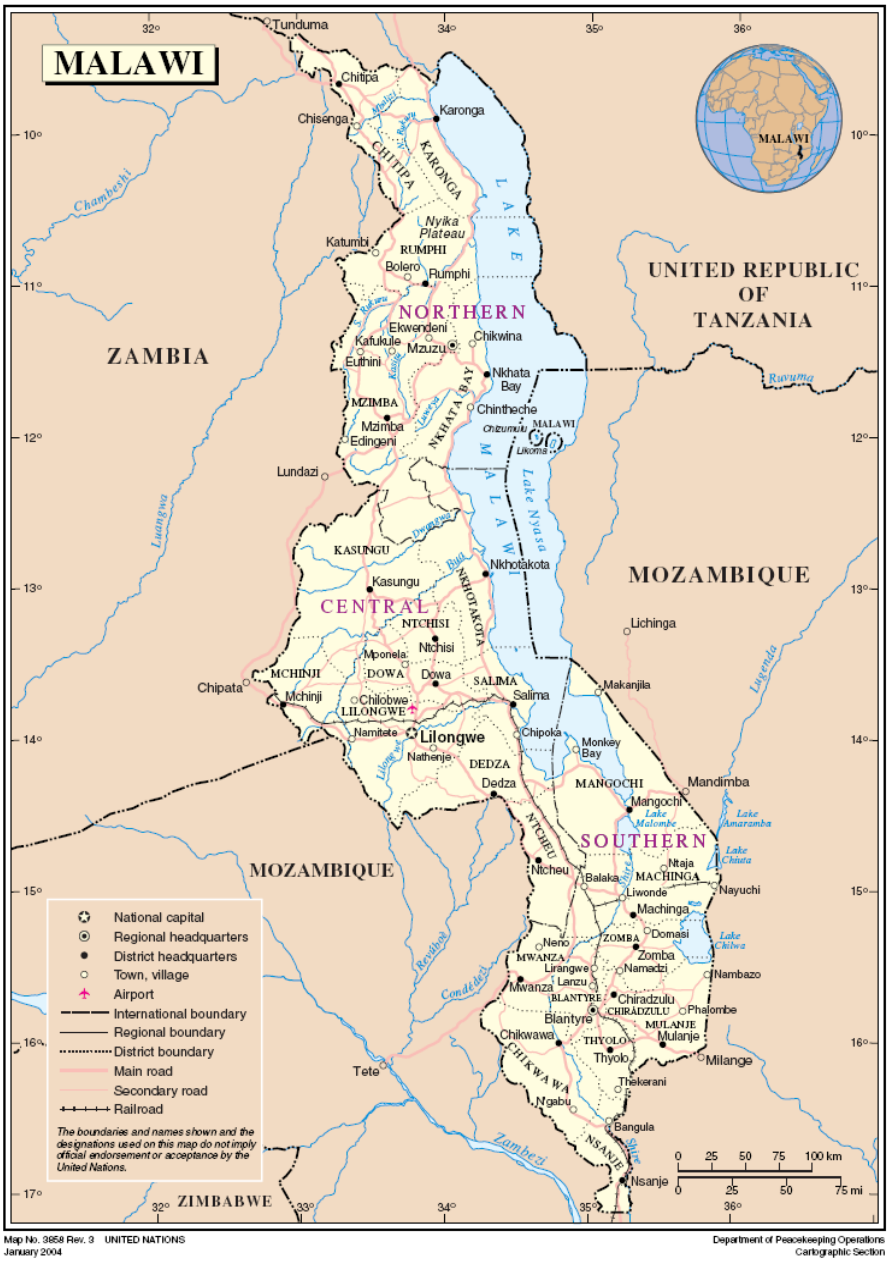


Figure 1: Map of Malawi (United Nations, 2004)

## A. SNAPSHOT MALAWI

Lying south of the equator, Malawi is a landlocked country sharing borders with Tanzania, Mozambique and Zambia. It is 900 kilometers long and ranges in width from 80 to 161 kilometers (UNDP, 2007) . Lake Malawi is the world's ninth largest lake making up nearly one fifth of the nations land area and, along with altitude, the lake heavily influences Malawi's warm tropical climate.

The country is divided into 27 districts within the Northern, Central and Southern Regions. The districts are subdivided into Traditional Authorities (TA's), which are governed by chiefs. Traditional Authorities are comprised of villages, the smallest administrative unit, and are governed by village headmen. Before gaining independence in 1964, Malawi was under British Colonial rule from 1891. In 1994, Malawi became a multi-party democracy adopting a poverty reduction strategy including a neo-liberal market economy as well as mandating free and compulsory primary school education.

Agriculture is the most critical sector of the Malawian economy as it consists of nearly 40 percent of the GDP, employs 85 percent of work force and provides an estimated 64% of the total income of rural Malawians (UNDP, 2007). In 2005, over 90 percent of Malawi's foreign exchange earnings were a result of tobacco, tea, and sugar production. (FAO, 2005; MoA, 2005) In addition to being the foundation of the economy, between 85-90% are subsistence farmers and rely on agriculture for their daily food intake (MoA, 2005). Between 70% and 80% of arable land in Malawi is under maize production (Sauer, Tchale & Wobst, 2006; Peters 1999), with maize constituting 90% of cereal production and, in turn, making Malawians, the highest per capita consumers of maize in the world at148 kgs. per capita per annum (Sauer, Tchale & Wobst, 2006).

**B. CONTEMPORARY AGRICULTURE VERSUS PERMACULTURE: MALAWIAN CONTEXT**

Donald Plunkett, former scientific advisor to CGIAR calls the technological advances in agriculture "the greatest agricultural transformation in the history of human kind. "The change" Plunkett writes, "was brought about by the rise of science-based agriculture which permitted high and more stable food production, ensuring food stability and security for a constantly growing world population" (Plunkett in Pretty, 2005, p.3). In Malawi agriculture is dominated by small landholders and is seen as the most important sector for achieving economic growth (Chirwa, 2005; MoA, 2005). Worldwide, contemporary agricultural practices have been influenced by the modernist approach, which relies on hybridized and/or genetically modified seed combined with chemical fertilizer to increase staple crop production per acre. The Government of Malawi has invested in the promotion of such technologies through provision of input subsidies, support of integrated rural development, and funding of research and extension services (Simtowe, 2006; Chirwa, 2005; Cromwell, et al., 2001).

The international attention that Malawi has recently received for its agricultural successes is largely attributable to such federal subsidies of agricultural inputs. A New York Times front-page article (2007) entitled "Ending Famine, Simply by Ignoring the Experts" highlights Malawi's 2006/2007 agricultural seasons during which heavily subsidized fertilizer use is credited with record yields of over 3.4 billion metric tons (World Food Programme, 2007). In 2005, when federal subsidies were smaller, yields were around 1.2 billion metric tons. Despite the face-value success the subsidies and the modernist approach have yielded, it has not come without considerable costs. Experts and researchers around the globe have called to question conventional agriculture's ecological and financial sustainability (Pretty 1995, 2005; Shiva 1991; Sauer, Tchale, & Wobst, 2006; Chavez-Tafur, Hampson, Roem, Thijssen, & Ingevall, 2006):

- Water contamination as a result of pesticides, nitrates, and soil & livestock wastes threatens biodiversity, disrupts the ecosystems, and poisons drinking water supply.
- Contamination of food and fodder- poisoned by residues of pesticides and nitrates.
- Damage to farm and natural resources by pesticides threatens the health of farm workers and the surrounding population. High levels of toxic chemicals used in pesticides have been found to cause cancer, genetic damage, fetal damage, and severe allergic reactions.
- Contamination of the atmosphere by ammonia, nitrous oxide, methane and the products of burning contributing to ozone depletion, global warming, and atmospheric pollution.
- Overuse of natural resources, causing depletion of groundwater, and loss of wild foods and habitats, and of their capacity to absorb wastes, causing water logging and increased salinity. Additionally, resource overexploitation, such as deforestation contributes heavily to both flooding and drought.
- The tendency in agriculture to standardize and specialize by focusing on modern varieties, causes the displacement and loss of traditional varieties and breeds which have been hybridized in nature over millennia to withstand insects and disease of their indigenous growing regions.
- Inability of low-income farmers to afford agricultural inputs such as fertilizer and hybridized seed and tendency to be locked in a cycle of dependency once the modernist approach has been adopted.

Permaculture is an under-researched assets-based approach to sustainable living and food production that optimizes use of what resources already exist in any given environment while following a strict ecological ethic. The word Permaculture is a union of the words "permanent" and "agriculture" and it is a worldwide movement[1] striving to make communities sustainable through conscious design of resource and energy efficient landscapes. Permaculture can be practiced in both rural and urban settings and can focus on subsistence farming and/or commercial production. Permaculture practice around the world varies, but the design theories include perennials and trees, intercropped plants for optimum yields, incorporation of livestock, natural pest management systems, and use of organic matter to protect the soil and increase soil fertility. Such designs mimic the ecological processes, interactions and services of ecosystems and result in an agriculturally productive and environmentally benign food system (Jackson,

[1] Because Permaculture refers to a movement, the word itself shall be capitalized throughout this paper.

1984; Chavez-Tafur, et al., 2006). As part of this movement, there are some basic philosophies on which Permaculture and sustainable agriculture, more generally, have been built:

- Adapting agriculture to local environments and optimizing the use of local resources including plants, animals, soils, water, and human labor
- Reducing the dependency and use of external and non-renewable inputs to reduce damage to the environment and toxicity in humans; animals and the ecosystem as a whole
- Maximizing the use of renewable resources (e.g. solar)
- Recognizing, appreciating, and building upon indigenous knowledge and incorporating this knowledge with science and technology
- Empowering local communities to control, manage, and benefit from natural resources.
- Valuing the role that agriculture plays in affecting the environment and ecosystem, and committing to an agricultural system that positively and sustainably integrates all of the goods and services that nature provides.

(Adapted from Chavez-Tafur, et al. 2006, p. 5; Mollison, 1997)

Malawi is home to a burgeoning Permaculture community. The Permaculture Network in Malawi (PNM) is an active group with over 100 individual and organizational memberships and was founded in the early 1990's as forum for sharing ideas and best practices. Today, the PNM is deeply involved in various initiatives to reduce food and nutrition insecurity through sustainable agriculture at the local and national levels. From smallholder farmers to development agencies, Permaculture is gaining recognition as a means to increase agricultural production and diversification at the household level while reducing labor and dependency on external inputs. Citing inconsistency in donated inputs and sporadic support from development partners, Malawi's Ministry of Education, Science and Technology (MoEST) is currently piloting World Food Program's Low Input Food & Nutrition Security Model, which uses Permaculture as the agricultural approach, for the School Health and Nutrition Strategy (MoEST, 2007). The MoEST pilot is focused on crop and diet diversification through use of localized and indigenous varieties, use of compost and organic manure as means of reducing dependency on inconsistently subsidized chemical fertilizer and transferring sustainable agriculture and nutrition knowledge to

primary school children through theory and practice. Additionally, several other large development organizations, (I)NGO's, and CBO's have recognized the potential that Permaculture holds for low-input, low-cost food and nutrition security and have incorporated it into their food security strategies. Organizations either using Permaculture or which have received training in the theory and practice of Permaculture include : Ministry of Agriculture and Food Security, World Vision, Family Health International, German Technical Cooperation (GTZ), GOAL, Emmanuel International, Africare, CARE International, Malawi Red Cross, Concern Universal, Canadian Physicians for Aid and Relief, World Food Programme Malawi, US Embassy Public Affairs Alumni Exchange Programme, National Association of Small Holder Farmers in Malawi, Ripple Africa, Children in the Wilderness, and Kande Care School & Garden.

The mean amount of land per capita devoted to food production in Malawi is estimated to be 0.6 hectares (Alwang & Siegel, 1999). With one of the highest population densities in sub-Saharan Africa and a population that is increasing at 3% per annum, agricultural land is a scarce resource. Permaculture offers a method of optimizing yields, expanding production areas, increasing production *and* consumption diversity, and reducing dependency on often-unreliable external inputs. The PNM is working with MoEST and several other organizations to incorporate this promising approach into development initiatives as an alternative to the contemporary[2], capital intensive method of agriculture. Table 1, below, displays the differing agricultural practices of Permaculture and contemporary Malawian practices.

[2] Information regarding current agricultural practices, unless otherwise noted, was primarily obtained by the author through an 8-month practicum followed by 5 months of primary research. For a description of the authors experience see Appendix A.

| **Table 1: Comparative Practices** | **Common Malawian Practice** | **Permaculture Practice** |
|---|---|---|
| **Field Preparation** (rain fed crops) | ▪ Clear land using slash & burn method<br>▪ Form ridges annually<br>▪ Soil exposed to wind, sun, and heavy rains usually for several months at a time | ▪ Add compost and mulch soil, protecting it from wind, sun heavy rains. Soil not exposed to erosive elements.<br>▪ Zero burn and reduced or zero-tillage<br>▪ Permanent structures added where needed for water management |
| **Planting (**rain fed crops**)** | ▪ Monocropped staple food (maize, cassava)<br>▪ Apply fertilizer if available; otherwise rely only on leftover stalks or nothing at all.<br>▪ Rarely save seed thus relying on "ganyu" labor or starter packs to access seed (Cromwell, et al., 2001)[3]<br>▪ Plants the same crops on the same land year after year | ▪ Intercropping of several staple foods (maize, millet, sorghum) with nitrogen fixing food plants (pigeon peas, etc)<br>▪ Majority of seeds saved from previous harvests with some collected from friends & nature.<br>▪ Properly rotates crops when necessary |
| **Kitchen Gardens** (irrigated, year round food production) | ***If*** there is a kitchen garden present:<br>▪ Usually far from the home (furthest corner of the plot or on another plot)<br>▪ Bucket irrigation using fresh, collected water<br>▪ Usually contains annual "foreign" vegetables (onions, tomatoes, cabbage, rape) in monocropped beds.<br>▪ Pesticides & fertilizers are used when available<br>▪ Soil exposed to elements<br>▪ No fence or fence constructed from dead wood/material | ▪ Close to the home using the Zone System[4]<br>▪ Fed with grey and harvested water<br>▪ Intercropped plants including perennials using the Guild System[5]<br>▪ Incorporation of localized and indigenous plants with particular emphasis on the six food groups<br>▪ Integrated Pest Management system<br>▪ Compost fed<br>▪ Constantly mulched<br>▪ Living fence |
| **Growing Season** | ▪ Rain fed crops require no irrigation but require laborious weeding<br>▪ Minimal harvest throughout the season<br>▪ Kitchen garden requires intensive irrigation during dry season (often 2-3 times per day | ▪ ***Not a growing season***, but year-round, permanent agriculture:<br>▪ Crops require additional mulch<br>▪ Kitchen gardens (zones 1 & 2) require moderate irrigation |
| **Harvest** | ▪ Yields one or two kinds of staple food.<br>▪ Maize is harvested at one time while cassava can sit be left in the ground for long periods of time. | ▪ Yields many varieties of food (six food groups)<br>▪ Food is harvested at all times of the year due to careful planning during the planting stage |

