The Development of a Project Management Methodology for Peace Corps Mauritania

By

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A REPORT

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This report, "The Development of a Project Management Methodology for Peace Corps Mauritania," is hereby approved in partial fulfillment for the Degree of MASTER OF SCIENCE IN ENVIRONMENTAL ENGINEERING.

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Preface

This report is submitted for the completion of a master's degree in Environmental Engineering from the Master's International Program in Civil and Environmental Engineering at Michigan Technological University. It is based on both literary research and field work done in the Islamic Republic of Mauritania while the author served as a Peace Corps volunteer in the village of Selibaby from September 2004 to August 2006.

This report discusses several aspects of project management and its application to development work in Mauritania. As a Community Health and Water Sanitation volunteer, the author helped with polio vaccination campaigns, malnutrition monitoring, feeding center management, small business development, wash water remediation, aquaculture, promoting personal hygiene, and small construction projects while facilitating cross-cultural exchange between the United States and the Islamic Republic of Mauritania.

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Abstract

Projects exist in all communities, both developed and developing. Project management in the developed world has been documented, studied, reviewed, and revised. Unfortunately, the standard project management methodology is not tailored to the realities of working in the developing world. One of the roles of the engineer in development work is project manager. Engineers must be well versed in project management techniques in order to deliver quality projects.

This report provides an overview of the Islamic Republic of Mauritania and Peace Corps service therein. The Project Management Institute's Process Group methodology is described next. The Project Management Institute's Process Group methodology defines five process groups with forty-four elements that encompass all aspects of project management. By using this framework the project manager can better ensure project success. As the limitations of the PMI method to Peace Corps project work are considerable, a new project management strategy is developed and suggested. This work introduces a new project management methodology more appropriate to projects in developing countries and presents two validation project studies in Peace Corps Mauritania.

This framework was applied to projects in Peace Corps Mauritania. The Cereamine project was presented first. From the analysis of this project, the importance of local knowledge and community ownership of projects is demonstrated. The aquaculture pilot project describes the installation of the first fish

ponds in Selibaby, Mauritania. From this project, the importance of personal involvement in the project is demonstrated.

Both of these projects illustrate how the new project management methodology applies to project work in Peace Crops Mauritania.

Acknowledgements

I dedicate this report to my friends and host family in Selibaby, Mauritania. Without your love, patience, and compassion none of my work would have been possible. Thank you for opening your homes and hearts to me.

I would like to especially thank Kalidou Sy. As a friend, counterpart, and mentor his unconditional support was unrivaled. Working with him was a pleasure and I could not have done the aquaculture project with anyone else. I will always remember sitting pond side in his garden watching the sun set and fish jump.

Thank you to my advisor, Dr. Kurt Paterson. Thank you for your visit to Mauritania. Your continued interest in my service helped fuel my motivation. Thank you, as well, for your time and patience in the preparation of this report.

Lastly, thank you mom and dad. I carry your love inside me. To my father, thank you for all your words. Your emails and letters challenged me, inspired me, and comforted me. To my mother, your visit meant the world to me. Mauritania will always hold a very special place in my heart and you are among the few people who see what I see when they hear, "Mauritania." Thank you for the countless trips to the post office with beef jerky and NYT Magazine sections. To the both of you: your love was a pillar of support during my service. Thank you.

Chapter 1: Introduction

1.1 Background

The United States Peace Corps has three goals: helping the people of interested countries in meeting their need for trained men and women, helping promote a better understanding of Americans on the part of the people served, and helping promote a better understanding of other people on the part of Americans (Peace Corps, 2006). Even though these goals are weighted equally, the day to day Peace Corps volunteer's professional activities are more closely aligned with project development and implementation than with cross cultural exchange. This paper will look at how traditional project management techniques can be adapted to and applied in Peace Corps Mauritania.

There are many activities that could construe a Peace Corps project. During my tenure in Peace Corps Mauritania, there were two main funding sources for projects: Small Project Assistance (SPA) funds or Peace Crops Partnership Proposals (PCPP). These funding sources were available to all Peace Corps volunteers. SPA funds usually come from USAID or some other government agency. In the fiscal year 2005/2006 (FY 05/06), Peace Corp Mauritania's SPA funds were provided from the U.S. embassy. Peace Corps Partnership Proposals are funded by private donors, usually friends and families of the volunteer. A PCPP will be posted on the Peace Corps web page and anyone can donate to the fund.

Over the last three years there have been 110 PCPP and SPA projects funded through Peace Corps Mauritania totaling $202,900 (Table 1).

Table 1: Funded Project in Mauritania

		FY 03/04	FY 04/05	FY 05/06
SPA Funds	# Projects	13	25	38
	USD	$25,900	$49,700	$87,000
PCPP Funds	# Projects	8	12	14
	USD	$6,400	$18,700	$15,200

Peace Corps volunteers complete more projects than reflected in Table 1. The total number of projects completed in one's service includes PCPP projects, SPA projects, and other projects. Other projects include any project whose funding came from a source outside of Peace Corps, or any project that did not require funding. An estimate from my experience in Peace Corps Mauritania is that for every Peace Corps funded project there were three other projects. From that assumption, there were about 440 projects during my tenure as a Peace Corps volunteer. All of these projects were designed and managed by Peace Corps Volunteers in conjunction with their supervisors, host communities, and fellow volunteers.

1.2 Experiences

As a community health and water sanitation volunteer working in the Islamic Republic of Mauritania, I was presented with a unique opportunity to work as a project manager in a developing nation. Whereas I would have been more comfortable working on infrastructure building projects, the focus of my Peace Corps program was on preventive health and food security. Although my focus was switched from classical engineering to public health, I found the same methods and practices were applicable for designing and implementing projects.

One observation that I had during my tenure was that Peace Corps Mauritania did not train its volunteers in project management techniques. Coming from an engineering background, I was aware of project management as a tool frequently used in industry and I was eager to investigate how project management could be better integrated in project development for Peace Corps Mauritania. This was one of my major goals for my tenure.

The majority of my time in Mauritania was spent working on cross-cultural exchange. Even though project work is not the largest pull on volunteer's time, project success and failure can greatly affect the overall success or failure of a volunteer's service. As Americans, volunteers are validated by their work; some volunteers feel that their service is a failure if their projects fail. Part of the challenges of Peace Corps's service is redefining success in face of the realities of working in the developing world. Hopefully, by integrating project management techniques more projects can be successfully completed. This, in turn, will increase volunteer moral and better help the host communities.

During my time as a Peace Corps volunteer I had two large projects. The first large project I had was funded via a Peace Corps Partnership Proposal. The project involved the training of Mauritanians to make a multi-grain flour, Cereamine. My second large project, one not funded by Peace Corps, was an aquaculture pilot project. The goal of this project was to demonstrate that aquaculture was possible at my site. Both of these projects will be discussed at length in Chapter 6.

1.3 Focus

Project management originated late in the 19th century; the increasing complexities of businesses and manufacturing created the need for a project management methodology. Frederick Taylor, an engineer in the early 20th century, was the first to study project management. He stated that labor could be analyzed and improved upon by breaking it up into components and studying those components. One of Taylor's contemporaries and associates, Henry Gantt, focused his studies on detailing the order of operations in Naval ship construction. With the onset of WWII, both Taylor's and Gantt's works were utilized to help increase productivity in face of a shrinking workforce and a rushed project delivery schedule. In the years following WWII, project management has been an essential aspect of delivering engineered systems (Sisk, 2006).

Currently, project management and project managers can be found in almost every industry. Often project managers and engineers work hand in hand to deliver projects on time and on budget. Project management methodology is similar to the engineering method: define the problem, weigh the options, choose a path, implement this plan, and evaluate the outcome. In many industries today, the role of chief engineer is linked to that of project manager (Shaw, 2005). The underlying reasoning behind this is that the project manager exists to ensure that solid engineering skills and tools are used to deliver products and services of quality (Shaw, 2005). When a project has been properly managed, there is a greater chance that project goals will be achieved. Project management methodology provides a framework where project managers must address a vast array of possible problems before initiating the project.

Peace Corps is a fulfilling and frustrating pursuit. One source of frustration in Peace Corps comes from project failure. There are no concrete numbers on the percentage of projects that failed during my tenure, but it is rare that a project comes in 100% on budget and on time. Statistics on the percentage of development projects that fail or succeed are difficult to find. Traveling in Mauritania, remnants of many failed projects dot the countryside: a water tower in a town that has never been filled because the supply pipe was never installed, a bridge over a seasonal drainage way that washed away with the first rain, fish basins that sit dry, and countless plots of fenced land without crops due to failed well or pump projects. Something needs to change.

Peace Corps volunteers work as project managers. In the hope of increasing project sustainability, the brunt of the project delivery is usually completed by host country nationals. If the Peace Corps volunteer does not incorporate the opinions and needs of their host country counterparts, there is little chance for sustainability. By working as a project manager, the Peace Corps volunteer can help steer the project to a successful conclusion while still allowing the host country nationals to deliver the project. Through delivering the project, the host country nationals will obtain ownership of the project and retain new skills.

All Peace Corps volunteers go through a training period prior to becoming a Peace Corps volunteer. In Mauritania, pre-service is ten weeks and it encompasses language training, sector specific skills trainings, and cross cultural training. Subsequently, there are two other training opportunities during the volunteer's service. I did not receive any training on project management during my tenure as a

Peace Corps volunteer. Because it was never presented in a formal way, project management is left up to the volunteers. By examining projects from my work as a health volunteer, the pertinence of project management in Peace Corps will be demonstrated.

1.4 Objectives

Every year volunteers in Peace Corp Mauritania do more than a hundred projects of varying scope. This report will:

- Summarize traditional Project Management Process Groups
- Develop a simplified project management methodology more applicable to work in Peace Corps Mauritania
- Evaluate projects completed in Mauritania
- Demonstrate the relevance of project management in Peace Corps Mauritania

1.5 Overview

Below is an overview of this report:

- Chapter two will give a detailed image of my country of service, The Islamic Republic of Mauritania.
- Chapter three will define project management and discuss the role of the project manager in Peace Corps.
- Chapter four will go through the Project Management Institute's Process Group methodology of project management.

- Chapter five will describe a new project management methodology for Peace Corps Mauritania.
- Chapter six contains a detail account of two projects that I completed as a Peace Corps volunteer. These projects will help validate the methodology proposed in Chapter five. They will also illustrate some of the pitfalls encountered in project development and implementation.
- Chapter seven will offer conclusions and recommendations.

Chapter 2: The Islamic Republic of Mauritania

2.1 Geography

Mauritania is located on the Atlantic coast of West Africa. Its 1,030,400 km^2 land mass borders Senegal to the south, Mali to the east, and Western Sahara and Algeria to the north (Figure 1). It has a 754 km long and fertile coastline but most of the country is desert (CIA, 2006). The population of 3.18 million lives primarily in Nouakchott and Nouadhibou, the two large coastal cities, or along the Senegal River, Mauritania's only perennial river. The climate is hot, dry, and dusty. Only 0.2% of the land is arable and only 0.01% of the land is used for permanent crops. The terrain is mostly barren with some rolling hills in the interior. Mauritania faces many environmental challenges: overgrazing, deforesting, desertification (aggravated by soil erosion), limited natural fresh water resources away from the Senegal River, locust infestation, and droughts.

Mauritania is divided into twelve regions: Adrar, Assaba, Brakna, Dakhlet Nouadhibou, Gorgol, Guidimaka, Hodh El Chargui, Hodh El Gharbi, Inchiri, Tagant, Tiris Zemmour, Trarza, and the capital district of Nouakchott. Peace Corps is present in nine of the twelve regions. There are no Peace Corps Volunteers along the eastern or northern boarders of Mauritania.

I was assigned to Selibaby. Selibaby has around 20,000 inhabitants and is the regional capital of the Guidimaka. The Guidimaka is the most southern region of Mauritania. The Guidimaka borders both Senegal and Mali and has an area of 10,700

km^2 (GTZ, 2004). The region receives more rain than any other region in Mauritania. The Ministry of Agriculture reported 510 mm of rain in 2004 and 418 mm in 2005.

2.2 History

Mauritania has a rich history of occupation and conflict. Early wars were fought between natives, Berbers from northern-Africa, and Soninkes of the Empire of Ghana. In the third and fourth century, natives of Mauritian were living in desert oases. From the fourth to the eighth century, these native cultures were mixed with Berbers from northern-Africa. The Berbers, a much stronger and more organized culture, held the region for many centuries. During the ninth and tenth centuries, the Berbers clashed with the Soninkes. The Berber stronghold was in modern day Adar, near Chinguetti and the Soninke front was in modern day Tagant, near Tidjikdja. These tribes fought over pasture land, water, and slat until Banu Hassan, and Arab expansionist, took over the area in the fifteenth and sixteenth century (Mc Dougall, 1985).

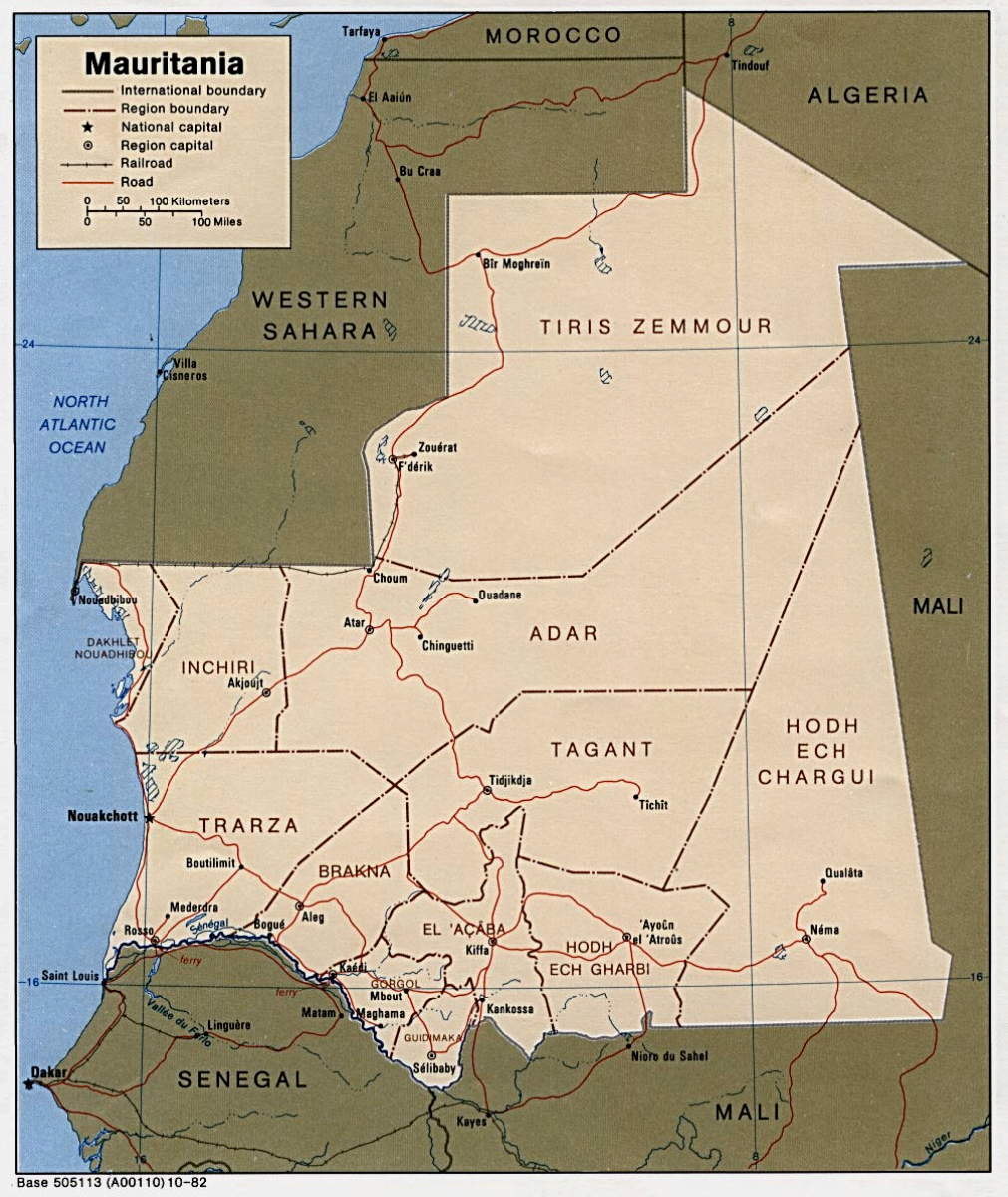

Figure 1 : Map of Mauritania

Even though Mauritania was not brought fully under French control until 1934, there was a French presence in Mauritania early in the 20th century. France's interests were connecting their stronghold in Morocco to the rest of their West African colonies. While under French control, the country was governed predominately by regional chiefs, or emirs. The emirs of Traraza and Adrar held

significant power. Mauritania officially became a French protectorate in 1903 and was officially made a colony seventeen years later in 1920. Following the French constitutional referendum of 1958 Mauritania won further independence; it entered the French Community as an autonomous, yet not fully sovereign state. In November 1958 the colony claimed the name, "Islamic Republic of Mauritania" (Peace Corps, 2002). On 28 November 1958, Mauritania proclaimed its independence. On 22 March 1959, it adopted its first constitution and it achieved its independence on 28 November 1960 (ONS, 2006).

Since independence, Mauritania has not transferred power peacefully. From 1960 to 1978, the country was governed by a civilian tribunal headed by Moktar Ould Daddah. Daddah strongly emphasized the Arab roots of the Moors and suppressed all open political opposition (Peace Corps, 2002). In 1976, he annexed the southern third of The Western Sahara. After three years of aggressive raids from the Polisario Guerrilla Front, Mauritania relinquished its control of the annexed territory (CIA, 2006). Daddah's popularity and strength was hurt by this military defeat and he was deposed in 1978. His civilian tribunal was succeeded by several military governments until Maaouya Ould Sid Ahmed Taya seized power in a 1984 military coup. Maaouya legalized opposition parties and ratified a new constitution in 1991 (Peace Corps, 2002). Maauouya won three elections after the 1984 coup but only the 2001 election was declared free and open (CIA, 2006). On 3 August 2005, Maaouya was displaced in a bloodless coup. Since that time, Colonel Ely Ould Mohamed Vall and his Military Counsel for Democracy and Justice have held power. Soon after the 2005 coup, Vall declared that the Military Counsel would be in power for two years and

then there would be free, democratic elections (BBC, 2005). Since the 2005 coup, there has been a census and a constitutional vote. The referendum on the new constitution contained an article limiting the tenure of any President to two five-year terms. The referendum passed with 97% majority and a voter turnout of 76% (African Elections Database, 2006).

2.3 People

The July 2006 census put Mauritania's population at 3,177,388 people (CIA, 2006). Mauritania has a complex social structure. Ethnically, it spans the gap between Arabic-speaking, developed Northern Africa and black sub-Saharan Africa. Racism is rampant among the different ethnic groups and there is a rigid social structure within the races. The ethnic breakdown is 40% black African-Arab-Berber (Black Moor), 30% Arab-Berber (White Moor), and 30% black African (mostly Wolof, Soninke, and Pulaar) (Encyclopedia Britannica, 2006).

Moors are commonly called "White Moors." The White Moors are from Arab and Berber decent and are traditionally nomadic. Even the White Moor families who have moved to larger cities still return to the bush with their traditional tents for vacations. Daddah, Maaouya, and Vall are all White Moor. Tensions between the White Moors and the Black Africans began back in the 1960s when Daddah pushed for Mauritania to be an Arab state. White Moors organize themselves by tribe. The tribe is an extended family and people are either seen as members of the tribe, relatives, or everyone else. (Bales, 1999).

Black Africans are divided into Soninke, Pulaar (or The Peul), and Wolof. The Wolof live predominately in Senegal and are the smallest African ethnic group in Mauritania. Many of the fishermen in Nouakchott and Nouadhibou are Wolof. Outside Nouakchott and Nouadhibou the Wolof are found in the south west corner of Mauritania. Generally, they are regarded as skilled craftsmen.

The Peuls are descendants of the Tekrour Empire. They are part of the larger Fulani language family which can be found in eighteen African countries (Dalby, 1998). Traditionally, the Pulaar were herders. There are still many Pulaar communities where cattle greatly outnumber people, but more and more the Pulaars are moving to regional capitals and becoming civil servants. The Pulaars can be found throughout the south. The Peuls are welcoming and open to outsiders. Even in predominately Moor areas, several Peace Corps Mauritania volunteers live with Pulaar families.

The Soninke are known for being enterprising. They are extremely proud and hard working. They trace their roots back to the Ghanaian Empire. The Soninkes are organized and many have an intricate web of immigrants in Europe and the US that support their families in Mauritania. It is common to find more than sixty percent of adult males in Soninke villages absent. These men leave and work as laborers in other African countries and, if possible, in Europe or the United States (Manchuelle, 1989). Soninkes are protective of their culture and Soninke women seldom marry outside their family; marrying first cousins is typical. The Soninkes are concentrated in the Guidimaka; almost all of the large villages in the Guidimaka are Soninke villages.

The Black Moors are the poorest members of the Mauritanian population. A Black Moor is someone that speaks Hassaniya, the language of the White Moors, but who has a mixed heritage. The Black Moors are thought to be Africans that the White Moors kept as slaves. There are commonly called, "haratines," literally translated, "freed slaves." Black Moors are the laborers of Mauritania. They are looked at as a slave class by the White Moors and often distrusted by Black Africans because they speak Hassaniya (Parker, 1991).

As previously stated, racism is prevalent in Mauritania. Within each culture there lies a deep distrust of the other cultures. The racial tension came to head in 1989 when a grazing rights and land tenure dispute between Mauritanian and Senegalese farmers turned violent. This incident sparked a wave of ethnic violence that swept through both Mauritania and Senegal. In Senegal, Black and White Moors were targeted. In Mauritania, Black Africans were targeted. Expulsions, selective killings, and expatriations were committed. In 1993, tens of thousands of Black Africans were deported from Mauritania and at least 500 black political prisoners were executed or died from being tortured (HRW, 1993). Whole communities were forced to relocate on both sides of the border. Tens of thousands of Senegalese were expelled or killed in Mauritania and more than 200,000 White Moors in Senegal were forced to return to Mauritania (Encyclopedia of the Modern Middle East & North Africa, 2006). Many Black Africans, especially those living on the border, still have a strong distrust of White Moors. Living in the Guidimaka, the distrust and underlying tension were noticeable. To my knowledge, the Mauritanian government has yet to acknowledge

any wrongdoing in the matter and holds the position articulated by Prime Minister Sidi Mohamed Ould Boubacar on 21 May 1993:

> *Now I am anxious to affirm here that Mauritania has never expelled any of its citizens. The events of April 1989 constituted a real tragedy for both our peoples....[T]his situation has now been put behind us. We believe that all Mauritanian citizens who are in Senegal or elsewhere are free to return to their country. This has always been the case* (HRW, 1993).

