



CHIKUNI PARISH TAONGA

AGRO-FORESTRY PROGRAM

PROGRAM ASSESSMENT

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I. Executive Summary

During the months of June and July 2013, I conducted research at the Chikuni Parish in the Southern Province of Zambia. The parish has established many programs, one of which is the Chikuni Parish Taonga (CPT), a program dedicated to providing education to underserved rural children. This program is broken into an academic side and an agro-forestry side, the latter of which was the primary focus of my research. Through a series of interviews and field visits with Bornface Hangala, the agro-forestry technician at CPT, I worked to gather the necessary information to create a content guide.

The intent of my research of the agro-forestry program was done for the purpose of compiling and organizing the different components of the program itself into a comprehensive guide. The guide is intended to be used as a foundation for the future development of a full-fledged agro-forestry curriculum. This assessment takes the research one step further by analyzing the current state of affairs for the agro-forestry program. While the guide presented a full range of concepts, this assessment will analyze where the strengths and weaknesses lay within the content and the structure of the CPT itself.

First, a brief history of the organization will be given, followed by some of the key successes of the program observed during my research. These include the content/techniques used, the method of teaching, the potential of the program for human/community development, and the potential of the garden for income generation. Generally speaking, this program has the potential to be one of the most versatile and pragmatic approaches to addressing both human development and environmental concerns and should continue to receive attention and funding.

The assessment will then highlight some of the key weaknesses of the program. These include issues with capacity, the teaching of the lessons, the availability of physical resources, and community involvement. In light of these challenges, the assessment will finish with recommendations for future action.

In order for the agro-forestry program to create a substantial and sustainable impact, several areas need to receive attention from CPT and its associated organizations. These areas include capacity building, program and curriculum development, community engagement, and the procurement of physical resources through targeted funding initiatives.

II. Overview of Program and Research

Chikuni Parish Taonga (CPT) is a Jesuit organization, which works to educate children living in very poor, isolated rural communities through the provision of academic and agro-forestry programming. The program began in 2000 with three education centers and has since grown to encompass 17 centers. The academic side of the CPT is centered on the use of Interactive Radio Instruction (IRI) as an alternative to formal school education. Each day, the Chikuni Community Radio Station broadcasts lessons. Students at each of the centers gather to listen to the lessons and participate in classroom activities under the direction of a local mentor.

In 2005, CPT added another component to the education program by introducing an agro-forestry section. The program aims to provide practical knowledge about sustainable farming practices to the children as well as the adults in the area. The program is designed to have mentors teach agro-forestry theory lessons in the class after the regular academic broadcasts, and then for the students to go out and practice what they have learned in the agro-forestry garden, which is located near the school. Activities include planting, watering, weeding, and making compost. Parents and community members are expected to help in the garden as well especially during construction. Produce from the gardens is harvested and dried in solar driers, and then taken to the CPT office where it is packaged and sold. Aside from the academic mentors, several centers have agro-forestry mentors, who focus exclusively on managing the gardens and teaching agro-forestry lessons.

Bornface Hangala, the Agro-Forestry Technician at CPT, designed this program and is largely responsible for monitoring and assessing each center's progress. Mr. Hangala has added several other aspects to the program such as the construction of cattle dip-tanks, used for livestock pest control. Mr. Hangala also produces radio programs, which are broadcast from the Chikuni Community Radio Station. These broadcasts cover topics such as environmental protection, water conservation, pollution, and tree planting. These programs are intended to reach out to adults and other community members, but also to bolster the lessons taught in class to the children.

While the program is robust, a full description of the rationale for the implementation of agro-forestry techniques and the process of creating and managing an agro-forestry garden has never been written. Furthermore, an official curriculum to be used by the mentors has not been developed. CPT lacked a single complete and organized description of the program.