[3] Portions of this chart have been adapted from Cromwell, Kamwemba, Mwanza, and Chirwa, 2001)
[4] The Zone System describes a theoretical and practical approach specific to Permaculture and is described in more detail in Appendix B
[5] The Guild System describes a theoretical and practical approach specific to Permaculture and is described in more detail in Appendix B

| Table 1: Comparative Practices | Common Malawian Practice | Permaculture Practice |
|---|---|---|
| **Water** | ▪ Water is used once and then dumped on unproductive ground.<br>▪ Rainwater is unmanaged causing crop loss, damage to homes and structure, and contributing to massive soil erosion. | ▪ Water is used as many times as possible (ex. After washing dishes, water is used for irrigated a garden bed.<br>▪ Non-toxic grey water is used for food production where appropriate<br>▪ Rainwater is harvested and stored for future use either in the soil or in a holding container |
| **Pest / Disease Management** | ▪ When possible apply chemical pesticides and herbicides for weed and pest control.<br>▪ If chemicals are unattainable, farmers may rely solely on laborious reactive measures (ex. removing caterpillars & snails by hand when the problem occurs)<br>▪ No fence or fence constructed from dead wood/material<br>▪ Fatalistic attitude: "It is God's will" | ▪ Preventative measures are taken to reduce vulnerability and susceptibility to pest and disease.<br>▪ Inclusion of strong smelling plants and mulch and use of strong smelling water<br>▪ Encourages beneficial species<br>▪ Live fencing<br>▪ Proactive, holistic attitude: "You don't have a snail problem, you have a duck deficiency" (Mollison, 1997) |
| **Trees / Agroforestry** | ▪ Importance of trees is known, but few trees are planted.<br>▪ Trees planted or desired to plant include Gmelina or Eucalyptus which were promoted by the colonial government. These trees disturb agricultural production.<br>▪ Few farmers plant fruit trees<br>▪ Firewood is collected from far away and significantly contributes to deforestation. | ▪ Many different types of trees are planted for food production, to increase soil fertility, and to conserve topsoil.<br>▪ Farmers plant trees specifically for firewood and building materials.<br>▪ Trees are used as "supporters" in the guild system thus introducing horizontal plane of agricultural production. |
| **Animal Husbandry / Livestock Farming** | ***If animals are kept***,<br>▪ Roam freely to scavenge for food, often destroying crops and raiding kitchen gardens<br>▪ Manure is not used on to enrich soil because it is too difficult to collect. | ▪ Kept in a "khola" (pen) for easy feeding and collecting of manure.<br>▪ Incorporated into the food production system- food is grown for animals that, in turn, provide food for humans. |
| **Diet** | ▪ 75% of daily caloric intake is from staple crop (maize) resulting in high rates of under-nutrition<br>▪ Monoculture cropping has led to high risk of food insecurity because of a dependency on external inputs, soil degradation, and high risk of crop failure. (Nordin, 2005) | ▪ Proper amounts of six food groups (or five with a protein source) are consumed on a daily basis.<br>▪ Diversified planting increased food and nutrition security by: reducing dependence on external inputs, better soil fertility and increased yields. |

## II. Statement of Research Question and Purpose

While Malawi has a burgeoning Permaculture community, there is currently no system in place to monitor or evaluate Permaculture adaptation rates, levels of practice, or perceived/actual benefits of Permaculture practice by farmers. The aforementioned NGO's and development organizations have rarely maintained records of those receiving Permaculture training and have done little follow-up to track farmers' adoption rates. Neither the PNM nor Never Ending Food (NEF)[6] has the capacity for follow-up and often completely loses contact with farmers who receive training; thus the PNM and NEF are unable to assess their success rates or attribute reasons for the "successes" or "failures" that they hear about. When the question is raised, it is often assumed that there are no clear common denominators among the participants who have adopted Permaculture practices. In describing the problem, Kristof Nordin, co-founder of NEF said, "In some cases, we have people who participate in twelve days of Permaculture training and never think about Permaculture again, and sometimes we see farmers who come to the demonstration plot for a half day and change their whole lives. We have no idea what makes these people [adopters/positive deviants] different" (K. Nordin, personal communication, September 25, 2006).

In an effort to understand why some people adopt Permaculture practices and why some do not, this Positive Deviance Inquiry (PDI) was designed to identify farmers who have been exposed to Permaculture, through various methods, with the hopes of answering the following questions:

[6] Never Ending Food (NEF) is the organization with which the author interned. A description of the organization and her experience are found in Appendix A.

***Overarching Question:***

What are the characteristics of Permaculture adopters?

***Sub-Questions:***

1. What are the constraints inhibiting Permaculture adoption?
2. How have high and low adopters overcome the constraints, resistance points, and barriers to Permaculture adoption?
3. Have adopters benefited from Permaculture practice?
4. Can food and nutrition security be predicted by Permaculture adoption?

The larger purpose of this PDI of Permaculture adopters in Malawi is four fold:

- To understand the constraints and barriers to Permaculture practice in Malawi and, in turn, the means by which adopters have overcome these constraints and barriers in order to inform Permaculture training in the future.
- Using this information to improve the targeting and selection of Permaculture trainees;
- To better inform policy and decision makers in Malawi and the relevant development agencies as the Permaculture movement in Malawi gains momentum; and
- To expand understanding, more generally, of agricultural adoption in developing countries as it relates to sustainable practices.

## LITERATURE REVIEW

### 1. Positive Deviance

The sociological concept of Positive Deviance has its earliest roots in deviance studies and the classical works of Emile Durkheim, Georg Simmel and Max Weber (West, 2003). Within sociology, positive deviance represents a paradigmatic shift from the traditional deviance studies and is thought by some prominent deviance theorists to be an oxymoron (Saragin, 1985; Goode 1991) because of the disparity associated with the juxtaposition of the words 'positive' and 'deviance'. Within deviance studies, the word 'deviant' implies a deviation from cultural norms, but usually is discussed in terms of "negative reactions to nonconformity" (West, 2003, p. 3). Dodge (1985) is credited for initiating the positive deviance debate in his article "The Over-Negativized Conceptualization of Deviance: A Programmatic Exploration".

By many accounts (Marsh, et al. 2004; Lapping, et al., 2002; Berggren and Wray 2002) the concept of positive deviance first made an appearance in the fields of nutrition and development in the 1972 *Tropical Pediatrics* editorial when then-editor, Joe Wray, asked "can we learn from successful mothers" (in Berggren & Wray, 2002, p.7). Curiously, there is no mention of the sociological roots of Positive Deviance in even the earliest PD Nutrition writings. While in the early 1980's sociologists acrimoniously debated the viability of PD's place in deviance studies, nutritionist Susan Van der Vynkt and medical doctor Samuel Wishik (1976) developed a method for modifying dietary practices in deprived populations using PD and published it *The American Journal of Public Health* (1976). Their report is widely accepted in the field as the first to prescribe a methodology of identifying PD families and PD behaviors as well as teaching PD practices throughout the population. Wishik and Van der Vynkt, however, never produced a results based report and PD went unmentioned in the literature for 14 years.

Marian Zeitlin's (1990) pioneering and extensive observations of PD behavior among Yoruba and Javanese families and their relation to children's nutrition, reintroduced the assets-based approach to development with a well-honed methodology. Jerry and Monique Sternin, colleagues of Zeitlin and founders of the Positive Deviance Initiative, have built upon Zeitlin's work with their own projects in Vietnam and have since made the most influential contributions to the amplification of Positive Deviance as a tool for inquiry and development.

**FIGURE 2: TERMS ASSOCIATED WITH POSITIVE DEVIANCE**

**Definition of the Positive Deviance Approach in Development:**
A development approach which helps a community and its members find existing, sustainable solutions to community problems today through the presence of positive deviant individuals within the community.

**Definition of a Positive Deviance Individual:**
A Positive Deviant is someone whose special practices of behaviors enable him/her to Overcome a problem more successfully than his/her neighbors who have access to the same resources or are affected by the same constraints.

**Definition of the Positive Deviance Inquiry:**
The Positive Deviance Inquiry is the tool used to discover the positive deviant's successful or desired practices.

(Sternin, in Clawson, 2002, p. 3)

Lapping, et al. (2002) suggests that the Positive Deviance Approach (PDA) differs from the widely employed needs-based approaches to developments which are aimed at identifying what resources communities lack. Rather, PDA is an assets-based approach that "focuses on individuals who have 'deviated' from conventional societal expectations and explored—though perhaps not openly—successful alternatives to cultural norms, beliefs, or perceptions in their communities" (PROWID, 1999, p. 1). Monique Sternin (in Clawson, 2002, p. 3) provides the most thorough definitions of terms associated with Positive Deviance (Fig. 2).

Many whose development work has included positive deviance activities (Wishik and Van der Vynckt 1976; Cederstrom 1999; Berggen and Wray 2002; Lapping et al., 2002; Marsh,

Schroeder, Deardon, Sternin & Sternin 2004) have written about the virtues of this approach, recognizing it as a powerful tool with many advantages for research and development initiatives. Below is a list of advantages compiled from the literature:

1. The poorest communities can use and benefit from this approach
2. It is a quick and low cost method to identify strategies that are already being employed for a positive outcome
3. It is sustainable in that the practices identified are easily replicable within the communities. This can reduce the occurrence of project failure after an intervention/project funding has ended.
4. Knowledge gained is informed by those who are the adopters / "doers".
5. The approach enhances local research capacity for problem solving.
6. It encourages and permits immediate action rather than having to await external resources.

Positive Deviance has gained attention within the development community and is now being used well beyond its "traditional" application in nutrition and child health. The Sternin's PDI website lists the many applications in which PD is being used (Fig. 3).

**FIGURE 3: VARYING APPLICATIONS OF POSITIVE DEVIANCE INQUIRY**

- Save the Children (SC)
  - Community Empowerment and Nutrition Program in Vietnam
  - Preventing Girl Trafficking in Indonesia
  - Family Planning in Guatemala
- World Bank and the Government of Argentina collaborative effort
  - Decrease school drop out rates in Argentina
- Center for Development and Population Activities (CEDPA)
  - Address female genital cutting (FGC, aka female circumcision or female genital mutilation), in terms of community awareness and in design of appropriate strategies for diminishing/eradicating this practice
- Latin American division of MERCK
  - Corporate application of PD to enhance sales.

(Examples of PDI's listed on the Positive Deviance Initiative website. Stable URL http://www.positivedeviance.org/projects/. Accessed on Sept. 17, 2007)

While there are numerous advantages to the PDA, there also are limitations. Marsh, et al. (2004) identifies the following limitations of the approach:

1. Uncommon positive practices have a prevalence rate of 1- 10% making them very difficult to find and identify.

2. Rare examples can be costly to identify in terms of both time and money. Common examples do not stimulate new thinking
3. It is an inappropriate approach in settings where positive deviant behavior is not possible; for example, when necessary resources are not available
4. Traditionally small sample size has led to criticism about the validity of generalizations
5. Scale-up requires human resources, community mobilization, and capacity building in the areas of participatory research and the concept of positive deviance.

Similarly, Karen Lapping (2003) of Save the Children USA writes that "statistical significance and quantitative rigor is not the goal of positive deviance. Rather, it is a problem-solving tool that can be widely applied to social and behavioral information of practical relevance to inform programmatic realities" (p.13).

Perhaps the most useful aspect of Positive Deviance is the basic underlying assumption that in every community and organization there are individuals whose deviant behavior results in viable innovations and solutions to local problems. In his study of Kenyan agriculture, Ochieng (2006) sees the potential of the PD framework in facilitating understanding both at the grassroots and at the policy level. Ochieng postulates "the resources needed for development (financial and intellectual) may already exist within African organizations and institutions" (p. 458). The ability to recognize and then harness such PD solutions represents a significant paradigmatic shift from contemporary development thought, but, argues Ochieng, such a shift has huge implications for development policy and practice in Africa (p. 458).

## 2. **Adoption of Agricultural Technologies and Practices**

There is an abundance of literature available on theories of agricultural innovation and technological change (Feder & Slade, 1984; Feder, Just, & Zilberman, 1984; Binswanger, 1986; Goldman, 1993; Chirwa, 2005; Simtowe, 2007) most of which relates to the adoption of "new", "modern", or (internationally) "conventional" methods of agriculture such as the introduction

and use of new seed varieties, adoption of fertilizer and other Green Revolution technologies. Little research, however, has focused on the adoption and dissemination of sustainable agriculture technologies in developing countries.

The literature provides several conceptual and theoretical models, empirically tested, that have been used to explain farmers' choices to adopt or not to adopt new agricultural technologies (Feder & Slade, 1984; Hayami & Ruttan 1987; Goldman 1993; Abadi Ghadim & Pannell, 1999; Negatu & Parikh, 1999; Isham, 2000; Chirwa, 2005.) The results of empirical studies in developing countries have identified the following as primary factors influencing farmers' decisions to adopt agricultural innovations: farm size, risk exposure and capacity to bear risks, human capital, labor availability, land tenure, access to financial and produce markets, access to information, participation in off-farm activities, social capital, household characteristics and ecological and environmental factors.

The Government of Malawi attributes lack of agricultural innovation and failure to adopt advanced technologies to the continuing household and national food insecurity (MoA, 2005). In Malawi, and many other developing nations, food security is typically defined in relation to staple crops production such as maize. Accordingly, Malawi's agricultural policies and pro-poor development strategies have focused almost solely on maize production for the past 40 years. Such policies and strategies have emphasized hybrid maize use and research by establishing national agricultural research stations and providing micro-credit and input subsidies in the form of fertilizer and improved seeds in order to encourage the use of these capital intensive and high yielding technologies. Despite four decades of agricultural policies and research focusing on modern agriculture, studies such as those of Chirwa (2007) and Simtowe (2006) have found that

a majority of Malawi's farmers have not adopted the new high yielding technologies and farming systems. (MoA, 2005; Chirwa, 2007; Simtowe, 2006)

Ephraim Chirwa's study of adoption of fertilizer and hybrid seeds by smallholder maize farmers in southern Malawi found that adoption of productivity enhancing technologies, specifically fertilizer, was positively associated with higher levels of education, larger plot sizes, and higher non-farm incomes, and negatively associated with households headed by women and distance from input markets. The study also found that hybrid seed adoption is positively associated with market-based land tenure systems and fertile soils while it is negatively associated with age and distance from input markets. Chirwa's study differs from earlier research (Green & Ng'ong'ola, 1993) which considers only fertilizer technology adoption, where Chirwa's study highlights the joint-decision making process and interdependency of adopting fertilizer and hybrid seed technology.

Similarly Simtowe (2007) explores the link between adoption of fertilizer and HYV seed through the lens of risk aversion. The study shows that risk aversion towards fertilizer is positively associated with low intensity of hybrid maize adoption. Simtowe stresses that even in instances where free inputs are provided, adoption rates remain low. In Simtowe's study, factors such as age, household size, land size, and off farm income were found to be useful in explaining non-adoption of fertilizer.

Research on adoption of sustainable agriculture techniques, such as Neill and Lee's (2001) study of maize-mucuna system in Northern Honduras, found significant and positive associations with farm size and tenure security. Neill and Lee explain that, like Green Revolution technologies, possession of a minimum threshold farm size and therefore a longer–term planning horizon are critical for adoption (p. 809) of sustainable agriculture techniques.

## METHODOLOGY

A PDI can mobilize communities by identifying positive role models with locally available, sustainable, accessible solutions to common problems. One of the long-lasting effects is the framework PD provides for facilitating understanding and the empowerment that understanding of such a method can provide. Marsh, et al. (2004), has found that communities that have used PD in nutrition interventions have applied the methodology to other common problems as well. Consequently, the design of the data collection and analysis are such that the Permaculture Network in Malawi (PNM) could repeat the process in the future if desired.

The participatory nature of a positive deviance inquiry is underlined by Marsh et al.; "the positive deviance approach involves partnering with communities to…develop case definitions [and] identify…people who have achieved an unexpected good outcome despite high risk" (Marsh, et al., p. 329, 2004). In this PDI, participants were selected from four areas in three districts: Kande Beach, Nkhata Bay District; Kanengo and Chitedze, Lilongwe District; and Monkey Bay, Mangochi District. These locations were selected because of their proximity to Permaculture demonstrations plots, all of which are owned and/or operated by members of the PNM.

Because of the limited record keeping of the PNM and poor communication infrastructure in Malawi, participants were selected using a snowball sampling strategy, a subcategory of the purposive sampling method. By capitalizing on the social network of the PNM, the snowball method was used to identify respondents who would otherwise have been difficult to locate. All twenty-seven participants met at least one of the following criteria:

- participation in a Permaculture Design or Permaculture Nutrition course
- living within walking distance of a Permaculture demonstration plot
- working / living at a Permaculture demonstration plot

The questionnaire included both open-ended questions, which provided context and elucidation, and closed ended questions, which were analyzed quantitatively. The Daily Practices questionnaire (Appendix C) was created by partnering with key members of the PNM who assisted in the articulation of Permaculture definitions and practices. The data collection tools were designed to:

- gather demographic and socio-economic information,
- determine levels of adaptation
- identify barriers/constraints to Permaculture practice adoption as well as coping strategies in addressing these constraints; and to
- gather information regarding participant food and nutrition security to determine the relationship of Permaculture adoption to this important measure of household wellbeing.

The questionnaire and interview guide were pre-tested and modified based on pre-test results. In a few instances, minor changes were made once actual data collection began in order to facilitate understanding and to account for minor inconsistencies the pre-testing failed to reveal. A Chichewa translator was used, when necessary, to interview participants. All participants read or were read, the Letter of Informed Consent in accordance with the Internal Review Board. When necessary, the letter was verbally translated into Chichewa. All participants were given a chance to ask questions and were informed that they could withdraw from the study at any time. No participants declined to participate. All participants received a copy of their signed Letter of Informed Consent.

