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An Assessment of Kigali, Rwanda

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Introduction

Rwanda

Rwanda, commonly known as the "the land of a thousand hills" is a diverse landlocked country that is home to an estimated 9.2 million people (Basic data, 2008). Bordered by Burundi, the Democratic Republic of Congo, Uganda and Tanzania, it is located on the far western edge of the Rift Valley. Rwanda is home to hills, valleys, dormant volcanoes and green plains that continue over a beautiful landscape. As the terrain is clearly mountainous there are few natural resources and minimal industry. This therefore forces 90% of the population to engage in the agricultural industry and to contribute to 40% of Rwanda's Gross Domestic Product (GDP) ("Highlights", 2008). Industries and services make up only 21% and 38% of the GDP and have such little impact on their economy due to the devastating effect that the country's dreadful past had on its economic well-being today ("Highlights, 2008). Although Rwanda does not show signs of impact today, its dreadful past is embedded into the country's history and into the hearts of the Rwandan people today.

The Genocide

The 1994 genocide was the turning point in the stability of the Rwandan economy, its political regime and its social equality. Historically, Rwanda was under the colonial rule of the German colonial authorities (1895-1916) until they were overtaken by Belgian colonial rule, who moved in from the Democratic Republic of Congo. The Belgians identified the people of Rwanda into 3 distinct classes: Hutus (84%), Tutsis (15%) and the Twa people (1%) (Politics: Political background, 2008). This distinction and separation of different people of dissimilar economic status lead to the empowerment of the Hutus to form an all-Hutu government (Party for the emancipation of Hutu). Following the independence of Rwanda in 1962, the Hutu regime sought to portray Rwanda as a Hutu country. After a drawn out civil war between the Hutu Regime and the Rwandan Patriotic Front (RPF) the two sides came to a cease fire agreement in 1993. When the leader of the Hutu political Party was assassinated, the ethnic cleansing of the Tutsi and Twa people began. The extreme violence and systematic killings lead to the deaths of an estimated 1 million Tutsi, Hutu and Twa people ("Politics: Political background", 2008). The genocide in Rwanda had a lasting effect on the people of Rwanda, as well as neighbouring countries where some fled to avoid the genocide. The Democratic Republic of Congo, Burundi, Tanzania and Uganda were popular settlement areas for those refugees fleeing the violence. While many international assistance missions failed to respond to the growing problem in Rwanda, the genocide came to an end when the RPF defeated the Hutu army and seized control of the country.

The genocide had a severe impact on Rwanda's economy, demographics and society as a whole. The country no longer attracts private and external investments as it did in the past and their country has suffered such a decline in poverty levels that the countries demographic statistics are on the rise. Not only was the country left impoverished, but the population was left scarred with the rise of HIV/AIDs infection due to the rape of women by the militia. The mortality rate has risen due to the disease while the life expectancy has increased to an alarming 45 years. These statistics prove how the genocide had a lasting impact on the generations that followed the devastating genocide of 1994("Highlights", 2008).

Pursuing this further however, it is evident that the country has successfully regained its pride over time. The government has stabilized and rehabilitated the country to pre-genocide state concerning economic status and social welfare. Today, the government has played a great role in policy to reduce poverty by improving education, infrastructure, and foreign and domestic investment. They are also putting forth efforts to tackle many important issues in Rwanda that need more attention. These include addressing issues surrounding those living with HIV/AIDs, mortality due to malnutrition and lowering the poverty level.

HIV/AIDs Pandemic effects on Rwanda

When discussing the HIV/AIDs pandemic, Rwanda has a prevalence rate of 2.8 ("Bureau of Public Affairs", 2009). It is evident that the HIV prevalence rate is relatively low compared to other countries in Africa who have been ravaged by the effects of the pandemic, due to the fact that it is being tackled by the government more than other countries. One way includes providing antiretroviral drugs which are now available free of charge for everyone in Rwanda. Furthermore, many other organizations such as UNAIDs, Health Centres and advocacy groups are pushing to help the People living with AIDs (PLWAs) in more ways than one. It is apparent however that there are some members of the community that still silently suffer in their own homes due to side effects of the antiretroviral drugs and symptoms of HIV/AIDs such as diarrhoeal disease and bacterial vaginosis. There are an estimated 3% of people who are living with AIDS (PLWAs) and more than 45% of infected children that suffer from diarrhoeal disease as well as about 30% of the women who are PLWAs suffer from bacterial vaginosis (Reid, 2006).

Diarrhoeal Disease

The American college of gastroenterology define diarrhea as "an abnormal looseness of the stool, changes in stool frequency, consistency, urgency and continence" (Surawicz et al, 2009). There are two types of diarrhea, acute and chronic.

Acute diarrhea is characterized by an increased number of stools or looser form than is customary for the patient. It typically lasts less than 2 weeks and it is often accompanied by

abdominal cramps, bloating, and gas. Acute diarrhea can lead to severe dehydration as a result of large fluid and electrolyte losses (Surawicz et al, 2009). Acute, watery diarrhoea is usually caused by viruses termed viral gastroenteritis, which attack the gastric system. Other causes of acute diarrhoea include antibiotics and drugs containing the element magnesium, dietary changes such as increased intake of coffee, tea, and colas, being exposed to pathogens of different places while travelling, or eating contaminated foods containing *E.coli* 0157:H7. It is also possible to have acute bloody diarrhoea caused by *Campylobacter, Salmonella or Shigella* (Surawicz et al, 2009). Acute diarrhea can be resolved by simply changing dietary habits.

Conversely, chronic diarrhea lasts more than two weeks and is usually diagnosed better based on whether the stools are bloody, oily, or watery. The causes of chronic bloody diarrhea are likely due to "Inflammatory Bowel Disease (IBD)" whereby patients find it painful to defecate due to an inflamed rectum (Surawicz et al, 2009). There are other causes of chronic bloody diarrhea but are rare and they include ischemia of the gut, infections, radiation therapy and colon cancer or polyps. Chronic oily diarrhea is caused by improper digestion and absorption, a condition known as chronic pancreatitis where the pancreas functions improperly. Causes of chronic pancreatic include alcohol abuse, cystic fibrosis, hereditary pancreatitis, trauma to the pancreas and pancreatic cancer. Other conditions such as biliary tract obstruction, cholestatic liver disease, and bacterial overgrowth can also lead to maldigestion problems (Surawicz et al, 2009). Fat malabsorption is caused by gluten sensitive enteropathy, small bowel mucosal diseases, or surgical resection of the small bowel. The causes of watery diarrhea include improper absorption of carbohydrates, intestinal infections, or Irritable Bowel Syndrome. Irritable bowel syndrome is a condition associated with frequent stools, alteration in bowel habits, and abdominal pain and its causes are unknown but it is recognized as a motility disorder (Surawicz et al, 2009). Some people get chronic diarrhea from certain medications such as NSAIDs, antacids, anti-hypertensives, antibiotics and anti-arrhythmics. People who have had poorly controlled diabetes for many years can have chronic watery diarrhea for nerve damage and bacterial overgrowth take place. Opportunistic intestinal infections such as giardiasis, people with HIV cause chronic watery diarrhea. To treat chronic diarrhea, antimotility agents and opiate anti-diarrheal drugs are most effective for not only do they reduce symptoms, they also reduce stool weight. Oral rehydration therapies are also used to keep patients hydrated.