2.4 Resources, Economy, and Infrastructure

Mauritania has three main natural resources: iron, fish, and oil. Historically, iron has accounted for 40% of Mauritania's exports (CIA, 2006). Large iron deposits are located in Northern Mauritania and a 717 km railway track connects the mines with the Nouadhibou sea port. The decrease in world demand for iron ore has hurt Mauritania. In 2004, only 9.2% of Mauritanian's GDP came from mining, this is down from 14.4% in 1998 (IMF, 2006). Mauritania also boasts the most fertile fishing coast in Africa. In 1986, Mauritania opened its first deepwater port near Nouakchott. Unfortunately, overexploitation by foreigners threatens this natural resource (CIA, 2006). In March 2006 Mauritania started pumping oil from an offshore rig eighty km from Nouakchott. In April of 2006, The New York Times reported that Mauritania was pumping 15,000 barrels a day and production could rise

to 160,000 barrels a day by 2009 (Mouawad, 2006). By the end of 2006, production could rise as high of 75,000 barrels a day (CIA, 2006).

The 2005 estimated GDP for Mauritania was 6.891 billion dollars with a real growth rate of 5.5% and a GDP per-capital of $2,200. In 2004, the unemployment rate was 20%, and 40% of the population lived below the poverty line. The 2001 labor force was estimated at 786,000 with 25% working in agriculture, 29% working in industry, and 46% working in the service industry (CIA, 2006).

Mauritania is a country of extremes. As with most developing countries, resources are not evenly distributed. There are 866 km of paved roads and 6,794 km of unpaved tracks (CIA, 2006). The quality of life for those on the paved road and those who live off of it is different. Selibaby is the only regional capital not to be connected to a paved road. A 250 km compacted dirt track extends from Kaedi to Selibaby and that track is used by all personal and commercial traffic. The road is in constant disrepair; it is often wash-boarded, forcing passenger cars to drive on dirt tracks next it. Without culverts or proper drainage, the Kaedi-Selibaby washes out every year. The new government has promised to start construction of a paved road to Selibaby in 2006; few people in Selibaby have confidence in that happening. The track to Kaedi is the only set route in the Guidimaka. All other tracks are simply two tire tracks in the bush. Transport is further complicated in the rainy season when the seasonal drainage ways fill with water. It is typical for all transportation to be suspended for two or three days after a large rain. Due to the difficult terrain, the only public transport that runs in the Guidimaka are four-wheel drive trucks. In a Toyota Land Cruiser like the one pictured in Figure 2, fourteen passengers normally ride.

Figure 2: Land Cruiser crossing a seasonal drainage way 20 km north of Selibaby, July 2005

The most recent water and sanitation statistics are from 2002. UNICEF estimates that 56% of the population has access to improved drinking water; 42% of the population has access to improved sanitation. The urban/rural breakdown for water access is 63% / 45% and 64% / 9% for sanitation (UNICEF, 2006).

2.5 Health and Food Security

There are 852 million food-insecure people in the world (FAO, 2006). The FAO defines food security as, "when all people, at all times, have access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active

and healthy life" (FAO, 2006). As a health volunteer, my main focus during my service was working with malnutrition. In Mauritania 42% of the children under five are underweight: 32% are moderately underweight, 10% are severely underweight (UNICEF, 2006). In 2004, I worked with a non-governmental organization monitoring nutrition in the Guidimaka. We weighed children in forty-four villages and found that 28% of the children were moderately underweight and 31% of the children were severely underweight.

Mauritanians live harvest to harvest. The country is dependent on food imports and aid (Figure 3).

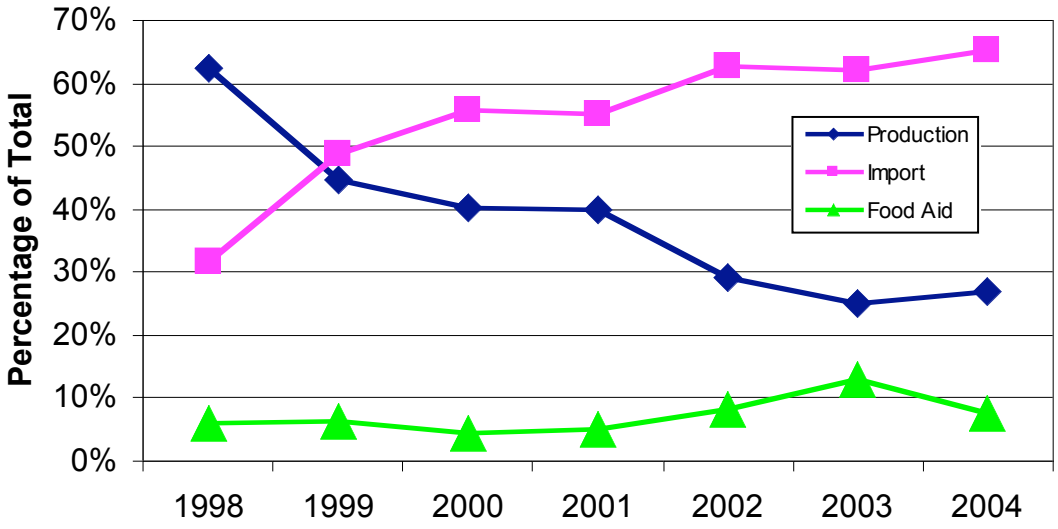

Figure 3: Percentage of cereals provided from production, import, and food aid for Mauritania from 1998-2004 (IMF, 2006)

Mauritania has had several years of drought and other environmental crises. In 2002, Mauritania suffered its sixth bad harvest in a row (Simpson, 2002). The rains, which normally come between June and August, did not come in 2002. The drought

caused many deaths in cattle, sheep, and goat herds. The lack of rain meant that the sorghum and millet crop, usually planted with the first rains, and the maize crop, usually planted with the last rains, never happened (Simpson, 2002). In 2004, just as I was starting my Peace Corps service, Mauritania was infested with locusts. The infestation added another blow to agriculture in Mauritania. As of September 2004, 40% of the year's crops had been eaten by the locusts. With 80% of the population relying on agriculture for their livelihood, the locust infestation was truly a plague. Mauritanians rely not only on their crops to feed their families but surpluses are traded for cooking oil, seeds, and other essentials. The locust plague increased urbanization as young men went to Nouakchott hoping to find the means to provide for their families back in the village (Harter, 2004).

The effects of years of bad harvests are evident. In response to the locust invasion, many farmers sold their cattle to be able to buy food in 2004. When that money ran out, they would borrow against their future crop (Harter, 2005). In 2005 the rains came, but later than usual. Malnutrition in Mauritania is not as bad as in other sub-Saharan countries and therefore it is not considered an "emergency" by international aid organizations. The presence of oil investors and foreign aid helps to keep Mauritanians fed, but it is unknown what will happen when this aid money stops coming in and the underlying problems are still not addressed (Harter, 2005).

2. 6 Actors and Beneficiaries

Peace Corps has been in Mauritania since 1967 but the roots of the current program were laid in the 1980s. There are five sectors represented: Community

Health, Agro-forestry, English Education, Environmental Education, and Small Enterprise Development. The focus of the health sector is on health education and preventative health. Due to the high incidence of malnutrition, the program is being expanded to include more work with improving food security and nutrition.

Dolous is a Christian non-governmental organization that works in Nouakchott and Selibaby. There are two Dolous offices in Selibaby, PNS Dolous and GM Dolous. GM Dolous runs micro financing projects and works on general development work. PNS Dolous works exclusively with malnutrition. They consult with the local health ministry on nutritional monitoring and have run feeding centers in rural Guidimaka. In 2004-2005, I measured Mauritanian children in more than forty villages with PNS Dolous and helped them manage twenty-three feeding centers.

Chapter 3: Definition of Project Management and Organization of Peace Corps

3.1 Definition of a Project

A project is an endeavor that has a finite time frame and creates a service, product, or result. Projects develop in steps. They have a logical progression from inception to completion. A project creates a deliverable. Services, products, and results are all deliverables. The time frame for a project is a finite element; a project has a definite beginning and end. The end of a project coincides with the moment in time when the objectives of the project have been met. Even though a project is a finite unit, the results of a project may be timeless. For instance, if a training project plans to train one hundred women, the project will end when the last woman is trained but the women can use their new skills long after the last training (PMI, 2004).

Projects are created when there is a need that cannot be addressed by the day to day operations of an organization. There is no limit to the nature of projects. A project can be as simple as organizing a weekend fundraiser or as complex as running the entire campaign for a political candidate. An essential aspect of a project is the fulfillment of a specific need. These needs are normally addressed in terms of objectives. Clear, definite, and precise objectives need to be identified so that the resolution of these goals can result in the conclusion of the project.

3.2 Definition of Project Management

Management is best defined by Peter F. Drucker. He said that management's fundamental task is, "to make people capable of joint performance through common goals, common values, the right structure, and the training and development they need to perform and respond to change" (Drucker, 2001). As a field study, project management is having achieved project objectives within time, cost, at the desired technological level. Additionally, resources must be allocated and used efficiently and the end product must be accepted by the end user (Kerzner, 2003).

Project management is management specific to a project. It encompasses the knowledge, skills, and activities, as well as the tools and techniques, to bring a project to its desired outcome. The project manager is the person charged with fulfilling the project objectives. The project manager can work independently or with others as part of a project management team. To properly manage a project, one has to identify the project requirements, clearly define the objectives and project deliverables, balance the "triple constraint" of time, scope, and cost, and collaborate with project stakeholders (PMI, 2004).

Project management is an accredited profession. The Project Management Institute has an accreditation process for its members. A Project Management Professional is held to a Code of Ethics and a Code of Professional Conduct.

3.3 Project Stakeholders

A stakeholder is any entity that is actively involved in a project. This includes people or organizations not only who are directly involved with the project but who

are affected by the results of the project as well. Part of the responsibilities of the project management team is to identify all stakeholders, determine their expectations, and manage their influence so that the project objectives can be reached. Different stakeholders will have varying levels of authority and expertise. Stakeholders are not always positive influences on a project. Negative stakeholders are those that will interfere with the completion of a project. To successfully manage a project, all stakeholders must be identified and managed. Managing stakeholders is often a formidable task because stakeholders can have contradictory objectives. There is a key list of stakeholders for every project (PMI, 2004):

- project manager or project management team
- customer or end user
- organization performing the work and all of its employees
- project team members
- sponsor or financial backer
- influencers

By having a comprehensive list of project stakeholders, a project manager can anticipate problems and seek preemptive solutions.

In Peace Corps Mauritania there are several stakeholders that must be managed. The Peace Corps volunteer is the project manager. The customer/end user can be an individual, a cooperative, or a community. The project management team is made up of the Peace Corps volunteer, his supervisors in Peace Corps, his Mauritanian counterparts, his fellow volunteers, and possibly his Mauritanian

supervisor. The sponsor or financial backer can be a number of organizations. Projects can be funded by Peace Corps, local governmental or non-governmental organizations, or international governmental or non-governmental organizations. Projects without backing are "sponsored" by the in-kind labor and donations from villages and cooperatives. There are many influencers in Mauritania. Certain protocols must be followed within the community for a project to begin. As part of the cross cultural training, the Peace Corps volunteer learns that village elders and town officials must be consulted before any work starts. Not having a comprehensive list of stakeholders can lead to greater frustrations for the Peace Corps project managers or even project failure.

In Peace Corps Mauritania, there are two main groups of stakeholders. The influencers are the stakeholders whose input is essential very early on in the project. These stakeholders will have much more influence in the planning stages of the project. As time progresses the cost of changing the project increases. New projects can be reorganized at a small expense. Due to the higher costs of changing the project in its later stages, the role of influencer stakeholders in the later stages greatly decreases (PMI, 2004).

Another set of stakeholders are the host country nationals that are working with the Peace Crops volunteer to manage the project. These stakeholders represent the individuals or organization that came to the Peace Corps volunteer with the initial project idea. Throughout the project, their involvement in the project will increase. Ultimately, they will take ownership of the project and retain new skills.

3.4 How Organizations Influence Projects

The organization is larger than the project. An organization can have several projects running concurrently. The project is influenced by the organization. A Peace Corps volunteer works for the larger organization of Peace Corps. Peace Corps is a United States Governmental Organization that falls under the jurisdiction of the Executive Branch. Peace Corps is then divided up into regions around the world. Those regions are divided up into country offices. The Peace Corps Bureau in Nouakchott is the direct supervisor of all volunteers serving in Mauritania. The Peace Corps Bureau is run by the Country Director (CD). The CD oversees all administrative aspects of Peace Corps in the host country. The CD appoints Associate Peace Corps Directors (APCDs) to be the sector specific supervisors. The APCDs work closely with Peace Corps volunteers in the design and implementation of projects.

Organizations can be divided into two categories: project-based organizations and non-project-based organizations. The majority of a project-based organization's work will pertain to projects whereas non-project-based organizations focus more on one single task (PMI, 2004). Peace Corps is a project-based organization.

The way an organization is structured can determine its effectiveness in project development and implementation. The classic organizational structure is called a functional organization. In a functional organization each employee has one direct supervisor (Figure 4). In a project oriented organization teams are established based on project need. Instead of functional managers having subordinates, project managers have project teams (Figure 5).

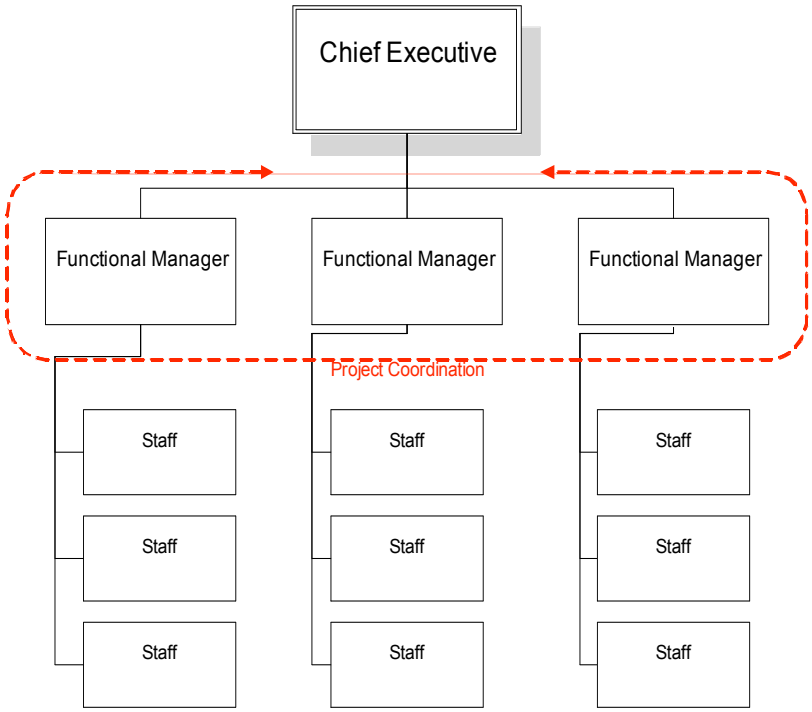

Figure 4: Functional organization

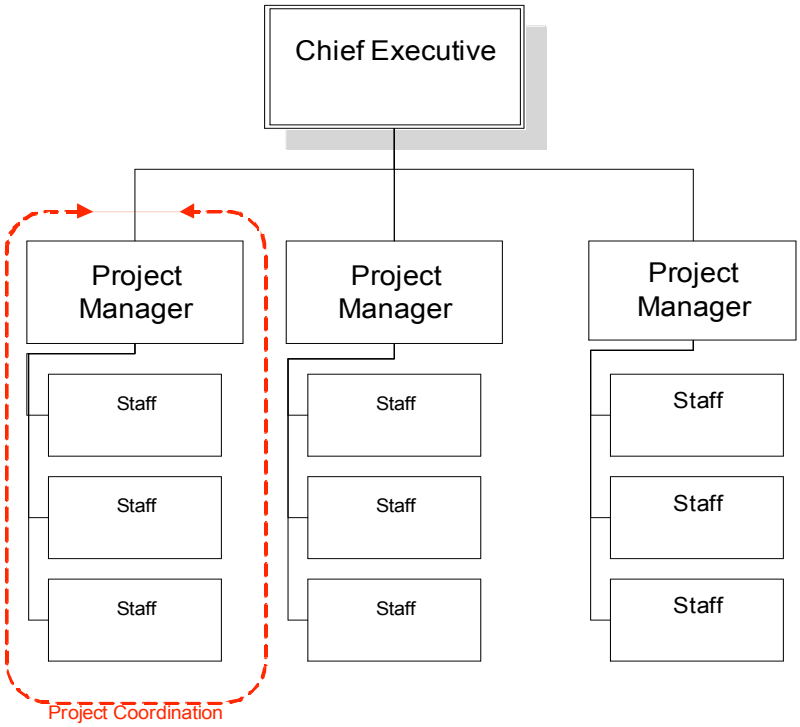

Figure 5: Project-oriented organization

In between functional and project-oriented organizations, there are matrix organizations. A weak matrix structure is closer to a functional system and a strong matrix system is closer to a project-based organization. Peace Corps Mauritania is a balanced matrix system. In a balanced matrix system, the organization respects the need for project managers but does not provide project managers with full control over projects and funding (PMI, 2004). Figure 6 demonstrates Peace Corps Mauritania as a balanced matrix organization.

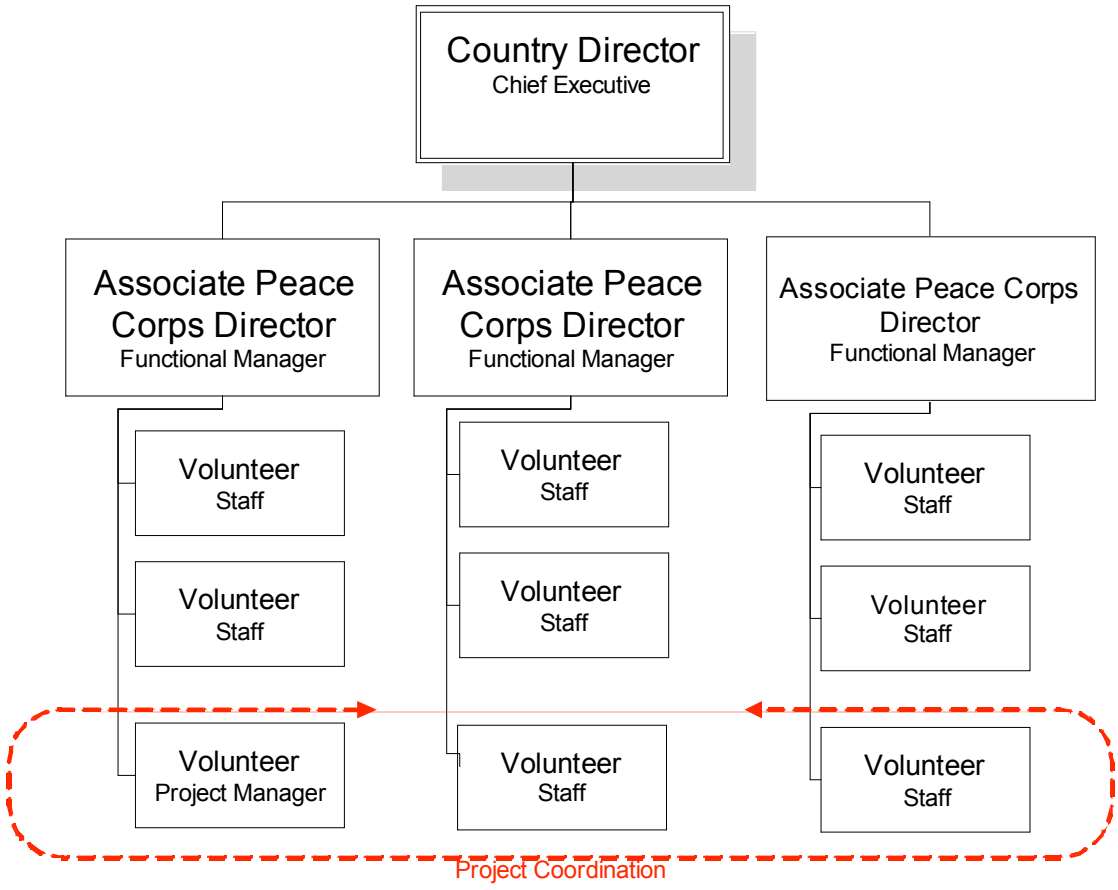

Figure 6: Peace Corps as a balanced matrix organization

The Country Director is the head of the organization. Below him, the sector specific Associate Peace Corps Directors direct their respective sectors. Under each of the APCDs are their volunteers. The volunteers can either be project managers or staff. The volunteer project manager, in his project coordination, can work with volunteers from other sectors.

Understanding the structure of the organization is essential in identifying stakeholders and accessing resources. It is also important for the organization to reflect on the pros and cons of its structure and how that helps or hinders the work of Peace Corps volunteers in the field.

Chapter 4: Project Management Methodology

In 1987, the Project Management Institute (PMI) developed the Project Management Body of Knowledge (PMBOK) in hopes of standardizing project management. In 2001, the Project Management Institute released the third edition of the *Guide to the Project Management Body of Knowledge* (PMI, 2004). The PMBOK is an internationally recognized standard, ANSI/PMI 99-001-2004, for project management. The PMBOK divides the project management process into five distinct process groups and nine bodies of knowledge. Whereas the PMBOK is generally accepted, it has its critics. In a multi-project environment, the Critical Chain method is more applicable (Focused Performance, 2001). A multi-project environment is an environment where one project manager or project management team is responsible for twelve or more projects at the same time (Chapman, 1997). Peace Corps is not a multi-project environment. Peace Corps volunteers can and do work on projects that sometimes run concurrently, but a single volunteer would never have twelve or more projects at the same time.

The project methodology and diagrams that follow in this section are all adapted from the PMI, *A Guide to the Project Management Body of Knowledge, Third Edition* (PMI, 2004).