The preconfigured questionnaire and interview were conducted at the same time. The interview and questionnaire were typically conducted at the home of the participant and, when

possible, were preceded by a tour of participants' home/food production areas. Together, the interview and the questionnaire required between 1.5 to 2.25 hours to complete.

**Quantitative Data**

Adoption levels were determined using a combination of subjective visual evaluations and quantitatively confirmed data collection on 14 areas of Permaculture practice. The assessment tool (Appendix D) permits Permaculture adoption scoring with a maximum score of 48 points[7]. On the basis of these scores, participants were categorized as "adopters" or as "non-adopters." A data set was created based on the quantitative responses and was analyzed to determine the associations between adoption score and the following participant characteristics: monthly income, off-farm income generation activities, income agricultural sales, farm size (both land rented in and owned land), gender, number of dependents, and education *(see Table 2 for variable definitions*).

Twenty-eight questions were asked to assess household food and nutrition security (FNS) in order to answer research sub-question 4: "can food and nutrition security be predicted by Permaculture adoption". Of these questions, ten were initially selected to create a food and nutrition security index. This index, in turn, was utilized in regression analysis to identify the extent to which Permaculture adoption affected this important indicator of household wellbeing, holding constant the effect of income and of land owned. In this case, FNS functioned as the dependent variable, while household income, amount of land owned, and Permaculture adoption score were the independent variables. Testing the model initially revealed concerns about collinearity (with food production related factors included both in the dependent and independent

[7] Because the PNM training emphasizes Permaculture theory rather than particular practices, there were several opportunities for participants to indicate "other" consistent practices, in which case the participant received one additional point. Accordingly, the highest adopter actually had a score of 49 points.

variables). Accordingly, it was decided to use a seven-question FNS score containing only consumption-related information (see Appendix E).

Table 2: DEFINITION OF VARIABLES AND DESCRIPTIVE STATISTICS

| Variable | Definition | Mean | SD |
|---|---|---|---|
| *adoptscore* | Adoption score, out of 40 | 11.963 | 11.982 |
| *FNS* | Food and Nutrition Security Score, out of 28 | 18.703 | 4.754 |
| *female* | Dummy: 1 if the participant is female | .44 | .506 |
| *age* | Age of the participant in years | 41.44 | 12.735 |
| *married* | Dummy: 1 if the participant is married | .89 | .320 |
| *employed* | Dummy: 1 if the household earn primary monthly income from off-farm income generation activities | .777 | .423 |
| *income* | Household monthly income in thousands of Kwacha per month | 7407.41 | 5607.408 |
| *agriculturalsales* | Dummy: 1 if the household earns monthly income from ag. sales | .407 | .500 |
| *acres_owned* | Size of the plots owned by the household, in acres | 1.680 | 1.320 |
| *acres_rented* | Size of the plot rented (in) by the household for ag. production | 2.13 | 1.793 |
| *live_exposure* | Dummy: 1 if participants only exposure to Permaculture is living within < 5KM from demonstration plot | .444 | .506 |
| *work_exposure* | Dummy: 1 if participant works at a demonstration plot | .185 | .395 |
| *certificate_exposure* | Dummy: 1 if the participants has earned a Permaculture Design/Nutrition certificate | .259 | .446 |
| *both_exposure* | Dummy: 1 if participant holds a Permaculture certificate *and* works at a demonstration plot. | .111 | .320 |
| *dependents* | Number of dependents in the | 6.78 | 4.685 |

| | | | |
|---|---|---|---|
| | household | | |
| *education* | Number of years the participant has gone to school | 7.44 | 3.423 |

The quantitative section of the FNS questionnaire was developed by combining Coates, Webb and Houser's Food Access Survey Tool (FAST) (2005) and specific questions from the Monitoring and Evaluation section of Nordin's Low Input Food and Nutrition Security Manuel (2005)**.** The Coates, Webb, and Houser Food Access Survey Tool (FAST) was designed through careful testing for use in Bangladesh and is founded on the following five major criteria which reflect contemporary thought in the field of food security.

- Level of adequacy in quantity of food consumed
- Level of adequacy in quality of food consumed (diversity, safety, and familiarity)
- Extent of security or predictability (anxiety over acquisition)
- Level of acceptability in acquisition (social norms are not transgressed), and
- Level of food security for all individuals in the household.

(From Coates, Webb, and Houser, 2005, p. 5)

Together with the PNM, the FAST questionnaire was adopted to more appropriately address food and nutrition security in the Malawian context and therefore includes quantitative questions about consumption of the six food groups as taught by the MoEST and MoAFS.

**Qualitative Data**

Qualitative data was collected using guided interviews and focus groups. Interviews took place at the time of the pre-configured questionnaire and interview questions were guided by participant responses to the questionnaire. Focus groups were designed to create an open environment in which participants could discuss together the barriers and constraints to Permaculture practice and to share ideas on how to overcome them. The original intent was to divide the focus groups by adopter level. After consultation both with members of the PNM and with several participants, it was decided that all participants in a particular village would be invited to the focus group meeting to avoid feelings of exclusion. Given the small sample size,

each focus group consisted of 6 to 9 participants falling within the suggested focus group range of 4-12 participants widely accepted in qualitative analysis (Rossman and Rallis, 2003). Because time constraints prevented a formal focus group in Nkhata Bay, interviews with Nkhata Bay participants were more in-depth and included many of the questions addressed in focus groups in other regions.

Such qualitative data was analyzed primarily by coding participant responses into previously generated categories based on agriculture practices and on constraints and barriers of Permaculture Practice. This qualitative data collection provided insights that would not have been possible from quantitative data alone. Results are presented in the following sections. Qualitative data collection is at the heart of the PDI providing not only contextual information for understanding the quantitative data, but also by allowing the farmers themselves to be the experts.

**Limitations**

The design of this research emerged from the field and was heavily influenced by needs and wants of the PNM. Because access to contemporary literature on adoption of agricultural practices was extremely limited, the data collection was more general than might have been the case, resulting in a fair amount of unused information. Although the survey instrument was lengthy, there were, in retrospect, some important gaps in that data collection, such as distance to markets and civic engagement. Both areas have been addressed in the adoption literature and may have been useful explanatory factors in this inquiry. Although enough data was collected to create the variables *employed* and *agriculturalsales*, these categories emerged post-data collection and consequently, there is no qualitative information attached to these variables.

The design of the research was sufficiently broad to quantify the Permaculture practices that are both promoted by PNM / Permaculture trainers and are being used by some who have been exposed to Permaculture. The survey instrument was not, however, designed to account for the extent to which participants employ specific practices. As a result, it is likely that a few participants with very low adoptions scores, if evaluated only qualitatively, would fall into the non-adopter category. Such an in-depth examination would have required more time, funding, and skill than were available at the time of research. In the years ahead, as larger numbers of farmers are exposed to Permaculture training- in part as a result of the MoEST pilot project - a more in-depth PDI of high adopters could provide, as a complement to this study, rich qualitative data on the barriers facing Permaculture practitioners, and the coping strategies utilized.

Finally, while the small sample size typical of PDIs has provided rich context and elucidation, it also has rendered many of the statistical models insignificant. The strength of this research, however, lies in combining quantitative data with complementary qualitative understandings which sometimes compensate for the absence of such statistical significance.

# PRESENTATION AND ANALYSIS OF DATA

## I. PROFILE OF THE RESPONDENTS

### FARMER CHARACTERISTICS

Specific farmer characteristics, with the exception of age, have not typically been useful in explaining farmers' decisions to adopt certain agricultural practices (Neill & Lee, 2001). However, several variables were included in the data collection as explanatory variables. Gender was measured as the dummy variable[8] *female,* where 1 was entered if participants are female. As seen in Table 3, fifteen male participants and 12 female participants were selected from four regions within Malawi. In Nkhata Bay, all 5 participants were male due to an inability to identify females who fit the specific criteria for participation. The ages of participants ranged from 23 to 75 years, with a mean of 41.

*Religion* was measured as a dummy variable, where 1 was equal to identification as Christian. All but one participant identified themselves as Christians with one participant who identified as Muslim. The variable *married* was measured as a dummy variable where 1 is equal to the participant identifying as being married. Three participants are separated or divorced, while the remaining 24 are married. All participants indicated financial responsibility for dependents such as children, ageing parents, and ailing family members and 20 of 27 participants indicated guardianship for at least one orphan child. This variable, *dependents,* was measured as a continuous variable indicating the number of dependents in the household. Excluding participant 17, who reported responsibility of 26 orphans, the mean of dependents among participants is 6.

[8] Dummy variable refers to the method of quantifying data that does not have quantitative value. Ex. 0 is equal to male, while 1 is equal to female.

| Table 3: Sample Characteristics of Positive Deviant Inquiry Respondents | | |
|---|---|---|
| | **# of Part.** | **Percentage** |
| **Region** | | |
| Kanengo | **9** | **33.3%** |
| Nkhata Bay | **5** | **18.5%** |
| Chitedze | **6** | **22.2%** |
| Monkey Bay | **7** | **25.9%** |
| **Sex** | | |
| Female | **12** | **44.4%** |
| Male | **15** | **55.6%** |
| **Age (mean)** | | |
| Average Age | **41** | |
| **Marital Status** | | |
| Married | **24** | **88.9%** |
| Single | **0** | **0%** |
| Divorced/Separated | **3** | **11.1%** |
| **No. Dependents (mean)** | | |
| Average No. of Dependents* | **6** | |
| **Religion** | | |
| Christian | **26** | **96.3%** |
| Muslim | **1** | **3.7%** |
| **Education** | | |
| None | **2** | **7.4%** |
| < Primary completion | **11** | **40.7%** |
| Primary completion | **6** | **22.2%** |
| Secondary and beyond | **9** | **33.3%** |
| **Permaculture Exposure** | | |
| < 5 km's from demo. plot only | **11** | **40.7%** |
| Training/Certificate | **7** | **33.3%** |
| Work @ demo. plot | **4** | **14.8%** |
| All of Above (Live, Work, Cert.) | **3** | **11.2%** |
| **Land Tenure/Ownership** | | |
| ***Rent*** | **13** | **48.1%** |
| Size of land holding (**mean acres**) | **1.03 acres** | |
| ***Own*** | **27** | **100%** |
| Size of land holding (**mean acres**) | **2.2 acres** | |
| **Income** | | |
| Employed (off-farm income generation) | **21** | **77.8%** |
| Income from Agricultural Sales | **11** | **40.7%** |
| Average Mo. Income | **7,200 MK** | |

* This average excludes participant 17 who indicated responsibility for 26 dependents thereby skewing the mean.

The variable *education* was measured in number of years the participant attended school. In the Malawian education system, primary schooling is complete at 8 years. Two participants (7.4%) reported having never attended school while eleven participants (44.7%) did not complete primary school for a total of 52.1 % participants never having completed primary school. This statistic differs slightly from USAID's calculation (2008) that 66 % of Malawians do not complete primary school but could be explained by the heavy distribution of participants who live within a twenty-mile radius of the capital city. Six participants indicated completion of primary school and 7 participants completed some level of secondary school. Two participants completed thirteen years of school as well as some college or technical school. No participant holds a Bachelors' degree or higher.

The variable *certificate* is a dummy variable, where 1 indicates that the participant holds a certificate from any kind of continuing education certificate course. This variable was included in order to discern if Permaculture adoption could be associated with continuing education, a factor that was hypothesized in discussions with the PNM. Sixty-six percent of participants (18 of 27) has received at least one certificate of course completion in the following areas: computer skills, adult literacy, house painting, brick laying, life skills, community design, ANAMED (Action for Natural Medicine), accounting, empowerment skills, pastor education training, gender workshop, and Permaculture Nutrition/Design.

*Income* was measured as a continuous variable. Participants' monthly income ranges from 1000 Mk per month to 25,000 Mk per month, with a mean of 7200 Mk per month. The household characteristic, *employed*, is represented by a dummy variable where 1 indicates off-farm employment. According to Chirwa (2007) non-farm incomes provide farmers with additional resources, which may be used to purchase new technologies (p. 5), while, similarly,

Green and Ng'ong'ola (1993) have found in their study on fertilizer adoption in Malawi that "probability to adopt was an increasing function of non-farm incomes and regular labor" (in Chirwa, 2007, p. 5). A majority (21) of participants indicated receiving some monthly form of off-farm income either through a job or "ganyu" (day labor). The research design did not include the collection of data on access to produce markets. However a question about income from agricultural sales was included in the preconfigured questionnaire in order to understand the bases for farmer incomes. After data collection was completed, further examination of the literature revealed that access to input and produce markets has been positively associated with technology adoption (Chirwa, 2007). Thus, a dummy variable, *agriculturalsales*, where 1 equals a monthly income from agricultural sales, was entered with the intent of examining the association between monthly income from agricultural sales and access to a produce market. The data shows that eleven, or 40.7 %, of participants receive a monthly income from agricultural sales.

**PLOT LEVEL-CHARACTERISTICS**

The land ownership and tenure variables, *acres_owned* and *acres_rented,* were measured in acres and represent an estimate made by the participant. All participants indicated ownership of the homes they live in with plot sizes ranging from 1/8 acre to 5 acres. The mean amount of land owned among all participants is 2.2 acres; however, the number is skewed by two participants who own an average of 3.5 acres. Thirteen participants rent land for food production with parcel sizes ranging from .5 acres to 5.5 acres. The mean of land rented among renters is 1.9 acres while mean of land rented among all participants is 1.03 acres. Again, these numbers are skewed by a few farmers who rent large tracts of land. When disaggregated by region, 12 of 13 renters live in the Lilongwe District villages of Chitedze and Kanengo while only one renter resides in the lakeshore villages of Nkhata Bay and Monkey Bay districts.

### EXPOSURE TO PERMACULTURE

Exposure to Permaculture was measured by several dummy variables. Participants whose only exposure to Permaculture is through living within 5 km of a demonstration plot were measured using the dummy variable *live_exposure*; there are 11 such participants. Four participants fall under the category *work_exposure* measured as a dummy variable for those participants who work at a demonstration plot. *Certificate_exposure* accounts for the 7 participants who received their introduction to Permaculture via a training/certificate course and *both_exposure* is a dummy variable where 1 indicates that the participant both works at a demonstration plot and holds a certificate. There are 3 participants who work at a demonstration plot, hold a design certificate and live within a 5 kilometer radius of a demo plot. Twenty five of 27 participants live within a 5 kilometer distance from the demonstration plot which first exposed them to Permaculture.

All of the participants in the Kanengo region have been part of a social group at the demonstration plot. The main focus of the groups is to promote nutrition within the community by educating young mothers about how to care for their children. The group is entirely run by local women and has never received external funding or support. The qualitative interviews revealed that at some point Permaculture was introduced as one focus of the meetings. During the design phase of the research, it was not known that such meetings existed and therefore Permaculture exposure of Kanengo participants has been placed in the category *live_exposure*.