WHO (World Health Organization) reports that diarrhea occurs world-wide and causes 4% of all deaths and 5% of health loss to disability which kills approximately 2.2 million people globally every year, affecting mostly children in developing countries. Diarrheal diseases are one of the major causes of infant and child deaths in the developing world (USAID, 2009). Children have a developing immune system that is not as tolerant of nutrition imbalances as an adult's. At the onset of dysentery and cholera, children do not fare well for it can cause life threatening diarrhea even in adults themselves. Dysentery is the presence of blood and/or mucus in stools and is a type of chronic diarrhea. It can be treated by the administration of anti-diarrheal drugs (Surawicz et al, 2009). Cholera is "an acute, diarrheal illness caused by infection of the intestine with the bacterium *Vibrio cholera" (CDC, 2010)*. Though infections are often mild and lacking symptoms, it can be severe where 'approximately one in 20 infected persons has severe disease characterized by profuse watery diarrhea, vomiting, and leg cramps" (*CDC, 2010).* Centres for Disease and Control and Prevention (CDC) reports that people with severe cholera rapidly lose bodily fluids which leads to dehydration and shock resulting in death within a few hours if goes untreated. Cholera can be contracted by drinking water or eating food contaminated with the cholera bacterium or coming into contact with the faeces of an infected person through improper treatment of drinking water. Cholera is treated by giving patients an oral rehydration solution, which is a mixture of sugar and salts to be mixed with water and drunk in large amounts to replace the fluid lost from the body (CDC, 2010).

Diarrhea is rare in people living in developed countries for there is the availability of a safe water supply and people practice good hygiene. Approximately 1.1 billion people in the world lack access to clean water and 2.4 billion have no basic sanitation (WHO, 2000). As evidenced by 64% of Rwandan households between the years 2000-2005 where there was no change in the proportion of households having access to safe water (eStandardsForum, 2009). Some of their problems can be linked to having only one public utility company Electrogaz being responsible for both the production and distribution of water and electricity is Electrogaz (eStandardsForum, 2009). In an attempt to reduce the incidence of diarrheal disease, WHO (2000) suggests the following as key measures:

- Access to safe drinking water

- Improved sanitation
- Good personal and food hygiene.
- Health education about how infections spread.

To decrease the duration and severity of diarrheal disease in children under 5, USAID supports zinc supplementation which has been shown to reduce the severity of diarrhoea by 40% and its duration by 20% within 7-10 days. Studies have also demonstrated that future occurrences of diarrhea are also limited (USAID, 2009). Also, the World Health Organization (WHO) introduced an oral rehydration salts formula in 2002, which reduces the severity and duration of acute diarrheal illnesses at the United Nations General Assembly Special Session on children (UNAID, 2009) and is now used as an effective treatment of diarrheal disease. It is thus apparent that there needs to be action taken to restore the intestinal flora in those living with diarrhoeal disease and prevent diarrhoeal episodes (Reid 2006), in order to improve the health of PLWA's and the general Rwandan population.

Bacterial Vaginosis

Bacterial vaginosis is a urogenital infection that affects over 300 million women worldwide each year (Reid, 2001) and is characterized by the colonization of the vagina by pathogenic bacteria, such as *Escherichia coli* or *Gardnerella vaginali* (Reid et al, 2003) creating an abnormal flora. Urogenital infections are infections that affect the bladder, kidneys, vagina, urethra, periurethra, and cervix, and they tend to recur even multiple times in one year (Reid, 2001). Bacterial vaginosis has been defined as "a mild infection of the lower female genital tract" (Reid, 2001). Women with an abnormal flora are also at an increased risk of preterm labor and acquisition of sexually transmitted diseases (Reid et al, 2001). Problems associated with preterm labor are the premature rupture of membranes and/or death of the fetus or newborn (Reid, 2001). Furthermore, bacterial vaginosis is a major cause of urogenital disease in women (Reid, 2001).

There are three of four criteria that characterize urogenital disease with the first being the release of an amine or fishy odor after adding potassium hydroxide. The second is a vagina with a pH greater than 4.5, indicating the vagina is promoting a basic environment instead of an acidic one, which is conducive to good health. The third is the presence of clue cells in vaginal fluid. Lastly, the fourth criterion is the presence of a milky homogenous vaginal discharge. (Reid, 2001).

Different studies have shown that prior to menopause, urogenital cells are covered by dense bacterial biofilms whose composition changes constantly and lactobacilli predominate. A biofilm is a collection of different microorganisms growing on a solid substrate characterized by "structural heterogeneity, genetic diversity, complex community interactions, and an extracellular matrix of polymeric substances" (Microbiology, 2009). Formation of a biofilm begins with the attachment of free-floating microorganisms to a surface. These first colonists adhere to the surface initially through weak, reversible van der Waals forces. If the colonists are not immediately separated from the surface, they can anchor themselves more permanently using cell adhesion molecules such as pili. However, in the case of urogenic infections such as bacterial vaginosis, uropathogenic organisms emerge from the intestine and come into contact with these biofilms on vaginal and urethral cells (Reid, 2001) creating a basic environment conducive to urogenital infections.

Bacterial Vaginosis is a very common infection that affects women of all ages. While bacterial vaginosis is quite common and is merely a nuisance infection, an untreated infection can cause serious complications and it can also increase susceptibility to many sexually transmitted infections including HIV (Reid, 2003). This thus facilitates and increases the transmission of HIV from partner to partner and causes HIV to be a much bigger threat to the Rwandan community. If bacterial vaginosis is targeted at the source, the transfer of HIV will be less likely from partner to partner. This is therefore a tangible problem that should be addressed in order to take steps toward slowing down the spread of the HIV virus in Rwanda.

Malnutrition

Along with the impact that HIV/AIDs has on the Rwandan community, there is the difficult reality of addressing malnutrition in children and adults. While 57% of the population is living under the poverty line, there are many that cannot afford proper nourishment. The World Health Organization reports that malnutrition is responsible for 54% of the major causes of under-five mortality rate (Booth *et al* 2001). Based on the information given in the Comprehensive Food Security and Vulnerability Analysis (CFSVA) and Nutrition Survey (NS) Led by NISR (Nat. Inst of Stats of Rwa), with support of other ministries (Min of Agr and Animal Resources, Min of Health, Min of Finance and Econ Planning, Min of Local Government and Administration), and

partners (WFP, UNICEF, WV) - (Data collection: February-March, 2009), 7% of women of reproductive age (15-49 years) are malnourished (BMI), 52% of children of 6-59 months are stunted, 4.6% wasted and 15.8% underweight. Furthermore, according to the Rwandan Demographic and Health Survey (RDHS, 2005) Chronic malnutrition or stunting results in delayed growth, affected 45% of children between 0 and 5 years. 56.3% of children under 5 years are anaemic and 32.8% of women of reproductive age. A child mortality rate higher than 70 per 1000 considered an indicator of Vitamin A deficiency, in Rwanda, mortality rate for children under 5 years of age is 152 per 1000 (RDHS 2005). 28.8 of Rwandan pregnant women have Iron deficiency Anaemia and this contribute to 8% of maternal death and to 12% of prenatal deaths and 5% of children between 6 to 59 months suffer from Vitamin A deficiency.