The purpose of my research was to compile and organize the different components of the agro-forestry program into a comprehensive guide, which would serve as the basis for the future development of a full agro-forestry curriculum. My research was focused on the agro-forestry gardens themselves and not the dip tanks or radio programs created by Mr. Hangala. Through a series of interviews and field visits with Mr. Hangala, I was able to create a complete guide to the program. The first half of the guide offers higher-level information about basic environmental science concepts to help articulate the importance of practicing sustainable farming. The second half is a full description of how to manage an agro-forestry garden, contextualized through the concepts presented in the first half of the guide. It includes everything from locating the garden, to planting crops, to marketing packaged agro-forestry products. Throughout the entire guide, key concepts and vocabulary are highlighted in the text.

This guide was the primary deliverable of my research and is separate from this assessment. Although it is not a curriculum itself, it should serve as a good foundation for the future development of such a curriculum. The organization of the chapters flows logically and each chapter, along with the key terms and vocabulary highlighted within, can be turned into units/lessons.

Aside from the guide itself, this program assessment will analyze the strengths and weaknesses of the agro-forestry program as it stands now. Many of the concepts/techniques described within the guide have yet to be taught or implemented at the centers. This assessment will highlight some of the successes and shortcomings that I observed during my research. It will then provide suggestions for future actions that can be taken in order to align what is outlined in the guide with what is happening in the gardens at the centers. This assessment is intended to aid CPT in future administrative planning and grant writing activities.

III. Program Strengths

The agro-forestry program (AFP) developed by Bornface Hangala is not only thorough and deep from beginning to end, but it also aptly synthesizes the local realities facing the people of Southern Zambia and the many concerns regarding the environment. This program has the potential to not only increase the wellbeing of the people who might adopt its practices, but it can help to create a foundation for environmental awareness in the children who are exposed to its concepts at an early age. Generally speaking, this program has the potential to be one of the most versatile and pragmatic approaches to addressing both human development and environmental concerns and should continue to receive attention and funding.

A. Content/Techniques

As mentioned before, the content of the AFP is very thorough and well thought out. Through my meetings and field visits with Mr. Hangala, I was able to gain a full understanding of the entire process of creating and sustaining an agro-forestry garden. Not only was Mr. Hangala able to explain the process from start to finish, but he was also able to recognize gaps in my questioning and fill them in with the appropriate information. Mr. Hangala has an extraordinarily firm grasp of the concepts that he tries to incorporate into the AFP.

The techniques included in the AFP reflect contemporary themes in sustainable agricultural practices being developed elsewhere in the world.¹ These techniques have been proven to not only reduce a farmer's impact on the land, but also to help increase the productivity of the farm and generate extra income. The AFP incorporates many different practices such as intercropping, crop rotation, no till farming, the use of natural fertilizer, and sustainable weed and pest control techniques. These techniques have been developed by conservationists looking for ways to challenge the current agricultural paradigm in order to preserve the environment without hurting smallholder farmers.

The techniques used in the AFP are interrelated and when combined create a virtually self-sufficient garden that once established, requires very little external inputs such as fertilizer or pesticides. Each of the components of the garden serves a purpose whether it is to feed the

¹ Pretty J, Toulmin C, Williams S. (2011) Sustainable intensification in African agriculture. *International Journal of Agricultural Sustainability*, 9:1, 5-24.

community, increase soil fertility, to ward off pests, or to be sold for extra income. This highly integrated program is truly a wonder to behold and if implemented correctly, has the potential to significantly empower rural farmers.²

Aside from being able to articulate the various techniques used in the AFP, Mr. Hangala is able to provide a rationale for each one. Part of my experience with Mr. Hangala was learning from him the many environmental issues that are present in Zambia. His understanding of these problems has shaped the AFP itself and was instrumental in my writing of the agro-forestry guide. In order to prepare future generations for the challenges they will face in the future, it has become crucial to build an understanding of the natural world and its complex systems. By presenting these concepts to students at a young age, the AFP can help to foster an awareness of the environment that will contribute to a more educated youth who will be better prepared to tackle future challenges.³

B. Scientific Approach

Another strength of the AFP is its scientific basis and approach to teaching/learning. Not only is the content of the AFP scientific in its basis, but it is also taught to the students in a scientific manner. Mr. Hangala knows most of the plant species by their botanical (Latin) name as well as their English nickname. His understanding goes beyond simply being a good farmer and is bolstered by a deep formal scientific understanding.