## II. ADOPTION

### FARMER CHARACTERISTICS

In order to answer the overarching research question: “What are the characteristics of Permaculture adopters?”, the characteristic variables have been disaggregated by adoption category. Adoption groups were determined after calculating the adoption scores, which showed

distinct number clusters. Participants who scored between 1-5 points were categorized as "non-adopters", while those were scored between 11 and 26 points are low adopters. Two participants, who scored 36 and 49 points are the only high adopters, thus it was decided to create only two groups: adopters and non-adopters (see Table 4 below). In this study, Permaculture adopters are the positive deviants. As Table 4 shows, the frequency of adoption is 51.9 percent. The mean score of adopters is 20.79 while the mean of non-adopters is 2.61

| **TABLE 4 – Frequency of Adoption (no. & % of total sample)** | |
|---|---|
| **Adopters** | **14 (51.9%)** |
| High Adaptors | 2 (7.4%) |
| Low Adaptors | 12 (44.4%) |
| **Non-Adopters** | **13 (48.1%)** |

Explanatory characteristics, which have been presented by adoption category in Table 5 show that the mean of years of education are nearly identical. The data suggests that neither formal education, nor continuing education, in the form of certificate courses (as previously mentioned), are predictors of adoption in this sample. This differs from Chirwa's (2005) hypothesis that farmers who have a greater endowment in human capital are receptive to new ideas, but supports Isham's work in Tanzania (in Chirwa, 2005) and Zeller, Diagne, & Mataya (1998) and Green & Ng'ong'ola's (1993) findings in Malawi that human capital has no strong association with adoption. An unsubstantiated, yet important factor to consider with the education variable is age. It has been suggested by members of the PNM that during the government of the first president of independent Malawi, Dr. Kamuza Banda, the education system was more efficient, rigorous and received more government support. This suggests that the quality of education may have been more important than the quantity. The average age of adopters is 45 and of non-adopters, 37.

| TABLE 5: SAMPLE CHARACTERISTICS BY ADOPTION GROUP | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Explanatory Variables | | | | | | | | | |
| | Ave. Adoption Score | % Female | Mean age | % Married | % Christian | Mean Education (in years) | Mean acres owned | Mean acres rented | Mean Income | P/C Cert. |
| **Adopters** | 20.79 | 5 (35.7%) | 45 | 12 (85.7%) | 13 (92.8%) | 7.42 | 1.96 | 2.03 | 8,600 | 6 (42.8%) |
| | | | | | | | | | | |
| **Non-Adopters** | 2.46 | 7 (53.85%) | 37 | 12 (92.3%) | 13 (100%) | 7.46 | 1.3 | 1.25 | 5,800 | 4 (30.8%) |

A Pearson's correlation test shows that age is positively associated with Permaculture adoption. The model shows statistical significance at the .05 level. Neill and Lee (2001) found age negatively associated with the maize-*mucuna* system in Honduras, while in other studies, another in Honduras and one in the Philippines, have also found age to be negatively associated with adoption of reduced tillage and soil protection practices respectively. Using the human capital theory, a positive association between Permaculture adoption in Malawi coupled with nearly identical levels of education could support the theory that a higher *quality* of education accounts for adoption among older participants.

Many studies have shown that adoption of Green Revolution technologies have a strong and positive correlation with income, as necessary inputs such as fertilizer and HYV seed are expensive. However, much of the literature as discussed in the review found that the type of income, such as farm generated income and off-farm income generation, are better indicators of adoption.

This study makes an attempt to analyze data that was collected before a review of adoption literature took place and to examine the associations between types of income generation and adoption.

A Pearson's correlation showed that the general variable *income* has a weak association with adoption, although the test was not statistically significant. Thirteen of 14 adopters (92.9%) reported receiving income from off-farm income generation activities, such as regular employment or "ganyu" labor, while the difference among non-adopters was more significant. The variable, *employed*, showed 8 of 13 non-adopters (61.5%) earned off-farm income. Respondents who indicated being *employed* had a mean adoption score of 13 while those who are not employed had an average score of 9. Two participants (ID5, ID15), both of whom work at the same demonstration plot in Chitedze, indicated that the social capital they are endowed with via employment at the demonstration plot allows them the security of taking risks. When talking about the risk of not using fertilizer and worrying about where food would come from, one participant said "I knew that if I didn't have enough food, that I could buy some because of my job here" (ID15). He went on to discuss the feeling of security that accompanies working at the demonstration plot and the knowledge that if he fails, his employers will help him. The seemingly positive association between adoption and off-farm income generation differs from other works such as Neill & Lee (2001) and Triomophe & Reuben, et al. (in Neill & Lee 2001) which have found negative associations with off-farm income and adoption of agricultural practices such as contouring and the maize-mucuna system.

Eleven participants indicated receiving income from agricultural sales; 7 of whom are adopters and 4 are not. Respondents who earn a monthly income from agricultural sales scored an average of 17.8 points on adoption score compared to 8 points for those who do not. The

literature suggests that income earned from agricultural sales indicates close proximity to markets therefore an incentive to intensify agricultural production. Unfortunately this research lacks both the quantitative and qualitative data regarding access to markets.

Fifteen (60%) participants are male and 12 (40%) are female. An Independent Sample T-test shows that men scored an average of 4 points higher than women. Gender was not qualitatively explored in this research, although it would be interesting to explore the reasons for a higher adoption score among men especially since human capital does not seem to be associated with adoption scores.

**PLOT LEVEL CHARACTERISTICS**

While not statistically significant (likely the result of small sample size), a Pearson correlation tests showed that Permaculture adoption scores were negatively associated (albeit weakly, .27) with acres rented, and positively associated (weakly, .18) with income. The test did however show statistical significance at the .01 level of a strong linear relationship (0.51) between adoption score and acres owned. This data strongly supports the theme of land tenure security, which emerged from the qualitative data. Secure access to a "munda", or agricultural production zone, is necessary over the long term. Because Permaculture is *permanent agriculture*, many farmers do not feel that they will realize the benefits of Permaculture if they do not own their own land and/or do not have secured access to rented land for more than one growing season. Similarly, Neill and Lee (2001) found that adoption and continuation of the maize-*mucuna* systems is positively associated with a perception of secure and tenured access to the same agricultural lands as it typically takes two to three years to benefits from the systems.

In Kanengo, one woman (ID24, adopter and renter), spoke at length about the lack of control she has regarding the fertility of the soil "because sometimes, people can use that land without applying manure." Another adopter and renter from Kanengo (ID12) indicated that in

the past she has preferred to use tobacco stems to fertilize her soil. She rents five acres and found that using tobacco stems produces more maize than with fertilizer. With soil infertility affecting a majority of agricultural lands in her area, she believes fertilizing her soil organically is risky for fear that the landlord will take it away for personal use.

> Tobacco stems bring back the nutrients to the soil and whenever you have heavy rains, the nutrients are still there. But with fertilizer, when the rains are heavy, it [fertilizer] runs away. We would be using tobacco stems every year, but they are not always available. Also, if we get a good harvest, the owners will take away the land so that they can use it the following year (ID12).

Several other participants indicated the belief that if they produced a very good harvest from rented lands, the landlords were likely to assume that the soil is more fertile and use it for themselves the following year. It is for this reason that another participant, an adopter and land owner from Chitedze (ID15), has decided only to plant maize on the land that he owns, thereby ensuring that his most important crop, maize, will benefit from his efforts to improve the soil. Another benefit of owning his own land, is that this participant has the freedom to experiment with soil fertility techniques, seeing for himself what works and what does not.

> "Because in Malawi, we like maize, we like a food crop. On the land that I rent I plant groundnuts and sweet potatoes. Only on the land that I own I plant maize. I rent a different piece every year. I use compost only on the land that I own. Last year I tried to use fertilizer. That is why the soil went bad. We can use fertilizer and the maize will grow and we will be harvesting. But if you have the fertilizer, the soil is going bad and the maize won't mature. In 2006, I used 50 Kgs of fertilizer [on 1.5 acres] and yielded 8 bags of maize. In 2007, with compost only [1.5 acres], I yielded 12. This year we didn't use fertilizer because it's not good."

The means by which participants have become exposed to Permaculture is an important variable to explore by adopter category. From the qualitative data, emerged an unexpected category of exposure; the *club_variable,* which has been created and analyzed post general analysis. Eight participants from Kanengo are members of the club and the wife of the remaining participant from Kanengo, the highest of all adopters, is the host. Four of the club

members are adopters and 4 are not. The focus group discussion showed that many of the women, before joining the group, were quite skeptical of Permaculture and several admitted to believing the owner (both a participant, ID17, and highest adopter) to be a "devil worshipper" or hiding a "band of armed robbers" in the trees he had planted. However, once they visited the demonstration plot and saw for themselves the benefits of Permaculture practice, they were inspired to try. An adopter (ID19) in the group said,

> "We want to encourage one another to do something new in addition to daily tasks. We didn't think that [Permaculture] was beneficial but after we saw how he [ID17] has struggled and now benefits. God helps those who help themselves. We [referring to her own agricultural practice] used what we saw, how he has benefited- because he was also poor when he moved to that land. By working hard, he has benefited."

Ten participants (37%) hold certificates in Permaculture design. Of those, 6 are adopters and 4 are not. All 4 non-adopters with Permaculture certificates live in Monkey Bay. June Walker, the founding PNM member and organizer of the Monkey Bay training course, indicated that this course, in particular, was designed to train young people in the area to learn an employable skill. It was originally intended that participants from these courses would then be hired by the Icelandic International Development Agency (ICEIDA) funded hospital to grow food and medical plants using Permaculture for the patients at the hospital. For a short while, the project was on track, with several participants employed at the hospital, but over time both interest and funding were lost (personal communication, June Walker) and today only one of the participants (ID23) is an adopter, with the lowest adoption score of 11. At the time of the Permaculture course, the majority of the participants were still students. One of these participants blames being a student for his lack of Permaculture practice;

> "I wanted to plant more fruits after the Permaculture course. By the time I was learning Permaculture, I was in school and was busy in school. When I came back from school the family was not supportive of my desire to practice Permaculture. I know this

> because when I left home to visit my friends my family would not take care of the seedlings. They let them die. Now that I am in my own house I lack seeds and am not able to build a fence, which prevents me from starting my own Permaculture garden. I want to build a fence and I will get seeds from June who has offered to give me seeds for free.

An adopter from Monkey Bay, who holds a Permaculture certificate from another course, criticized the selection method for participation in the aforementioned course, saying that the participants who were selected for participation were lured to the course by the promise of getting a job and not because of interest in improving their own agricultural situations. This sentiment is supported by the 100% adoption rate of participants who both hold a Permaculture certificate and work at a demonstration plot. The three respondents, who both work at demonstration plot and hold certificates, were all employed at the demonstration plots at the time of certification. In total, 6 participants are employed at demonstration plots. Those who hold certificates in addition to their employment are adopters while those who have not completed a certificate course are not adopters[9].

**Evaluated Practices by Adoption Category**

Table 6, below, presents the frequency of which participants employ the evaluated Permaculture practices. While the quantitative data presented is largely a result of participant responses, some of data was interpreted subjectively by judging the intent of the practice. For example, where a respondent indicated that they do not use fertilizer and qualified the statement by stating that the only reason is because they can not afford fertilizer, Permaculture intent was not assumed and therefore such responses received 0 points.

[9] It is interesting to note that at the time of interviewing, one of the three non-adopters employed at a demonstration was very clearly a non-adopter. However, in the time between the interview and the focus group, about three weeks, the participant's son, who lives in the same house, became an intern at the demonstration plot and used the knowledge that he had gained thus far to reduce sweeping and expand permanent production areas. He began planting garden beds in the guild system and encouraged his family to put their grey water on the garden beds. This participant is still considered to be a non-adopter.

There are a few practices that a majority of participants employ. Practices that over 50% of both adopters and non-adopters employ include:

- planting trees for soil conservation
- no burning of organic matter
- inclusion of localized and indigenous plants in food production zones

Also of interest is that nearly 46% (6) of non-adopters included leguminous plants in their food production zones during the most recent growing season (2006-2007). None of these more commonly used practices are specific to Permaculture. Tree planting, incorporation of leguminous plants, and no-burn agriculture have been promoted by other development initiatives/organizations. For example, deforestation has been cited as a major barrier to development as far back as the 1930's when the colonial government completed a series of surveys on Nyasaland (Berry & Petty, 1992). Since then, in both the colonial and independent governments, reforestation has been well supported at the policy, extension, and research levels. In fact, Malawi has the largest man made forest in Africa. It is important to note that while this assessment calculated the number of participants who have planted trees for soil conservation reasons, it did not measure the extent to which they have adopted this practice. Additionally, no respondent indicated having planted a woodlot, as Permaculture theory suggests.

Roughly 70% of participants indicated growing indigenous or localized plants. The design of this inquiry did not include a methodical categorization of such food plants, but rather used a quick recall by participants to gain an understanding of what indigenous and localized participants are intentionally cultivating.

**TABLE 6: FREQUENCY OF EVALUATED PRACTICES**

| PRACTICE | NO. & % OF TOTAL RESPONDENTS USING THE PRACTICE | NO. & % OF TOTAL *ADOPTERS* USING THE PRACTICE | NO. &% OF TOTAL *NON-ADOPTERS* USING THE PRACTICE |
|---|---|---|---|
| **GREY WATER USE** | | | |
| For food production | **12 (44.4%)** | **11 (78.6%)** | **1 (7.7%)** |
| **WATER HARVESTING** | | | |
| For food production | **10 (37%)** | **9 (64.3%)** | **1 (7.7%)** |
| Store for dry season use | **2 (7.4%)** | **2 (14.3%)** | **0** |
| **IRRIGATION** | | | |
| For year round harvest | **9 (33.3%)** | **9 (64.3%)** | **0** |
| **SOIL CONSERVATION** | | | |
| Mulching | **8 (29.6%)** | **8 (57.1%)** | **0** |
| Reduced sweeping | **7 (25.9%)** | **6 (42.9%)** | **1 (7.7%)** |
| Reduced tillage | **2 (7.4%)** | **2 (14.3%)** | **0** |
| No burn | **21 (77.8%)** | **12 (85.7.2%)** | **9 (69.2%)** |
| Swales/Vetiver | **9 (33.3%)** | **8 (57.1%)** | **1 (7.7%)** |
| Trees | **23 (85.2%)** | **13 (92.9%)** | **10 (76.9%)** |
| Other | **1 (3.7%)** | **0** | **1 (7.7%)** |
| **SOIL FERTILITY**[10] | | | |
| **Organic only** | **11 (40.7%)** | **9 (64.3%)** | **2 (15.4%)** |
| Increasing use of organic | **5 (18.5%)** | **3 (21.4%)** | **2 (15.4%)** |
| **No fert. (P/C intent)** | **8 (29.6%)** | **8 (57.1%)** | **0** |
| Decreasing fert. use | **9 (33.3%)** | **5 (35.7%)** | **4 (30.8%)** |
| **Makes/uses own compost** | **6 (22.2%)** | **6 (42.9%)** | **0** |
| Applies organic matter | **16 (59.3%)** | **12 (85.7%)** | **4 (30.8%)** |
| **Turns stovers into soil** | **9 (33.3%)** | **9 (64.3%)** | **0** |
| **Nitrogen fixing plants** | **16 (59.3%)** | **10 (71.4%)** | **6 (46.2%)** |
| **Animal manure** | **11 (40.7%)** | **9 (64.3%)** | **2 (15.4%)** |
| Other | **5 (18.5%)** | **5 (35.7%)** | **0** |
| **DIET DIVERSITY (6 FOOD GROUPS CONSUMPTION: SELF REPORTING)** | | | |
| Everyday | **3 (11.1%)** | **3 (21.4%)** | **0** |
| Several times per week | **7 (25.9%)** | **5 (35.7%)** | **2 (15.4%)** |
| **GROWING SIX FOOD GROUPS**[11] | | | |
| 6 groups | **4 (14.8%)** | **4 (28.6%)** | **0** |
| 5 groups | **4 (14.8%)** | **3 (21.4%)** | **0** |
| **PERMANENT/YEAR ROUND HARVESTING OF FOOD** | | | |
| Frequency of practice | **15 (55.5%)** | **12 (85.7%)** | **3 (23.1%)** |
| **GUILD SYSTEM** | | | |
| Frequency of practice | **2 (7.4%)** | **2 (14.3%)** | **0** |
| **REDUCED FOOT TRAFFIC** | | | |
| Permanent prod. areas | **5 (18.5%)** | **5 (35.7%)** | **0** |
| ⇓ sweeping for production | **10 (37%)** | **8 (57.1)** | **2 (15.4%)** |

[10] The practices in boldface represents the optimal of the two related practices and is worth 2 points, while the indented practice is an accepted Permaculture practice worth 1 point.