4.1 Classic Approach

Any approach to project management is merely a development of basic problem solving methodology. Defining the problem, weighing the options, choosing

a path, executing the path, and evaluating the results is a methodology that can be seen in the engineering method, project management theory, the scientific method, and any other linear approach to problem solving.

The origins of the PMBOK process group methodology come from the American Society for Quality. In the American Society for Quality Handbook, the Plan, Do, Check, Act cycle is presented as shown in Figure 7 (PMI, 2004).

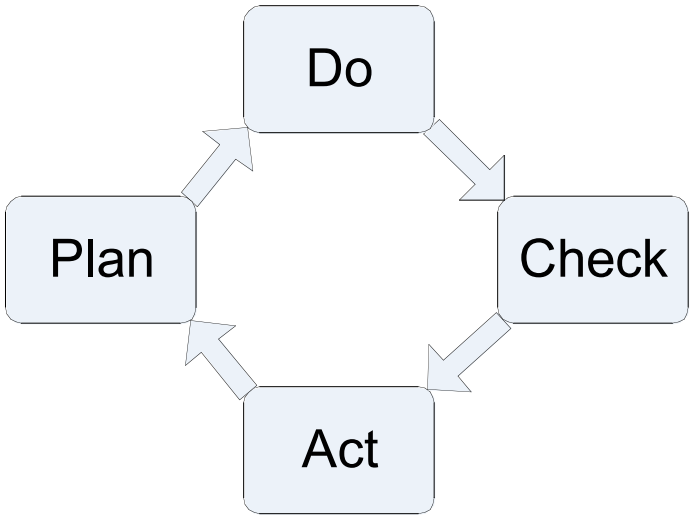

Figure 7: American Society for Quality's *Plan-Do-Check-Act* cycle

In this cycle, the end products from one process are the inputs for the following process. The Process Groups (Section 4.2) methodology expanded on the basic premise that the outputs from one process were integral to the subsequent processes.

4.2 Process Groups

The Process Groups approach to project management is similar to the Plan-Do-Check-Act cycle in that it uses the outputs from one process as the inputs for the another process. The Process Groups methodology is more complex than the Plan-Do-Check-Act (Figure 8).

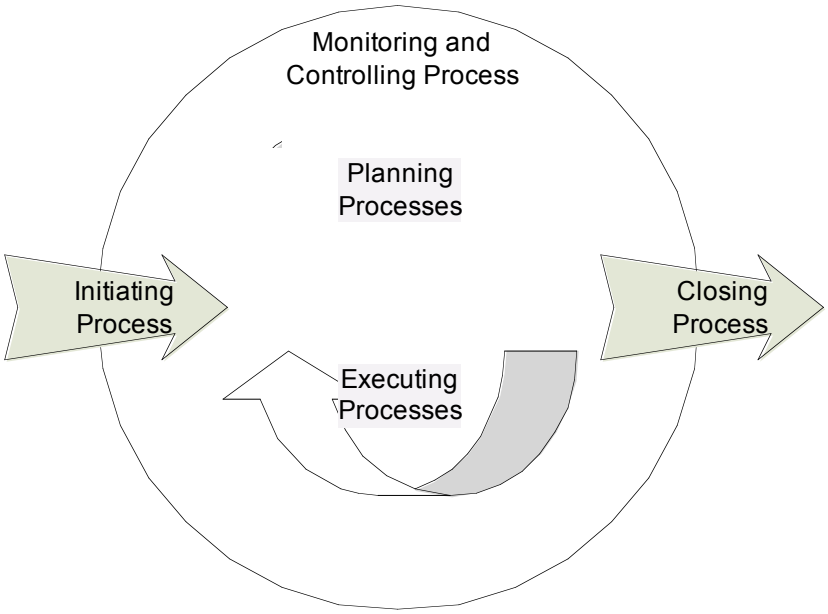

Figure 8: The PMI Process Groups project management methodology

Whereas in the Plan-Do-Check-Act cycle inputs from the proceeding process only affect the subsequent process, in the Process Group cycle each process influences the others. The Process Groups methodology has five distinct groups: Initiating Process Group, Planning Process Group, Executing Process Group, Monitoring Process Group, and Closing Process Group (PMI, 2004).

It is important to remember that each element of the Process Groups is not a phase of a project. A project can have many phases. When projects are complex, they are often divided into phases. For instance, construction systems are often described

as design-bid-build or design-build. These subsections are phases in the project (Lothe, 2006). The Process Groups Methodology suggests that each of these phases should go through the initiating, planning, executing, monitoring, and closing process groups (PMI, 2004).

The balance of this chapter will discuss in detail the five Process Groups and their interdependences. Any text in **bold** refers back to the accompanying Process Group Figures.

4.2.1 Initiation Process Group

The end goal of the Initiation Process is the formal declaration of a new project. It is within this process that project objectives are developed and defined. The documentation from this group includes a basic description of project scope, duration, and deliverables.

During the Initiation Process, involvement of stakeholders is essential. Involving as many stakeholders as possible increases the shared ownership of the project. Also, the project deliverables will be more accepted because the clients and project recipients will be able to voice their opinions early in the process.

There are two main elements in the Initiation Process Groups: **develop project charter** and **develop preliminary project scope statement** (Figure 9).

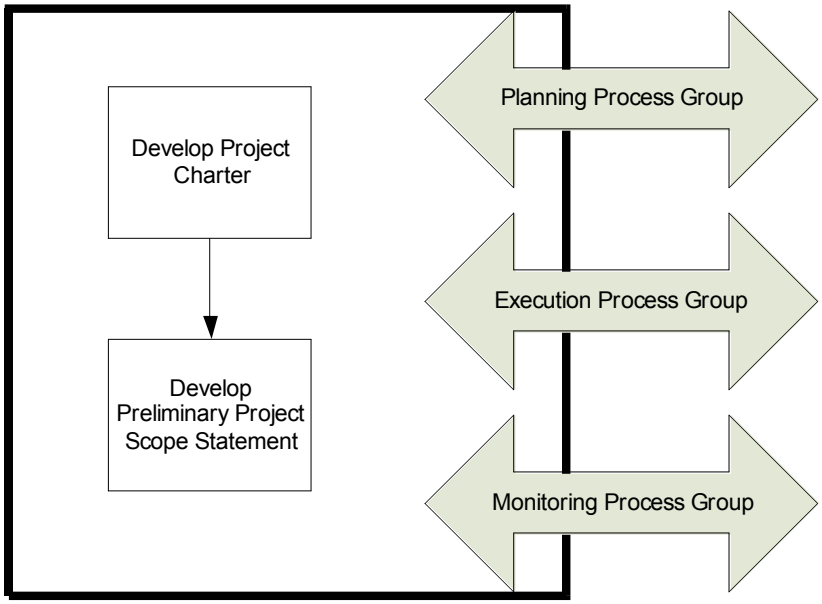

Figure 9: The Initiation Process Group

The first step to a project is to **develop the project charter**. The project charter is an official document that links the project on hand to the greater direction of the organization. Usually the project charter includes a statement of work. A statement of work is a narrative description of project deliverables. It includes the organization's needs, the characteristics of the project, and a strategic plan for achieving the project's goals.

Once the project charter has been created, the second part of the Initiation Process is the **development of a preliminary project scope statement**. This is a high level scope definition and will be used in the Planning Process Group to fully define the scope of the project. The primary project scope statement defines deliverable and project requirements. It also outlines the boundaries of the project and the methods of acceptance for the project (PMI, 2004).

4.2.2 Planning Process Group

The Planning Process Group encompasses all the planning aspects of a project. By addressing all the elements in this group, the project manager will have a comprehensive list of what needs to be done, when it needs to be completed, and who will be doing the work. Also, it is in this process group where the high level scope defined in the Initiation Process Group is refined to a specific scope definition. There are many elements to the Planning Process Group. Not all elements are necessary for every project. There are also several interdependencies in this process group. Figure 10 illustrates many of the interdependencies but, for the sake of clarity, not all relationships are shown. For the sake of clarity, these elements will be discussed as part of their larger management bodies of knowledge. For example, risk management, risk identification, qualitative risk analysis, quantitative risk analysis, risk response planning are all part of Risk Management and will be discussed as such. As with Section 4.2.1, all the elements are set in bold and can be referenced back to this figure.

The Planning Process Group has many elements to it. The first element is to **develop the project management plan**. The project management plan defines how the project will be executed, monitored, and closed. The defined scope from the Initiation Process Group, environmental factors, and the expertise of the project manager are all used to make a solid plan for the project. The plan can be changed and amended through the Monitoring and Controlling Process Group (Section 4.2.4).

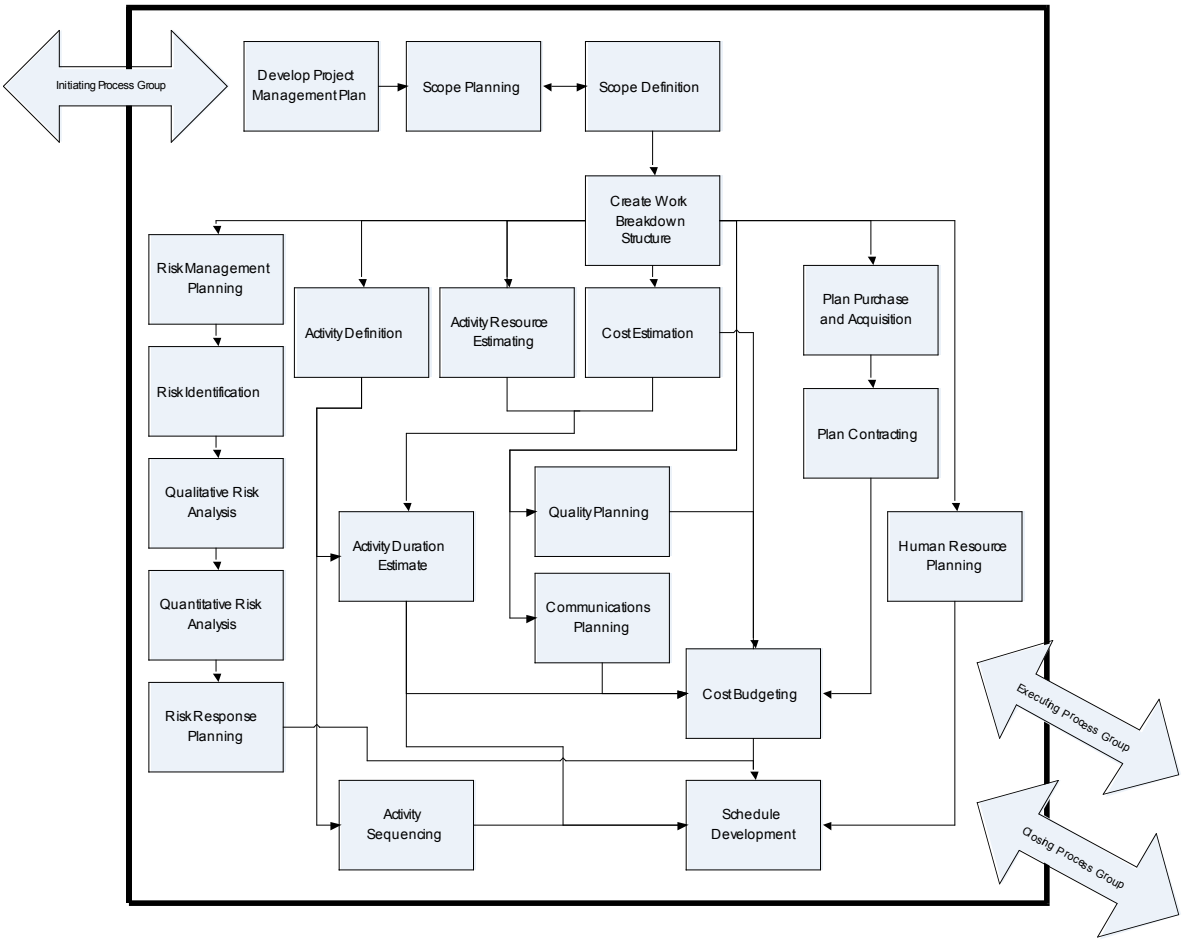

Figure 10: The Planning Process Group: This is the most complex process group to be covered in this text. Many of the above elements are dependent on each other.

Once the project management plan exists, the scope of the project needs to be rigidly defined and the future project work needs to be detailed. This happens in the **scope planning**, **scope definition**, and **create work breakdown structure** elements. **Scope planning and definition** help the project manager balance the tools, data sources, methodologies, and procedures with environmental factors, social factors, and project limitations to clearly define the project's size, importance, and

complexity. The more rigid the scope of the project is, the more precise the project team can be in their execution planning. The project manager and stakeholders should use their judgment and expertise to clearly plan and define the scope. Once the scope is defined, the **work breakdown structure** needs to be created. This structure details the necessary work to obtain the project deliverables and objectives. It clearly defines what members of the project team will complete which aspects of the project work. The **scope definition** is divided into smaller, more achievable, blocks. Usually during the work breakdown structure, the scope of the project is revisited and revised to more accurately reflect what can be accomplished within the project.

After the **work breakdown structure** is completed, several aspects of the project can begin. The larger group of risk management includes **risk management planning**, **risk identification**, **qualitative and quantitative risk analysis**, and **risk response planning**. All aspects of all projects come with risks. The goal of risk management is to preemptively define the risks the project will encounter. By defining possible risks during the planning process, it is easier for the project management team to allocate adequate resources to mitigate the risks. Experience is the best tool the project management team has for **risk identification** and **risk response planning**. Along with reviewing past projects, a thorough stakeholder assessment can help in risk management.

Project time management is also part of the Planning Process Group. Within the group, project time management consists of **activity resource estimation**, **activity definition**, **activity duration estimation**, **activity sequencing**, and **schedule development**. Using the work breakdown structure as a guide, the project

management team can define the necessary work activities, the **activity definition**, to achieve the goals of the work blocks. Once the work blocks of the work breakdown structure have been decomposed into activities, the project team can begin sequencing the activities, creating project milestones, and assigning appropriate resources to achieve these milestones. After a project has gone through the activity sequencing process, it should be able to start its **resource estimation**. **Activity resource estimation** determines the labor, equipment, and materials needed to achieve each task. This is closely aligned with the **cost estimating process**. Once a project has gone through the **activity sequencing** and **activity resource estimation** elements, **the activity duration estimation** elements can begin. In these elements, the project management team will assign a time to each activity. A time is assigned to each activity so that a project schedule can be created. A classic method for project scheduling is the PERT (Project Evaluation and Review Techniques) method. PERT charts not only show timing but illustrate dependencies as well. From scheduling diagrams, the critical path for the project can be determined. The critical path is the essential project path with the longest duration. The amount of time it takes to complete the critical path is the minimal timeframe for the completion of the project.

Human resource planning, **quality planning**, and **communication planning** can all happen after the **work breakdown structure** has been completed. **Human resource planning** helps the project team determine who will do what. It determines the project roles, responsibilities, and reporting relationships. When organizing the human resources of the project, the project manager must answer several project specific questions. The project manager must be mindful of which

technical skills are needed for the project, what logistical limitations exist within the project team, and what political and interpersonal issues may arise during the project. The project manager must also have a good understanding of what technical expertise is present within the organization and what skill will have to be outsourced. **Quality planning** pertains to which industry or organizational standards are pertinent to the project on hand. Communication planning is another element to the Planning Process Group. The **communication plan** details which stakeholders, contractors, and laborers need to be contacted. It also details how they should be contacted and how frequently they need to be contacted.

Planning purchases and acquisitions, **plan contracting**, **cost estimation**, and **cost budgeting** are all fiscal aspects to the Planning Process Group. Once the work breakdown structure has been completed, material for the project can be purchased and certain aspects of the project can be contracted out. With a detailed list of activities and resource estimates, a cost estimate can be created. This cost estimate becomes the basis for the project budget.

4.2.3. Executing Process Group

Within the Execution Process Group, the main project goals are achieved. There are six elements in the Execution Process Group: **direct and manage project execution**, **perform quality assurance**, **acquire project team**, **develop project team**, **request seller responses**, **select sellers**, and **information distribution**. The independencies of these elements are shown in Figure 11.

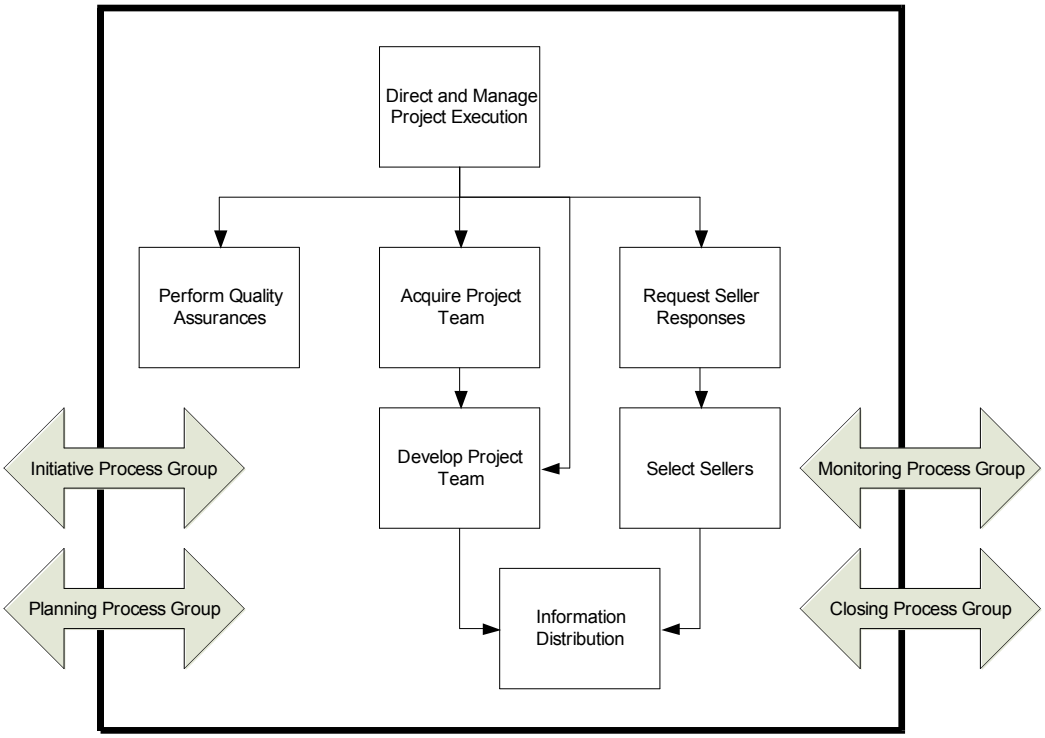

Figure 11: Executing Process Group

How one **directs and manages project execution** varies greatly with the subject of the project. During the Executing Process Group, the defined project objectives are met. Depending on the nature of the project, this process group can take weeks, months, or years. Often during the management of the project execution, the plans developed in the Planning Process Group need to be revisited and revised.

Performing quality assurance is an important aspect in delivering a good project. Quality assurance can be defined as the application of planned, systematic quality activities to ensure that the project will meet its requirements (PMI, 2004). A project's requirements vary from organization to organization and project to project. There are several professional accreditation organizations that have specific

regulations for project delivery; in order to say that a project meets these standards the project team must perform the necessary quality assurances.

Projects are usually a large and complex undertaking. The necessary laborers for a project are called the project team. One of the Planning Process Group's elements is **human resource planning**. In this element, the project manager or project management team makes a detailed list of what other laborers they will need to complete the project. Depending on the project and the direct level of involvement of the project management team, they may or may not have any direct involvement with the project team. Usually on larger projects, contractors are hired which, in turn, manage their own teams. On smaller projects, the project manager will often have much more direct involvement with the project team.

The project team must be assembled; this occurs in the **acquire project team** element. Once the team has been acquired, it is important to educate them on the goals and restraints of the project. This process is called **project team development**. There are two main objectives to developing the project team: improving skills of the project team to increase their capacity to complete the project, and fostering feelings of trust and cohesiveness to create an atmosphere more conducive to project success.

Project completion is achieved through collaboration between the project team and outside sellers. Once the project management team has determined which aspects of the project are going to be completed by the project team, and which aspects of the project are going to be outsourced, the outsourced labor must be bid. The process of soliciting bids for parts of the project is known as **requesting seller responses** and the process of awarding the bid is the **select seller element**. It is important to

remember that the overall quality of the project is the responsibility of the project management team. The outsourced labor may not have the same quality standards as the project team.

Information distribution requires the project management team to keep project stakeholders abreast of project development, setbacks, and milestone achievements. Being proactive with stakeholders can help the project run smoothly.

4.2.4. Monitoring and Controlling Process Group

As illustrated in Figure 8 (Section 4.2), the Monitoring and Controlling Process Group has a presence throughout the project. This process group is responsible for the collection, measurement, and dissemination of project performance information. As shown in Figure 12, there are several elements to the Monitoring and Controlling Process Group: **monitor and control project work**, **integrated change control**, **scope verification**, **scope control**, **schedule control**, **cost control**, **perform quality control**, **manage project team**, **performance reporting**, **manage stakeholders**, **risk monitoring control**, and **contract administration**.

The monitoring and controlling of the project happens throughout the project. Through the **monitor and control project work** element the project management team has a sense of the overall health of the project. Hand in hand with the monitoring and control of the project is the **integrated change control**. Projects are fluid; they are constantly changing and moving. Even the best laid plans can be

uprooted. A successful project usually has a project management team that anticipates pitfalls and adjusts accordingly.

A good project management team is constantly monitoring its project team to make sure that milestones are being met and quality is being maintained. This occurs in the **manage project team** element. It is also important to **manage stakeholders**. Stakeholders need to be kept abreast of changes to the project. Additionally, they may be useful in solving unexpected problems.