The scientific method, although not taught explicitly as a part of the AFP, is implicit in many of the theories and garden exercises. For example, teaching students the importance of watering crops coupled with having them go out and water the plants themselves is a good way to show cause and effect. By teaching the theory behind a technique, students are presented with a hypothesis, on which they conduct an informal experiment, seeing the results as they go. This hands-on approach enables students to actually observe what they are

² Gelb A, Ali AG, Dinka T, et al. (2000) Spurring Agricultural and Rural Development. In: *Can Africa Claim the 21st Century*. The World Bank: Washington, D.C. 170-207.

³ Saina KE, Kathuri NJ, Rono PK, et al. (2012) Food Security in Kenya: The Impact of Building Rural Farmers' Capacity through Agricultural education in Secondary School. In: *Journal of Emerging Trends in Educational Research and Policy Studies*. 3:3 338-345.

learning in the classroom. With the majority of rural Zambians still relying on agriculture, this is a very tangible, accessible, and practical form of knowledge.

C. Versatility of Gardens

The diversity of the techniques and concepts covered by the AFP makes it both robust and versatile. Each agro-forestry garden can bring a variety of benefits to the entire community including students and their families, the elderly, women, those that are ill.

One obvious benefit is food security. Plants such as Moringa are packed with nutrients and can be dried and crushed into a powder that can serve as an excellent dietary supplement. Furthermore, the AFP encourages the growing of a variety of crops that diversify diets and create address food security by reducing the risk of losing all food due to a single crop's failure.

As mentioned before, the AFP also addresses a multitude of environmental concerns. One of these problems is the growing demand for firewood and the resultant deforestation of the countryside. Deforestation has a variety of negative ramifications such as temperature volatility, soil erosion, increased wind speeds, and more damaging fires. By planting Gliricidia, a fast growing and resilient tree, several of these issues can be remedied. Having a small plot of Gliricidia trees can act as a renewable source of firewood due to the fact that they grow back so quickly. Furthermore, when planted close together, Gliricidia grows very straight, making for a useful and strong building material. Finally, Gliricidia can be planted in long rows to provide wind and fire breaks. Of course, Gliricidia is just one of many versatile plants that can be included in an agro-forestry garden.

D. Economic Potential

While the AFP is useful for addressing food security and environmental degradation, it also represents an excellent opportunity to increase the income of those who adopt its practices.

On a basic level, sustainable farming techniques can act as important time savers. For example, implementing Gliricidia into a family garden saves time by removing the need to

travel several kilometers to collect firewood. Using drip irrigation means that less time needs to be spent collecting water. The time saved by these practices can be spent studying or conducting income-generating activities.

The versatility of the AFP goes beyond nutritional diversity. Many of the plants that are included in the program can increase the productivity of the soil and replenish its nutrients. The litter from fertilizer trees can be used as an excellent source of fertilizer or compost. By incorporating these nutrients back into the soil, gardens will be more productive and farmers will spend far less money on chemical fertilizers, which also harm the environment.

These nutritious leaves can also be fed to livestock, making them more healthy and productive, thus adding to the economic potential of an AFP practitioner. Healthier livestock reduces the investment risk faced by farmers who fear the death of these expensive animals.

Some of the products from an agro-forestry garden can be processed and sold to generate extra income. *Jatropha* seeds, for instance, can be turned into a biofuel and sold. Other plants can be turned into natural pesticides and used in the garden or sold to other farmers. Food crops can be harvested, dried in on site solar dryers, packaged, and sold for a profit. This particular activity provides a new source of income and introduces more farmers to the basics of business in terms of distribution, marketing, and sales.

E. Community Development

Another strength of the AFP is that it has the potential to build a sense of community, especially because it is located at the radio school centers. Generally, these schools are centrally located within the communities they serve, thus making them more accessible. Citing a garden at the schools not only means that it is easier to parents and community members to travel to help with the construction of the school, but it also means that when the garden is complete, they will be able to reap the benefits of the garden more easily.