Poverty Reduction

As the HIV/AIDs pandemic and the growing problem of malnutrition are discussed, there is in fact one factor that has lead to the ultimate increase in these numbers. This fact is the growing poverty level in Rwanda. Presently, the poverty level has risen to an alarming 57%. It is evident that more than half of the population is living in poverty and thus this is leading to increased malnutrition and increased trends in spread of the HIV infection ("Basic data", 2008). There are many factors that contribute to the poverty in Rwanda and as seen in Table 1.1, it is evident that is it due to the fact that much of Rwanda's demographics (land, climate, infrastructure…) are not adequate to create a thriving agricultural sector which makes up most of their GDP.

Table 1.1: Major causes of poverty identified Share of respondents (%)

Lack of land (*Kutagira isambu*)	49.5
Poor soils (*Ubutaka butera*)	10.9
Drought/weather (*Izuba ryinshi*)	8.7
Lack of livestock (*Kutagira itungo*)	6.5
Ignorance (*Ubujiji*)	4.3
Inadequate infrastructure (*Ibikorwa remezo*	3.0
Inadequate technology (*Ikoranabuhanga ridahagije*)	1.7
Sickness (*Uburwayi*)	1.7
Polygamy (*Ubuharike*)	1.2
Lack of access to water (*Kubura amazi*)	1.1
Population pressure (*Ubwiyongere bw'abaturage*)	0.7
Others(*Izindi*)	10.6
Total	100

From:http://statistics.gov.rw/images/PDF/poverty%20and%20environment%20in%20rwanda.pdf

Gender-Based Violence

Increased poverty levels have also proven to show increased gender based violence. This thus leads to the suppression of women in their own homes as "sometimes being poor and being a woman is often bad for [women] run into conflicts where their husbands abuse them," (Minister of Gender, 2009). This is termed economic violence. Economic violence is violence that women face from their spouses when they are unemployed for they are seen as not contributing to family finances. Such violence could be in the form of emotional and/or physical abuse. According to the Kigali Minister of Gender, this gender based violence leads to the helplessness of women in society to generate income and thus they turn to options such as prostitution to fill in the economic hole they must fill in order to avoid gender-based violence (2009). There are however, businesses affiliated with the ministry of gender that offer business training for women and programs that train rural women to be more business oriented by enabling them to prepare "income generating schemes" which focus on skills to run a business and finding funds to run projects (minister of gender, 2009). It is evident that there is gender –based violence in Rwanda

due to economic problems, thus it is imperative that the issues of gender based violence, low-income families and empowerment of women be addressed so gender based violence does not occur. According to Deputy mayor of Kigali, "Gender is a success story [in Rwanda]" (2009) and thus in order for us to eliminate all gender based violence and to render this statement true, the economic status of those living under the poverty level must be addressed, specifically for women.

Health Care in Rwanda

Data from Rwanda's Ministry of health estimates that the total population of people in Rwanda is 9.3 million with life expectancy at birth being 52.73. The Rwandan health care infrastructure is composed of 3 referral hospitals, 33 district hospitals, and 369 health centres (Savadogo, 2008). Based on the Swiss centre for international health survey in Rwanda, there is a single doctor for every 50,000 inhabitant. Also, there is one nurse for every 3, 900 inhabitants (Savadogo, 2008). However in 2009, there was a doctor for every 18,000 inhabitants and a nurse for every 1690 inhabitants. Access to health care has been steadily improving. A financial standards foundation, eStandardsForum, also states that "there is a very low level of health care providers… (there were) 432 physicians, 21 dentists, 101 environment and public health care workers, 39 laboratory health workers and 3,647 nurses and midwives in 2004 (2009)". They also reported that there were 160 hospital beds per 100,000 people. In 2005 only 37.9% of people had access to health care, whereas in 2007-2008, it jumped to 71% showing a 40% increase in access to health care (Savadogo, 2008). Based on per capita annual health spending in Rwanda being at US$14 with approximately 25% coming from households, 33% from government and 42% from donor funds, one can clearly see that it is unsustainable (Savadogo, 2008). Donor funds are not unlimited and can change at any time and the government must be able to accommodate these changes for the country to progress further in providing health care services.

Probiotics - Explained

The term probiotic is derived from the Greek meaning "for life" (Reid et al, 2003). The appropriate definition for probiotics as defined by FAO (Food and Agriculture Organization) and WHO (World Health Organization) is that probiotics are "Live microorganisms which when administered in adequate amounts confer a health benefit on the host" (Reid et al, 2003). Examples of probiotic bacteria *Lactobacillus, lactococus, leuconostoc, streptococcus, enterococus, bifidobacterium, and saccharomyces* species are some examples of probiotic bacteria (Donohue and Salminen, 1996). In the development of probiotic food products, lactic acid strains such as *Lactobacillus, Bifidobacterium,* and *Enterococcus* species have been commonly used due to their ability to interact well with the intestinal microflora as well as their "GRAS" status (generally regarded as safe) (Dunne, 2001).

Bifidobacterium species and LAB (lactic acid bacteria) are "naturally commensal bacteria in the small and large intestines" whose role is to protect host organisms against pathogens through competitive exclusion as well as in the production of bacteriocins, antimicrobial agents which inhibit pathogenic growth (Matsuzaki and Chin, 2000). Commensal bacteria metabolize digested food in the lumen hence providing more nutrients for the body. The composition of commensal bacteria is highly stable and characteristic for an individual over time but it varies considerably between individuals.

There are many products on the shelf currently marketed as probiotics, however there are certain criteria for selecting and assessing probiotics intended for human consumption. Probiotics should be: "1) of human origin; 2) demonstrate non-pathogenic behavior; 3) exhibit resistance to technological processes (i.e., viability and activity in delivery vehicles); 4) prove resistant to gastric acid and bile; 5) adhere to gut epithelial tissue; 6) be able to persist, albeit for short periods, in the gastrointestinal tract; 7) produce antimicrobial substances; and 8) modulate immune responses" (Dunne, 2001).

Gastrointestinal health

The gastrointestinal tract is "a complex ecosystem host to a diverse and highly evolved microbial community composed of hundreds of different microbial species" (Dunne, 2001). Due to the high prevalence of illnesses associated with deficient or compromised microflora, interactions occurring between the microbial community of the gastrointestinal tract and the human body have been closely studied. The gastrointestinal microflora is described as a "metabolically adaptable and rapidly renewable organ of the body, the composition and activities of which can affect both intestinal and systemic physiology" (Dunne, 2001). The gastrointestinal tract provides "distinct physiological environments for the complex milieu of microbes that inhabits it, varying from acid conditions in the stomach to an alkaline pH in the small bowel" (Dunne, 2001) with microorganisms being influenced by "bile juices, pancreatic secretions, and an active mucosal immune system". It has been suggested that the failure of immunological tolerance towards the indigenous microflora of the gastrointestinal tract facilitates the disease-associated dysregulation of the immune system (Dunne, 2001). Also, there is growing recognition that intestinal microbes greatly influence the biochemistry, physiology, immunology, and disease resistance of the host (Dunne, 2001).