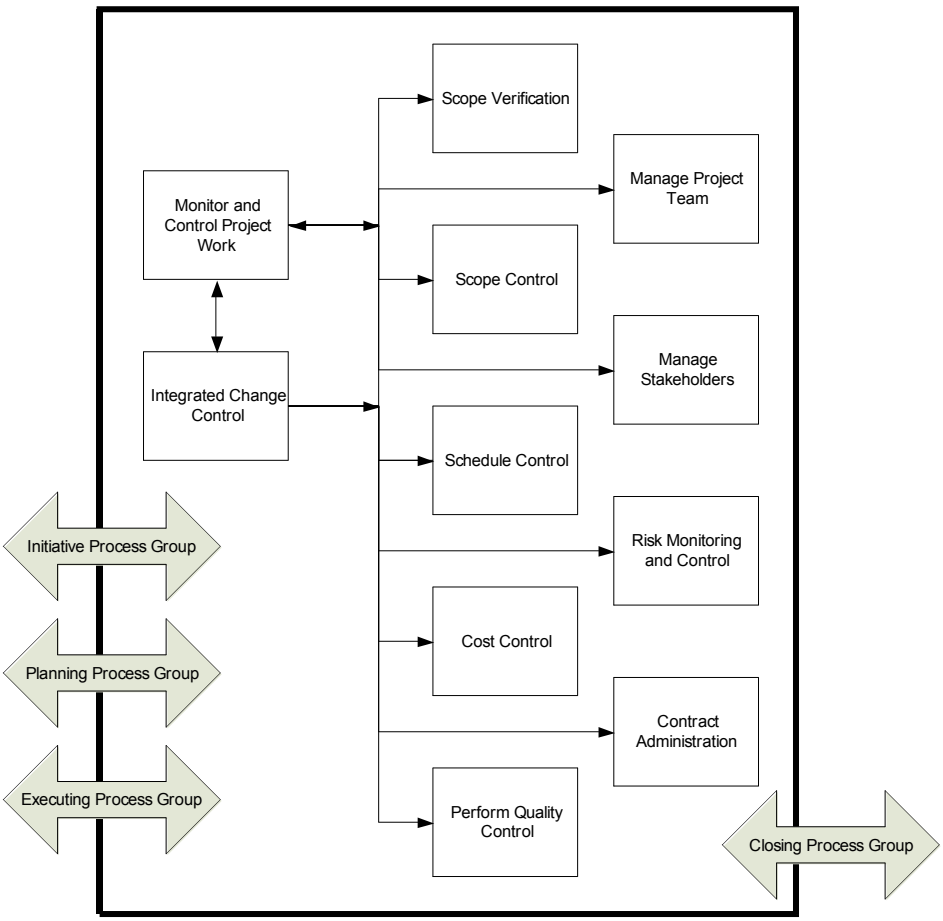

Figure 12: Monitoring and Controlling Process Group

Scope verification encompasses working with the stakeholders to assure that the project objectives and deliverables are viable. **Scope verification** also includes the acceptance of the project deliverables by the stakeholders. Once the project scope has been verified, it needs to be controlled. The scope of a project can easily be changed by unexpected hardships and pitfalls. **Scope control** assures that if any changes are made to the project scope they are accepted by the stakeholders and the project team is updated. The vehicle for these communications is the **integrated change control** element of the Monitoring and Controlling Process Group.

As the scope can shift and change through a project, so can the schedule, cost, and quality assurances. Whereas the project management team hopes that their planning is comprehensive enough to finish the project as planned, the team must also allow for deviations and setbacks. With the **schedule control** and **cost control** elements, the project management team can anticipate problems and adapt the project accordingly. All changes to programs and schedules need to be communicated to the project team and if the changes affect the scope or project objectives the stakeholders must be notified as well.

Risk monitoring and control is arguably the most important aspect of the Monitoring and Controlling Process Group. In the Planning Process Group (Section 4.2.2), several possible risks are identified and a plan is created for how to mitigate the risks. These risks must be constantly monitored and the project team must always be anticipating new risks. Mitigating risks is a large part of any project. Proper risk monitoring entails identifying and managing new risks, tracking identified risks,

reanalyzing existing risks, establishing and monitoring trigger conditions, estimating residue risks, and judging the effectiveness of risk response measures.

While managing a project through its execution, the monitoring of **quality control** in important. Depending on the number of unexpected problems that arise, the focus on quality can deteriorate. To assure that the project meets quality standards, quality must be continuously monitored.

The project management team is also responsible for managing any project contracts. **Contract administration** maintains that the work that is contracted out is performed in line with the drafted contract.

4.2.5 Closing Process Group

The final Process Group, the Closing Process Group, is show in Figure 13. It contains two elements, **close project** and **contract closure**.

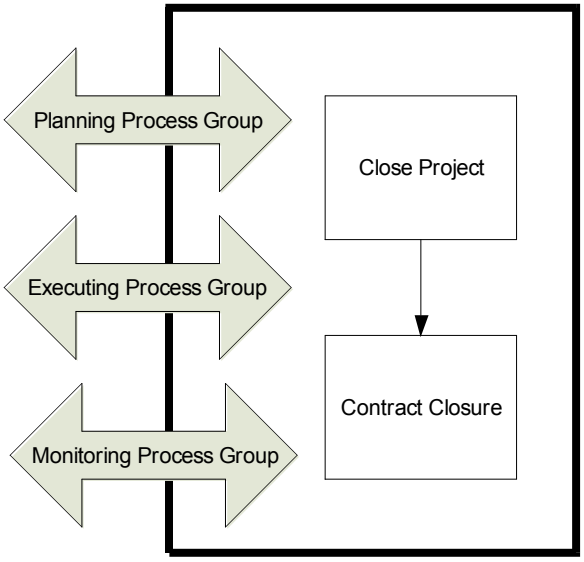

Figure 13: Closing Process Group

When the project has achieved its objectives, it can be closed. There are two aspects to closing a project: the administrative closure process and the contract closure. The administrative closure marks the formal end to the project and is encompassed in the **close project** element. At this point, the project management team delivers the product to the end user. The project management team collects any project records and analyzes them for project successes and failures. The information is archived for future use. The lessons learned and experiences gathered from project to project are the project manager's most important tools. The **contract closure** element includes finalizing any aspect of the outstanding contracts and closing any administrative aspect of the project.

Chapter 5: Project Management Methodology for Peace Corps Mauritania

The PMI methodology was designed for use in industry and difficulties exist when using it for projects in developing countries. A simplified methodology, more focused on the realities of the developing world, is needed.

5.1 Overview of Methodology

To more adequately meet the project management needs of Peace Corps Mauritania, a new project management methodology has been developed (Figure 14). There are nine elements in this proposed Peace Corps Mauritania project management methodology: selection of project, identification of stakeholders, definition of objectives, design of project plan, allocation of resources, project implementation, project documentation, and close of the project.

5.2 Element #1: Selection of Project

The selection of the project is one of the most important aspects to having a successful project. If the volunteer selects a project that is not supported by the community, then the chances of the community working on the project are little. When choosing which project to work on, the volunteer must work closely with host country counterparts.

While deciding on the project, the project management team should emerge. Typically, the project management team will be the Peace Corps volunteer and the host country nationals that proposed the project.

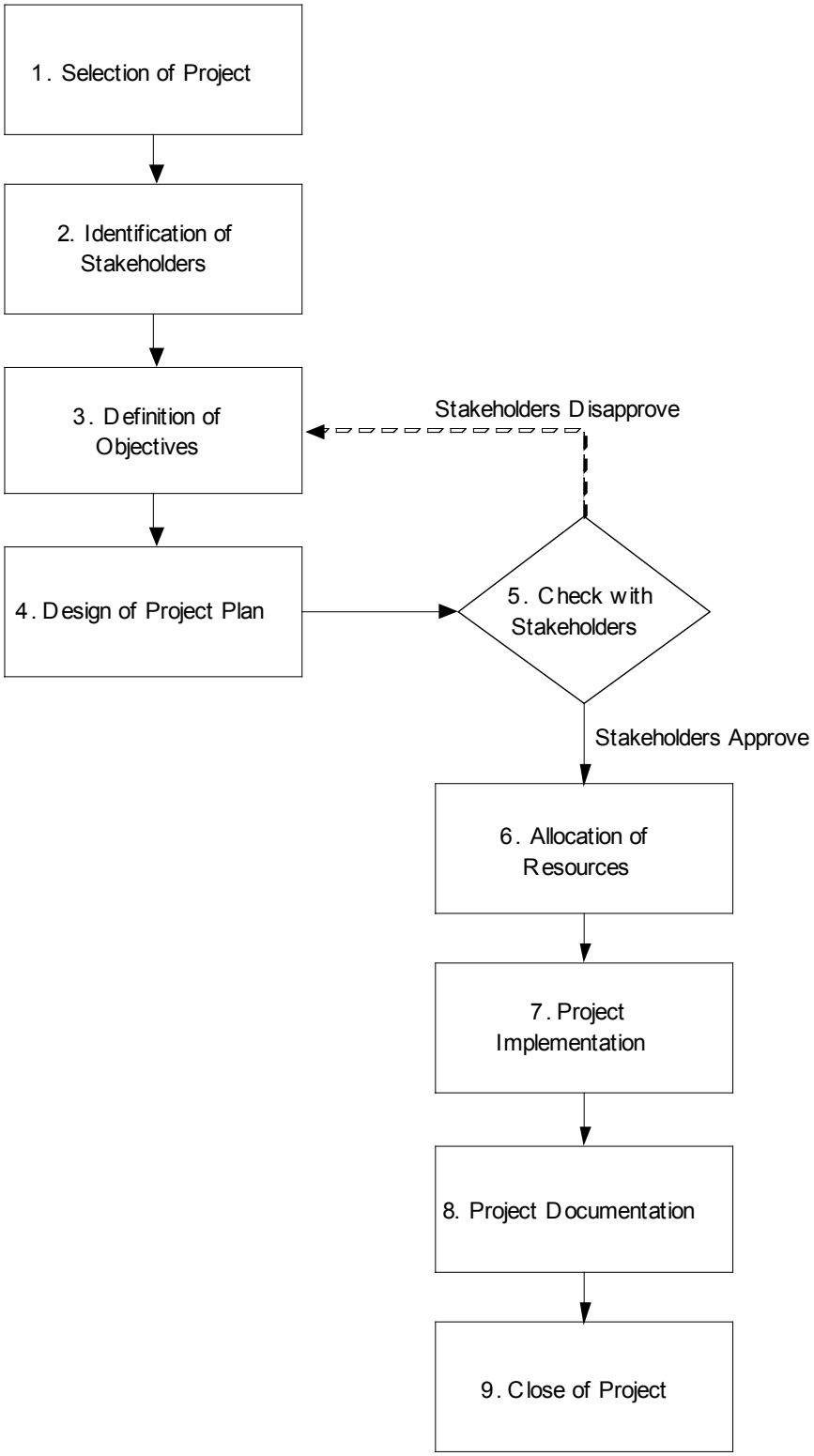

Figure 14: Proposed project management methodology

5.3 Element #2: Identification of Stakeholders

Once the project has been chosen, the volunteer should sit down with his counterpart and make a list of all the stakeholders in the project. They should then take that list and discuss it with their APCD in the hopes of getting an even more comprehensive list. The more stakeholders identified, the better the Peace Corps volunteer can manage the stakeholder involvements.

Stakeholders can have a positive or negative effect on the project. One of the jobs of the project management team is to determine what effect each stakeholder will have on the project and how they should be managed. Local knowledge will be crucial in this process.

In Mauritania protocol is important. Any project idea needs to be discussed with the local leaders. In villages this can be as simple as talking to the village chiefs or elders but in regional capitals this can involve the Mayor's or even the Governor's office.

Stakeholders must be identified early in this element because their input is important to the third and fourth elements of this methodology. Their acceptance of the project objectives and project plan will increase project sustainability.

When determining the stakeholders, consider the following:

- Who are the end users?
- Are there any land tenure issues to be considered?
- Who will want to see this project succeed?

- Who will want to see this project fail?
- Are there any NGO or government agencies that are doing similar work?
- What protocol needs to be followed?
- Who will benefit from the project?

Recall from Section 3.3, that there are two main types of stakeholders: the influencer stakeholders and the project management team stakeholders. At the inception of the project, the Peace Corps volunteer will have the most knowledge about the project. Part of the volunteers' responsibility is to transfer knowledge to their host country counterparts. The counterpart will work with the volunteer throughout the project. At some point, the Peace Corps volunteer will remove themselves from the project and let the host country national assume ownership (Figure 15).

5.4 Element #3: Definition of Objectives

Clearly defined objectives are important to the direction of the project. If the objectives are too large in scope, project management can be cumbersome. When defining the objectives of the project consider the following questions:

- What are the major deliverables of the project?
- What constraints have to be overcome to reach these deliverables?
- What resources are on hand?
- What resources can be obtained?
- How will the community accept the project?
- What is included in the project, what is excluded within the project?

- Are these objectives in line with the wants and needs of the stakeholders?

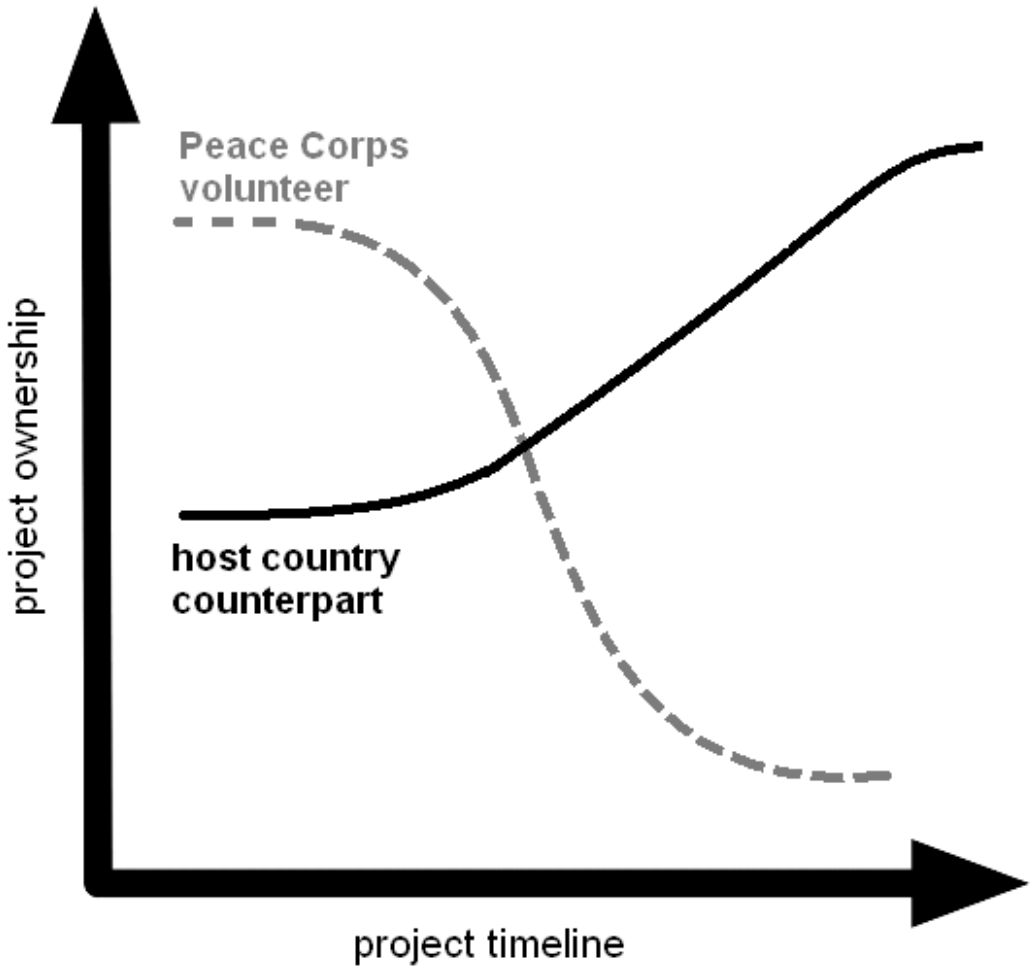

Figure 15: Project ownership relationship between project management team stakeholders and the Peace Corps volunteer and over the course of a project.

5.5 Element #4: Design of Project Plan

The project plan design depends very much on the nature of the project. The more work that is done in conjunction with counterparts and local stakeholders, the

more feasible the project plan will be. When developing the project plan, focus on the following questions:

- What activities are needed to achieve the objectives of the project?
- What resources need to be secured for each activity to take place?
- What is the order of the activities?
- What risks are we possibly going to encounter?
- What is the best way to mitigate these risks?
- What quality standards is the project held to?
- What labor is needed to complete the project?
- What is the budget for the project?
- Where are the funds for the project going to come from?
- How will information about progress be disseminated to stakeholders?
- What are the milestones of the project?
- What is the calendar for the project?
- Do the project stakeholders support the project plan?

5.6 Element #5: Stakeholder Project Assessment

When the preliminary project plan is completed, it should be reviewed by key project stakeholders. The goal of this feedback is to focus the project management team on the end users of the project. During this review process, it is still very easy to change the project (Figure 16).

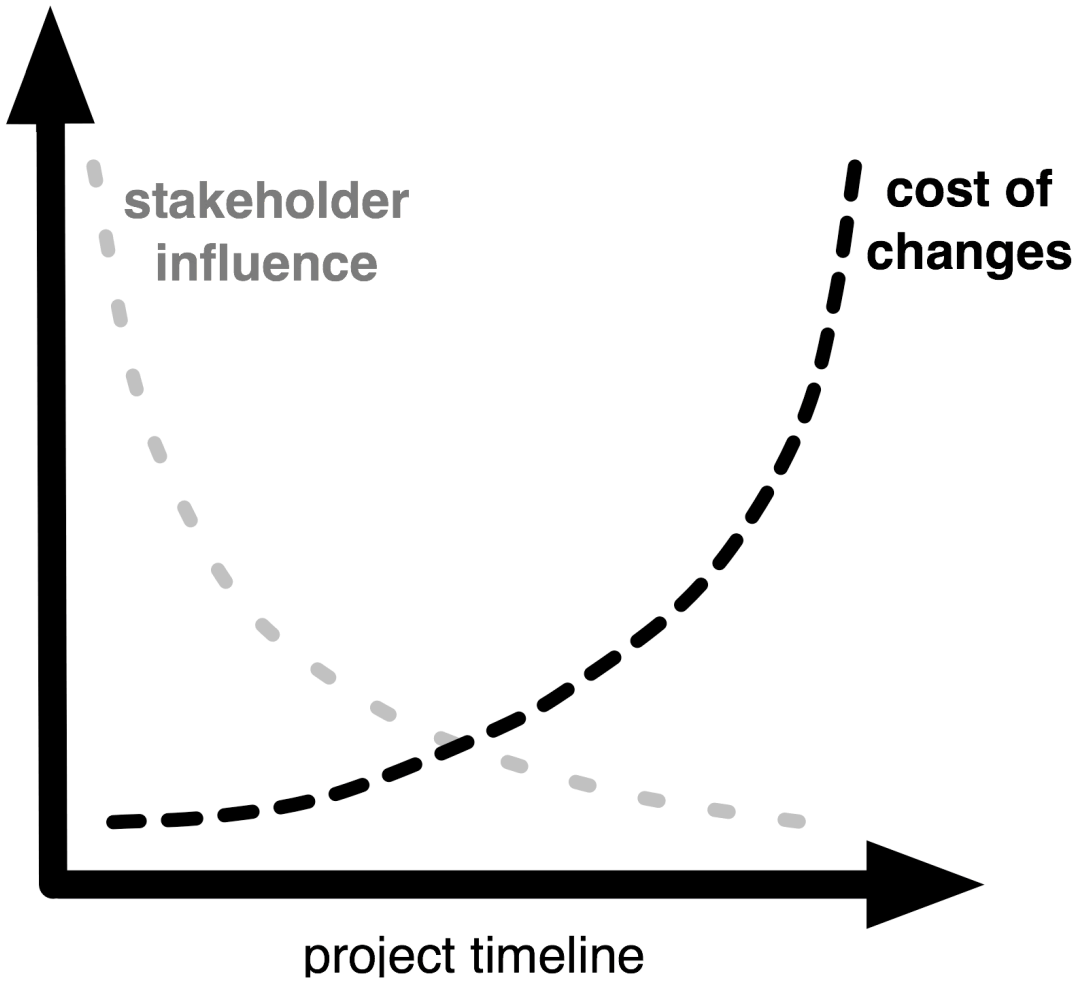

Figure 16: Relationship between influencer stakeholders and cost of changes over the course of a project.

Once the project implementation begins, it becomes more difficult to change the project plan. Assuming that the project plan meets the needs of the stakeholders, the project can continue to the next project element, the allocation of resources.

5.7 Element #6: Allocation of Resources

The allocation of resources for a project will differ greatly depending on the objectives of the project. One of the roles of Peace Corps volunteers is to demonstrate transparency in their work. By having a clear and open allocation of resources, volunteers can protect themselves from suspicion and demonstrate transparent business techniques. Some techniques for running a transparent project are listed below:

- Document all financial transactions in a balance sheet.
- Work to ensure that all ethnic groups benefit equally from the project.
- Keep lists of participant names.
- Discuss all financial aspects of the project with the community contact, have dual signatures on any large withdrawals of project money.
- Report any discrepancies or problems when they are realized.
- Have a clearly defined budget and adhere to it.
- If deviations to the budget are needed, discuss them with the community counterpart and supervisors.
- Clearly explain that project accountability is shared between the entire project management team, not just the Peace Corps volunteer.

5.8 Element #7: Project Implementation

The implementation of a project can be stressful. Hopefully, with good planning, the project implementation will go as the project management team designed. It is a good idea to have weekly meetings with the major project

stakeholders to keep them abreast of the project. The project management team should be in constant communication during the project implementation. The more attentive the management team is to the project, the less time it will take them to react if something goes awry.

When implementing the project:

- Link all activities to the larger project plan; do not become shortsighted in focusing on one task.
- Trust the developed project plan.
- If problems arise that forces a change in the project plan, discuss a plan of action with the project management team and then proceed.
- Document all changes to the project plan.
- Keep a project log.
- Have regular project management meetings to discuss the progress.
- Have a presence at the work site, do not manage from afar. Work along side the host country nationals.
- Be professional.

5.9 Element #8: Project Documentation

After the project has been implemented it is important that the project management team documents their successes and failures. Peace Corps is a transient organization. Every year there is a completely new group of volunteers in the country, each having a two-year tenure. By having a good record of the project, future volunteers can build on the project, not repeat the same project. The process of

documenting the project is also beneficial to the project management team; it provides them with a good environment to assess their work. When documenting a project, the project management team should consider the following questions:

- Did we meet the defined objectives of our project?
- What was our project plan?
- How did the project plan change during its implementation?
- What were the successes/failures of our project?
- How could we have better designed the project?

5.10 Element #9: Project Closure

When the project has been documented, it is time to close the project. The project management team should transfer the project over to the project recipients and explain any operation and maintenance needed. The team should close any outstanding contracts and confirm that all laborers and contractors have been compensated. All resources allocated to the project should be accounted for and all project information should be stored within the Peace Corps central office. Here are some suggestions for the closing of the project:

- Meet with project stakeholders to discuss project results.
- Clearly explain any maintenance or continuing work needed.
- Balance the budget and have the project management team sign off on it.
- Reflect with project management team on project successes and failures.