[11] Beacause the PNM believes that *consumption* of 6 food groups trumps *production* of 6 food groups, only those participants who indicated either daily or weekly consumption of six food groups earned points for the practice of growing 6 food groups.

| Table 6, cont.: Frequency of Evaluated Practices | | | |
|---|---|---|---|
| **ZONE SYSTEM** | | | |
| Frequency of practice | **2 (7.4%)** | **2 (14.3%)** | **0** |
| **PEST MANAGEMENT** | | | |
| Strong smelling plants | **7 (25.9%)** | **6 (42.9%)** | **1 (7.7%)** |
| Strong smelling water | **3 (11.1%)** | **3 (21.4%)** | **0** |
| Strong smelling mulch | **0** | **0** | **0** |
| Encourages beneficial Species | **1 (3.7%)** | **1 (7.1%)** | **0** |
| Intercrops | **5 (18.5%)** | **5 (35.7%)** | **0** |
| Living fence | **1 (3.7%)** | **1 (7.1%)** | **0** |
| Fence | **4 (14.8%)** | **4 (28.6%)** | **0** |
| Other | **5 (18.3%)** | **2 (14.3%)** | **3 (25%)** |
| **USES INDIGENOUS / LOCALIZED VARIETIES** | | | |
| Frequency of practice | **19 (70.4%)** | **12 (85.7%)** | **7 (53.8%)** |
| **SHARES KNOWLEDGE** | | | |
| Frequency of practice | **13 (48.1%)** | **9 (64.3%)** | **4 (30.8%)** |

Qualitative data showed that for the most part, both adopters and non-adopters have chosen to cultivate just a few indigenous/localized greens: pumpkin, sweet potato, papaya, mango, black jack, amaranth, spider plant, and groundnuts, avocado and local maize. With over 600 food plants indigenous to Malawi (Nordin, 2005), there exists a significant opportunity for under-utilized plants to contribute to achieving food and nutrition security. Interviews and focus groups discussions highlighted a significant barrier to growth of such "bush foods": culture. Many individuals, as well as all three focus groups said that such food plants "come from the bush" and therefore do not have to be cultivated. Additionally, a few participants alluded to the "shame" associated with eating "poor peoples' plants" and questions about them were often met with snickering and shyness. Those who admitted to growing and eating "bush foods" cited the Bible, particularly Genesis and mankind's mandated stewardship of the earth, as a source of support and guidance (ID17, ID5).

There are a significant number of practices that neither adopters nor non-adopters had a frequency above 50 %:

- reduced sweeping for soil conservation
- permanent production areas
- storing harvested water for dry season use
- reduced tillage
- consumption of 6 food groups either every day or a few times per week
- production of 6 food groups and 5 groups with a protein source
- guild system
- zone systems
- Any pest management practice

These infrequently used practices represent the difference between high adopters and low adopters and are some of the more important practices in Malawian Permaculture practice. The qualitative data shows the barriers to reducing sweeping are largely to do with cultural perceptions of hygiene. An adopter from Chitedze (ID6) attributes the health of his family to the cleanliness of the area surrounding his house; "We are sweeping and washing sheets. Sometimes disease affects us if we don't sweep around here." Focus group discussion showed that participants know the large swept areas surrounding their houses could be used for agricultural production, but that the messages they receive from community health workers and Permaculture practitioners are conflicting.

Unsurprisingly, participants have a fear of storing water near the house as it is widely known that malaria-carrying mosquitoes lay their eggs in standing water. Another reason often provided for not harvesting water is having a grass roof. Participants do not want to catch the rainwater that runs off of the grass roofs because it is considered to be "dirty" and "useless".

Very few participants indicated taking any proactive, preventative pest management measures in either adoption category. The most frequently cited method of pest management is the inclusion of strong smelling plants, specifically "mpungabwe" or local basil, in problem areas. One adopter from Monkey Bay (ID23) sprays the plants in his kitchen garden with water scented with goat dung to keep the goats from destroying his garden. Free roaming goats,

coupled with inadequate fencing, were cited as the main reason why participants in Monkey Bay could not practice Permaculture. No participant from Monkey Bay, however, had a goat proof fence despite the presence of goat-proof thorn fences in the area. When the issue was pressed in the focus group discussion, a rift between the adopters (2) and remaining non-adopters resulting in an admission that the goats, while annoying, are not a true barrier to Permaculture adoption as the materials to build fences are available and are free. The true barrier, the participants said, is that they are "lazy". The highest of Monkey Bay adopters denied this claim and believes that because they are a fishing community that agriculture and agricultural improvements comes second to fishing and therefore does not receive much attention.

Many participants indicated using reactive pest control measures such as removing snails by hand, collecting and killing army worms, gathering and eating grasshoppers, and applying ashes to the garden once a problem has presented itself. Only 2 participants, the highest of all adopters, indicated using the guild system of planting. Both high adopters cited the advantages of intercropping in preventing insect damage as just one reason for using the guild method.

There are several practices that only adopters employ, including the zone system and guild system, which are specific to Permaculture. Both the guild and zones systems are used solely by the two participants with the highest adoption scores. The following practices are employed only by adopters:

- irrigation for year-round harvesting,
- mulching
- reduced tillage
- zero use of fertilizer
- compost making
- turning stovers into soil
- consumption of 6 food groups everyday
- production of 6 food groups
- production of 5 groups, with a protein source
- permanent production areas

- pest management practices: strong smelling water, encourages beneficial species, intercropping, living fence, any fence
- Use of guild and zone systems

**III. YIELDS**

As previously mentioned, one question regarding yields was originally included in the adoption score. However, during the analytical process, it was decided that "increasing agricultural yields per acre" is not a Permaculture practice as much as it is a goal. As well, the phrase has very different subjective meanings. Accordingly, questions regarding yields were removed from the evaluation tools and the responses are discussed below.

Participants were asked if they believed that their agricultural yields per acre had increased or decreased in the past five years. At the time of enumeration, it was stressed that "yields" refers not only to maize yields but also to the yields of any food. However, this proved a difficult obstacle to overcome, as most participants could only recall yields in terms of "bags", "Kgs" or "wheelbarrows" of maize. Very few participants indicated that yields of all foods per acre had either increased or decreased. Answers were recorded using a 5-point scale ranging from "increased significantly" to "decreased significantly". In many instances, participants remembered the amount of maize they yielded during each growing season of the past five years but did not equate non-maize production with yield calculation.

**TABLE 7: RESPONDENTS AGRICULTURAL YIELDS**

| In the past five years, have your agricultural yields (all foods) per acre increased or decreased? | Adopters | Non-adopters |
|---|---|---|
| Increased significantly | 3 (21.4%) | 1 (7.7%) |
| Increased slightly | 8 (57.1%) | 1 (7.7%) |
| Remained the same | 3 (21.4%) | 3 (25%) |
| Decreased slightly | | 5 (38.5%) |
| Decreased significantly | | 3 (25%) |

As Table 7 shows, there was a noticeable difference in response between adopters and non-adopters as no adopters indicated decreasing yields. Eleven adopters indicated that over the

past five years their yields have increased compared to 2 non-adopters. The remaining 3 adopters indicated that their yields per acre have remained the same. Eight non-adopters indicated that they have experienced decreasing yields per acre over the past five years. The qualitative data shows that many participants, especially non-adopters, attribute their decreasing yields to prior fertilizer dependency coupled with an inability to currently afford fertilizer. When referring to the land he inherited from his parents, a non-adopter from Monkey Bay (ID25) said that his agricultural yields have decreased because "my parents were not using compost manure and were only using fertilizer. When they could no longer afford fertilizer, the soil lost its fertility." Other participants, such as an adopter from Kanengo (ID24), blames being dependant on renting land for her decrease in maize yields, but adds "our fruit and vegetable yields have increased because of planting at home," a practice which she says she learned from the nearby Permaculture demonstration plot and which has led to an overall yields increase. Another participant, an adopter from Monkey Bay (ID11), attributes the increase in agricultural yields of all kinds to Permaculture knowledge he gained first from a Permaculture training course. "In the past, I was doing these things [agriculture] without any knowledge. I was doing these things as usual. I am now doing these things with knowledge; how to make compost, growing leguminous plants, using grey water." The knowledge this participant gained in the course was reinforced by his work as country counterpart with a Peace Corps volunteer and today, he says, "there is no hunger season in this house".

An explanation for such a drastic difference in reported yields may be that Permaculture helped participants increase their soil fertility practices, as most participants were exposed to Permaculture within the last five years. Another possibility could be that Permaculture exposure has broadened participants' narrow definition of food and that adopters are more likely to

consider the food from their kitchen gardens in their yield calculations. Because the data collected relied on participants memory, there is no way of measuring the exact yield of all food produced, but that data does show, despite accuracy, 78.6% of adopters believe that their yields per acre have increased compared to only 15.4% of non-adopters.

## IV. Food and Nutrition Security

The concept of food security is founded on the following three pillars: accessibility, availability, and utilization (IFRC & RSC, 2008.) Measures of food adequacy, which typically consider food intake in terms of dietary energy supply (DES), rarely measure the quality (micronutrients and protein) of the food but rather only the quantity (caloric intake). In most developing nations, Malawi being no exception, populations rely on cereal crops to account for more than 50% of daily caloric intake (Nawani, 1994). Therefore, says Nawani, ensuring cereal crop production is just the first step and without taking further steps to ensure nutrition security as well, food security merely prevents a person from dying (n.p.). Kristof Nordin, key member of the PNM, echoes this sentiment when he says, "you can bring all of the maize in the world to Malawi, and people will still be malnourished, sick, and dying," (K. Nordin, personal communication, September 25, 2006) Consequently, the following data represent a measure of accessibility, availability and utilization of food with a particular emphasis on nutrition. As previously mentioned, the tool used for the food and nutrition security (FNS) evaluation is a marriage of Coates, Webb & Houser's (2005) FAST method and Nordin's (2005) Low Input Food and Nutrition Security Manual.

The 7 question FNS survey was scored on a 4-point scale, where 4 equals the optimal answer and 0 equals the least desired response. Respondents' scores range from 9 to 28, with a mean of 18.9. The average score among adopters is 21 compared to 16 among non-adopters.

| TABLE 8 : FOOD AND NUTRITION SECURITY RESPONSES | | Adopters | Non-adopters |
|---|---|---|---|
| 1 | **In the past 12 months, did *you* skip meals due to food scarcity?** | | |
| | Never | 12 (85.7%) | 5 (38.5%) |
| | Rarely (few times per year) | 0 | 2 (15.4%) |
| | Sometimes (1-2 times/month) | 2 (14.3%) | 4 (30.8%) |
| | Often (few times/week) | 0 | 2 (15.4%) |
| | Mostly (most days) | 0 | 0 |
| 2 | **In the past 12 months, how often did your household eat three meals per day?** | | |
| | Mostly (most days) | 9 (64.3%) | 3 (23.1%) |
| | Often (few times/week) | 2 (14.3%) | 6 (46.2%) |
| | Sometimes (1-2 times/month) | 3 (21.4%) | 2 (15.4%) |
| | Rarely (few times/ year) | 0 | 2 (15.4%) |
| | Never | 0 | 0 |
| 3 | **In the past 12 months, how often did your household run out of food with no money to buy more?** | | |
| | Never | 11 (78.6%) | 5 (38.5%) |
| | Rarely (few times/year) | 0 | 1 (7.7%) |
| | Sometimes (few times/month) | 1 (7.4%) | 5 (38.5%) |
| | Often (few times/week) | 2 (14.3%) | 2 (15.4%) |
| | Mostly (most days) | 0 | 0 |
| 4 | **In the past 12 months, how often did you worry about where food would come from?** | | |
| | Never | 7 (50%) | 4 (30.8%) |
| | Rarely (few times/year) | 2 (14.3%) | 4 (30.8%) |
| | Sometimes (few times/month) | 4 (28.6%) | 3 (23.1%) |
| | Often (few times/week) | 1 (7.4%) | 2 (15.4%) |
| | Mostly (most days) | 0 | 0 |
| 5 | **In the past 12 months how often did your household eat 6 food groups in one day?** | | |
| | Mostly (most days) | 2 (14.3%) | 0 |
| | Often (few times/week) | 4 (28.6%) | 1 (7.7%) |
| | Sometimes (few times/month) | 3 (21.4%) | 2 (15.4%) |
| | Rarely (few times/year) | 1 (7.4%) | 4 (28.6%) |
| | Never | 4 (28.6%) | 6 (46.2%) |
| 6 | **In the past 5 years, has the diet diversity in your household increased or decreased?** | | |
| | Increased significantly | 3 (21.4%) | 0 |
| | Increased slightly | 2 (14.3%) | 1 (7.7%) |
| | Remained the same | 9 (64.3%) | 11 (84.6%) |
| | Decreased slightly | 0 | 1 (7.7%) |
| | Decreased significantly | 0 | 0 |
| 7 | **In the past three years has your household experienced an increase or decrease in frequency of illness.** | | |
| | Decreased significantly | 1 (7.4%) | 1 (7.7%) |
| | Decreased slightly | 8 (57.1%) | 8 (57.1%) |
| | Remained the same | 3 (21.4%) | 2 (15.4%) |
| | Increased slightly | 1 (7.4%) | 1 (7.7%) |
| | Increased significantly | 1 (7.4%) | 1 (7.7%) |

Table 8 presents the respondents answers disaggregated by adopter group. Twelve (85.7 %) adopters indicated having never skipped a meal in the past 12 months due to scarcity of food, while 5 (38.5%) of non-adopters responded similarly. When asked how often the household eats three meals per day in question 2, 64.3% (9) adopters indicated eating three meals everyday compared to 23.1% (3) non-adopters. The majority of the remaining non-adopters however, indicated eating three meals in a day several times per week. Question 3 asks participants how often their households "ran out of food" combined with a lack of money to purchase more. At the time of enumeration, it was stressed that "ran out of food" referred to empty "kholas" (cereal storage rooms) and non-producing gardens. Eleven (78.6%) of 14 Permaculture adopters indicated that this never happened to them in the past 12 months, while 5 (38.5%) of 13 non-adopters answered the same. Nearly 54 % of non-adopters responded that their households ran out of food and money either a few times per month or a few times per week.

Question 4, regarding participant anxiety over predictability (Coates, Webb & Houser, 2003) showed no significant difference between adoption groups. Nine (64.3%) adopters and 8 (61.6%) of non-adopters indicated that they either never worry about where food will come from or if they do it is a few times per year. No participant indicated experiencing anxiety of acquisition of food on a daily basis.

Question 5 was included in order to evaluate how often participants eat 6 food groups, as promoted by the PNM and by the Ministries of Education and Agriculture. The responses showed that only 2 participants, both adopters, eat six food groups every day. Four adopters eat six groups a few times a week, compared to 1 non-adopter while the remaining participants eat six food groups a few times per month or less. Six participants indicated an increase in diet diversity over the past 5 years, while the majority of participants showed no change in diet.

However, this question was difficult to enumerate, as most participants did not understand the concept of "diet diversity". Where participants did not answer, or did not understand, it was assumed that their diets have not changed. This question indicated an area that would have significantly benefited from more in-depth pre-testing. Interestingly, of those who did understand the concept and indicated an increase, 5 out of 6 were adopters.

Responses to the 7th question regarding frequency of illness in the household showed no significant difference between adopter groups. Only 1 non-adopter and 1 adopter indicated that disease has decreased significantly over the past three years, while 16 participants, split evenly between the two groups, indicated a slight decrease in illness. Examination of the qualitative data showed that 8 participants indicated that either they "don't know why" the amount of illness has increased, and/or that it a result of "God's will". Seven of these participants are non-adopters and 1 is an adopter. In contrast, of those participants who attribute "increase in food availability" or "increase in diet diversity" for the reason behind a decrease in illness, 8 of 10 are adopters. This qualitative examination of responses suggests that non-adopters tend to be more fatalistic when it comes to health than adopters- who have indicated causality between quantity and quality of food ingested and frequency of household disease as a reason for decreased household illness

One woman, an adopter from Kanengo (ID19) with a food security score of 27, said "the disease has decreased in the household because we are eating six foods and it is helping our bodies." The same woman, however, admits that before she joined the social group, she believed that only people infected with HIV/AIDS should eat six food groups.

> "In the past whenever we saw someone eating six food groups we thought that they were HIV positive. We would go and tell our friends that these people eating six food groups were HIV positive. Now we see if a child is suffering from malnutrition we go and tell their parents how to take care of them. Sometime we try to buy beans and

> maize and groundnuts to make Likuni phala [porridge] to help them with malnutrition." (ID19)

Another adopter from Monkey Bay (ID11) said,

> "In the past I was relying on only one type of food. In our culture, we just rely on one type of food…so people in the morning rely on frying maize, all the time. In the morning, in the afternoon, nsima [maize meal], and in the evening nsima and all of the time only with one ndiwo [side dish]. (ID11)

More fatalistic responses attributed either no change in illness or a decrease in illness to God. A non-adopter (ID27) said, "I don't know, maybe it is because of God," while another non- adopter from Kanengo said, "It has remained the same because God has loved us and we are not suffering."