Probiotic yogurt

Dr. Gregor Reid, Immunologist and Surgeon at St. Joseph's hospital discovered two strains of lactic bacteria acid, *Lactobacillus rhamnosus* GR-1 and *Lactobacillus fermentum* B-54 or RC-14. After attending a talk where Stephen Lewis, UN envoy spoke about malnutrition and high mortality rates in Africa, Robert Gough, who at the time was a residence staff at the University of Western Ontario along with other residence staff felt the need to be instrumental in helping reduce the prevalence of HIV while at the same time empowering women. The empowerment of women has been shown to create positive change such as the realization of women's rights. Women with equal rights are better educated, healthier, and have greater access to land, jobs and financial resources. Their increased earning power in turn raises household incomes. By enhancing women's control over decision-making in the household, gender equality also

translates into better prospects and greater well-being of children, reducing poverty of future generations.

When Robert Gough and other residence staff found out about Dr. Reid's research they contacted him and told them of their interest in doing something to combat the high malnutrition and mortality rates in Africa while at the same time focusing on empowering women. The group wanted to engage in a project where there would be the transfer of technology to an identified women's group and it would be both easy to implement and maintain in the long run. "Transfer this technology, free of charge to an African community to enable local input into their application to foods…This illustrates a partnership between developed and developing countries, in which technology clinically tested in Canada is passed along to partners in HIV/AIDS ravaged communities, with a view to the local researchers assessing their impact on diarrhoea and HIV. It is hoped this type of collaboration can lead to a sustainable, community controlled, food-based probiotic production site. If successful, the model could be replicated at other sites." (Andoniou and Flesher 2007)

It was then proposed that the probiotic strains discovered by Dr. Reid be added to yogurt for traditionally, microorganisms such as lactobacillus have been used in fermented dairy products to promote human health "in addition to affecting lactose intolerance, incidence of diarrhea, mucosal immune response, levels of blood cholesterol, and cancer" (Dunne, 2001). Dr. Sharareh Hekmat, food scientist at Brescia University College was then contacted and she set to work to make the dream a reality. The challenge was to use both strains and make the final product suitable for human consumption for to ensure better colonization, it has generally been advisable to use more than one lactobacilli organism in probiotic products for studies have shown where some lactic acid strains colonize better in some patients than in others (Reid et al, 2001).

Also, having an oral product such as yogurt, which is already predigested, was the best way of delivering nutrients to all persons including those who were healthy, people living with HIV/AIDS, and those suffering from malnutrition. Furthermore, the benefits far outweigh the negatives, especially because there are no side effects associated with consuming probiotic yogurt. Yogurt is a product that can be made by a women's group and it can be recreated over and over again. When Dr. Hekmat was able to successfully introduce the lactobacilli cultures

into yogurt and the final product deemed fit for human consumption, the dream was finally realized and it was then possible to transfer technology from the University of Western Ontario to identified women's groups in Eastern Africa. The yogurt was named FITI probiotic yogurt and has since been introduced to Mwanza, Tanzania and Oyugus, Kenya. FITI has been produced in Mwanza, Tanzania for the past 5 years . FITI has been recently introduced in Oyugus, Kenya and it has been active for a year.

FITI Probiotic Yogurt

FITI probiotic yogurt contains the strains, *Lactobacillus rhamnosus* GR-1 and *Lactobacillus reuteri* RC-14, which have a proven efficacy to treat and protect against many gastrointestinal and urogenital infections (Andoniou and Flesher, 2007). FITI probiotic yogurt is now being made in Mwanza, Tanzania as well as in Oyugus, Kenya. It is the hopes of WHE (Western Heads East) for the project to start-up in Kigali, Rwanda.

FITI Yogurt Proven Health Effects/ Positive outcomes of WHE Project:

HIV/AIDs

Human Immunodeficiency Virus (HIV) is a retrovirus which causes AIDS (Acquired Immunodeficiency Syndrome). A retrovirus is a type of virus that has an RNA genome and a reverse transcriptase enzyme (emedicinehealth, 2010). During infection, the AIDS virus binds to human immune system cells and uses reverse transcriptase to copy the virus's RNA genome into double-stranded DNA molecules in the cytoplasm of the host cell. Once integrated into a host-cell chromosome, the viral genome can do one of two things; one the virus can command the host cell's machinery to make hundreds of new viral particles that bud off from the parent cell, taking each time a part of the cell membrane with them, this sometimes results in the host cell's death. Alternately, the virus can lie latent inside the host chromosomes, but copy and transmit the viral genome to two new cells with each cell division by the host (Hartwell et al, p.270). The immune system is protected by systematic responses through the release of antibodies in the

body at the sign of attacks against the body.CD4 cells are types of lymphocytes, white blood cells also known as antibodies which act as a measure of the strength of an immune system and helps predict the risk of complications and debilitating infections (AACC, 2010). CD4 cells are the main targets of HIV and as HIV progresses, the number of CD4 cells tend to decrease because more CD4 cells are being rapidly destroyed at a higher rate than any other type of lymphocytes. As CD4 cells rapidly die off, the CD4 count, or a CD4/CD8 ratio decreases and the immune systems becomes defenseless to many other pathogens and viruses.

The consumption of oral probiotics such as probiotic yogurt has been shown to improving the immune function in people living with HIV/AIDS by increasing the CD4 count. Probiotics have also been shown to reduce the risk of HIV infection especially when certain *Lactobacillus* strains colonize the vagina, raising the questions of whether and in which way probiotics reduce the risk of HIV infection (Reid et al, 2003)

Bacterial Vaginosis

Though antimicrobial therapy has been effective at curing urogenital infections of the bladder and vagina, there has been an increase in drug resistance and failure of antibiotics to change host receptivity to pathogen recurrences (Reid et al, 2003). Exposure of women to antibiotics or spermicides disturbs the urogenital microflora by making women more susceptible to pathogens. In vitro studies have shown that antibiotics and spermicides destroy most of the lactobacillus present in the urogenital microflora, thus eradicating the acidic environment and promoting an environment of a higher pH which supports the growth of pathogens in the urogenital tract. Therefore, antimicrobial therapy has a negative impact on patient quality of life and the search for alternative therapeutics has since long been underway. Laboratory studies have shown that when probiotics such as *Lactobacillus rhamnosus* GR-1 and *Lactobacillus fermentum* B-54 or RC-14 are inserted into the vagina, they "colonize and compete against uropathogens and reduce the risk of Urinary tract infections" (Reid et al, 2001) thus proving to be effective in treating bacterial vaginosis. Also, Matsuzaki and Chin (2000) found that when the balance of commensal bacteria has been disturbed due to the consumption of antibiotics, probiotic supplementation was shown to re-establish a healthy balance. Other studies have also shown that following oral intake