Chapter 6: Research Validation

In this chapter, I will describe two projects that I worked on in Mauritania in terms of the proposed project management methodology. These project examples will help to illustrate some of the problems and pitfalls I encountered in my work. They both deal with increasing food security. The first project discussed is the Cereamine project; the second project discussed is an aquaculture project.

6.1 Project 1: Cereamine

This project has been broken down into the nine elements of the proposed methodology. Since the methodology was produced in retrospect, not all elements of the methodology were followed. This example will illustrate the problems that arose when stakeholders were not consulted in the early elements of the method.

6.1.1 Background

Cereamine is a high-energy flour that is made from maize, beans, rice, millet, and peanuts. Before this project, Cereamine was relatively unknown in Mauritania. Through this Peace Corps project, Cereamine has been introduced to eighteen communities. This project study will focus on the project design, implementation, and management of the Cereamine Project.

6.1.2 Selection of Project

Malnutrition is a large problem in West Africa. UNICEF estimates that 32% of Mauritanian children are underweight (UNICEF, 2006). As the Peace Corps health extension agent in Selibaby, I worked with a local NGO, PNS Doulos, on nutritional projects. PNS Doulos runs feeding centers in the Guidimaka. When I started working with them, we were just monitoring and managing feeding centers in rural Guidimaka. Our course of action for villages with malnutrition was a four month community run feeding center. At the center, the malnourished children would be fed a high-energy porridge, USAID Wheat Soy Blend (WSB).

Feeding the malnourished children USAID governmental aid food presented many problems. USAID food is not sustainable; when the feeding center program ends the villagers can no longer provide the porridge to their children. The USAID flour is not locally made and it is not a market-ready good. As aid food, it comes from an outside source and does not build the capacity of the village to feed itself. As a Peace Corps volunteer, I was troubled by the lack of sustainability in the feeding centers and started working with PNS Doulos to find a replacement for USAID WSB.

In 2003, GM Doulos, another branch of the Doulos organization, ran a program introducing Cereamine to several small villages in the Guidimaka. Cereamine is nutritionally comparable to USAID WSB. In hopes of finding a sustainable food supplement, PNS Doulos decided to run a pilot program with Cereamine in two villages. For a trial program, they purchased 100 kg of Cereamine from Megué, a small village about eighty km from Selibaby.

When I inquired about why the Cereamine was not available in Selibaby, I was told that GM Doulos had done the majority of its trainings in the rural Guidimaka. I saw the need for a training project in Selibaby and other regional capitals. I discussed the idea with the head of GM Doulos and received his approval to use their recipe and training information.

6.1.3 Identification of Stakeholders

I did not identify many stakeholders for this project. Before proceeding with the project, I organized a meeting with GM Doulos. They knew more about Cereamine than anyone else. My meeting with them consisted of asking permission to use the recipe and the name Cereamine. Whereas this was important, it was not sufficient. I should have sought out women that had worked with Cereamine and talked with people that would be interested in the training.

Also, at this point my project management team should have been developing. Because I was introducing this project without a direct request from the community, I did not have a community counterpart working with me. I was managing this project with some help and guidance from my colleague at PNS Doulos, but none of us were Mauritanian.

6.1.4 Definition of Objectives

The objective of this project was to train women how to make Cereamine. This objective was clearly defined, but the women lacked stakeholder involvement.

Without stakeholder involvement, the project merely represented my wants, not the wants of the host community.

6.1.5 Design of Project Plan

Every project has its own unique planning requirements. The planning of the Cereamine project included securing funding, running a pilot training, and writing the project proposal.

6.1.5.1 *Funding*

In 2004, there was an infestation of locust in Mauritania. In response to this infestation, a returned Peace Corps volunteer started raising money for spraying equipment, food aid, and agricultural relief. She had planned on receiving enough money to buy spraying equipment and chemicals, run trainings on how to use the equipment, and run feeding programs in areas most devastated by the locust. In total, she received just over $6000 in her drive. This fund was known as the "cricket fund." This was substantially less money than she expected, so there was not enough money in the fund to buy a significant amount of equipment and train workers. The APCD in charge of the fund decided that all the money was to be used for feeding centers. There were three volunteers who offered to open and run feeding centers with these funds. After they submitted their budgets, there was a little over $1000 left in the "cricket fund".

I approached the agro-forestry APCD with the idea to use the remaining money in the cricket fund for Cereamine trainings. He asked me to submit a Peace Corps Partnership Proposal; my proposal was approved. A full copy of the project

proposal is available in Appendix A. My grant totaled $1250, about 57% of the yearly average income for a professional in Mauritania.

6.1.5.2 *Proposal and Pilot Training*

The format for a Peace Corps Partnership Proposal is standardized. The applicant must demonstrate that the project is community initiated and directed, that the project meets a pressing need, that the community is making a 25% contribution to the project, and that the community has a well developed plan for project implementation and sustainability. Thereafter, the volunteer must outline the indicators of success for the project and provide a detailed budget for the project.

There were a large number of unknowns with this project. First of all, Cereamine was relatively unknown. GM Doulos had some statistics about Mauritanian acceptance of the product but there was no data for Cereamine acceptance in Selibaby. Two members of the PNS Doulos team and I developed a training module. We would buy a large amount of grain and then ask Mauritanian women to prepare the Cereamine. To prepare Cereamine the women needed to wash and dry the grains, roast the grains, mix the grains, and bring the mixed grains to a hammer mill to be floured. Mauritanians were familiar with all these steps so we thought that it would not be difficult for the women. After the Cereamine was finished, the women would receive 10 kg of Cereamine to bring home to eat with their neighbors and family. This would take the place of any formal payment for their time and it would also inject a large amount of Cereamine into the community.

PNS Doulos funded the first pilot training. The ratio of grains for Cereamine is simple: four parts beans, four parts maize, two parts rice, two parts millet, and one part peanuts. We arbitrarily choose 20 kg, 20 kg, 10 kg, 10 kg, 5 kg for our trainings. We designed the trainings for four participants with the idea that we would give each participant 10 kg of Cereamine for their time and work. We knew that there was some loss of the original grain with each training, but we did not know how much of the 65 kg of grains we would lose during fabrication. At the time of the pilot training neither my colleagues nor I had made Cereamine. We explained the general concept to the women and let them proceed as they saw fit. In doing so, we learned from them.

In the proposal we said that each training would be led by a woman who had been trained how to make Cereamine. We thought this was the easiest way to spread the knowledge and we felt it would increase the acceptance of the project if the message was coming from a Mauritanian and not a foreigner.

The 25% community contribution was an in-kind contribution. Years of development projects have conditioned the Mauritanians to expect that when Westerners introduce a new program, the West pays. In the most extreme sense, this can mean a participant being paid for attending a workshop where the only party that benefits is the participant. In terms of our Cereamine project, it meant that women would not contribute monetarily to the project; hence the in-kind contribution. There are many material goods needed to run a Cereamine training: pots, plates, utensils, wood, water, and other household goods. We were able to use the value of these utensils as the community contribution.

Using the pilot training as my base, I wrote the project proposal. The

indicators of success for the project were listed in the proposal:

- there would be 20 training sessions on the production and the nutritional value of Cereamine,
- 50 women would be trained to make Cereamine,
- Cereamine would be available in the shops and known in the marketplace,
- that a framework would be developed for the introduction of Cereamine into a community, and
- a market for Cereamine would be created.

6.1.6 Check with Stakeholders

Because of the poor identification of stakeholders earlier in the project, this element was not fully completed. There was a review of my proposal by the Peace Corps office in Mauritania and then Washington. As part of the proposal, I needed to have my community counterpart approve the proposal. As he was not personally interested in the project, he did not question any aspects of the proposal. Additionally, there are cultural barriers with correcting people. Mauritanians are rarely openly critical. Because of this, there is an even greater need for high stakeholder involvement. The volunteer must seek out input to develop quality projects.

6.1.7 Allocation of Resources

One of the first things needed was a formal request form for people to apply for the Cereamine trainings. This was important to allow for transparency in the

project. I developed the training form and distributed them to active health agencies in Selibaby. By doing this, I was able to document where all the project resources were allocated.

I also created a project database that was updated after each training. The database held a record of the name of every women trained, where they were from, and how many kilograms of Cereamine the received. It also tracked how many kilograms of Cereamine were made from the 65 kg of grain and any comments on the training.

6.1.8 Project Implementation

Once a formal request for training had been received, I went to speak with the interested parties. I explained to them that the Peace Corps would provide the necessary grains and they were responsible for all the cooking utensils, the water needed for washing, and the wood needed for cooking the grains. Normally the training would take two days. The morning of the first day the women would clean, wash, and dry the grains. That afternoon they would start cooking the clean grains. The next morning they would finish roasting any grains, mix the roasted grains, bring the grains to the hammer mill, mix the peanut butter into the flour, and sift the final product.

On average, for every 65 kilos of grains purchased, 58.5 kilos of Cereamine would be produced. Forty of the 58.5 kilos would go to the trainees, the remaining 18.5 kilos I would take for the project. I used this Cereamine for product introduction into the community. Part of this project was to make Cereamine a market-ready good.

If there was a fiscal motivation for the trainees to continue making Cereamine, there would be a larger chance of project sustainability.

Soon after the first trainings, the popularity of Cereamine was growing within the Peace Corps community. We had planned to have trainings in Selibaby and two other regional capitals. From word of mouth and strong advocacy from the Peace Corps Bureau in Nouakchott, the project grew quickly; in total we trained groups in thirteen communities (Figure 17).

Figure 17: Communities where Cereamine trainings were held

As the project grew, my role shifted from trainer to project manager. My responsibilities were now more administrative. I would make sure that interested

volunteers knew how to run the training and understood what the trainees must contribute.

6.1.9 Project Documentation

Seeing a need for more readily available information, I created a Cereamine webpage (Emerson, 2005). The web page was helpful because it was universally available, all interested volunteers could access the webpage and get all the necessary information for running their trainings.

During the course of the project, a database of women trainees and a balance sheet were kept. This documentation was very important to the transparency and accountability of the project.

6.1.10 Close of Project

As a Peace Corps Partnership Project, a report needs to be filed at the close of the project. In this report, all receipts were submitted and filed in the central Peace Corps office.

Due to the lack of a community counterpart on the project management team, there was not a project hand off as depicted in Section 5.3, Figure 15. Even though there was no hand off to a Mauritanian counterpart, the Cereamine project served as a springboard for other projects. Whereas the objective of my project was just the introduction of Cereamine as a new product, three Small Enterprise Development volunteers designed business and micro-financing projects around Cereamine.

6.1.11 Observations

The Cereamine project changed a lot from the initial Peace Corps Project Proposal. There was no need to have trained women run the future trainings. Originally we had thought that a trained woman would run the future trainings. This was before we really had a good and clear idea of the project. The actual fabrication of Cereamine was simple; all of the steps were already part of the women's daily routines. There did not need to be a woman trainer. A Peace Corps volunteer acting as a facilitator could easily run the trainings. Due to an increase in the price of grains, I only had enough funds for eighteen trainings. I was not aware that the price of grains fluctuated with location and time of purchase. I was thinking as a Westerner; prices would be stable. If I had consulted any Mauritanian I would have been aware of the price shift in grains. This miscalculation was so great that it reduced the amount of trainings by 10%.

Another problem I saw was that the quantity, 65 kilos of grains, was too much work. When we trained a cooperative, there was no problem making the 65 kilo batch, but with smaller groups it was obvious that the women were worn out. The problem with this is that it gave the women an exaggerated idea about the amount of work necessary to make Cereamine. The initial quantity of 65 kilos came from the Doulos American workers and me. This was a mistake. This was a part where local stakeholder input should have been used.

It is hard to judge the sustainability of the Cereamine project. There are still ongoing projects with Cereamine but they are being encouraged by Peace Corps volunteers. There is not a community where Cereamine has taken hold just from my

project. In communities where the Cereamine project has continued, there is a Peace Corps presence that sustains the project. This is a difficult problem to address. It is not a problem unique to the Cereamine project. For a project to truly take hold in a community, it requires that the community embrace the project and sustain it. The more the project is in line with the needs and the wants of the community, the greater the likelihood it will be sustainable. The problem lies in the introduction of completely new things. Cereamine was completely unknown to all the communities where we ran our trainings. Because we were introducing a completely new product, we had many other hurdles to sustainability. The Cereamine project was a top-down project. It needed to be; we were teaching a totally new skill to the people. To expect sustainability just after my project would be unreasonable. There were other Cereamine projects that followed mine. One in particular, dealt with developing Cereamine as a business. This project worked notably better in communities that were exposed to Cereamine through my project.

More stakeholder involvement was needed in the early elements of this project. The lack of a solid stakeholder list hurt this project from inception to completion. This will be discussed further in Section 6.3.

6.2 Project 2: Tilapia Aquaculture

My aquaculture project came about a year after the Cereamine project. During that year, my language skills improved, I became more respected in the community, and I learned a lot about Mauritanian culture. I was more comfortable in my surroundings and had much more local knowledge.

6.2.1 Background

Fish farming has many benefits for homesteads and villages. Fish ponds can be established on clay or salty soils, soils that would otherwise be unusable from an agricultural standpoint (Bocek, 2006b). Fish have a faster grow-out time than other livestock. They are docile animals that will not destroy crops or property.

Fish is a culturally accepted source of protein in Mauritania. A fish pond can provide a source of protein and food security for isolated villages. Fish also have high economic value. Co-ops or homesteads can easily sell surplus fish. Fish farming also links people to their food source making them more self-reliant.

There is potential for fish farming as an agricultural business. For a hectare of pond surface area, using simple animal manure and clippings as a food source, a farmer can expect a yield of 2500 kg per year of fish. For the same area, most grazing animals will produce less than half that yield (Bocek, 2006b).

Fish ponds also protect the local environment. There are many parts of the Senegal River where over-fishing has depleted the fish supply. Instead of stopping fishing, fishermen are now just catching younger and younger fish. During one visit to a river village, I saw a young woman with a plate of fifty fish where there was not a single fish larger than six inches! Fish ponds next to the river can benefit from a year round source of water, provide another fishing option for the village, and allowing the river to recover from over fishing. Additionally, surplus fry from the pond system can be thrown back into the river to help restock the river. Also, fishing in fish ponds is easier and less time consuming than fishing in large bodies of water.

Many developing countries have fish farming projects. There have been some experiments with fish farming in Mauritania prior to my project. In Kiffa, 2003, a PCV had a project with World Vision but that project is no longer active. In Bakau, a village outside of Boghe, there is a large installment that was funded by UNICEF. It is not running at its full potential, but it is operational. The third project is one that I started here in Selibaby.

6.2.2 Selection of Project

Fish is a staple of the Mauritanian diet. One of the most commonly eaten dishes in the Black African cultures is *Chub e Gen,* rice and fish. Almost all of the fish available in Selibaby comes from the Atlantic. The two main fishing ports are Nouakchott and St. Louis, Senegal. The fish is trucked into Selibaby over land. The fish are small, usually six to ten inches. There is some fishing of the Senegal River but years of over-fishing have greatly decreased the number and size of fish available in the river. During the rainy season, many of the seasonal drainage ways fill with water and connect to the Senegal River. Fish swim up these tributaries and get trapped when the rains stop. The fish are then cut off from the river. For any village not on the river, this is the only source of fresh fish.

A local farmer, Sajo Diarara, approached me in September 2005 about the possibility of a fish-farming project in Selibaby. He had a garden where erosion over the years had produced a deep channel in the garden (Figure 18).

Figure 18: Sajo Diarara's Garden

At that time, I did some preliminary research but nothing came of the project. The following April I was approached a second time by a representative from N'Dieo. N'Dieo is a village that is about 100 km north of Selibaby. It is a well organized Soninike village. In 2004, they had constructed a large earth dam 4 km from their village. With that dam, they now had a year-round source of water. As part of the dam project they were going to start an aquaculture project. I first visited N'Dieo in the spring of 2006. When I returned to Selibaby, I talked with the village representative about the project. I felt that before we attempted to do a large-scale aquaculture project in N'Dieo, we should have a pilot project in Selibaby. He agreed and I started to design the pilot pond project.

6.2.3 Identification of Stakeholders

There were two major stakeholders in this project. My community counterpart for this project was Kalidou Sy. He and I were inseparable during this project. Every time I learned a new bit of information I would go over to his house and share the information with him. Kalidou was a member of the project management team. By the end of the project, he was the stakeholder who took over the project. The project was fully transferred to him. He is now the local expert of tilapia aquaculture. Six months after the project's inception, local non-governmental organizations are starting to send groups to Selibaby to see the project and talk with Kalidou.

The other major stakeholder was a representative from N'Dieo. He is a classic example of an influencer stakeholder. He was very active in the initial planning of the project. He helped Kalidou and I plan the objectives of the project and found the required resources. Seeing that he was working on several other projects with the village of N'Dieo, he had less and less interaction with the project as it progressed.

There were other stakeholders involved in the project on various levels. Kalidou and I knew that any large training or demonstration would have to be approved by the local authority. Sajo Diarara, the farmer who proposed the idea in November 2004, was a possible end user. Kalidou invited the entire neighborhood to comment on the project. One concern they posed was that having the fish ponds in the neighborhood would increase the mosquito population. Kalidou and I researched this and found that tilapia eat mosquito larva, ergo the ponds would not be breeding grounds. This kind of back and forth with the community helped us better design our

project and created more trust between the community and the project management team.

Peace Corps was also a stakeholder in this project. Both the Agro-forestry and Health APCDs were very interested in this project. They were able to help Kalidou and me with information gathering and official protocol.

6.2.4 Definition of Objectives

The objective of this pilot project was to demonstrate that fish farming was possible in Selibaby. With this project I took a more supportive role. With every step of this project I was working with Kalidou, I was there to support him. We had defined five major objectives of the project:

- to build the pond,
- to find a fish supply,
- to catch and transport fish from the supply to our pond,
- to maintain the pond, and
- to train others.

6.2.5 Development of Project Plan

The aquaculture project was a pilot project. We wanted to know if it was possible to have a fish-pond in Selibaby. This meant that we needed to be more flexible in our project plan to allow for changes in our project execution. For the planning phase of this project my counterpart and I focused on gathering information on aquaculture.

At the beginning of the project I knew little about fish farming. The first part of the project was to research fish farming. I found a comprehensive set of technical briefs from Auburn University (Auburn University, 2006). I learned many important design considerations from these technical briefs: pond dimensions, best fish species, feeding requirements, fish reproduction, and fish transport.

The first decision we had to make was the species we wanted to cultivate. This was important because different species have different habits and tolerances. We decided on the species *tilapia*. I had never seen a tilapia and therefore had no first hand experience with them. Most of my research suggested using tilapia because it is a resilient fish. Kalidou, growing up on the river 45 km from Selibaby had experience with tilapia. He was confident that we could find a good source of tilapia to start our pond. Without his local knowledge, the project would never have passed the information-gathering phase.

6.2.6 Check with Stakeholders

The stakeholder check was simple for this project. The project selection, objective definition, and project planning were done in close association with stakeholders. Because of this, the project continued with a strong base of support.

6.2.7 Allocation of Resources

The aquaculture project did not have many resources to allocate. The financial assistance from the village of N'Dieo was quickly used for the start up costs of the pond. All of the expenditures were agreed upon by the project management team.

6.2.8 Project Implementation

The implementation of the aquaculture project included five aspects: the construction of the pond, the finding, obtaining, and transferring of the live tilapia, establishing a maintenance regiment for the pond, training others, and documenting our work.

6.2.8.1 *Pond Construction*

The first obstacle to aquaculture in Selibaby was creating the pond environment. Seeing that there is not a constant source of surface water in Selibaby, we decided to dig an earthen pond and fill it with water from the city well. Water is relatively cheap in Selibaby, about sixty cents per cubic meter.

Tilapia live in less than one meter of water so we set the pond depth at one meter (Rakocy and McGinty, 1989). The minimal size of a tilapia aquaculture system should be ten meters by ten meters (Bocek, 2006c). Because we were unsure of the project success, we wanted to limit the pond size. A smaller surface area decreases the size of fish and the quantity of fish that can be carried by the pond but it also decreases the amount of water needed.

The soil in Selibaby has a high percentage of clay. Because of this, infiltration was expected to be low. It is typical to see holes like pictured in Figure 19. This hole is nominally 3.5 m in diameter and about 1m deep. Masons use such holes to make mud bricks (as seen stacked in the background of the Figure 19). Kalidou had two of these holes in his garden. We discussed elongating the hole to make our first pond. The pond was going to be small with a surface area of only 25 m^2, but we felt it was

manageable. Due to the many unknowns, anything bigger than this would not have been prudent.

Figure 19: Initial hole for the fish pond

The village of N'Dieo offered to help defer any initial costs of the project. We had prepared a simple budget of incidental costs like the initial filling of the pond and transport cost associated with getting the fish. They had also offered to pay someone for the digging of the pond. We declined. This was the first time either Kalidou or I had done any project like this. We knew there would be essential information gained from doing the manual labor ourselves. We also realized that this was a way to

demonstrate our commitment to the project. In March 2006, Kalidou and I dug the first pond (Figure 20).

Figure 20: Digging the first fish pond

Figure 21 shows a schematic of our first pond. The pond was formed by elongating the 3.5 m brick hole by 7.5 m. The pitch of the sides of the pond was 45 degrees. This was done to prevent the banks of the pond from caving in when they became saturated. For the first pond, we also used a plastic liner. The liner can be seen in Figure 20. Unfortunately, the liner was made of thin plastic and ripped easily. When the pond was filled, the weight of the water ripped the liner in many places.