As mentioned before, the creation of these agro-forestry gardens is highly dependent on community development. The children alone cannot do activities that require heavy labor, such as clearing the land, building fences, and constructing shades. Therefore, in order for a garden to be successful, the community needs to come together as a whole to help build it.

Finally, the benefits of the garden extend beyond a student's education. The construction of a garden provides food, resources, and income for the entire community. For

instance, the drilling of a borehole near the garden brings water to a centralized location within the community. Before, community members might have had to travel much further to gather water, but now, they have a reliable and safe source at a centralized location. The borehole is not only for the benefit of the garden, but also for the community at large, thus making the establishment of a garden a large-scale effort with many different stakeholders.

In the Case of the center at Cheelo, the introduction of the AFP has provided a shining example of what a community can come together to do. Aside from having two classroom blocks completed, Cheelo also has a functioning agro-forestry garden and a cow-dipping station, which were all built by the community members. These same community members now benefit from these new improvements and come together regularly to manage them and pay for the necessary supplies.

IV. Program Weaknesses

Although the AFP is built on a very solid theoretical foundation, there are many challenges that exist in terms of creating a functioning garden that both serves the educational needs of the students as well as the larger needs of the community. Hypothetically, these gardens have the potential to fulfill these needs but there remain several key issues that will be highlighted in this section.

A. Staff Logistics

One of the largest challenges for the implementation and success of the AFP that I observed was a matter of capacity. Despite the immeasurable expertise of Mr. Hangala, he remains only a single person. The 17 centers are widely disbursed, some as far as 45km away, meaning that Mr. Hangala cannot physically visit each center within a week and perform the necessary activities that he is charged with conducting.

Of his many organizational responsibilities just within the office, Mr. Hangala is responsible for many other activities. These include establishing and articulating timelines and construction plans, monitoring construction, checking student workbooks, training agro-forestry mentors, and to an extent, conducting lessons for the children. Although these duties fall well within his job description, the distances to the various centers makes it difficult for Mr. Hangala to conduct the necessary activities at reasonable intervals.

The result is that some centers, particularly those furthest away, are visited less often. Any problems with the construction or maintenance of the garden might go unnoticed for extended periods of time. Often, problems fail to be articulated to CPT by the mentors until one of the two technicians (Mr. Hangala or Mr. Muntanga) make a visit and see them in person.

B. Lessons and Education

Another major issue facing the AFP relates to the actual teaching of the content to the students. In my observations, the only theoretical AFP lessons being taught were those that

saw Mr. Hangala conduct himself during our visits. The level of understanding from some of the students would indicate that this was the first time they were hearing the lesson, or that it had been long enough for them to remember what Mr. Hangala was teaching them.

The theoretical lessons are crucial to the success of the AFP. Without a sound understanding of *why*, the techniques used in the AFP are far less understandable. The failure to instill these higher-level environmental science concepts within the students can undermine the process of attempting to provide them with life skills in the future. If a student does not understand the rationale behind the AFP, they will likely revert to conventional agricultural practices because they are more familiar with them.

Furthermore, if theories are not taught in the class, then the students' interactions with the garden become far less meaningful. Even though I did observe students working in the garden, I was unconvinced that they knew why they were doing what they were doing or if they were simply going through the motions.

C. Physical Resources

Another challenge for the AFP is the availability of physical resources. Even though the gardens are intended to incorporate a living fence made up of trees and other plants, during the initial stages, they require a conventional fence for security purposes. These fences are crucial for keeping out pests or livestock that can damage the crops. Unfortunately, some areas have too little resources to construct good fences. Instead of sturdy wood, some fences are constructed of twigs and provide inadequate protection. Lack of good building material is also an issue for the construction of nursery shades, which are a necessary component of each garden.

As mentioned before, boreholes are not only good for the development of the garden, but they can also greatly increase the positive impact of the garden on the community at large. Unfortunately, the process of drilling, casing, and capping boreholes is both tedious and expensive. Contracting with drilling companies takes time and money and has resulted in the slow spread of boreholes to the various gardens.