**Regression Analysis: Food and Nutrition Security Score**

| Variables | Unstandardized Coefficient. B | t | P value / sig. |
|---|---|---|---|
| *Adoptscore* | **.216** | **2.919** | **.008** |
| *Acres_owned* | **.423** | **.587** | **.563** |

While this research is not suggesting that Permaculture adoption is the only means to achieve a desirable quality of life in rural Malawi, it has sought to identify the benefits that adopters have experienced, especially in this primary area of focus: food and nutrition security. A regression analysis model, where *FNS* score (FNSS) is the dependent variable and *income, acres_owned,* and *adoptscore,* are the independent variables, finds that the FNSS is positively associated with Permaculture adoption score and with landholdings, albeit weakly. In this model, a 10 unit change in adoption score is associated with a 2.2 unit increase in FNSS. The model is statistically significant at the .05 level. *Income* has neither a positive or negative association with adoption score as there is not enough variance in the data. *Acres_owned* showed a slightly positive association with adoption score where a 10-acre increase in land

holding is associated with a 4 unit change in FNSS. The model is not statistically significant and *acres_owned* is not a significant predictor of food and nutrition security.

Permaculture adoption is positively associated with acres owned, holding constant other factors. It is not, however, associated with income. This suggests that, at present, those with larger land holdings have been better able to put Permaculture teachings into practice than small farmers. The food and nutrition security regression analysis, however, has also found that food and nutrition security scores, again holding constant other factors, are positively associated with Permaculture adoption, weakly associated with landholdings, and not associated with income. This finding has considerable implications, suggesting, most likely, that those lower income farmers with smaller holdings who *are* able to introduce Permaculture practices are more likely to benefit from food and nutrition security than wealthier farmers who do not.

The regression analysis supports the theoretical approach to Permaculture, which aims to optimize yields using available space and without dependence on expensive external inputs, by showing that income and acres owned are not predictors of FNSS. Interviews with adopters support the quantitative data as several participants attributed their increase in yields and in diet diversity to their increasing Permaculture practices. The highest female adopter, (ID 5) said this:

> One reason that I used to eat poorly was because I was very poor and I didn't know the food. I also didn't know Permaculture. Permaculture has helped me because I have learned about different food and about keeping different food, and now I know how to feed the soil and it has helped me to grow my family well without any problems.

Similarly, an adopter from Chitedze (ID6) said that the increase in diet diversity in his household is because they have "changed the environment so that the foods are more readily available." The greatest benefit of Permaculture adoption, however, is best concluded but by four different adopters (ID5, ID11, ID17, ID19) who all indicated separately, "there is no hunger season in this household."

## CONCLUSION

**OVERARCHING QUESTION**: *What are the characteristics of Permaculture adopters?*

The research has found that about 50 percent of those exposed to Permaculture, have adopted some portion of the Permaculture practices being promoted in the country. Only two participants emerged as "high adopters," while the remaining adopters have employed a handful of practices. All participants are landowners, but adoption scores are positively associated with acres owned and negatively associated with acres rented. Because Permaculture is permanent agriculture, the perception of secure access to agricultural land has allowed land owning adopters to experiment with soil fertility techniques and improve their soil organically without fearing that their efforts will be wasted.

While Permaculture adoption is positively associated with age and land owned, it is not predicted by years of education, Permaculture certificates or monthly income. Thirteen of 14 adopters, however, did indicate earning a monthly salary via off-farm income generation activities. The positive association between age and adoption coupled with no association with years of education may suggest that adopters received a better quality education in different political eras as the PNM suspected.

Men scored a mean of 4 points higher than women on the adoption scale and could be explained by the fact that most participants with secondary source of exposure to Permaculture are men. Many participants indicated that while many women carry out the farm labor, the approach to farming is defined by the man in the family. Accepting this to be true, women who are exposed to Permaculture and would like to adopt Permaculture practices must seek permission from their husbands who may not have been exposed.

**SUB-QUESTIONS 1 & 2**: *What are the constraints and barriers to Permaculture adoption and how have adopters overcome them?*

Permaculture is very different from contemporary agricultural practice and requires overcoming cultural barriers associated with being "different". For the most part, adopters who indicated facing ridicule from friends, family, and neighbors, were able to do so because they had visited demonstration plots on several occasions and had seen for themselves the benefits that Permaculture practice brings.

While land ownership/tenure was identified by participants to be a prerequisite for Permaculture practice and the biggest constraint to practice, this perception may not be well grounded in reality. One hundred percent of participants own the land on which their houses sit, but only a few use the land immediately surrounding their homes for agricultural purposes. Not only is it part of Malawian culture to keep the area around the house swept and "clean" to reduce the spread of disease but also, focus group participants indicated that this emphasis on "cleanliness" is promoted and reinforced by health officers who visit their villages and homes. Participants feel that the competing messages of Permaculture practitioners and health extension officers were confusing. The very few participants who grow food on land they own and which surrounds their homes, identified moral support from demonstration plot owners as their source of encouragement (ID5, ID15, ID11, ID17) or repeated and/or elongated exposure to Permaculture via demonstration plot visits / employment (ID5, ID15, ID8).

The literature identified *access to information* as a primary factor associated with adoption of yield increasing techniques. When asked why Permaculture is difficult to adopt, many participants indicated that lack of education plays a significant role. The data shows that the method of exposure to Permaculture plays an important role in adoption as most adopters have a secondary source of exposure such as working at a demonstration plot or participation in a certificate course in addition to living near a demonstration plot. The two participants with the

highest adoption scores indicated their continued exposure or support from PNM members as a source of support in making these agricultural changes, while many low adopters indicated that visiting the demonstration plot a number of times, in some cases over a number of years, has provided them the confidence to adopt particular practices. This would suggest, as does the literature, that adopters have benefited increased access to information and skills,

**SUB-QUESTION 3***: What are the benefits for Permaculture adopters?*

Food and nutrition security scores have shown to be positively associated with adoption scores. Both quantitative and qualitative data have shown that adoption of these practices have led to tangible benefits which the adopters themselves appreciate in terms of both quantity and quality of food and regardless of income or education. Adoption scores were found to be associated with acres owned but qualitative analysis of yields (as recalled by participants), showed that 11 of 14 adopters had increasing yields over the past five years compared to 2 of 13 non-adopters. Because farm size was taken into consideration when calculating increasing yields, this data suggests that increasing yields are not a function of increasing acreage but other factors such as intensification and/or increased soil fertility. It is important to reiterate that participants had a difficult time recalling yields of all food grown, but had an easy time recalling yields of maize or staple crop. However, the quantitative data, supported by the qualitative data, suggests that participants who have adopted Permaculture practices have benefited not only in terms of caloric intake through staple crop consumption, but also in terms of dietary diversity. Overall, adopters scored an average of 5 points higher on the 28-question food and nutrition security questionnaire. Additionally, only participants in the adopter category both grow and consume six food groups.

**SUB-QUESTION 4***: Can food and nutrition security be predicted by Permaculture adoption?*

The regression analysis model suggests, with statistical significance, that food and nutrition security can be predicted by adoption score- holding other variables constant. This finding suggests that farmers who have been able to adopt Permaculture practice, despite lower income and fewer acres owned likely benefit more from improved food and nutrition security compared to wealthier (income and land) non-adopters.

### APPLICABILITY AND QUESTIONS FOR FURTHER RESEARCH

As the contemporary agricultural system continues to degrade what is left of Malawi's forests, erode precious remaining top soil, and contaminate vital water sources, Malawians remain food insecure at the household level. The School Health and Nutrition Strategy seeks to address this problem holistically while other offices within the government seek to temporarily bandage this problem by subsidizing fertilizer and promoting the dangerous and destructive modernist approach. The findings in this research will prove useful to those involved in Permaculture initiatives in Malawi, such as the MoEST's School Health and Nutrition Strategy, but also in its ability to contribute to the continuing discussion on sustainable agriculture and food and nutrition security. The conventional wisdom regarding improved food and nutrition security is centered on provision of external inputs for increased yield and income generation (perhaps through agriculture) rather than and assets-based intensification of Malawi's existing agricultural diversity for self sufficiency. In a country where nearly 90 percent of the populations are farmers, all food groups exist in nature and there is a twelve-month growing season, household food and nutrition security should not be the biggest threat to development. This study of Permaculture positive deviants has shown that adoption of more intensified planting strategies combined with organic fertilization and nutrition education has likely

increased respondents food and nutrition security by increasing agricultural yields and diversifying food production and consumption. As agricultural lands become scarcer due to increased population density, the need to optimize growing space in a sustainable way becomes even more needed that is already has been. Permaculture theory and practices has demonstrated to be beneficial to Malawian farmers and it has to many others worldwide.

The rapidly increasing number of demonstration plots spread throughout the country due to the MoEST pilot program will increase the number of Malawians exposed to Permaculture and provide, as it did these participants, a source of encouragement to make agricultural change. Similarly, organizations wishing to use Permaculture or other sustainable agriculture approaches in Malawi should consider the results of this research and establish several demonstration gardens in project areas. Additionally, training should be aimed not only at the poorest of the poor, but also landowners who have shown to be better able to adopt Permaculture practices. Because the MoEST is promoting this approach nationally, there should be intersectoral support of the initiative within the other ministerial department, especially from the Ministry of Agriculture and Food Security. In the same manner that maize, soy beans, and cassava are studied empirically, a full study of a Permaculture demonstration plot should be undertaken at one of Malawi's many agricultural research stations. The long-term study should collect data measuring labor, inputs, soil fertility, and should include and analysis of the nutritional value foods produced.

Qualitative data showed that participants who own their own land are more willing to experiment with soil fertility practices but very few are willing to introduce food plants to the land immediately surrounding their homes for fear of insects and disease. With agricultural lands at a premium, optimizing food production land is necessary for household food and

nutrition security. Claims by MoH extension officers that planting food near the home is unsanitary and leads to disease should be empirically investigated. Results of this investigation should inform health extension officers work and be used in collaboration with the MoEST pilot program.

## CONCLUSION

There is a small faction of people who believe, the PNM included, that the resources for development- including food and nutrition security- already exist within each community, organization and country. Positive Deviance and Permaculture, as ideologies, are very similar in that they are both assets based approaches and represent significant paradigmatic shifts from contemporary development thought. Malawi is a rich country when looked at through the lens of Permaculture. Malawi does not need to rely on Jeffrey Sachs to build a Millennium Village or on the United States or China for agricultural inputs but rather Malawi and Malawians should make use of the what assets already exist by mimicking the ecological processes, interactions and services of its ecosystems while using appropriate science and technology to enhance agricultural understanding and production. The result, as it has been for some Permaculture adopters, will be an agriculturally productive, diverse, and environmentally benign food system that will allow for a healthy labor force and true “bottoms-up” development.

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# APPENDICES

## APPENDIX A: AUTHOR'S PERSONAL EXPERIENCE

This research has evolved as a result of an 8-month practicum working with a small community education center called Never Ending Food (NEF). NEF was founded, in 2006, by the husband and wife team of Kristof and Stacia Nordin who came to Malawi as Peace Corps volunteers in 1997. Kristof, a social worker by training, and Stacia a nutritionist, were placed as HIV/AIDS educators at the local clinic in the village of Chitedze. Over the course of their work with HIV/AIDS and other patients, the Nordin's found many of the problems and illnesses that patients experienced were a consequence of poor nutrition.

In order to address nutrition related illnesses, the Nordins expanded their teaching curriculum to include the importance of diversified diet- as the Malawian diet consisted of nearly three-quarters plate processed maize meal. They soon discovered that when advocating for diet diversification, one must also include the practical problem of access to a diverse food base. In response to poor access to diverse foods and the national focus on staple crop production, the Nordins began looking for methods and approaches to agriculture that increase farmers access to nutritious food, reduce dependency on maize and external inputs, and could be cultivated on a small plot of land. In their search, the Nordins found that all of the resources needed for a nutritious and healthy lifestyle were growing indigenously in Malawi and that it was only in the past one hundred years that Malawi began to have nationwide problems with hunger caused by soil infertility and volatile environmental factors such as drought and flooding. In their search for a holistic, assets-based approach to improving the nutrition status of the population of people served by the Chitedze clinic, the Nordins found Permaculture.

Permaculture offers a means for the average Malawian farmer to diversify his/her diet and increase their health with only a small amount of land and without relying on external inputs to improve soil fertility. In addition, Permaculture offers a strategy for bottom-up development by creating a healthy, nourished labor force free from the barriers of food and nutrition insecurity and expensive agricultural inputs. Seeing Permaculture as a response to their immediate concerns at the Chitedze clinic as well as to other barriers to development that Malawi faces, the Nordins contributed significantly to strengthening the already established Permaculture Network in Malawi (PNM). Today, the PNM has nearly one hundred members, many of whom are organizations that serve thousands of Malawians. Permaculture is slowly gaining recognition in Malawi (and worldwide) as a form of sustainable agriculture that holistically addresses issues of food and nutrition insecurity as well as decreased soil fertility, dependence on external agricultural inputs, deforestation, HIV/AIDS infection rates and can improve the lives of people living with HIV/AIDS (PLWHA).

I interned with Never Ending Food for a total of 8 months. My role in the organization consisted of a month long introduction, both theoretically and practically, to Permaculture in the Malawi context. I assisted in facilitation of trainings and performed consulting jobs throughout Malawi on NEF's behalf. My two largest projects were:

- A several month consultancy for Children in the Wilderness- an organization that seeks to provide Orphans and Vulnerable Children (OVC's) with a unique summer camp experience. The camp curriculum is expanding to include life skills and as a result they have contracted the work of NEF to assist in integrating Permaculture into the organization.

- Design and implementation of the Model Village, the newest NEF project in which I worked with neighborhood children to design a sustainable food producing system from which tenants will learn the principles of Permaculture and therefore use available resources to produce nutritious food for free.

Living in Malawi for nearly a year allowed me to see the agricultural cycle as currently practiced by most Malawians. Comparing this cycle with the principles and practices of Permaculture left me wondering about the wisdom of the conventional method. I saw neighbors labor in the fields to prepare them for maize cultivation, wait for the rains to come, and then harvest maize in the early dry season. So many of these neighbors did not produce enough maize for both home consumption and for agricultural sales, which is often their only means to earn money for school fees and medical bills.

Throughout my internship, the theme of adoption was omnipresent. Why do some farmers see the agricultural and nutrition benefits of Permaculture while other do not? More interestingly, why do some farmers acknowledge the benefits but continue to practice agriculture and nutrition using the conventional Malawian approach? There were times that I wondered why something which seemed so obvious to me as an outsider, was so difficult for an insider to practice? Of course, I knew the answer was not simple. I decided to focus on what makes those few farmers who have adopted Permaculture practice different and in the search to find a research method that, like Permaculture, was assets based, I was introduced to the concept of Positive Deviance.

## APPENDIX B: DESCRIPTION OF EVALUATED PERMACULTURE PRACTICES

1. **Grey Water Use**: Water is a valuable resource that is often wasted. Grey Water is water that has already been used for household activities such as cooking, mopping, bathing, laundry etc. This water, which does not contain toilet discharge or high concentrations of toxic chemicals, can be used/drained into food producing garden beds for year round production. *Farmers who use grey water year round food production received one point.*

2. **Water Harvesting**: "Water harvesting" is the process of collecting and concentrating runoff water from a runoff area into a run-on area, where the collected water is either directly applied to the cropping area and stored in the soil for immediate use by the crop, i.e. runoff farming, or stored in an on-farm water reservoir for future productive uses, i.e. domestic use, livestock watering, aquaculture irrigation. *Farmers who store water (either in a container or in the soil) for agricultural production received one point for each method used. Ex. those who both store water in a container and in the soil received two points.*

3. **Irrigation:** Irrigation, the act of supplying water (clean and/or grey) to production zones, is typically not practiced in Malawi. *Farmers who irrigated food production areas for year round harvesting received one point.*

4. **Soil Conservation**: According to the World Bank, Malawi looses 20 metric tons of top soil per hectare, per year. In order to conserve topsoil, the PNM teaches the following practices:

    a. **Mulching:** Any substance that is spread or allowed to remain on the surface of the soil effectively protecting the soil from the erosive and dehydrating effects of wind and sun can be defined as mulch. The technique also reduces weeds, saving time and energy.
    b. **Reduced Sweeping:** It is a common cultural practice in Malawi and elsewhere to sweep organic matter away from the house leaving a large area of exposed, dry, hard soil. This practice reduces potential food production zones, leaves rooftops exposed to damaging winds, and weakens the structural integrity of houses by removing soil from the foundation.
    c. **Zero burning of organic matter:** Many Malawians practice slash and burn agriculture. Due to increasing land pressure, fallow periods for soil regeneration are not an option resulting in the erosion and depletion of soils. The PNM encourages the slash and mulch method, which returns nutrients to the soil and protects it from erosion.
    d. **Reduced/Zero tillage:** Tilling the soil removes organic matter that protects the soil from the eroding effects of wind, water, and sun. Many Malawians plant their maize in neat, tilled rows that damage the topsoil, exacerbate erosion and drought, and reduce food production area.
    e. **Swales / Vetiver:** A swale is a wide depression in the ground used to stop and sink flowing water. It is a permanent feature (as opposed to the typical “Boxed Ridges” used in Malawi) and is usually highly vegetated with long-rooted plants, such as vetiver grass, to strengthen the structure.
    f. **Trees planting:** Planting trees is a widely known method for conserving soil and preventing soil erosion.

g. **Other:** Participants were asked to identify any other practices they may have employed to prevent soil erosion.