of probiotic lactobacilli, these lactobacilli remain in the vagina for several months. This means that the probiotic organisms successfully survived the low pH and bile salt of the stomach, and passage through the intestine, and that they then ascended without functional intervention, into the vagina. Therefore, FITI probiotic yogurt was created with this principle in the hopes that it would "provide a practical way for women, many of whom are in developing countries, at high risk of sexually transmitted diseases to potentially better manage their urogenital health" (Reid et al, 2001). These probiotic strains then promote a healthy flora in the vagina by *L. fermentum* RC-14 producing hydrogen peroxide while *L. rhamnosus* GR-1 resists the killing action of spermicide nonoxynol-9, which contributes to the restoration of the urogenital flora in women with bacterial vaginosis (Reid et al, 2001). Furthermore, when women with bacterial vaginosis receive treatment, their risk of acquiring HIV-1 have been shown to decrease as well as opening the possibility of decreasing infant mortality and preterm labor as it is associated with bacterial vaginosis (Reid et al, 2003). Though intestinal infections in newborns are common, the prime cause of infant morbidity and mortality in children of developing nations is diarrhea (Reid et al, 2003). In Reid et al (2003), a study conducted on newborns indicated when infants consumed live *Lactobacillus acidophilus* and *Bifidobacterium infantis;* there was a reduction in overall mortality as well as a 60% reduction in necrotizing enterocolitis. Necrotizing enterocolitis is a condition characterized by "abdominal distension, bilious emesis, bloody stools, lethargy, apnea, and bradycardia" and the disease progresses through an "inflammatory cascade with septic shock and intestinal necrosis". Therefore, not only are probiotics useful to women with bacterial vaginosis to prevent preterm labor but it is also beneficial to infants as well in reducing their mortality.

Diarrheal Diseases

Probiotic yogurt has been shown to be effective in treating diarrheal symptoms in adults and children. Many strains of probiotic microorganisms such as lactic acids have been shown to "inhibit the growth and metabolic activity as well as the adhesion of enteropathogenic bacteria such as Salmonella, Shigella, enterotoxigenic E. coli, or Vibrio cholerae (1–3) to intestinal cells of the intestinal microflora and to have immunostimulatory or -regulatory properties" (DeVrese

and Marteau, 2007). Also, probiotic yogurt benefits have been observed to improve diarrhea as a symptom of AIDS. A study conducted by Anukam et al (2008) amongst twenty-four HIV/AIDS adult female patients (18 to 44 y) with clinical signs of moderate diarrhea, with CD4 counts of over 200, and not receiving anti-retrovirals or dietary supplements, consumed either 100 mL supplemented or unsupplemented yogurt per day for 15 days. When CD4 cell counts and quality of life was evaluated at baseline, 15 and 30 days postprobiotic-yogurt feeding, CD4 cell count remained the same or increased at 15 and 30 days in 11/12 probiotic-treated subjects (Anukam et al, 2008). This indicates that probiotic yogurt is indeed beneficial to the health of HIV/AIDS patients for diarrheal symptoms deplete the body of electrolytes.

Malnutrition

Malnutrition affects many children of developing countries. Severe acute malnutrition affects 13 million children worldwide and causes 1–2 million deaths every year (Kerac et al, 2009).

Acute malnutrition is "defined as weight-for-height of less than 70% of the median, nutritional oedema (kwashiorkor), or both, mid-upper arm circumference of less than 11 cm, or both" (Kerac et al, 2009).Not much data is available on the effects of probiotics and or probiotic yogurt on people suffering from malnutrition. However, a study conducted by Kerac et al (2009) where malnutrition was assessed in Malawian children based on their probiotic yogurt consumption. The average dose was 10^{10} lactic acid bacteria per day and researchers wanted to determine if there would be weight gain (Kerac et al, 2009). The trial conducted was large scale and though colonization of probiotic bacteria took place, there were other factors that were not understood. In the end, it was assumed since gastric acid usually functioned as a natural barrier preventing the entry of live probiotic bacteria, acidity was probably decreased in children suffering from severe acute malnutrition hence the observed colonization.

Gender-Based Violence

Violence against women around the world is widespread and it violates many human right such as sexual abuse of children, rape, domestic violence, sexual assault and harassment, trafficking of women and girls and several harmful traditional practices (UNFPA, 2008). Furthermore, it reflects and reinforces inequalities between men and women and it compromises the health, dignity, security and autonomy of its victims. UNFPA (2008) stated that gender based violence can have the following direct or indirect effects on a woman's reproductive health:

- Unwanted pregnancies and restricted access to family planning information and contraceptives
- Unsafe abortion or injuries sustained during a legal abortion after an unwanted pregnancy
- Complications from frequent, high-risk pregnancies and lack of follow-up care
- Sexually transmitted infections, including HIV
- Persistent gynaecological problems
- Psychological problems

Gender-based violence serves "to perpetuate male power and control" and is sustained by a culture of silence and denial of the seriousness of the health consequences of abuse (UNFPA, 2008).

Poverty Reduction Strategies

To effectively reduce poverty, there needs to be the "*economic participation"* of women (Lopez-Claros and Zahidi, 2005). The presence of women is crucial in lowering the levels of poverty among women and it is an important step towards raising household income and encouraging economic development in countries as a whole. When women become involved in decision making for their families, marked improvements are observable. Micro business operations such as women making probiotic yogurt has been evidence to be better at addressing problems than macro schemes such as big factory schemes. The implementation of the FITI Probiotic yogurt project tries to alleviate some of the problems associated with poverty for the women involved.

In making the FITI probiotic yogurt, a women's group can benefit from selling that yogurt and can then distribute income generated amongst themselves to improve their family's wellbeing.

Western Heads East Background Information

In June 2002, after an impacting presentation given by Stephen Lewis a UN Special Envoy for HIV/AIDS in Africa, at a conference of the Ontario Association of College and University Housing Officers hosted by Western's Housing Department, an innovative group of staff from the department decided to react. Soon after, they formed the first ever steering committee and the Western Heads East initiative was born.

The project aims to develop a sustainable community development project that goes beyond financial contributions and help with the HIV/AIDS pandemic in Africa.

With its main goal to engage faculty, staff and students as well as the community at large in teaching, research and service targeting the African HIV/AIDS crisis directly on the ground, this program will give students from the University of Western Ontario onsite experience while making a sustainable difference to communities in Africa. Western Heads East is therefore a University of Western Ontario community response to the HIV/AIDS crisis.

Research has shown that probiotics may reduce the transmission of HIV infection in women and lower mortality and morbidity due to diarrhea in children and patients living with AIDS. The healthy bacteria found in yogurt and other fermented foods are known to kill pathogenic bacteria and viruses.

WHE sends support to Africa to assist with the crisis at the grass root level. The interns from UWO go to Africa to work with women's groups who have learned to produce the probiotic yogurt. The interns then return to Western to educate the community about the conditions in Africa and to assist with Western Heads East fundraising campaigns.