D. Community Commitment

One of the main focuses of CPT is to ensure that communities have a stake in what is going on with the gardens and schools. The value of having community built initiatives has been clearly articulated by CPT and is fundamental to the organization. The rationale is that CPT does not want to create a dependence on external organizations (even themselves) by the communities. Having communities actively participate in the construction of classroom blocks and agro-forestry gardens fosters a positive sense of confidence. CPT aims to be a facilitator rather than an implementer.

Therefore, the community members are responsible for constructing the gardens, and to a certain extent managing them when they are created. While some centers, like Cheelo have exceptional community involvement, others have little or none. These centers are often the ones that also have low community involvement on the academic side of CPT. These centers are often located near formal schools where it is harder for the community to see the merits of becoming involved in the CPT projects.

Finally, the security of the gardens is not restricted solely to animals and pests. Unfortunately, there have been a variety of cases where community members have stolen produce from the agro-forestry gardens. Not only does this undermine the hard work of the students, mentors, and other community members, but it also threatens the fabric of the community itself and makes progress even harder to achieve at these centers.

V. Recommendation for Future Action

In light of these strengths and weaknesses, there are several courses of action that should be undertaken to ensure the success and future sustainability of the AFP.

A. Formalization of AFP

One of the most important activities that should be undertaken by CPT is to formalize and document the entire process for creating an agro-forestry garden. Although the content guide produced this summer is a start, there are many generalizations and broad suggestions within it that do not provide enough specifics to help someone start a garden from scratch with no outside help. The content guide should be used as a basic structure for the development of a more specific step-by-step guide that would allow a single farmer in the community to replicate the program on his/her own. This expanded guide should not focus on the environmental science theories but rather the practical logistics of creating a garden.

In order to do this, further research would have to be conducted to provide advice on things such as soil conditions, an understanding of which is crucial for locating a garden and populating it with the appropriate plants. This expanded guide should be more practical and less focused on the theoretical so that it does not become unwieldy for those who might not be highly literate. Nevertheless, the entire process should be documented fully in some location, perhaps the CPT office, so that it can be shared with other organizations looking to replicate the program elsewhere.

B. Curriculum Development

The next most important action to be taken by CTP is the development of a full curriculum. While the expanded guide referred to in the previous section would be useful for community members and organizations, it does not get at the educational aspect of the AFP. The basis for the research was to compile the information so that it could be turned into a curriculum, which is essential to the future success and sustainability of the AFP.

The structure of the guide is both logical and chronological in its organization. This means that it should be easily transferrable to a curriculum. Each specific chapter could

become a unit with three or four lessons. Time should be devoted to teaching environmental science concepts, contained in the first half of the guide, leading up to the planting season. The actual techniques encapsulated in the second half of the guide should then be taught in an order consistent with the activities required in the garden. For example, lessons about creating fertilizer should be taught during a time when fertilizer is actually being made in the garden.

Ideally, each unit or lesson would be coupled with an activity or “lab” in the garden to help solidify the concepts taught in the class. This would also help to ensure that the students have meaningful interactions with the garden rather than simply going through the motions without ever knowing why. Labs do not necessarily need to be directly related to garden activities. For instance, a lab could consist of growing two plants in the classroom, one with composted soil and one without, to demonstrate the importance of having healthy soil. Another example would be to have the students package the products and label them to understand the importance of marketing products to promote sales.

In order to do this, experienced curriculum developers should be consulted. While the majority of the information required to create a garden and teach theory is contained within the guide, it is not broken down into individual lesson plans. It reads more like a textbook. Creating a curriculum is something that requires much forethought and planning but has been done successfully before. Having the content is not enough, however, and attention must be paid to organization and presentation.⁴

The formalization of a curriculum will ensure consistency between the centers. It will also reduce the burden on the technicians because the mentors will have a physical document to refer to help guide their lessons and labs.