*Participants received one point for each of the above soil conservation technique employed.*

5. **Soil Fertility:** There are many effective ways to add fertility to soil without depending on chemical fertilizers. Some of the commonly used methods are:

    a. **Incorporation of leguminous plants:** It is widely known that incorporating leguminous plants into the garden fixes nitrogen into the soil. Studies have found that such practices are as effective, if not more effective, than high cost chemical fertilizer.
    b. **Compost/organic manure:** The use of compost or organic manure, made from decomposed household scraps, agricultural by-products, human and animal excrement, and any other organic matter, adds nutrient rich soil well suited for gardening and farming. *Participants who make compost received two points and those who throw composed organic matter on their soil (as opposed to burning it) received one point.*
    c. **Animal manure:** Many Malawians have access to goat, sheep, chicken and cow manure.
    d. **Manure teas:** Manure teas provide soluble nutrients which can be used as a liquid fertilizer
    e. **Other:** Participants were asked to enumerate any other measures taken to improve soil fertility.

    *Participants received one point for each of the above methods employed to add nutrients to their soil.*

6. **Diet Diversity- consumption and production:** The practice of Diet Diversity was evaluated by assessing both the production and consumption of a diverse diet through Permaculture methods.

    a. **Increased diet diversity:** Never Ending Food and the PNM focus heavily on improving nutrition through Permaculture practice. The average Malawian consumes nearly 75 % of daily caloric intake from carbohydrates from staple crops such as maize (Sauer, Tchale, & Wobst, 2005) Increased diet diversity is a key Permaculture practice in Malawi.
    b. **Growing five/six food groups:** In Malawi, where most farmers are subsistence farmers, the only means to consuming six food groups is to produce them. Protein does not have to come from an animal source and this was taken into consideration when evaluating participants adoption rates and production of food groups.

    *Participants received 2 points for indicating consumption of 6 food groups on a daily basis. Those who reported eating six food groups a few times per week received one point. Of those participants who received point for consumption of 6 food groups, 2 points were assigned to*

*those growing 6 food groups and 1 point to those who grow 5 as long as at least one included the production of a protein source.*

7. **Three Season (year round) Harvesting:** Economically speaking, a majority of the fields in Malawi are productive for only one month; the harvest month. Permaculture encourages "permanent agriculture" and results in harvest during all three of Malawi's seasons. This practice does not have to include an irrigation method, but rather a knowledge of Malawi's indigenous edible plants- which are available for harvest throughout the year. *Participants who harvest food year round were given 3 points.*

8. **Guild System:** The guild system is unique to Permaculture and is a method of intercropping by manipulating natures systems for food production. This concept is a key component to food production using the Permaculture method while including soil fertility, optimum use of space, and plant protection in the garden bed design. The seven parts of the Permaculture guild are:

    a. **Food for humans:** The MoE promotes a diverse diet based on 6 food groups and each garden bed should be designed to include as many food groups as possible.
    b. **Food for the soil:** Plants and organic matter that add nutrients to the soil such as nitrogen fixing plants, decaying matter, compost, compost tea, mulch, manure, etc increase the soil fertility, reduce cost associated with fertilizer, and can reduce labor.
    c. **Diggers:** Deep or wide rooted plants or animals, such as trees and chickens, will dig into the soil allowing water and beneficial insects in as well as bring minerals to the surface. In Malawi common diggers are cassava, sweet potatoes, yams, any trees.
    d. **Ground Cover:** These plants protect the soil from the eroding effects of wind, rain, and sun, while holding in the moisture and often providing food. Additionally, a good groundcover can prevent unwanted plants from growing in the guild. Sweet potato vines, pumpkin, cucumbers are just a few examples of groundcover that grow well in Malawi. Mulch can also be a groundcover.
    e. **Climbers:** Incorporating plants that produce food vertically increases the amount of food one can harvest from limited soil space, thus creating a new food production space. Climbers such as beans, passions fruit, loofa, air potatoes, and cucumbers grow well Malawi.
    f. **Supporters:** Every climber needs a supporter and this should be considered when planting the guild. Supporters can be food producing or nutrient fixing plants/trees or a supporter could be a house, bathing room, fence, etc.
    g. **Protectors:** Anything that protects the guild, is a protector. Such protecting plants include thorns, flowers, strong smelling plants. Protectors could also include beneficial specials such as frogs, birds, lizards, etc.

    *Participants were awarded seven points only if they are using all seven parts of the guild (all or nothing). Participants not employing the entire guild system received no points.*

9. **Zone System:** The Zone system is a method of organizing labor and conserving valuable resources, especially energy. There are six parts to the Permaculture Zone System, which can be thought of as concentric circles moving out from the center of energy, Zone 0.

a. **Zone 0:** This zone is the source of energy and is typically the house. Resources available in this area are usually human labor, grey water, food scraps, etc. Permaculture principles that apply in this zone include a reduction of energy consumption, such as electricity, as well as energy expenditure, such as labor-intensive practices. Water should be conserved and used as many times are possible.
b. **Zone 1:** Plants in this zone require constant input or receive daily attention. This area is typically fully mulched, and well pruned. Annuals, culinary herbs, chicken laying boxes, propagation areas and kitchen-scraps compost are just a few examples of what could be in this labor intensive zone. These plants should be planted within 6 meters of the house or Zone 0 and this is where nature is arranged to serve human needs.
c. **Zone 2:** Plants/crops that require less energy, less water than zone 1 plants are planted in Zone 2. Perennials, including fruit trees, large compost piles, and beehives are a few examples of what might be included. This area is typically spot-mulched and infrequently irrigated.
d. **Zone 3:** This zone is considered to be the "farm zone", where commercial or subsistence, rain-dependent staple crops are planted. Maize, millet sorghum, nitrogen fixing trees as well as other parts of the guild should be planted in this zone- where very little input is required. A heavy mulch and good ground cover should reduce weeding, protect the soil from gaps in the rain, wind erosion, etc.
e. **Zone 4:** This area can be used for grazing animals (milk cows, goats, etc) and should be semi-wild. It is lightly managed for wild gathering for fuel needs for the house, pasture or range. Trees in this zone could be incorporated through low-input methods like coppicing.
f. **Zone 5:** This is an area left untouched to serve as a natural habitat for wildlife. This zone is a natural unmanaged environment used for observation and land regeneration and is where practitioners learn and live the first Permaculture principle- to work with nature rather than against nature.

*Participants who partially employ the zone system were given one point for each zone used. Where participants have 4 or more zones, 5 points were awarded because of the impracticality of Zones 4 and 5 in Malawi.*

10. **Pest Management System:** Conventional agriculture promotes the use of chemical pesticides/insecticides to rid plants of disease and ALL insects thus destroying the balance that exists in ecosystems. Permaculture promotes use of natural pest management systems based on the principle that using natural predators and protection measures reduce toxicity and dependency on external inputs[*]. Natural pest management methods promoted by the PNM include:

    a. **Strong smelling plants:** Using strong smelling plants such as basil, tephrosia, marigolds, garlic, lemon grass, and hot peppers discourages certain predators from attacking food plants. Some of these examples are also edible thereby serving two purposes when planted in the guild.

[*] A famous and favorite phrase of Bill Mollison's, the founder of Permaculture, is "you don't have a snail problem, you have a duck deficiency."

b. **Strong smelling water:** Natural "insecticides" can be made by crushing strong smelling plants, such as those mentioned above, and mixing them into a watering can. When this mixture is allowed to sit overnight and then sprinkled on the plants, insect damage will likely stop.
c. **Strong smelling mulch:** Any strong smelling plant can also be used as a protective mulch by sprinkling it through garden beds.
d. **Encouragement of beneficial species:** Creating and attractive place for birds, lady bugs, lizards, etc to live restores the balance of nature. This is a process that may take as long as a year to realize the benefits but once restored labor and losses should be drastically diminished. Most insects are good for the garden and minor insect damage is natural.
e. **Intercropping:** As mentioned previously intercropping, or companion planting as it is sometimes called, not only protects plants by producing a strong smell that is confusing and discouraging to insects but it also reduces the likelihood that an entire crop of one plant will be destroyed. This is because the plants are not all located in one place. Moncropped beds of carrots might be a complete loss if discovered by the carrot fly, but intercropped with leeks and other plants the carrot fly is discouraged.
f. **Live fencing:** In Malawi, where livestock roams free, a fence is an essential component to any pest management system. A living fence, made of any combination of impenetrable living plants require energy only during the initial stages. Once established, a living fence will provide protection without intensive labor, permanently. The straw fence method that is typically used in Malawi must be replaced each year.
g. **Other**: Participants were asked to identify other pest management practices employed which were consistent with Permaculture values and were given one point for each.

*Participants were given one point for each of the above practices employed.*

*11.* **Use of localized/indigenous varieties:** The PNM promotes the use of plants that have been hybridized by nature since the beginning of time. Localized and indigenous plants are more resistant to pest, disease, and environmental factors. Malawi has over 600 documented edible food that exist in nature, the majority of which are under-used. *Participants received one point if they indicated use of localized/indigenous plants.*

*12.* **Knowledge dissemination:** One important Permaculture principles is to share knowledge and ideas with neighbors, friends, and family. *Participants who qualified as "adopters" on the basis of earlier responses, received one additional point if they indicated sharing knowledge with others.*

**APPENDIX C: PRECONFIGURED QUESTIONNAIRE AND INTERVIEW GUIDE**

## BACKGROUND INFORMATION AND DAILY PRACTICES QUESTIONNAIRE

Name_____M/F_____Date_____

Year/ Date of Birth_____

Place of Birth_____

Place raised_____District_____Tribe_____

Location of Interview_____

Address _____

Phone number_____ email_____

| NO. | QUESTION | RESPONSE | RESPONSE OPTION |
|---|---|---|---|
| **Background Information** | | | |
| 1. | Have you ever lived outside of Malawi? | | a. yes<br>b. no |
| 1a. | If yes, where did you live and for how long? | **Location** | **Yrs.** |
| | | | |
| | | | |
| | | | |
| 2. | What is your religion? | | 1. Chose not to disclose<br>2. Christian<br>3. Muslim<br>4. Bahai<br>5. Other |
| 3. | What is your highest level of education? | | 1.Primary<br>2.Secondary<br>3.College, trade or technical school<br>4.University<br>5.Post graduate |
| 3a. | Please indicate, to what level you have completed. | | Ex. Standard 4, Form 3, etc. |
| 3b. | If you have marked 3, 4, or 5, please indicate what courses you primarily studied. | 1. | |
| | | 2. | |

| NO. | QUESTION | RESPONSE | RESPONSE OPTION |
|---|---|---|---|
| | | 3. | |
| 4. | Have you participated in any certificate courses? | | a. yes<br>b. no |
| 4a. | What certificate courses have you participated in? (If possible, please list those related to agriculture/nutrition/food production) | 1. | |
| | | 2. | |
| | | 3. | |
| | | 4. | |
| 5. | Are you employed? | | a. yes<br>b. no |
| 5a. | If yes, where are you employed and what is your position? | **Employer** | **Position** |
| | | | |
| 6. | What is your primary source of income? | | 1. Agricultural sales<br>2. Job<br>3. Ganyu<br>4. Friends / Family<br>5. Other (if so, please specify) |
| 6a. | From what other sources do you receive a monthly income? | | 1. Agricultural sales<br>2. Job<br>3. Ganyu<br>4. Friends / Family<br>5. Other (if so, please specify) |
| 6b. | What is your average monthly income? | | 1. Less than 5,000 MK<br>2. Between 5,000-14,999 MK<br>3. Between 15,000-49,000 MK<br>4. Above 50,000 MK |
| 7. | How many dependents do you support? | | Please include all children you are currently supporting or guarding |
| 8. | What is your marital status? | | 1. Never been married<br>2. Married<br>3. Separated or divorce<br>4. Widow / Widower |
| 9. | Do you own or rent the home that you live in? | | 1. own<br>2. rent<br>3. living with friends/family |

| NO. | QUESTION | RESPONSE | RESPONSE OPTION |
|---|---|---|---|
| 9a. | If you own land, how much land do you own? | | Please indicate acres or hectares. |
| 9b. | If you rent land from someone else, how much land do you rent? | | Please indicate acres or hectares. |
| 10. | How much land did you have under food production during the most recent rainy season? Please include both owned and rented land. | | Please indicate acres or hectares. |
| 10a. | In the past five years, has the amount of land on which you produce food increased or decreased? | | 1. Increased significantly<br>2. Increased slightly<br>3. Remained the same<br>4. Decreased slightly<br>5. Decreased significantly |
| 10b. | What are the contributing factors to a change in the amount of land you have under cultivation / food production? | | |
| 11. | In what year did you first learn about Permaculture? | | Please indicate the year to the best of your ability. If you can not remember, please give your best guess. |
| 11a. | Who or what organization first exposed you to Permaculture? | | 1.Kristof & Stacia Nordin<br>2.Never Ending Food<br>3.Permaculture Network In Malawi<br>4.Other (please specify) |
| 11b. | Where was your exposure to Permaculture? | LOCATION | |
| **DAILY PRACTICES: WATER CONSERVATION & HARVESTING** | | | |
| 12. | Do you use your waste / grey water? | | a. yes<br>b. no |
| 12a. | If no, where do you put your waste / grey water and why? | | |

| NO. | QUESTION | RESPONSE | RESPONSE OPTION |
|---|---|---|---|
| 12b. | If yes, approximately what percentage of grey water do you use? | | 1. 100%<br>2. More than half<br>3. About half<br>4. Less than half |
| 12c. | Where do you redirect grey water or waste water? | | 1. Food producing garden bed<br>2. Flower pots and beds / grass<br>3. Swept / unproductive ground<br>4. Drain / off your property<br>5. Other (please list) |
| 13. | Do you harvest or collect rainwater? | | a. yes<br>b. no |
| 13a. | If no, what happens to the rainwater on your land? | | |
| 13b. | If yes, where do you store harvested/collected water? (check all those that apply) | | 1. Water tank<br>2. Soil<br>3. Dam<br>4. Other (please list) |
| 14. | Do you irrigate your munda, kitchen garden or other? | | a. yes<br>b. no |
| 14a. | If no, what are the contributing factors to not irrigating? | | |
| 14a. | If yes, what methods do you use? | | 1. Water can<br>2. Drip irrigation (bottle/unglazed pot)<br>3. Gravity<br>4. Other (please specify) |
| 15a. | What do you irrigate? | | 1. Kitchen garden<br>2. Zones 1-2<br>3. Grass & flowers<br>4. Trees only<br>5. Other (please list) |
| 15b. | How large is the irrigated area? | | Please indicate the unit of measurement.<br>Ex. .5 acres, one-quarter hectare, etc. |