The WHE project goal is to establish probiotic yogurt programs in Tanzania, Kenya, Rwanda and Uganda. The first site was initiated in Mwanza, Tanzania and has become the regional headquarters of the project. Five years later, the Tukwamuane Women's Group in Mwanza has become licensed as a Non-Governmental Organization and has become a hub in the community to provide lay counseling and school lunch programs, as well as producing the

probiotic yogurt. Tukwamuane provides training with the probiotic yogurt production to women's groups in other Tanzanian communities and in other East African Countries. They now provide probiotic yogurt free of charge for more than 150 people living with AIDS and are seeking subsidy to pay for the yogurt for those who cannot afford to buy it.

The WHE internship program provides an exciting and challenging opportunity for students to assist in improving the HIV/AIDS crisis in East Africa. The goal of the project has been to send people who return to promote education of the AIDS pandemic in Africa and promote the AIDS Awareness Campaign in raising funds for the specific needs in our now various project sites. In 2008, WHE was able to send interns to Oyugis, Kenya, where the second probiotic yogurt project has started with the stepping-stones that the Mwanza project has been able to provide.

In September 2009, the first interns will be sent to do an exploratory visit in Kigali, Rwanda.

Assessments of Rwanda

In the following three compiled reports, the situation in Kigali, Rwanda will be assessed in order to ensure that a sustainable FITI yogurt project with the guidance of Western Heads East can succeed. The report will identify key partners and infrastructure needed, milk availability in order to establish the means to produce the yogurt and finally it will assess the business and marketing tactics necessary for a sustainable operation. It will identify the steering committee needed to lead the women, it will explore the acceptability of the project, and will assess the positive impact that the project will have on environmental and public health within the country of Rwanda.

ASSESSMENT #1

ASSESSMENT OF INFRASTRUCTURE AND PARTNERS by Helen Awai

Introduction:

In an aim to expand the health benefits of probiotic yogurt to communities in Kigali, Rwanda, it was necessary to do an exploratory visit which assesses the infrastructure and partners that will be involved in the project prior to the implementation of the project. During the exploration phase, milk availability and affordability and visits were made to local hospitals and health centers to recruit their help in culturing the lactic acid bacterial cultures. Meetings were also held with community leaders such as the Minister of Health and Family Promotions, The Deputy Mayor of Kigali, Nyarugenge District Office Representatives, Pro Femme, KHI (Kigali Health Centre), KIST (Kigali Institute of Science and Technology). The search for a women's group was underway as well as a possible location of a yogurt kitchen. Potential funding agencies such as UNDP (United Nations Development Programme), UNIFEM (the United Nations fund for women), and PSI were also visited. The level of interest amongst people living with HIV/AIDS (PLWAS), "Rwandan Inter-Faith Aids Network" (RIAN) and "Cooperative of People for Agriculture and Livestock" (COPABURO) was also documented to get a better overall picture.

Objectives:

I. To explore and document elements that were necessary for the establishment of community kitchen operations for the production of the probiotic yogurt, FITI which was developed here at The University of Western Ontario

II. To measure the amount of interest and readiness in Kigali for key community stakeholders to develop a Steering Committee which will provide the local vision and leadership and

III. To identify women's groups that will be involved in the project.

Methods:

To fulfill objectives:

A. Visited were made to local milk shops
B. Focus group discussions
C. Conducted a poll for milk consumption
D. Used Journal articles to convey message
E. Face-to-face meetings with local hospitals and health centers
F. Face-to -face meetings with key community leaders
G. Face to face meetings with potential funding agencies
H. Held meetings with PLWAS

Results/Discussion

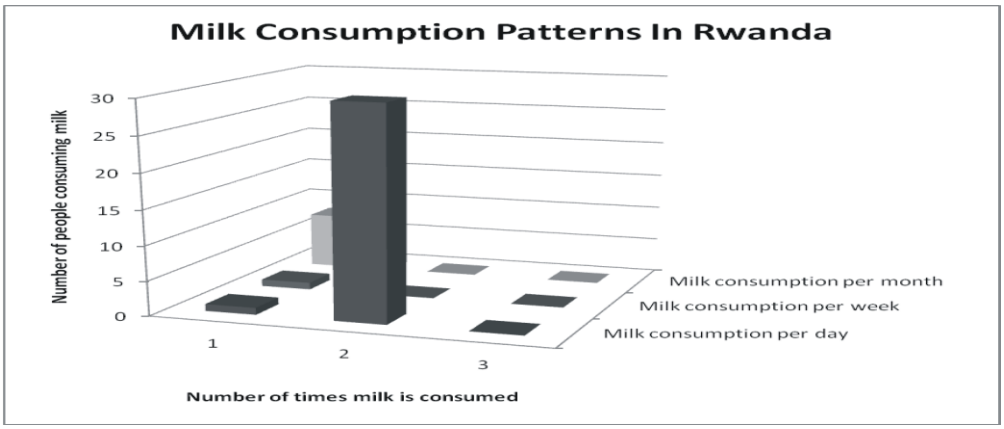
A. Milk Availability and affordability

Local shops selling milk as well as a milk pasteurizing shop were visited to assess the availability and affordability of milk. In Kigali, milk is sold in aluminum packaging after it has been pasteurized, indicating the milk is safe to drink. Milk purchased in aluminum packaging at one liter is sold for 350 RF. These can be purchased at small and large supermarkets. A cheaper alternative would be purchasing milk from a local milk pasteurizing shop which sells for a cheaper price, 280RF per liter. Milk sold at the pasteurizing shop comes from the eastern province where there is an abundance of milk. Due to a lack knowledge for milk preservation

techniques, the farmers of the Eastern province end up selling milk at “a giveaway prices as low as Frw 100 per liter” (Richard, 2006).

The figure below shows the results of a random poll on milk consumption based on the input of forty participants. The following were questions asked: How many times do you drink milk in a day, per week, and per month? The results of the poll indicated most people drank milk twice a day representing 30/40 participants while very few, 8/40 drank milk once a month. This indicates many people can afford the costs of milk and it will reflect positively when the project is implemented.

When asked in total how much milk was consumed in a given day, graphics were used in an attempt to complement with milliliters and on average it was about 500ml.



Results of a milk consumption poll

Based on an article published by Richard in 2006, there are over 1.3 million cattle producing 133,000 tonnes of milk annually, while “the average Rwandan consumes 13litres of milk per year” which is far below the consumption rates of other nearby countries. On average, Mauritians drink about 90 litres per year and Ugandans drink 40 litres. The results of the poll conducted paints a positive picture for it shows a marked increase in the milk consumption patterns of Rwandans. Milk consumption is expected to continue rising for demands in milk will increase. The annual demand for milk and dairy products is expected to grow at a percentage of

3.2 and 3.5 annually by 2020 therefore demand for milk is expected to increase to about 400million tonnes in 2020 (Richard, 2006).

B. Visits to local Hospitals and Health Centers to explore their interest and availability to participate in the project

Due to the fact that the host organization KHI (Kigali Health Institute), was the one who expressed an interest in the probiotic yogurt project and contacted Western Heads East, because they are affiliated with KIST (Kigali Institute of Science and Technology), KIST will be culturing the lactic acid bacterial strains. Kist has a food lab and Dr. Hilda Vasanthakaalam, Head of the Department of the Food Science and Nutrition there will be supervising the culturing of the lactic acid strains. Dr. Vasanthakaalam was quite excited about the project and expressed that Kist is very community oriented and is involved with many different farming communities. To grow bacteria, some type of media broth or agar must be present to supply food for the bacteria. In Rwanda, media availability is very low for there are no companies creating such products. There is a big dependence on Uganda and Dr. Vasanthakaalam mentioned it would be beneficial to find out who the supplier is in Kenya so there are more available sources.