Perhaps the best way to utilize this curriculum once it is developed is to convert it into a radio broadcast program that can be more consistent and directional than the 20 broadcasts or so that Mr. Hangala conducts on a yearly basis. My team’s research indicated that some of the most favored radio programs were the agro-forestry broadcasts from Mr. Hangala and that these were the most informative of all the programs after the local news. This indicates that there is a high demand within the community for the knowledge that the AFP can provide. Furthermore, converting the AFP into an IRI format would allow it to fit in with the class

⁴ Rudebjer, Per G; Temu, August B; and Kung’u, James. “Developing Agroforestry Curricula: A Practical Guide for Academic Institutions in Africa and Asia.” International Centre for Research in Agroforestry. (2002): 6-42.

structure that is already in place at the 17 centers. This would make life easier for the mentors who would not have to learn how to teach lessons directly.

The Chikuni Community Radio station should devote energy toward creating this type of programming once the curriculum has been developed fully. Due to the fact that it is the sole provider of radio programming in the region surrounding Chikuni, community members who have access to radios already have to listen to educational programming at midday. By adding an agro-forestry lesson at the end of the academic broadcast, CPT could disseminate knowledge to both children in school and the community members who are tuned in at the time. Provided that funding can be found for airtime and the actual recording of the programs, this could be an excellent way to spread knowledge about agro-forestry.

C. Capacity Building

In order to address challenges stemming from capacity, there are several actions that should be taken. The creation of a formal agro-forestry guide as well as a curriculum will reduce the burden on the staff of CPT in that it will provide a physical document where confused mentors could get the answers they need. Providing the mentors with the tools they need to problem solve on their own can increase the capacity of the organization without needing to hire any new staff or conduct more training sessions.

That being said, the problem still remains with Mr. Hangala's ability to visit each center in a meaningful way on a consistent enough basis. Therefore, the hiring of an assistant might be a good use of resources. This person could be responsible for travelling to the centers and conducting routine checkups on the physical status of the gardens and looking for any potential problems. This assistant might also be used to monitor the progress of garden construction to ensure on time completion of projects and identify barriers. This would ensure that problems become notices more quickly and that Mr. Hangala would have more time to devote to things that require his specific expertise.

One of the major barriers to the successful implementation of the AFP is a lack of training for the mentors. Although training is tedious and time consuming, ensuring that the mentors are adequately trained is an important step toward increasing the capacity of CPT. Mentors who have a good understanding of both the theory and the techniques will be better

prepared to handle issues on their own and will make the implementation of the AFP more efficient.

D. Community Engagement

Because the commitment of the community is of such high importance to the success of the AFP and the other CPT programs, identifying ways to increase community engagement should be a major focus of the CPT. Although it may be difficult to motivate communities at the early stages, once they begin to see the benefits of being actively engaged, motivation becomes less and less difficult to generate.

One of the most effective ways to show the benefits of the AFP to community members is to conduct workshops within the communities. One such workshop could focus on creating liquid manure whereby Mr. Hangala or another CPT representative would travel to the community and demonstrate in person how this is done. Some of these workshops might take several days to complete, but the fact of the matter is that interactive demonstrations where people can ask questions are a more effective way to convey concepts and teach techniques than radio broadcasts.

In addition to these workshops, adult education programs can be conducted to help raise awareness of environmental concerns. The content for these programs could be drawn directly from the AFP curriculum for the IRI centers and reworked to be appropriate for an adult audience. Expanding the environmental awareness of the community will not only help to motivate the communities to participate in the construction and maintenance of the agro-forestry gardens located at the centers, but it will also help to spread sustainable farming techniques to areas beyond the school agro-forestry garden.

Presenting an incentive for community engagement is crucial. Therefore, workshops should be given to those who show active participation in the gardens. These workshops can act as a sort of reward for the contributions of community members to the implementation of AFP.