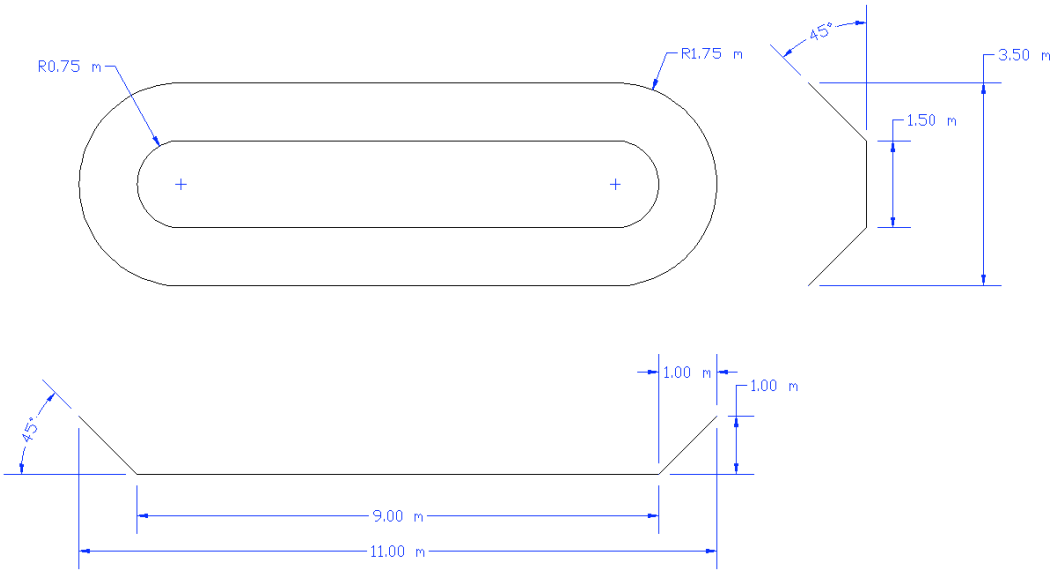

Figure 21: Design of the first pond: side, plan, and right views

Figure 22: Fish pond number 1, April 2006

On the left hand side of Figure 22 a shade can be seen. We covered one end of the pond. This was to create a shady area. Tilapia is a resilient species. They can

withstand water temperatures greater than 88°F, survive in water with a DO concentration of less than 0.3 mg/L, and they live optimally in a pH of 6-9 but they can survive in a pH range of 5-10 (Popma and Masser, 1999). The species was important to this project. Our pond was not going to have any circulation and due to the climate in Mauritania, the water was going to be warm. The next part of the project was finding, catching, and transferring tilapia back to our pond.

6.2.8.2 *Finding, Obtaining, and Transferring Tilapia*

Once the pond was constructed, our next challenge was obtaining our stock. Our hope was that we could find a small number of fish, around twenty, and bring them back to Selibaby where they would then reproduce. The generation of fish bred in captivity would become the stock-fish for any further projects in Selibaby or the surrounding area.

My first choice for finding fish was the Senegal River. It was 45 km to the south west of Selibaby, and while the dirt track to Gouraye was far from smooth or easy to travel, it was the best route to the river. Gouraye is a small village of about 2000 people on the boarder of Senegal. Kalidou is from Gouraye and is well respected in the community. Also, there has been a Peace Corps presence in the community since 2002. Kalidou arranged a fishing expedition with the local fishermen and I planned the mission to the river. I was dubious. The river is large and we were looking for tilapia. Kalidou assured me that there was lots of tilapia in the river and I had nothing to worry about. Adding to my doubts, Kalidou would not be coming on the mission with me. He works for a French non-governmental

organization in Selibaby, GRDR, and could not take the time off. I had never seen a tilapia outside a book and I was supposed to bring back two dozen live fish.

The fishing mission went exactly as Kalidou had predicted. Within four casts of the fishing net the local fishermen had caught about 20 three-inch tilapias. I transported the fish back to Selibaby in 20 L pails (Figure 23) and then released them into our ponds (Figure 24). I made several mistakes during the first fish mission. First of all, the small fish were fragile and about half of them died during transport or within the first week in the pond. Because of the problems we had in the first transport mission, I started looking for more information on how to properly transport live fish.

Figure 23: Four-inch tilapia caught from the Senegal River

Figure 24: Releasing the fish into the pond

The lack of a good transportation infrastructure and hot temperatures make the transportation of fish in Mauritania difficult. There are two major monitoring needs while transferring fish: water temperature and oxygen level.

Preparing the specimens for transport is important. The simplest way to transfer fish is with plastic bags. The plastic bag creates a vessel in which water and oxygen can exist. To prepare the bag for transport, about 1/3 of the bag should be filled with water, then air should fill the remaining space. To keep the air cool, ice packs could be placed on top of the bags. Ice should not be directly added to the water; this will thermally shock the fish and kill them. When I transported fish on my second fish mission, I placed my bags of fish in a barrel and used ice to keep the pack cool (Figure 25).

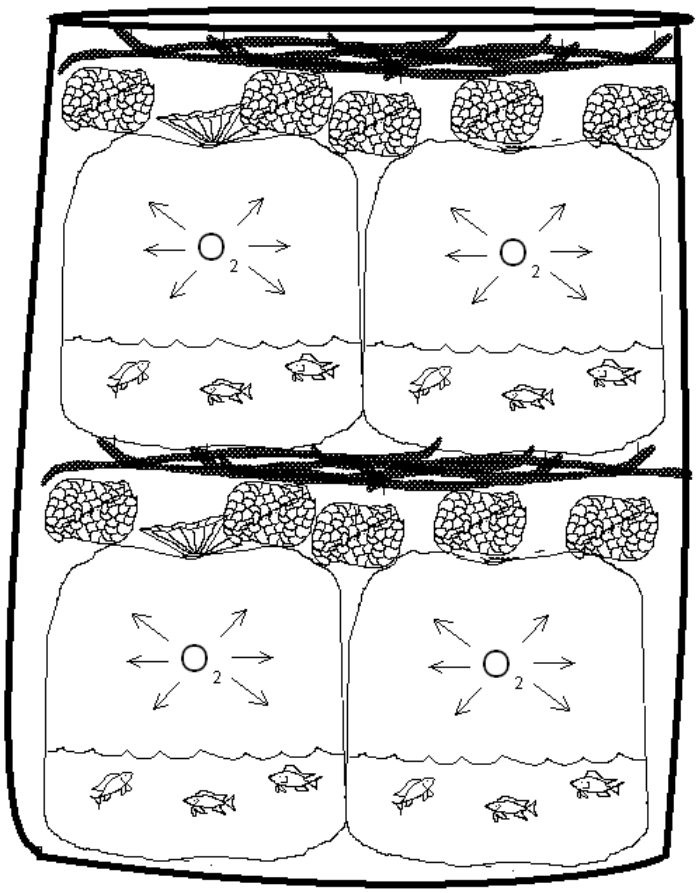

Figure 25: Fish bags packed in a barrel with ice and towels as diving layers (Image adapted with permission from Auburn University, 2006).

When the fish arrive at their destination, the bag needs to be floated in the new pond for fifteen to thirty minutes to stabilize the water temperatures. If there is a temperature difference greater than 3° C at the time when the fish enter the pond, it can cause the fish to die (Bocek, 2006d).

Armed with the knowledge of how to properly transport fish, we were ready for another fishing mission. At the time of our second transport mission only three of the original sixteen fingerlings released into our pond were still alive. Kalidou had mentioned several times before that there was a better source of tilapia in Saboussiré,

a town south east of Selibaby. It was a little farther away than Gouraye and the road to Saboussiré was much more difficult. Saboussiré was not on the river but GRDR had helped the community dam up one of tributaries that ran by the village. Kalidou had worked on that project and knew that the dam in Saboussiré was full of fish.

The mission to Saboussiré was important. We needed new fish. I was going on vacation the following week and I wanted mature adults in the pond before I left so that they could mate during my vacation. The pressure was also on for the project to work. Because of the high level of exposure, several people were now visiting the pond and asking about our progress. All in all, we needed this mission to be successful. Adding to all of it, my APCD was going to be visiting the Guidimaka and he would be accompanying me on the mission to Saboussiré. I prepared all the necessary tools for the second fishing mission. Kalidou's eldest son, Abdou, would be accompanying me on the mission. When we arrived in Saboussiré, we went directly to where Kalidou had directed us, a village elder's house. Abdou explained who we were and what we wanted to do. The village elder was a little confused but was more than happy to help friends of Kalidou. He showed us to the dam and gave us some traditional fishing nets (Figure 26).

Figure 26: Traditional hand held fishing nets

The dam at Saboussiré had created a natural fish pond. Fish would swim upstream when the tributaries filled with water and would get trapped behind the dam. The last big rain of 2005 in the Guidimaka was around late September, it was now late March. With the dry season just beginning, the pond at Saboussiré would soon be dry. The deepest part of the reservoir was a little over a meter deep (Figure 27).

Figure 27: Abdou at the Saboussiré dam

Just as Kalidou predicted, the pond was filled with fish. There were so many tilapias in this pond that there were dead fish all along the banks of the pond. Abdou and I fished there for less than two hours and caught more than fifty sexually mature adult tilapias. We prepared the fish for transport and gave half of the catch to the village. In total we put about twenty adults into our pond. I was leaving the next day. Within the next few days, only one fish died. Thereafter, all of our fish lived. When I returned from my four-week hiatus the fish had bred. Kalidou and I had successfully bred tilapia in Selibaby.

6.2.8.3 *Maintenance*

Maintaining a fish pond in a hot, dry climate without a constant source of water is difficult. As the fish pond was at Kalidou's house, he took care of the day-to-day maintenance. This included feeding the fish, skimming any debris off the top of the pond, and maintaining a minimal water level. The water level never got to the one meter depth. The earth around the pond was a clay/sand mix. When the depth of the pond was 30 cm, equilibrium was reached. After that point, we would lose no more than a 1/4 cm a day to transpiration. If we ever filled the pond up past 30 cm, the water would just infiltrate into the soil on the sides of the pond. From a visual inspection, we were losing 2.5 to 3.5 cm a day when the water level was higher than 30 cm.

The feeding requirements vary with pond fish density and number of fish per square meter of surface area. After the first generation of fish, we had no way of knowing the fish density of the pond. Auburn University has an informative technical brief on the feeding of tilapia (Becek, 2006a). We fed our tilapia dried blood, bread crumbs, couscous, cooked white rice, and leaves. Tilapia can survive on plankton and zooplankton also. By supplementing their diet with additional sources of protein and energy, the fish farmer can increase the growth rate of the fish (Becek, 2006a).

6.2.9 Project Documentation

As a pilot project, Kalidou and I were both adamant about sharing our experiences. We brought a small group of people from N'Dieo to the pond early on in the project to show them the system and discuss how they could continue with the

project in their village. In June 2006, we invited thirty-five people to the pond site and had a day of informational sessions and demonstrations; at that time the project was four months old. I also compiled all the information we had gathered and wrote a manual for Peace Corps Mauritania. The manual is available in Appendix B.

6.2.10 Project Closure

Kalidou and I closed this project as a success. We met all of our objectives. Also, there was a successful transfer of skills from myself to Kalidou. He has maintained the ponds since the closure of the project. When I left Selibaby for the last time, he looked me in my eyes and told me that he would never let his aquaculture system fail. I felt very confident in the transfer of the project and the possibilities for future projects.

6.2.11 Observations

The fish pond project has continued after my departure. Before I left Selibaby, Kalidou and I dug a second pond on his property. There are several members of the community that are interested in attempting seasonal fish farming and some courageous people that want to attempt to operate year-round fish ponds. Kalidou has become the local expert. He has a regular stream of interested visitors.

We made some mistakes in the construction of first pond. We were losing too much water due to infiltration. We did not compact the soil on the sides of the pond and water was infiltrating into the sides. This was evident by looking at the vegetation on the sides of the pond (Figure 28). We tried to use a plastic liner to decrease

Figure 28: Kalidou standing next to pond number 1, July 2006

infiltration but the plastic was poor quality and easily ripped. If our objectives were to grow large fish, the low water would have been a big problem. Our goal was to have a stock of tilapia in Selibaby. We had achieved that. At the onset of the project, we did not know what to expect. Once we had the fish in Selibaby and they reproduced, we realized that overcrowding was going to be an issue. We adjusted our thinking accordingly. We knew that we were not going to use our first pond as a grow-out pond; it was too small. It could be used a stocking pond and as a training pond. Kalidou and I quickly started looking for a grow-out pond.

Digging the pond was a strenuous, but it demonstrated to the community that we were personally involved in the project. From the day we started digging, and for months to follow, people would always stop and ask us what we where doing. This

provided great exposure for the project and was an easy way to gain the community's support for the project.

6.3 Discussion of Cereamine Project

The Cereamine project was ill-designed and not budgeted correctly. Anyone in the community could have told me that the prices of grains were going to spike before the harvest. The training modules were too strenuous. For the most part, the women trained did not retain how to make the Cereamine flour. One problem was that I explained how to make the Cereamine flour in terms of a ratio: four parts maize, four parts beans, two parts rice, two parts millet and one part peanuts. To me this made perfect sense. We would do a batch at the training that was twenty, twenty, ten, ten, five but the women could do a two, two, one, one, half batch at home. The women did not have the mathematic skills to scale the ratio. They thought that the only way to make Cereamine was in the 65 kg batches. I tried to alleviate this problem with a chart that told how much of each grain was needed for X kg of Cereamine, but the majority of women trained were illiterate. That chart is available on the Cereamine web page (Emerson, 2006). These problems could have avoided if there was proper stakeholder involvement in the early elements of the project.

I think that the management of the project did adapt well to the problems it faced. Expanding the project to more regions greatly widened the scope of the project. In doing this, the financial investment reached a lot more Mauritanians. In the project proposal, it stated that 50 people would be trained how to make Cereamine, in total we trained 188. The project also changed with respect to how the trainings

would run. When it became evident that a Peace Corps volunteer could easily run the training, we eliminated the aspect of having one of the trained women lead the next training.

In summary, greater collaboration with stakeholders was needed in the development process.

6.4 Discussion of Aquaculture Project

The aquaculture project was a success on several levels. We reached our main objective of building the pond, finding a fish supply, catching and transporting the fish, maintaining the pond, and training others. The project was strongly supported by the community. Because of this support, the community would continually ask about the progress of the project. This social pressure motivated Kalidou and me to keep working.

The project was initiated by locals, but there were other aspects to the project's success. I was personally and physically involved in the project. By digging the first hole myself I demonstrated that I was invested. This investment was mirrored by Kalidou's involvement as well. I think that there is often a hands-off mentality to development work. In a hope to increase sustainability, the development agent works more as a manager. Case in point, with the Cereamine project I never made the Cereamine with the women. This can come off as arrogance. Personal involvement is important in West Africa. I think my personal involvement, whether it was digging the pond or the daily monitoring, demonstrated my commitment to the project. This commitment then inspired my African counterparts to accept the project as well.

This project was a pilot project. There is opportunity for aquaculture in Mauritania. A large scale aquaculture project in Selibaby would involve a considerable investment. Following our project, it is possible. Having a stocking pond in Selibaby opens the possibility of someone constructing a grow-out pond. One alternative to a grow-out pond is doing seasonal fish farming. In seasonal fish farming, the ponds are not active year round. There are a few locations around Selibaby where the seasonal flooding creates small ponds. These ponds can be stocked with fingerlings from the stocking ponds. When the seasonal ponds dry up, the owner can harvest his fish. In Figure 29 I am stocking a seasonal pond in Selibaby with forty fingerlings from our ponds.

Figure 29: Stocking of Sajo Diarara's pond, August 2006

Another positive aspect of this project was the documentation. At the close of the project, I wrote an aquaculture manual for Mauritania. My manual, available in Appendix B, will serve as a basic introduction for any Peace Corps volunteer. From my research, I was able to add twenty-four English technical briefs on aquaculture to the Peace Corps Mauritania library as well as nineteen technical briefs in French. With these technical briefs, Peace Corps volunteers and their counterparts have easy access to aquaculture information.

6.5. Project management findings

Comparing the two validation project studies to the proposed Peace Corps Mauritania project management methodology revealed the following:

- The community must be involved from the inception of the project and throughout the project.
- Personal investment and physically working on the level of the people demonstrates the volunteer's level of commitment to the project and sends a social message of the volunteer being on equal footing with the community served.
- Research is essential to new projects. As engineers, we need to become experts on the topic on hand prior to project execution.
- Having defined objectives is important to the project, but the project management team must also be able to adapt the project to unexpected changes along the way.

- Having a strong community counterpart is essential to project success.
- The final stages of any project must be the documentation of experiences. By increasing the body of knowledge, the Peace Corps volunteer can help future volunteers and host country nationals learn from their successes and failures.
- Nothing can take the place of experience. The more culturally integrated a volunteer is the more attuned he will be to the nuances of how that culture works.

Chapter 7: Conclusions and Recommendations

The objectives of this report were stated in Section 1.4 as the following:

- Summarize traditional Project Management Process Groups
- Develop a simplified project management methodology more applicable to work in Peace Corps Mauritania
- Evaluate two projects completed in Mauritania
- Demonstrate the relevance of project management in Peace Corps Mauritania

This project met its objectives. Chapter 4 described the project management Process Groups in detail. Coupling my personal experiences in Peace Corps Mauritania and the Process Group methodology, a simplified project management methodology was described in Chapter 5. In Chapter 6, two projects from my service were presented and compared to the proposed project management methodology. These projects illustrated some of the realities of working in Mauritania and the applicability of the new project management methodology.

I believe that with the adoption of the methodology described in Chapter 5, Peace Corps volunteers in Mauritania will have a greater project success rate. Also, with the implementation of the documentation elements described in Section 5.9, Peace Corps Mauritania will start to build a library of projects. This will facilitate the ability to quantify project success and failure rates as well as serve as a bridge from one class of volunteers to the next. The methodology in Section 5 needs to be tested

and constantly modified and updated. From this work, several major recommendations are listed below:

- All APCDs should include sessions on project management in their volunteer trainings.
- There needs to be a greater level of project accountability. This accountability needs to apply to the entire project management team, not just the Peace Corps volunteer.
- Peace Corps volunteers need to be comfortable with project management methodologies. Their comfort level will help transfer the project management skill to their counterparts.
- Peace Corps volunteers need to give feedback on the methodology so it can better meet the needs of volunteers.

The challenges that face the development of Mauritania are seen all across the African continent. Development in Africa is complex. The continent has had a difficult past and there are few indicators that its future will be easier. Many projects introduced by the International Monetary Fund and the World Bank have not been effective. At the beginning of the 21st century, Africa was poorer than it was forty years earlier when these development agencies started their interventions (Sachs, 2005). The economic factors that are stacked against Africa are numerous. Jeffery Sachs, an influential contributor to the UN Millennium Project and development economist, wrote this in reference to Africa:

> *To understand and overcome such [poverty] crises, it would be necessary to unravel the interconnections between extreme poverty, rampant disease, unstable and harsh climate conditions, high transport costs, chronic hunger, and inadequate food production (Sachs, 2005).*

This is a formidable challenge, a formidable challenge that has no good solutions in sight. In Sachs's 2005 work, he stresses that a large increase of aid is needed to end extreme poverty. At roughly $65 per extremely poor person and 1.1 billion extremely poor people in the world, $72 billion is needed yearly until 2015 (Sachs, 2005). What happens after 2015 is undefined.

There are other development economists who state that the $2.3 trillion dollars given over the last fifty years has yet to obtain its goals (clean water for all, basic schooling for all, end of malaria, etc.) (Easterly, 2006). William Easterly comments that the problem with development is not the monetary amount of aid, but how that aid is spent. He states that there is little accountability for development projects that fail to perform and says, "Aid workers now tend to be ineffective generalists; accountability would make them into more effective specialists" (Easterly, 2006).

Peace Corps volunteers are afforded a unique opportunity to make small advances in the development battle. Working on the local level can have resonating effects. On a personal level, my work in Mauritania had small, yet measurable, results: two fish ponds created, eighteen Cereamine trainings completed. The quality

of projects that Peace Corps volunteers do is important. Having good project management will help assure that projects are successfully completed.

The project management methodologies presented in Chapter 5 come from my personal reflections and experiences in Mauritania. It was written in hindsight, using my project work as a guide. The methodology needs to be tested, critiqued, and amended. Hopefully, this report will serve as a baseline and future work will build on my experiences.

The problems in the developing world will not just disappear. There is an immense network of people in The West that want to help the 1.1 billion needy people in developing countries. The nature of a project unites us. The deliverables are different, the stakeholders are different, but the transformation of resources to a desired outcome is universal. Project management can influence whether this transformation is chaotic, destructive, and ineffective, or planned, sustainable, and beneficial. Project management is almost ubiquitous in the West; it is time to implement it in the developing world as well.

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Appendix A: Cereamine Peace Corps Partnership Proposal

Proposal Summary:
Peace Corps Partenship Program: Céréamine
Total Amount Requested: $ 1249.07
Peace Corps Volunteer: Brock Emerson
Peace Corps Sector: Community Heath, Water, and Sanitation
Peace Corps Site: Selibaby, Mauritania
Community Leader: Kalidou Sy

Céréamine is a high-energy flour that is made from roasted corn, beans, rice, millet, and peanuts. This flour can be prepared with water to create a porridge which is much more nutritious than porridge made from wheat or millet flour alone. This project involves training women to make Céréamine, while at the same time creating demand for the product with market-stimulating activities.

Background Information:
One of the largest obstacles in the fight against malnutrition in Mauritania is the lack of reasonably priced, locally available, nutrient diverse, and culturally appropriate food. Many children, in small villages especially, eat only white rice for lunch and dinner.

Most feeding centers for malnourished children use a vitamin rich flour provided by a US Governmental aid organization as their supplemental food, USAID WSB (United States Aid, Wheat Soy Blend). Céréamine, especially in conjunction with Moringa powder, is comparable to USAID WSB from a nutritional standpoint. As a locally available good, Céréamine can replace USAID WSB to lessen reliance on external aid.

The Guidimaka is a region in the southern part of Mauritania. Many of the Africans in the region are traditionally farmers whose crops already include the ingredients of Céréamine. Production of Céréamine will provide an opportunity to stimulate local business. If Céréamine is successfully introduced in Selibaby, the regional capital of the Guidimaka, the project can be replicated in other regional capitals and surrounding villages in the Guidimaka.

Verification of Partnership Guidelines

1. Project is community initiate and directed

The best way to conduct training is neighbor to neighbor. Women are accustomed to cooking and sharing technical information with each other. Making Céréamine is a simple yet time intensive process.

A successful pilot training was done in April 2005 by a Peace Corps Community Health, Water, and Sanitation Volunteer and PNS Doulos, a Selibaby NGO interested in finding a locally available alternative to USAID WSB. Three multi-lingual and motivated women were chosen for the pilot training. This grant will provide the finances for 20 additional trainings. Previously trained women can lead trainings in Pulaar, Hassaniya, and Soninké making Céréamine available to all ethnic groups. This grant will provide the finances to buy raw materials. The women will be given the grains and the instructions for making Céréamine. From that point the women themselves will drive the project. Ideally one of the women will have done the process before. The pilot training demonstrated that this is not essential. If there is a training leader she will be able to prepare some Céréamine porridge for the women to taste while making the flour.