In the event that other locations around Kigali are identified, Dr. Sammy Menim and Dr. Joseph Ntarindwa, physicians at King Faisal hospital have expressed an interest in culturing the bacteria and observing its effect on their patients.

King Faisal Hospital

King Faisal Hospital, located in Kacykiro, Kigali, Rwanda, is one of the high end hospitals which caters to many of the wealthy people in Rwanda. Unfortunately, patients are charged a fee each time they use the facilities of any hospital. With the high prices associated with patient admittance into King Faisal Hospital, the general population usually goes to Centre Hospitalier Universataire de Kigali (CHUK)-where medical students are practicing proper diagnosis and treatment, or health centers such as Gitega Health Centre and Centre Medico Social De Biryogo.

Gitega Health Center

This health centre is located in the Nyarugenge district and is near Centre Medico Social De Biryogo within walking distance of KHI and KIST. Gitega Health Centre provides HIV testing and CD4+ count checks including counseling on anti-retroviral drugs. Along with these, the centre also has a special prenatal care ward counseling and information service on prenatal care for those living with HIV/AIDS. Though there is only one doctor, there are approximately 10+ nurses that shift work as the centre is open 24 hours a day, 7 days a week. The nurses provide "visites a domicile" or " house calls" where they pay visits to the homes of their patients and they follow up on their eating habits and their overall health and caring for their child as well as for themselves. Currently, Gitega health centre provides its patients with protein-rich biscuits called RTF, cereals given to increase mineral, and nutrient intake, and SOSOMA (Soy, Sorghum and Maize) given to improve general nutrition. There was a great interest in the possibility of also taking part in the probiotic yogurt project. Many patients of Gitega Health Centre could benefit once the project is in place. There was also a mention of including the probiotic yogurt as a breakfast program if proper measures were taken to finding more funding. Currently, Gitega Health centre is primarily funded by the government.

Centre Medico Social De Biryogo

The health centre has been providing care to its patients since 1973. Starting in 1977 they provided the public (adults and children) with nutritional information and a rehabilitation center for malnourished persons. In 1983, a small elementary school for those ages 5-6 years was opened as well as the adoption of broader objectives to provide treatment to the people living with HIV with anti-retroviral drugs as well as providing information sessions on preventing the contraction of HIV in 2003. Centre Medico Social De Biryogo is located in the Nyarugenge District and is also within walking distance of KHI and KIST and is located at the heart of one of the poorest regions in Kigali.

Nurses in charge of maintaining the vision of Centre Medico Social De Biryogo were very enthusiastic about the nutritional benefits that probiotic yogurt could bring to their patients. Some of the major concerns raised by these nurses was in the past many have come in attempts to create a project but lack in the end they turned out to be failed attempts. The nurses stressed

the importance of having a sustainable project where the hopes of the locals involved are not crushed after investing so much hope in an idea that has not yet materialized. Regardless, the nurses were excited about the project and they wanted to visit Mwanza, Tanzania to see the project firsthand.

C. Finding a Women's Group

Pro-Femme is an umbrella organization of all women's groups in Rwanda and prior to going to Rwanda, there was a preconceived notion that Pro-Femme would assist in identifying a women's group to make the probiotic yogurt. However, unsuccessful attempts to try and set an appointment with Pro-Femme allowed us to explore other options. When Yves-Didier Umungerimwiza, KHI staff and probiotic yogurt project contact in Rwanda contacted the Deputy Mayor of Kigali, she was interested in hearing from us. Deputy Mayor, Jeanne d'Ark Gakuba is in charge of social affairs and upon meeting with her, she recommended starting with the Nyarugenge district as it was the poorest of the three districts and it could very well benefit from such an initiative. Kigali is made up of three districts, Gasabo, Kicukiru, and Nyarugenge. The deputy mayor had also hinted that a good location would be Centre De Medico Biryogo where many womens's group took part in different self-empowerment activities. A meeting date was set to meet people at the Nyarugenge District Office. After meeting Nyarugenge District Representatives, who we were told that even if we met with Pro-Femme, we would still be referred back to the Nyarugenge District Office to find a suitable group. Pro-Femme is more of an advocacy group whose goal is to fight for women's right and to promote gender equality. We were also told that Centre Medico Social De Biryogo would be an ideal location for it held all the resources necessary for the start of the project as well as catering to the health of many different small and large women's organizations. This was the second time we were hearing the name Biryogo. A meeting was scheduled to with Biryogo Health centre to get a better picture. Centre Medico Social De Biryogo was very interested in the project and they wanted to select the women themselves for many of the women that came to the health centre were coming from different organizations and also as a way of protecting the women from false promises. One of

the aims of this health centre is to empower women and it cannot live up to its expectations if it allows its patients to be deceived and their hopes lost.

Empowerment of Women

Though there are laws that state women have human rights, "women are still much more likely than men to be poor and illiterate. They usually have less access than men to medical care, property ownership, credit, training and employment. They are far less likely than men to be politically active and far more likely to be victims of domestic violence" (UNFPA, 2008). There is a lack of gender equality where women do not enjoy the same opportunities as men. Gender is "not synonymous with women, nor is it a zero-sum game implying loss for men; rather, it refers to both women and men, and to their status, relative to each other" (Lopez-Claros and Zahidi, 2005).

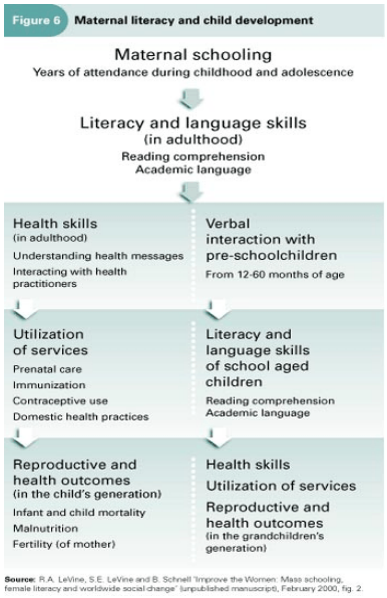
An empowered woman is a woman who is in control of her life, confident that she can "control her own fertility", plan her own family by exercising her reproductive rights, such as "the right to decide the number, timing and spacing of her children, as well as making decisions regarding reproduction free of discrimination, coercion and violence (UNFPA, 2008). By applying culturally sensitive approaches not only is there respect for the different social organizations in place, an increased awareness of women's rights takes place and as time progresses, the world's women become more and more empowered and free to live up to their potential. It has been quoted many times that "when women are empowered, whole families benefit, and these benefits often have ripple effects to future generations" (UNFPA, 2008). Five important dimensions of female empowerment and opportunity based on the findings of UNIFEM, concerning global patterns of inequality between men and women need to be addresses for women to be fully empowered (Lopez-Claros and Zahidi, 2005).