CPT's position as a Jesuit organization offers a unique opportunity to increase community participation from a theological perspective. Encouraging parish priests to incorporate environmental concepts such as the importance of being stewards of the earth into their sermons might be a good way to increase community awareness. Brother Keith

Warner at Santa Clara University is an expert on spirituality and its relationship to environmental ethics, and has published several works on the potential for this concept to be used to promote sustainability.⁵ CPT has an opportunity to make use of an existing information channel, the parish priests, to help increase environmental consciousness.

Grounding environmental stewardship in spirituality has a large potential to make up for a lack of education, particularly for older community members who are no longer learning in school. For many of these people, religion is a major part of their lives and sermons are taken very seriously. The creation of a lay environmental group could that is rooted in the theology of environmental ethics could serve to increase community participation. This group could conduct environmental ethics workshops and help to organize garden building activities. The articulation of environmental concepts through a theological lens is a unique solution that could result in a heavily increased level of community engagement.

E. Targeted Funding

The final section of this recommendations list is focused on what items should be the focus of future funding requests. Arguably, all of the recommendations thus far link back to funding in some way and by no means is this list exhaustive. The point of this list is to present the items whose primary barrier is financial.

The first item that should have a targeted funding campaign is fencing materials. Metal chain-link fences are one of the best ways to ensure the security of the garden. Not only do they not use valuable wood resources, but they are also more durable and less easy to infiltrate by both animal pests and humans. Because they do not provide wind protection or protection from weeds, these fences should be incorporated into the living fences that are part of the AFP. The primary barrier to the purchasing of metal fences is money. These fences are extremely expensive and largely out of the budget range of the communities. This is one of a few garden improvements that CPT should look to fund directly from outside sources. This is especially true because these fences should be constructed early in the garden process, when the garden itself is not capable of producing income to offset the price of the fences.

⁵ Warner, Keith D. "The Franciscan Intellectual Tradition: Science, Ethics & the Environment." *Keith Douglass Warner OFM's Research and Education Website*. Santa Clara University, 2005. Web.
<<http://webpages.scu.edu/ftp/kwarner/franciscan.htm>>.

Another piece of equipment that should be the focus of a targeted marketing campaign is the solar dryers. These are a very important aspect of the AFP in terms of income generation. Having two or three of these solar dryers, which are manufactured in Zambia, at each of the centers can greatly increase the income generating potential of each garden and can increase the volume of products that CPT can sell. Of course, solar dryers need not be purchased until after the gardens have become productive enough to warrant this equipment. Nevertheless, the cost of these is also too expensive for communities to pay on their own.

Finally, one of the most important aspects of the AFP is the provision of water. The best way to provide water to these gardens, and what has been the focus of CPT regarding water, is the drilling of boreholes. This water source is safe and reliable barring any damages to the pump or pipes after installation. Unfortunately, this is one of the most expensive aspects of the AFP. Not only does CPT have to pay for the drilling, but they also need to pay for the fuel used during the process. Furthermore, it is not something that can be done by CPT. Rather, professional borehole drillers must be contracted. This has been the reason for why only a few gardens have boreholes today. Funding for the drilling of boreholes should be a primary focus of CPT and rightfully so because boreholes are absolutely central to successful creation of a flourishing agro-forestry garden.

VI. Conclusion

The AFP developed by Mr. Hangala and CPT is an incredibly robust and thorough program that has the potential to be implemented in many other areas across Zambia and Sub-Saharan Africa at large. Now that the program has begun to be more formalized through the writing of the content guide in June and July 2013, much work has to be done to ensure the success and sustainability of this remarkable and extremely promising program.

This guide has identified some of the many strengths of the program as well as some of its weaknesses that were observed during my research. In order to continue to build on the successes and to remedy the shortcomings the CPT should focus on several items including the formalization and expansion of the guide to make it more accessible for people looking to adopt the practices of the AFP, the development of a full curriculum with the potential to be made into an IRI format, the building of CPT's capacity, the development of community engagement, and several targeted funding campaigns.

CPT's agro-forestry program is a shining example of what can be done to address human development and environmental concerns in the developing world and following the suggested future actions outlined in this assessment could greatly improve the programs potential for success and even widespread adoption at similar institutions across the country and continent.

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