The process takes about two days. The first day is a half-day of cleaning and washing the grains. The second day is full day of roasting, mixing, and grinding. During this time the training leader will explain the nutritional benefits of Céréamine over other single-grain flours. She will become the animator and share knowledge with the other women.

Once the Céréamine is made, each participant will receive 10 kilograms. With the pilot program, 65 kilograms of raw materials were purchased and 60 kilograms were produced. With a four person training session this will leave 20 kilograms extra. These 20 kilograms will be distributed to local boutiques to sell or they will be used in publicity campaigns.

Having Céréamine available in the market will increase the demand for the product. When boutique owners need more Céréamine they can contact the women that have been trained. The return on investment for the women is 15% to 20%. Local health structures will also be able to employ the trained women for large orders if they want to use Céréamine for feeding centers.

Because most boutiques are owned and run by men, it is foreseeable that a woman could make Céréamine and her husband could sell it in their boutique, eliminating the middleman. Men can also be involved with the promotion of the product. Kalidou Sy, the Community Leader for this project, is now promoting Céréamine. His wife was one of the three women trained in the pilot training.

Initially the previously trained women will lead the trainings with their neighbors. As the interest in Céréamine grows, any assembly of four people can request funding for

a Céréamine training. In order for this project to be open to all in the community, a form will be designed and made available at the Peace Corps Bureau in Selibaby. The Community Leader and the responsible Peace Corps Volunteer will evaluate and approve all applications before funding any training.

2. Project meets a pressing community need

Having Céréamine available in the local market is a great opportunity. Blended flours are more nutritious than single grain flours because they incorporate the different nutritional benefits of various grains. With 150g of Céréamine and 25g of moringa powder, a child less than six years old can meet their energy RDA and protein RDA. Additional nutritional information is presented in Supporting Data.

Céréamine can also be applied in feeding centers, which are currently supported by USAID food. If Céréamine were available in large quantities, local health structures could commission Céréamine for use in their feeding centers. Also, mothers could conceivably continue feeding their children Céréamine after the child finishes the rehabilitation treatment. This is impossible with USAID food aid. Additionally, food transport costs from Nouakchott to the feeding centers in the Guidimaka can cost upwards of 50% of the cost of running the center. As a locally available food source, Céréamine could drastically decrease that expense.

3. Community is making at least a 25% self-help contribution

The community will be making a 65.5% contribution to this project. The women will be expected to have all the cooking equipment, firewood, and water. The requested finances will go toward buying the raw materials for the production of Céréamine.

Any revenue acquired from the extra 20 kilograms produced during each training will go toward continuing trainings and market stimulating activities. For example, the extra Céréamine could be used to do a taste sampling at a boutique, or the revenue from selling Céréamine could be used to make promotional posters and billboards. All expenditures and revenues will be accounted for in a monthly balance sheet. As the project evolves, the best uses of supplemental food will be apparent. If the market for Céréamine is self-perpetuating, resources could be invested in more trainings, if not, advertising and sampling would be more appropriate.

Also in the budget is transportation for one Peace Corps Volunteer and one counterpart to two regional capitals. This has been included so that Céréamine can be introduced into several regions in Mauritania.

4. Community Demonstrates a Well-Developed Plan for Project Implementation and Sustainability

The neighbor to neighbor approach will provide a sustainable introduction of Céréamine. A top down structure of teaching trainers, having them train cooperatives, and then expecting the women of the cooperatives to use the technique at their homes is the wrong approach. The nature of Mauritanian women is to cook together. The custom of visiting and passing the day while preparing food supports this neighbor to

neighbor approach.

By providing the women with Céréamine, they will be able to promote Céréamine among their families and friends. Céréamine has a high chance of acceptance since it is made of ingredients that are already part of a Mauritanian's diet. Additionally, families already eat porridge; Céréamine is just a more nutritious alternative. The more people that are exposed to Céréamine the faster the demand will spread. As demand increases, the trained women will be there to fill the demand.

In following with the bottom-up approach to development, the trained women can bring the skill to their cooperatives. Ideally the concept will then spread through existing pathways. After Céréamine trainings are successful in Selibaby, this project is easily replicated in other regions and sites. Céréamine trainings in conjunction with nutritional sessions may also be good projects for Girl's Mentoring Centers.

As a locally produced good, Céréamine will inject money back into the community. Because the ingredients are agriculturally produced, all money will go into the immediate community, as opposed to buying building supplies where only the profit margins stay with the community, not the full cost of the goods. With the money staying in the community, there is a higher chance of acceptance and sustainability.

5. **Indicators of Success:**

The indicators of success to be used for this project are as follows

Quality of Life

- 20 Training sessions on the production and the nutritional value of Céréamine
- 50 Women will be trained to make Céréamine.
- Céréamine will be available in the boutiques and known in the marketplace.

Organizational Capacity

- A framework has been developed for the introduction of Céréamine into a community
- A market for Céréamine has been created

6. **Cross Cultural Exchange:**

The donors will be informed on the progress of the project. Any advice or suggestions that they make will be considered and appreciated.

7. **Partnership Funds Restricted to Proposed Project:**

The community understands that partnership funds are to be used only for costs associated with project implementation as detailed in the proposed budget, and there can be no further requests made of project sponsors outside the Partnership Program. There are occasions when the Partnership Program will help identify additional funding for a project when unforeseen circumstances affect project expenditures. However, it is up to the Partnership staff to determine the appropriateness of such action. In addition, the host community understands that proposal acceptance and circulation to potential sponsors does not guarantee that funding will be identified.

8. Supporting Data

Summary of PNS Doulos Training April 2005						
	Unit	Price/Unit	Quantity	Total Cost (UM)	Ideal Yield (Kg)	65
Beans	Kg	300	20	6000	Actual Yield	60.3
Corn	Kg	140	20	2800	Percent Loss	7.2%
Rice	Kg	140	10	1400		
Millet	Kg	160	10	1600	Market Price (UM/Kg)	330
Peanuts	Kg	250	5	1250	Wholesale Price(UM/Kg)	310
Water	Unit	300	1	300	Break Even Price(UMKg)	264.5
Wood	Unit	1500	1	1500	ROI Market	24.8%
Grinding	Unit	1100	1	1100	ROI Wholesale	17.2%
			Total	15950		

Figure 1: Summary of PNS Doulos' April Training

Figure 1 demonstrates that at the specified price a favorable Return On Investment (ROI) can be made. The cost of Céréamine will change over time, but by setting the market value at around 25% return there will be room for the price to fall without destroying the opportunity to profit from the manufacturing.

The surplus from the pilot training was used for some small market penetration activities. The response has been favorable. In one neighborhood, a boutique sold around 20 kilograms in a period of two weeks. Also, the Ministry of Health is in the process of opening a feeding center in Selibaby and they are planning on using a Céréamine Moringa mix.

Table 2: Nutritional Comparison of USAID WSB and Céréamine

Nutritional Values for 100g of Flour		
	USAID WSB	Céréamine
Energy (kcal)	354.5	425
Protein (g)	21.5	15.132
Lipids (g)	5.9	7.085
Glucoses (g)	46.9	75
Sodium (mg)		166.5
Potassium (mg)		192.5
Calcium (mg)	842	60.1
Magnesium (mg)	227.28	22.5

Table 1 shows the nutritional values for 100 grams of USAID WSB and 100 grams of Céréamine (Nutrition Department, University of Nouakchott). USAID WSB is used almost exclusively in Mauritanian feeding centers.

The most similar market-available product is a wheat porridge mix that Nestle produces. For the above listed nutritional components, Céréamine is comparable to the Nestle product. The Nestle product is enhanced with vitamins making it more

nutritious than Céréamine; however the Nestle product costs 800UM for 350gm, where Céréamine costs 330UM for 1000gm.

Appendix B: Mauritanian Fish Pond Manual

RIM PC Fish Pond Manual

This manual has been compiled from technical briefs collected from the International Center for Aquaculture and Aquatic Environments, Auburn University, Alabama and personal experiences with fish ponds in Selibaby. For more information on any of the following topics please see, http://www.ag.auburn.edu/fish/icaae/publications.htm.

Why Fish Farming:

Fish farming has many benefits for homesteads and villages. Fish ponds can be installed on agricultural land that is less than ideal for crop production (salty soils, clayey soils, ect.). Fish have a faster grow-out time than other livestock. They are docile animals that won't destroy crops or property.

Fish is a culturally accepted source of protein. A fish pond can provide a source of protein and food security for isolated villages. Fish also have high economic value. Co-ops or homesteads can easily sell surplus fish. Fish farming also links people to their food source making them more self reliant.

There is potential for fish farming as an agricultural-business. For a hectare of pond surface area, using simple animal manure and clippings as a food source, you can expect a yield of 2500kg per year of fish. For the same area, most grazing animals won't produce half that yield.

Fish ponds also protect the local environment. There are many parts of the Senegal River where over-fishing has depleted the fish supply. Instead of stopping fishing, fishermen are now just catching younger and younger fish. During one visit to a river village, I saw a young woman with a plate of 50 fish where there wasn't a single fish larger than six inches! Fish ponds next to the river can benefit from a year round source of water, provide another fishing option for the village, and allow the river to recover from over fishing. Additionally, surplus fry from the pond system can be thrown back into the river to help restock the river. Also, fishing in fish ponds is easier and a lot less time consuming than fishing in large bodies of water.

Many developing countries have fish farming projects. There have been some experiments with fish farming in Mauritania. Projects have been done in the Assaba, Brakna, and Guidimakha. In Kiffa, 2003, a PCV had a project with World Vision but that project is no longer active. In Bakau, outside of Boghe, there is a large installment that was funded by UNICEF. Sources say is not running at its full potential but it's operational. The third project is one that I stared here in Selibaby. The project is four months old as of this writing and has been met with a lot of local support[1].

Why Tilapia:

This manual will talk exclusively about raising tilapia. Tilapia has many attributes: it is a resistant fish, they reproduce quickly, and are eaten by Mauritanians. It naturally

[1] The project in Selibaby is at Khalidou Sy's house. He lives two doors away from the Gouraye police post in Selibaby.

exists in the water ways of West Africa. The type of tilapia found locally is *Oreochromis niloticus.*

Tilapias are temperature resistant, they can withstand both hot and cold extremes. The optimal water temperature range for tilapia is 25°-30°C (77°- 86° F). Beyond being temperature resistant, they can survive in stagnant, brackish water (water with low levels of dissolved oxygen or water with high concentrations of slats or minerals).

Tilapias will reproduce in captivity. A female can lay 75-150 eggs each reproduction cycle. Mature tilapias will reproduce when their water temperature is between 25°-29° C (77°-84°F), so in Mauritania they can reproduce pretty much year round.

There are few feeding requirements for tilapias. Tilapia can survive on plankton and zooplankton. Other food sources can be used to increase growth rates, but in the simplest system all you need is to have natural, "pond water," and your fish will be happy.

Types of Fish Ponds:

There are two main types of fish ponds, above ground and below ground.

Above Ground Pond:

This is the preferred system. In this system you use earthen dykes to create a 1 meter deep above ground pond. The dykes should be 1.2 m high and 2.9m wide with a crest width of around 50cm. When you are constructing your dykes it is important that you compact the soil. A good of rule of thumb is to lay down about 20cm of moist clayey soil (not too wet, only about 30% water) and compact it down to 10cm (if the mud is splattering, it is too wet).

It is important that you keep the slopes of your banks at a minimal slope of 1:1 (rise: run). A more aggressive slope (1.5:1, 2:1, ect) will cause your sides to cave in when you are filling the pond.

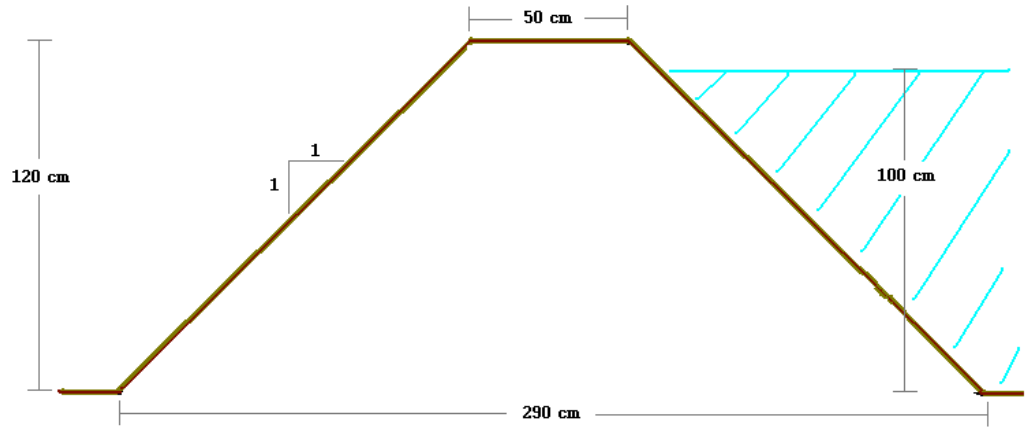

Figure 1 : Cross Section of Dyke

If you are attaching the pond to an irrigation canal or other source of water, put a screen over your inlet pipe. This protects your pond from unwanted things getting in and your fish swimming out.

To harvest an above ground pond you normally drain the system. This can be done by cutting a section of the dyke and putting a large screen over the opening to stop fish from flowing away with the water or with a drainage pipe. This is a preferable method because you don't have to rebuild your dykes but it requires you to buy a drainage pipe and a valve.

Draining your pond is the easiest way to fish out every single fish. Additionally, you can use the drained pond for crop production; the fish excrement makes the pond bed fertile soil.

One downside of this type of system is that you waste a lot of water when you drain the pond. If you are in a location where water is in abundance (next to the river, in a village with a dam, near a natural lake, etc) this shouldn't be a problem. If you are in a place where water is scarce, you may want to look into below ground ponds.

The surface area of your pond should be 100 m^2. The 10m x 10m x 1m pond is ideal for small scale fish farming. If there isn't an existing fishpond system in your area, you may need to establish a rearing pond. A rearing pond is smaller than the 10m x 10m ponds and is used for fry and fingerling production. A good rearing pond size is 6m x 5m x 1m. The benefit of the rearing pond is you can have a plentiful source of fingerlings close to your grow-out pond (10m x10m x 1m). When you stock your rearing pond initially, try to find 10-20 mature adults. In three- five months you should have hundreds of fingerlings for stocking your larger ponds. Your grow-out ponds should be stocked at a density of 1-2 fry per surface square meter (100-200 fingerlings for a 10m x 10m pond). A possible rearing and grow-out pond system is illustrated in Figure 2.

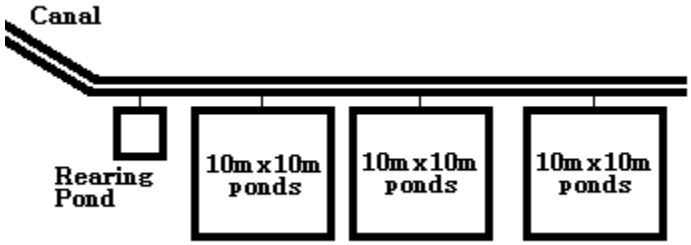

Figure 2: One Rearing Pond and Three Grow Out Ponds Fed of a Canal

Below Ground (dug) Ponds:

In this system you dig your pond. A below ground pond can't be drained. To fish a below ground pond system you use nets. This will allow you to take the large fish and leave the smaller fish to continue growing. With this system, you can use the same water year round - only adding water to compensate for infiltration and transpiration.

The cheapest way to decrease infiltration is to use a clay liner. If you are in a zone where there isn't a good source of clay, then concrete can be used. The slopes of your pond should be, as with the above ground pond, no greater than 1:1 (rise: run).

Overpopulation is more of a problem in un-drainable ponds because you aren't losing all of the newly hatched fish when you empty the pond. See the section on overpopulation for some possible ways to control this problem.

One commonly used solution to overpopulation in dug ponds is to use a rearing pond but only transfer the males into the "grow out" ponds. Instead of transferring fingerlings from your rearing ponds you will only transfer mature adults. To learn

how to identify the difference between the males and females see the Overpopulation section.

If you are in a place that has a clayey soil you may be able excavate less than the full 1 meter depths and use the excavated clay to make your dyke, see Figure 3.

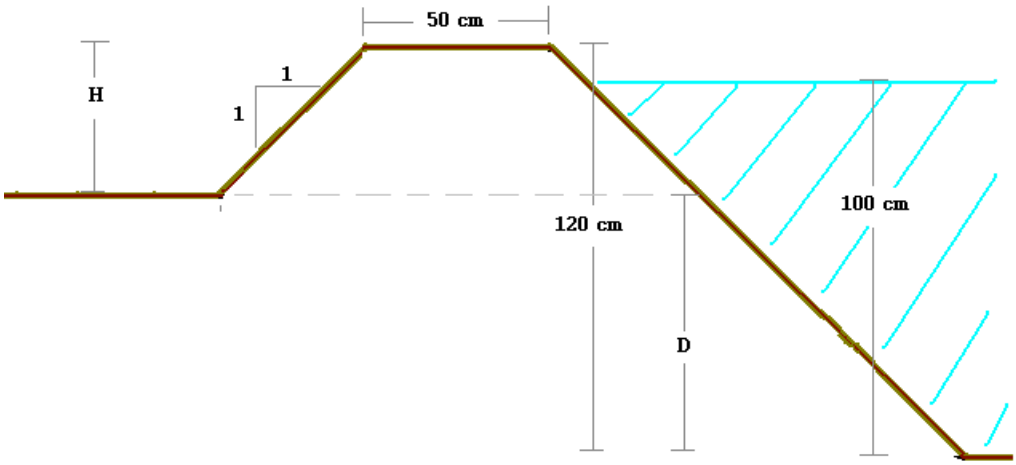

Figure 3: Partial Excavation Dyke

Ideally, you will excavate only the clay needed to build your dyke. For a 10m by 10m pond if you excavate 0.5 m (D) you should have enough soil (with a 50% compacting factor) to build a 0.7m (H) dyke around your pond.

Life Cycle of Tilapia:

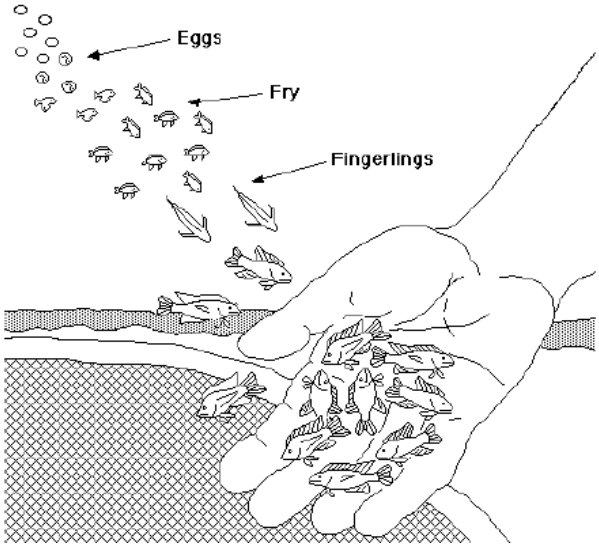

Figure 4: Tilapia Fry and Fingerlings (used with permission, Auburn University 2006)

Tilapias are mouth brooders. This means that the mother fish holds the eggs in her mouth until the eggs are ready to hatch. Once the mother has the fertilized eggs in her mouth they will hatch in three to five days. The larva will return to the mother's

mouth for eight to ten days as a protective mechanism. Once the larva grows into fry, they are on their own.

It will take four to five months for the fingerlings to become sexually mature. At this point they will be 50g to 100g and 10cm to 12cm. If you want to separate your males and females, their sex organs should have developed by this point.

If left uninhibited, with adequate food and space, tilapia can grow up to 40cm or 50cm in about four to five years. Fish will stop growing if they are overcrowded. Because of this problem, it is important to respect the stocking density, 1-2 fish per surface square meter.

Feeding Requirements:

Tilapias are not picky when it comes to what they will eat. They eat phytoplankton, zooplankton, simple aquatic animals, and decomposing material. Phytoplankton, zooplankton, and other aquatic organisms will develop from the decomposing material, manure, or commercial fertilizers. Building a small compost pit in your pond can provide a constant source of food for your fish.

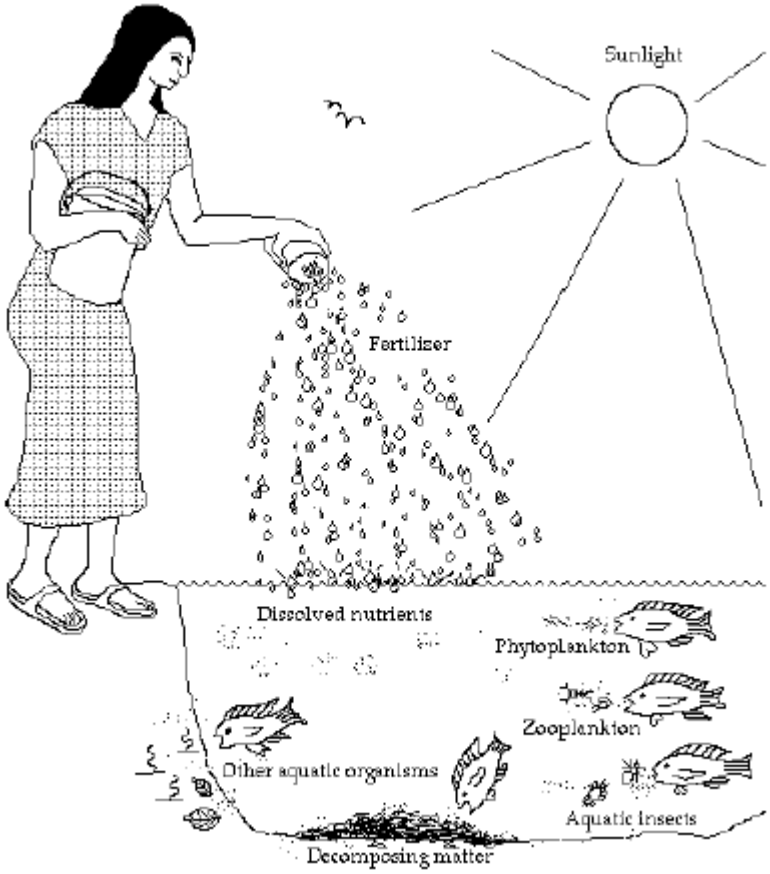

Figure 5: Food Web (used with permission, Auburn University 2006)

Animal manure may be the miracle product for fish ponds. Ten kilos of manure (from grazing animals- cows, sheep, donkeys, ect) a week will meet the feeding requirements of a pond with a surface area of 100 m^2. If you have a source of duck or

chicken manure the dosage decreases to 6kg/100m^2/ week. As you can see from Figure 5 the manure will provide nutrients for all of the tilapias' food sources.