| NO. | QUESTION | RESPONSE | RESPONSE OPTION |
|---|---|---|---|
| 15c. | Approximately how many times per day do you water during the dry season? | | 1. 2-3 times per week<br>2. Once per day<br>3. Twice per day<br>4. More than twice per day<br>5. Other (please specify) |
| 15d. | In the past five years, has the amount of water used for irrigation on your land (owned and/or rented) increased or decreased? | | 1. Increased significantly<br>2. Increased slightly<br>3. Remained the same<br>4. Decreased slightly<br>5. Decreased significantly |
| 15e. | If you indicated a change in the amount of water used per unit of land in the past five years, please list the main contributing factors. | 1.<br>2.<br>3. | |
| 16. | Where does your irrigation water come from? | | 1. Borehole<br>2. Well (chitsimi)<br>3. Lake / Dam / Lagoon<br>4. City water (tap)<br>5. Other (please list) |
| 16a. | Approximately how far must you travel to get irrigation water? | | Please indicate the unit of measurement.<br>Ex- .5K, 500 meters, etc. |
| 17. | Where does your drinking water come from? | | 1. Borehole<br>2. Well (chitsimi)<br>3. Lake / Dam / Lagoon<br>4. City water (tap)<br>5. Other (please list) |
| 17a. | Approximately how far must you travel to get drinking water? | | Please indicate the unit of measurement.<br>Ex- .5K, 500 meters, etc. |
| **DAILY PRACTICES: SOIL CONSERVATION & FERTILITY** | | | |
| 18. | Does your land have problems with soil erosion? | | a. yes<br>b. no |
| 18a. | If yes, what are the contributing factors? | | |

| NO. | QUESTION | RESPONSE | RESPONSE OPTION |
|---|---|---|---|
| | | | |
| 19. | What do you think about the fertility of the soil on your land? | | 1. Very fertile<br>2. Somewhat fertile<br>3. Undecided<br>4. Somewhat infertile<br>5. Very infertile |
| 19a. | What contributes to the fertility levels of your soil? | | |
| | | | |
| | | | |
| | | | |
| 19b. | In the past five years, has the fertility level of your soil increased or decreased? | | 1. Increased significantly<br>2. Increased slightly<br>3. Remained the same<br>4. Decreased slightly<br>5. Decreased significantly |
| 20. | Do you use artificial / inorganic / chemical fertilizer? | | a. yes<br>b. no |
| 20a. | On what crops do you use fertilizer? | 1. | |
| | | 2. | |
| | | 3. | |
| | | 4. | |
| 20b. | Approximately how much fertilizer per acre/hectare did you use during the most recent growing season? | | Please indicate the unit of measurement. Ex. 3x 50kg bags = 150 kgs |
| 20c. | In the past five years has your fertilizer use per acre increased or decreased? | | 1. Significantly increased<br>2. Increased slightly<br>3. Remained the same<br>4. Decreased slightly<br>5. Significantly decreased |
| 20d. | What factors contribute to change in fertilizer use, if any? | | |
| | | | |
| | | | |
| | | | |
| 21. | Do you use organic / compost manure? | | a. yes<br>b. no |

| NO. | QUESTION | RESPONSE | RESPONSE OPTION |
|---|---|---|---|
| 21a. | If yes, on what percentage of your land do you use compost / organic manure? (if you know the approximate percentage, please indicate) | | 1. Less than half<br>2. About half<br>3. More than half<br>4. 100% |
| 21b. | In the past 5 years, has your use of compost / organic manure increased or decreased? | | 1. Increased significantly<br>2. Increased slightly<br>3. Remained the same<br>4. Decreased slightly<br>5. Decreased significantly |
| 21c. | On what foods do you use organic / compost manure? | 1.<br>2.<br>3.<br>4. | |
| 22. | What **soil conservation** methods do you practice? | Mulching<br>Reduced sweeping<br>No burning of organic matter<br>Reduced tillage<br>Swales / permanent structures<br>Trees / Plants (non legume)<br>Other: | Please place an **x** next to those practices which you use. |
| 23. | What **soil fertility and structure** methods do you practice? | Legumes (plants/trees)<br>Compost / organic manure<br>Animal manure<br>Manure teas<br>Other: | Please place an **x** next to those practices which you use. |
| **DAILY PRACTICES: FOOD & NUTRITION SECURITY** | | | |
| 24. | In the past 12 months, how often did you, yourself, skip meals due to food scarcity? | | 1.Never<br>2.Rarely (few times per year)<br>3.Sometimes (1-2 times per month)<br>4.Often (few times per weeks)<br>5. Mostly (most days/week) |
| 24a. | In the past 12 months, how often did your household eat three meals per day? | | 1.Mostly (3 meals per day)<br>2.Often (few times per week)<br>3.Sometimes (1-2 times per month)<br>4.Rarely (few times per year)<br>5.Never |

| NO. | QUESTION | RESPONSE | RESPONSE OPTION |
|---|---|---|---|
| 24b. | In the past 12 months, how often did your household run out of food with money to buy more? | | 1. Never<br>2. Rarely (few times per year)<br>3. Sometimes (1-2 per month)<br>4. Often (few times per week)<br>5. Mostly (most days/weeks) |
| 24c. | In the past 12 months, how often did you worry about where food would come from? | | 1. Never<br>2. Rarely (few time per year)<br>3. Sometimes (1-2 per month)<br>4. Often (few times per week)<br>5. Mostly (most days/weeks) |
| 25. | In the past 12 months, how often did your household eat six food groups per day? | | 1. Mostly (3 meals per day)<br>2. Often (few times per week)<br>3. Sometimes (6-10 times per month)<br>4. Rarely (few times per year)<br>5. Never |
| 25a. | Which food groups are most often missing from your diet? | Fruits | Please place an **x** next to those food groups which apply to you. |
| | | Vegetables | |
| | | Legumes / Nuts | |
| | | Animals (including milk & eggs) | |
| | | Staples | |
| | | Fats / Oils | |
| 25b. | What food groups do you grow on your land? | Fruits | Please place an **x** next to those food groups which apply to you. |
| | | Vegetables | |
| | | Legumes / Nuts | |
| | | Animals (including milk & eggs) | |
| | | Staples | |
| | | Fats / Oils | |
| 25c. | This week, what food groups were **eaten** daily from your land? | Fruits | Please place an **x** next to those food groups which apply to you. |
| | | Vegetables | |
| | | Legumes / Nuts | |
| | | Animals (including milk & eggs) | |
| | | Staples | |
| | | Fats / Oils | |
| 25d. | How many times per week do you eat: | Fruits | Please indicate the number of times per week. |
| | | Vegetables | |
| | | Legumes | |
| | | Animals (including milk & eggs) | |
| | | Staples | |
| | | Fats/Oils/Substitutes | |

| NO. | QUESTION | RESPONSE | RESPONSE OPTION |
|---|---|---|---|
| 25d. | In the past five years, has the diet diversity in your household increased or decreased? | | 1. Increased significantly<br>2. Increased slightly<br>3. Remained the same<br>4. Decreased slightly<br>5. Decreased significantly |
| 25e. | What are the indicators and contributing factors to any changes in diversity in your household? | | |
| 26. | In the past 5 years, have your agricultural yields increased or decreased? | | 1. Increased significantly<br>2. Increased slightly<br>3. Remained the same<br>4. Decreased slightly<br>5. Decreased significantly |
| 26a. | What are the contributing factors to change in your agricultural yields? | | |
| 26b. | What foods and during which months do you harvest food? | SEASON | FOODS |
| | | **Early Dry Season** (April, May June, July) | |
| | | **Late Dry Season** (Aug, Sept. Oct. Nov.) | |
| | | **Rainy Season** (Dec, Jan, Feb, March) | |

| NO. | QUESTION | RESPONSE | RESPONSE OPTION |
|---|---|---|---|
| 27. | In the past three years, has your household experienced an increase or decrease in frequency of illness. | | 1. Increased significantly<br>2. Increased slightly<br>3. Remained the same<br>4. Decreased slightly<br>5. Decreased significantly |
| 27a. | What illnesses have affected your household? (Please indicate all those which apply to you) | | 1. Diarrhea<br>2. Malaria<br>3. Chaifuwa / Chimfini<br>4. Malnutrition<br>5. Other (please list) |
| 27b. | How many times per year does your household experience these illness? | **Illness** | **Frequency** |
| | | 1. | |
| | | 2. | |
| | | 3. | |
| | | 4. | |
| | | Other: | |
| 27c. | What are the contributing factors to change in the frequency of illness in your household? | | |
| | | | |
| | | | |
| | | | |

| DAILY PRACTICES: PERMACULTURE | | | | |
|---|---|---|---|---|
| 28. | What parts of the Permaculture guild to you use? | Food for the soil | | Please place an **x** next to those parts of the guild that you use. |
| | | Food for us | | |
| | | Groundcover | | |
| | | Diggers | | |
| | | Climbers | | |
| | | Supporters | | |
| | | Protectors | | |
| 28a. | Are these planted together in one garden bed? | | a. yes<br>b. no | |
| 28b. | Do you incorporate perennial plants into your garden? | | a. yes<br>b. no | |
| 29. | Do you protect your soil using permanent garden beds and pathways? | | a. yes<br>b. no | |
| 30. | Are you using the Zone system? | | a. yes<br>b. no | |

| | | | |
|---|---|---|---|
| 30a. | Do you have a Zone 5, woodlot, or natural habitat for animals and beneficial species? | | a. yes<br>b. no |
| 31. | Do you use an integrated pest management system? | | a. yes<br>b. no |
| 31a. | If no, how do you protect your plants/food from pests? | | |
| 31a. | What natural/organic methods do you use to protect your plants from insects, disease and pests? | Strong smelling plants<br>Soapy/strong smelling water<br>Strong smelling mulch<br>Encouragement of beneficial species<br>Intercropping<br>Live fencing<br>Other: | Please place an **x** next to those methods that apply to you. |
| 31b. | Are you using synthetic / artificial / chemicals on your plants to protect from insects, disease, & pests? | | a. yes<br>b. no |
| 31c. | What diseases, insects, & pests do you have problems with? | Aphids<br>Slugs / snails<br>Cutworm, eelworm, cabbageworm, etc<br>Termites<br>Thieves, goats, chickens, monkeys<br>Other: | Please place an **x** next to those practices that you use. |
| 32. | Have you planted indigenous or localized plants on your land (owned or rented)? | | a. yes<br>b. no |
| 32a. | In the past five years, has your used of localized or indigenous plants increased or decreased? | | 1. Increased significantly<br>2. Increased slightly<br>3. Remained the same<br>4. Decreased slightly<br>5. Decreased significantly |
| 32b. | Do you share and collect seeds? | | 1. Share only<br>2. Collect only<br>3. Both share and collect<br>4. no |

| | | | |
|---|---|---|---|
| 32c. | Approximately what percentage of your crops are localized or indigenous crops? | | 1. None<br>2. Less than 20 %<br>3. 20-50%<br>4. 50-70%<br>5. 70-100% |
| 33. | Have you shared your knowledge of Permaculture with others? | | a. yes<br>b. no |
| 33a. | With whom have you shared your knowledge? | | 1. Friends<br>2. Family<br>3. Co-workers<br>4. Participants of a training<br>5. Other (please list) |
| 34. | Have you encountered difficulties in adopting Permaculture practices? | | a. yes<br>b. no |
| 34a. | What factors serve as **barriers to <u>adoption</u>** of Permaculture practice in Malawi?<br>(Please list all that apply) | | 1. culture<br>2. money<br>3. land availability<br>4. education<br>5. vulnerability<br>6. time<br>7. other (please list) |
| 34b. | What factors serve as **barriers to <u>continued</u> practice** of Permaculture?<br>(Please list all that apply) | | 1. culture<br>2. money<br>3. land availability<br>4. education<br>5. vulnerability<br>6. time<br>7. other (please list) |
| 35. | Since adoption of Permaculture practices, have you been satisfied or dissatisfied with your choice? | | 1. Very satisfied<br>2. Slightly satisfied<br>3. Undecided<br>4. Slightly dissatisfied<br>5. Very dissatisfied |

## APPENDIX D: ADOPTER ASSESSMENT TOOL

| | points | pos. points / practice |
|---|---|---|
| **Grey Water** | | **1** |
| Use on Food Plants | 1 | |
| Other: | 1 ea | |
| **Water Harvesting** | | **2** |
| Redirect to Food Plants | 1 | |
| Store for Dry Season Use | 1 | |
| Other | 1 ea | |
| **Irrigation** | | **1** |
| Irrigating food plants for year round harvesting | 1 | |
| Other: | 1 ea | |
| **Soil Conservation** | | **6** |
| mulching | 1 | |
| reduced sweeping | 1 | |
| no burning | 1 | |
| reduced tillage | 1 | |
| swales & permanent structures | 1 | |
| trees (planted w/ soil cons. intent) | 1 | |
| Other: | 1 ea | |
| **Soil Fertility & Structure** | | **9** |
| Soley uses organic method (w/ P.C intent) | **2** | |
| increasing use of organic (w/P.C intent) | **1** | |
| Does not use fertilizer (w/ P.C intent) | 2 | |
| Decreasing fertilizer use (w/ P.C intent) | 1 | |
| makes and uses own compost | 2 | |
| uses compost | 1 | |
| turns stovers into soil | 1 | |
| leguminous trees & plants | 1 | |
| animal manure | 1 | |
| Other: | 1 ea | |
| **Diet Diversity ( 6 food groups self report)** | | **2** |
| answered 1 ( mostly everyday) | 2 | |
| answered 2 (often, few times per week) | 1 | |
| **Growing Six Food Groups** | | **2** |
| If answered 1 or 2 above, and growing 6 | 2 | |
| If answered 1 or 2 above, and growing 5 | 1 | |
| **Permanent/Year Round Harvesting of Food** | | **3** |
| Harvest during rainy and 2 dry seasons | 3 | |
| **Guild System** | | **7** |
| Grows food in the guild system (7 parts) | 7 | |
| **Reduced Food Traffic/Sweeping** | | **2** |
| permanent food production areas | 1 | |
| reduced sweeping areas for food production | 1 | |
| **Zone System** | | **5** |

| | | |
|---|---|---|
| up to and including 4 and/or 5 Zones | 5 | |
| partial use (1 point for each zone) | 4 | |
| **Integrated Pest Management (w/ P/C intent)** | | **6** |
| strong smelling plants | 1 | |
| soapy/strong smelling water | 1 | |
| strong smelling mulch | 1 | |
| encouragement of beneficial species | 1 | |
| intercropping | 1 | |
| live fencing | 1 | |
| Other: | 1 ea | |
| **Use of localized/indigenous plants** | | **1** |
| conscious inclusion of indigenous/localized food plants | 1 | |
| **Shared Knowledge** | | **1** |
| Share innovation knowledge | 1 | |
| | | |
| **Total Possible Points** | | **48** |

## Appendix E: Food and Nutrition Security Score Tool

| | Question | pts | pos |
|---|---|---|---|
| 1 | **In the past 12 months, did *you* skip meals due to food scarcity?** | | **4** |
| | Never | 4 | |
| | Rarely (few times per year) | 3 | |
| | Sometimes (1-2 times/month) | 2 | |
| | Often (few times/week) | 1 | |
| | Mostly (most days) | 0 | |
| 2 | **In the past 12 months, how often did your household eat 3 meals/day?** | | **4** |
| | Mostly (most days) | 4 | |
| | Often (few times/week) | 3 | |
| | Sometimes (1-2 times/month) | 2 | |
| | Rarely (few times/ year) | 1 | |
| | Never | 0 | |
| 3 | **In the past 12 months, how often did your household run out of food with no money to buy more?** | | **4** |
| | Never | 4 | |
| | Rarely (few times/year) | 3 | |
| | Sometimes (few times/month) | 2 | |
| | Often (few times/week) | 1 | |
| | Mostly (most days) | 0 | |
| 4 | **In the past 12 months, how often did you worry about where food would come from?** | | **4** |
| | Never | 4 | |
| | Rarely (few times/year) | 3 | |
| | Sometimes (few times/month) | 2 | |
| | Often (few times/week) | 1 | |
| | Mostly (most days) | 0 | |
| 5 | **In the past 12 months how often did your household eat 6 food groups in one day?** | | **4** |
| | Mostly (most days) | 4 | |
| | Often (few times/week) | 3 | |
| | Sometimes (few times/month) | 2 | |
| | Rarely (few times/year) | 1 | |
| | Never | 0 | |
| 6 | **In the past 5 years, has the diet diversity in your household increased or decreased?** | | **4** |
| | Increased significantly | 4 | |
| | Increased slightly | 3 | |
| | Remained the same | 2 | |
| | Decreased slightly | 1 | |
| | Decreased significantly | 0 | |
| 7 | **In the past three years has your household experienced an increase or decrease in frequency of illness.** | | **4** |
| | Decreased significantly | 4 | |
| | Decreased slightly | 3 | |
| | Remained the same | 2 | |
| | Increased slightly | 1 | |
| | Increased significantly | 0 | |
| | | TOTAL | 28 |