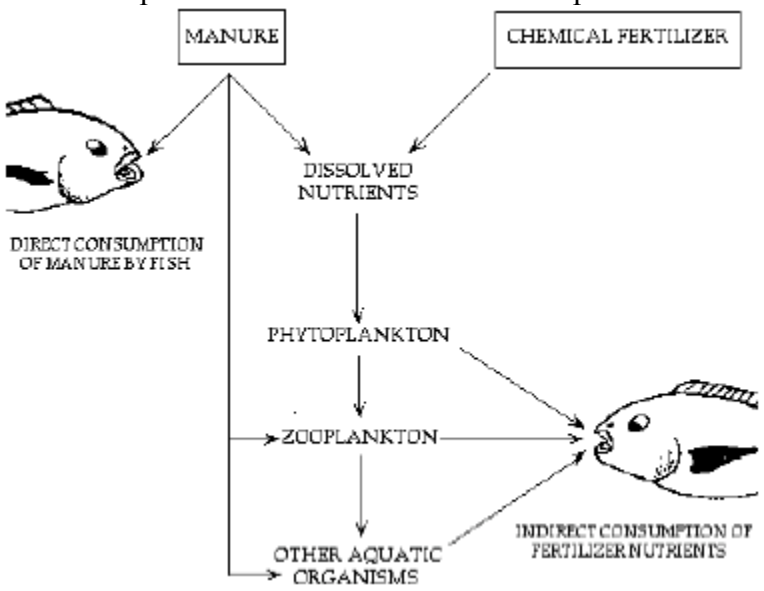

Figure 6: Manure as a Food Source (used with permission, Auburn University 2006)

From time to time, there can be a problem with overfeeding. I think, though I am not sure, that this problems only develops when you are using commercial fish foods and/or commercial fertilizers. Surplus nutrients in the water can create an algal bloom that will choke out the fish (there will be an oxygen shortage in the pond). In order to breathe, the fish will stick their heads out of the water and breathe on the surface. To monitor this problem, check the clarity of the water. You should be able to see 20cm-30cm into the pond.

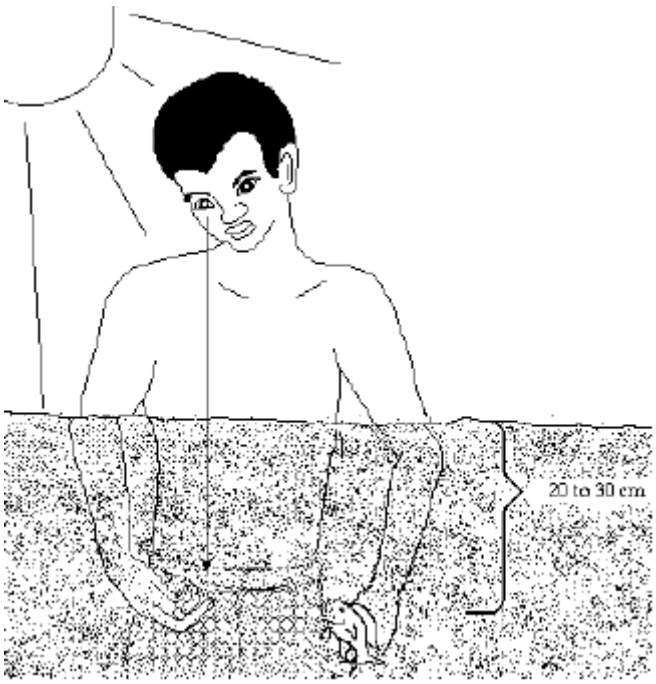

Figure 7: Clarity Test of Your Pond (used with permission, Auburn University 2006)

If you are interested in making your own fish food or optimizing the nutrients you are giving to your fish, there is an excellent technical brief on the topic. When you get to that level of nutrient management, the quantity of food you give to the fish is based on the fish density in your pond.

Reproductive Cycle:

To raise tilapia requires a basic understanding of their reproductive cycle. As previously stated, Tilapias are mouth brooders. Before the eggs get to the female's mouth the males have to fertilize the eggs and this fertilization takes place in nests.

When the water temperature is right for reproduction the males prepare the nests. To do this, the male fish digs a hole in the bottom of pond (lake, river, ocean, ect). The nests are usually 20-30cm in diameter. When the nests are ready, the male fish search out their mates. The male leads the female to the nest where she deposits her eggs. Thereafter the male returns to the nest and fertilizes the eggs. The female will then return to the nest and pick up the fertilized eggs with her mouth. The new generation will hatch directly from their mother's mouth.

The mother will hold the eggs in her mouth for 3-5 days before they hatch. For the next eight to ten days the fish larva will return to their mother's mouth for protection. During this time the female fish will not eat. Because of this self imposed fast, males grow at a faster rate than their females contemporaries.

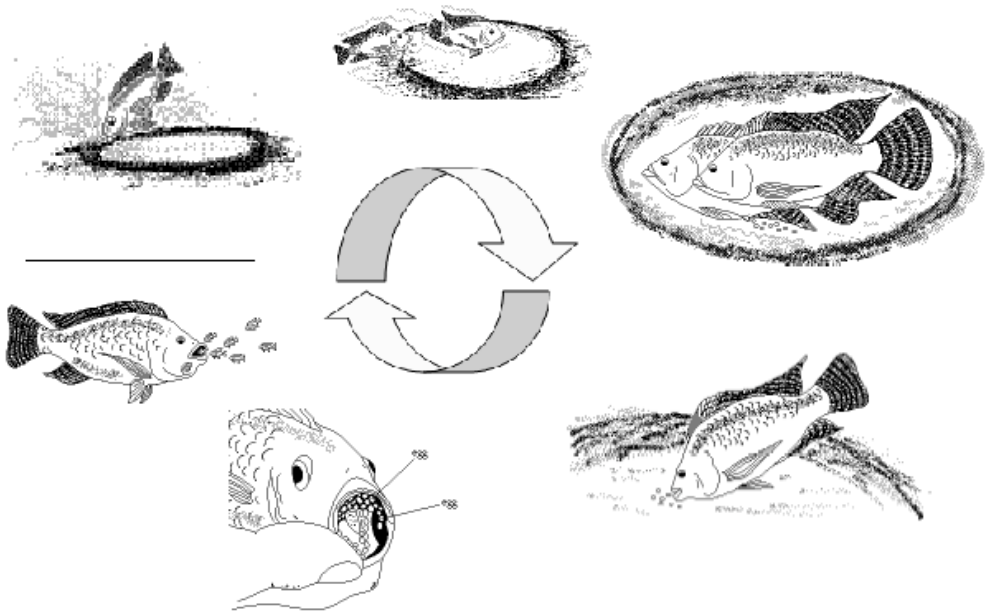

Figure 8: Reproductive Cycle of Tilapia (adapted with permission, Auburn University 2006)

Overpopulation:

Overpopulation is the most common problem in tilapia cultures. Overpopulation can stunt the growth of your fish. From a commercial standpoint, this stunting means that you have less large fish to bring to the market. But here in Mauritania, with the

exception of the coastal cities, you rarely see a fish larger then 15 cm. This may mean that overpopulation may be less of a problem here.

With that said, there are three ways to control the population of your pond: sexing your fish, adding a predator species, and periodically draining your pond.

Sexing your fish:

One extraordinary aspect of tilapia is that you can tell the difference between the males and the females.

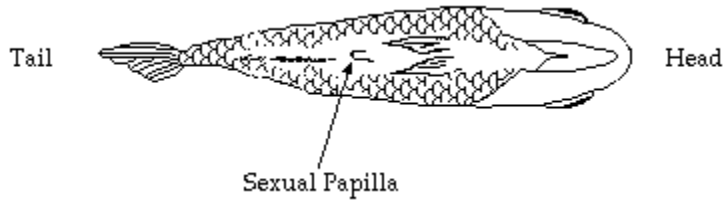

Figure 9: Underbelly of a Tilapia (used with permission, Auburn University 2006)

The sexual papilla is a small, but visible, sexual organ on the underbelly of tilapia. You can see the papilla with the natural eye but a magnifying glass can be helpful identifying the sex of your fish.

To sex your fish securely hold your mature fish and look at its papilla. Figures 10 shows the difference between the male and the female fish:

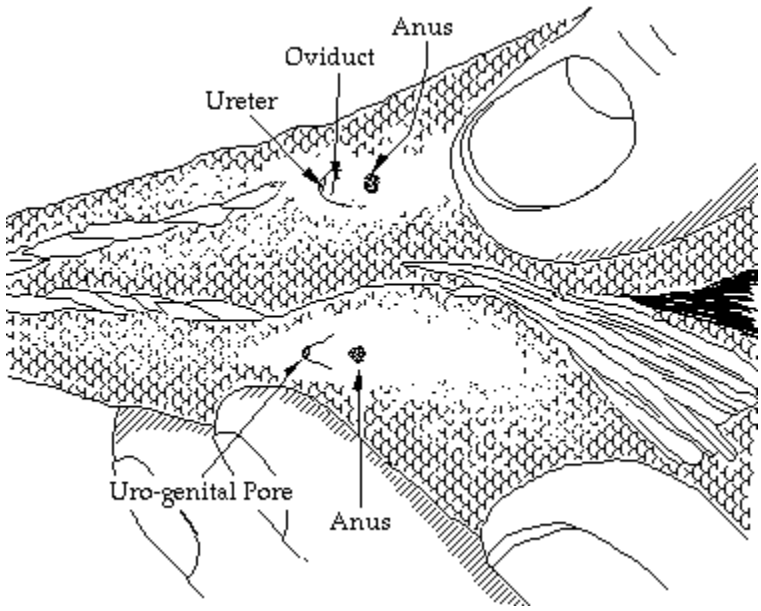

Figure 10: Sex of Tilapia 2 (used with permission, Auburn University 2006)

Sexing of fish can be done with 80-90 percent accuracy. As with everything, practice makes perfect. When you are sexing your fish, do it in a shady area and use three buckets: males, females, and unsure. You want to be careful not to introduce any females to a male only pond. If this happens you may need to drain the pond and

start over. There are also genetic crosses which will produce nearly 100% male offspring, but I think that this is beyond the work of the small scale farmer.

Introduction of a predator species:
Another, more natural, overpopulation control method is to introduce a predator species to your pond. I have not done this in either of my pond systems. I have yet to find accurate information on how many predators to add to the system. Additionally, I fear that the predators could attack my larger fish instead of weeding out the new generations. My ponds are small (24 and 30 square meters) and I never felt there was enough space to support two species. Perhaps I would feel more comfortable if I had a larger system to add a predator.

Reservations aside, there are many types of fish that can be used a predator species in Tilapia cultures. Eels, large mouth bass, and catfish all work. You must do an extensive amount of research before introducing a new species to your pond. For instance, there are certain types of catfish that are mouth brooders. If, by the [bad] luck of the draw, this is the type of catfish that you introduce into your pond soon you will have a catfish overpopulation problem. Captain is a desirable fish here in Mauritania. There is the possibility of using this fish as a predator but they are aggressive and a invasive species.

Periodically draining your ponds:
Draining your pond can be used as a population control device. When you drain your pond walk around and pick up all the larger fish. With a group of ten or so, you should be able to collect all the larger fish before they die. By digging a small pool next to your pond, you can store the desirable fish until you have refilled your pond. If there are dead fingerlings left in the bed of your pond don't feel like you need remove them. They will decompose or be eaten by the larger fish.

After you drain your pond let the mud crack before you refill it. This will kill any unwanted eggs that have been deposited (by tilapia or foreign organisms) and can help prevent disease.

Single Pond System for Sustainable Production of Oreochromis Niloticus, a technical brief from Auburn University, describes an excellent small scale system. When harvesting a single pond system they suggest fishing the pond with a fine net first. The fine net will catch any fingerlings that have grown in the pond. You then put the fingerlings needed for restocking (1-2 fingerlings per square meter of surface area) in a small holding container (can be a hole dug next to the main pond). Now you are ready to harvest your pond. Drain the pond and harvest all the large fish leaving the fry/ fingerlings to die. When you re-fill the pond use the captured fingerings to stock the new (un-populated) pond, wait six months and do it again.

Transport:
Chances are you are going to have to transport fish to start your project. The lack of a good transportation infrastructure and hot temperatures make the transportation of fish in Mauritania difficult. There are two major things that you need to monitor while transferring your fish: water temperature and oxygen level.

Preparing your fish for transport is important. The simplest way to transfer your fish is with plastic bags.

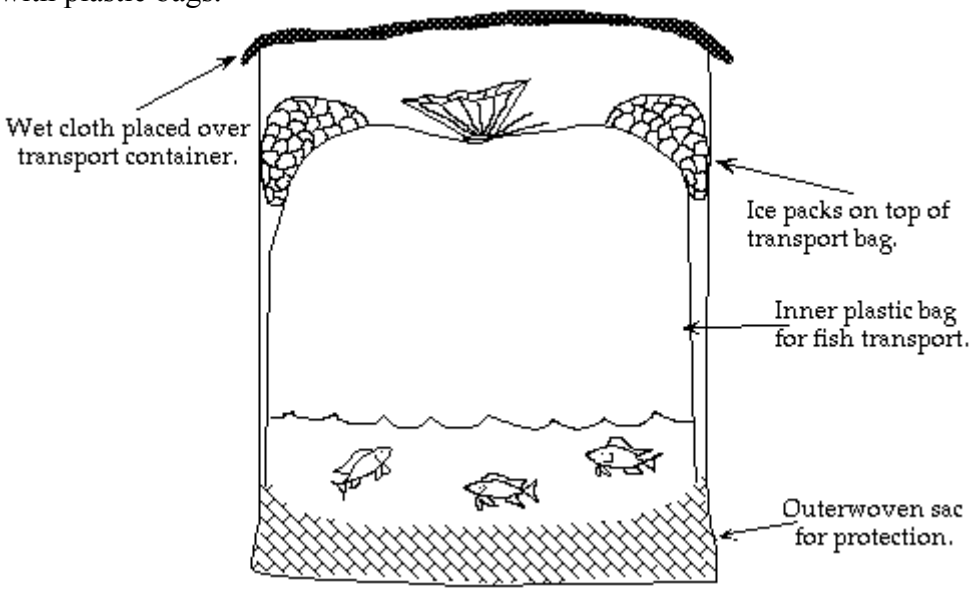

Figure 11: Transport of Tilapia (used with permission, Auburn University 2006)

As shown in Figure 11, fill about 1/3 of the bag with water. In the remaining space, pump pure oxygen or air (DO NOT USE YOUR BREATH- YOU EXHALE CO2, NOT O2). You can put ice packs on top of the bag to keep the system cool, but NEVER add ice directly to the water; this will thermally shock your fish and kill them. In Figure 11 they used a woven sack to protect their plastic sack but pails and thermoses also work.

When you arrive at your destination, you need to float your bag of fish in the new pond. This will stabilize the temperature between the water in the bag and the water in the pond. If there is a temperature difference greater than three degrees C at the time when the fish enter the pond it can cause the fish to die.

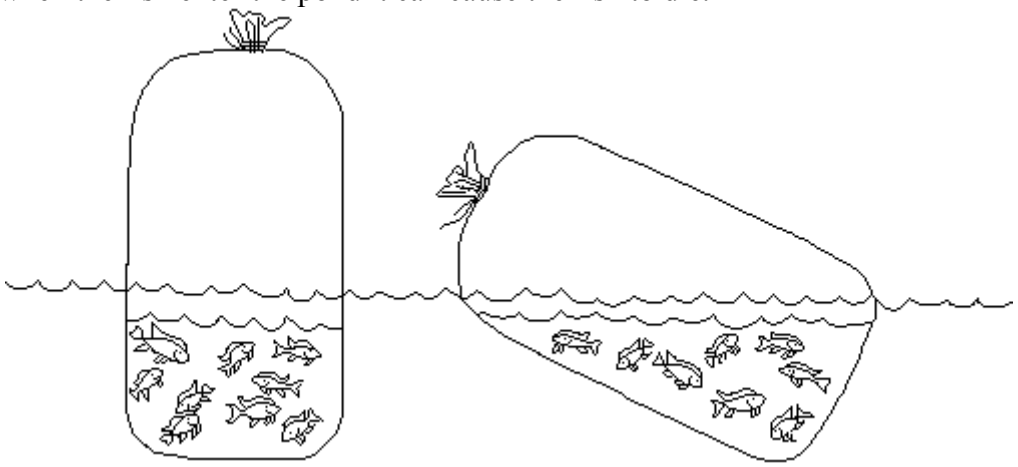

Figure 12: Floating Your Bag of Fish (used with permission, Auburn University 2006)

After 20 or 30 minutes the water temperature will have stabilized and your fish can be released. To release your fish into their new environment, untie the bag and let the fish swim out on their own.

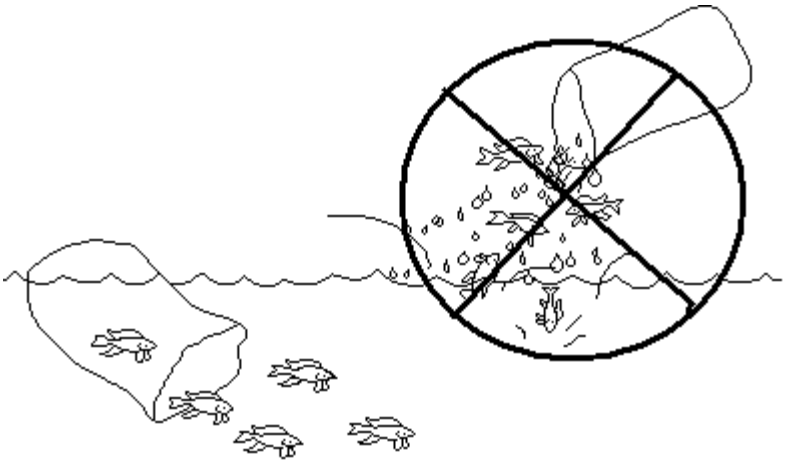

Figure 13: Releasing Tilapia (adapted with permission, Auburn University 2006)

Transporting fish is difficult. Before you embark on your first fish mission you should consult the technical brief, *Transporting Fish*. A note from personal experiences, fish die during transport. Don't let this discourage you. If you are starting a pond try to find sexually mature fish (100g to 200g; 10cm-20cm) to transport. They are stronger than fingerlings and will better stand up to the travel. Another benefit is that they can immediately start reproducing.

Information Available:
Here is a list of the list available from your APCD

<u>Available in English</u>
From Auburn University:

- An Introduction to Aquaculture
- Introduction to Fish Culture in Ponds
- Introduction to Fish Pond Fertilization
- Introduction to Tilapia Culture
- Culture of Hand-Selected Male Tilapia
- Introduction to Polyculture of Fish
- Eliminating Unwanted Fish and Harmful Insects from Fish Ponds
- Reproductive Biology of Oreochromis niloticus
- Oreochromis niloticus Fry and Fingerling Production in Tanks
- Production of 1-gram, Mixed-Sex Oreochromis niloticus Fingerlings in Earthen Ponds
- Net Enclosure System for Oreochromis niloticus Fingerling Production
- Single Pond System for Sustainable Production of Oreochromis niloticus
- Introduction to Water Harvesting
- Introduction to Fish Culture in Rice Paddies

- Feeding your Fish
- Chemical Fertilizer for Fish Ponds
- Organic Fertilizers for Fish Ponds
- Transporting Fish
- Introduction to Intensive Cage Culture of Warm water Fish
- Introduction to Oreochromis niloticus Production Systems

From the Southern Regional Aquaculture Center:

- Tilapia- Life and Biology
- Tank Culture of Tilapia-SRAC
- Site Selection of Levee-type Fish ponds
- Site Selection and Construction
- Repairing Fish Pond Levees
- Renovating Leaky Ponds
- Pond Culture of Tilapia
- Calculating Area and Volume

<u>Available in French</u>

From Auburn University:

- Fertiliser Votre Etang : Une Introduction
- Engrais Chimiques Pour Etangs Piscicoles
- Engrais Organiques Pour Etangs Piscicoles
- Transport Du Poisson
- L'alimentation Du Poisson
- Recolter L'eau Une Introduction
- Elimination Des Poissons Indésirables Et Des Insectes Nuisibles Dans Les Etangs Piscicoles
- Introduction A La Polyculture Piscicole
- Introduction A La Pisciculture En Etangs
- Aquaculture, Un Introduction
- Introduction A La Rizipisciculture
- Introduction A La Pisciculture Intensive Tropicale En Cage
- Introduction A L'élevage Du Tilapia Biologie De La Reproduction Chez Le Oreochromis Niloticus
- Introduction Aux Systèmes De Production De Frai Et D'alevins De Oreochromis Niloticus
- Système De L'enclos En Filet Pour La Production De Frai Et D'alevins De Oreochromis Niloticus
- Production Sexe Mixte D'alevins De Oreochromis Niloticus De 1 Gramme Dans Les Etangs En Terre
- Elevage Mono sexe Du Tilapia
- Système A Etang Unique Pour Une Production De Subsistance De Oreochromis Niloticus
- Production De Frai Et D'alevins Oreochromis Niloticus En Tank

Vocabulary :

Pond- le étang
Aquaculture/ Fish Framing- la pisciculture
Manure- le fumier
Fisherman- le pêcheur
Sinner- le pécheur
Fingerlings- l'alevins
Food- la nourriture/ l'alimentation
Below ground pond- L'étang creusé
To Drain- vider
Magnifying Glass- la loupe
Surid (general name for catfish-like fish)- la sulure
Fish- le poisson
Overpopulation- surpeuplement
Dyke- la digue
Fish Net- le filet
Larva- la larve
Adult- l'adulte
Tilapia- Tilapia
Oxygen- l'oxygène
Pipe- le tuyau

Picture Reference :

Auburn University. *Water Harvesting and Aquaculture Development Series*. Department of Fisheries & Allied Aquacultures. 2006. http://www.ag.auburn.edu/fish/international/waterharvestingpubs.php Last Viewed, October 10, 2006.