1. Economic participation
2. Economic opportunity
3. Political empowerment
4. Educational attainment
5. Health and well-being

Economic participation refers to the participation of women in the workforce and the assessment of why women get paid less for the same amount of work as men. Also, often times women work longer hours in strenuous environments than men and are often paid less. Women also work under strenuous conditions. Economic opportunity refers to opportunities available to women at work. Are they able to progress forward without stumbling blocks on the way to getting a promotion. Is there even a promotion on the way? Political empowerment refers to the voices of women and if they can be heard in the political sphere. Also, whether or not women are able to influence political change is a big determinant of political empowerment. UNFPA (2008) states that if women were more politically aware, they can influence their ability to:

- Own land and to inherit property
- Obtain access to credit
- Attend and stay in school
- Earn income and move up in their work, free from job discrimination

Educational attainment refers to the education level of women. Women can also be empowered through education for studies have shown "girls who have been educated are likely to marry later and to have smaller and healthier families" (UNFPA, 2008). Educated women are aware of available services and know their importance. However, in developing countries, the literacy rates of women are lower than that of men. Women's literacy rates are significantly lower than men's in most developing countries. Finally, Health and well-being refers to gender based violence where there is not much data available but is a wide spread problem. Though the rights of women clearly affirm their right as human beings, this problem is not widely acknowledged and is often hidden behind closed doors. Women must be able to overcome these obstacles and only then will they truly enjoy the same freedom men experience. The figure below shows a summary of what women can achieve when empowered.



From-Unicef: http://www.unicef.org/sowc01/figures/

D. Space availability and its suitability for a community kitchen

Centre Medico Social De Biryogo has a community kitchen it usually rents to people interested in using that space. This kitchen faces residences surrounding the health centre and it has 8 stove burners, a refrigerator, a sink, counter space, two tables, storage space, cooking utensils, lots of pots and pans, and a dining area fully furnished with tables and chairs. The availability of these resources cuts down on costs.

Centre Medico Social De Biryogo is in a peri-urban community located in a low socio-economic neighborhood. Peri-urban refers to the middle ground between rural and urban. Though the health centre is located in a low income neighborhood, it has gained the trust of its patients for many come and go as well as catering to patients who have come far and wide because of the services they can receive. The health centre is also within walking distance of KIST (Kigali Institute of Science and Technology) and is near a local milk pasteurizing shop whose prices are more affordable than those at small and large supermarkets making it always viable to create probiotic yogurt.

E. Potential for future funding and sales to sustain the program

Based on meetings held with Nyarugenge District and Ministry of Gender and Family Promotion, funding was said to be available once a sound proposal was submitted. There is a difference in culture where a project must first begin before it can be funded. UNIFEM showed an interest in the project and said that funding was tight for them and is typically available only in the first quarter. Follow-up is still ongoing.

There is potential to sell probiotic yogurt to schools, patients of Centre Hospitalier Universataire de Kigali, Gitega Health Centre, and Centre Medico Social De Biryogo at an affordable price for those who cannot afford the market price equivalent, 350Rw for a 250ml yogurt. There is also a local orphanage, Gisimba, located in Nyamirambo near Centre Medico Social De Biryogo which could benefit from the probiotic yogurt. Also, Physicians at King Faisal hospital have expressed that their patients are affluent and can afford to buy yogurt at full price. A representative at Nyarugenge district office said she was HIV positive and she is very interested in learning more about the yogurt and its benefits so that she is constantly updated.

F. Talking to known HIV positive groups and people living with aids about the probiotic yogurt and their perceptions

When meeting with RIAN and COPABURO, both expressed an interest in wanting to be the group chosen to make the yogurt.

RIAN (Rwandan Inter-Faith Aids Network):

RIAN is an advocacy group founded by women and is located in Nyamirambo. Though RIAN was started by women, men have also joined and are active participants. RIAN members along with other HIV positive patients receive free anti-retroviral medications from the government. Their children are able to be conceived HIV negative thanks to advances in science. RIAN members were all eager to help with any task related to the probiotic yogurt project. The women showed significant interest in taking on this project first hand and the men expressed that they would also like to help. It is evident that the women and men of RIAN are an interesting

association and that they would be ideal candidates for this project for the group seemed to fit the necessary characteristics for the project. They would also make a great addition to the steering committee as they are a very dedicated and energetic group.

COPABORU (Cooperative of People for Agriculture and Livestock):

COPABORU is a cooperative located in a remote village in the Western Province. When the KHI's western province campus shared information regarding the Western Heads East probiotic yogurt project with local associations, COPABURO asked to meet with us. COPABURO consists of people all ranging in different ages, women and men, the young and old, people with HIV, orphans, and widows. This cooperative has two objectives, to eliminate poverty and to fight stigma associated with AIDS. The group is quite proud of their diversity and they believe this helps their group to be dynamic for they are able to address and tackle more issues than a homogeneous group. The group also expressed that their group is very transparent in many aspects such as their usage of the group funds. This group has the typical structure of having a president, vice president, secretary and so on. They have a meeting once a month and this is often when they make their decisions. To join the cooperative, each member pays 10,000 RWF.

In terms of the project taking root in this village, there are some foreseeable problems many of which are associated with the remoteness of this village. There is only one microbiology lab and this lab cultures all the bacteria and microorganisms found in this region. It would be unfeasible for the media to be cultured here for there is a greater likelihood of contamination with harmful bacteria such as *E. coli*. Furthermore, the health centre that hosts the cooperative each time they want to have a meeting is far for many members. If there were many labs in the vicinity or if there was one created for the sole purpose of dealing with non-pathogenic bacteria, then this location would be practical. Thought this project could be very beneficial to this cooperative and they appear to have such great group dynamics and show an interest in running their own business and improving their health, unless resources are nearby, having the probiotic kitchen here would be unfeasible.

G. Conclusion:

In assessing the situation on the ground in Rwanda to decide whether it is ready and conducive to establishing a sustainable probiotic yogurt project, one must look at all the factors involved to make an informed decision. The exploratory visit enabled the assessment of existing infrastructure and partners to increase the knowledge of how social systems in Rwanda work and what needs to be in place prior to the implementation of the project. Milk availability and affordability proved to be a straight forward inquiry where a poll conducted showed many people consumed milk and that it was affordable. Visits to local hospitals and health centers not only increased physician interest but it gave insight into services missing in hospitals and health centers which probiotic yogurt can assist with. Meetings with community leaders proved to be fruitful for there was an air of transparency during meetings. Furthermore, the search for a women's group and a possible location of a yogurt kitchen is dependent on Centre Medico Social De Biryogo who have taken the role in identifying a women's group as well as letting Western Heads East rent their community kitchen for probiotic yogurt production. In terms of funding potentials, the Canadian culture and Rwandan culture are very different and in Rwanda, a project must first be in place for funding to be issued. There was also a high interest in people living with HIV/AIDS (PLWAS) which shows the project can be a potential success in Kigali and possibly move to other surrounding areas in Rwanda.

ASSESSMENT #2

ASSESSMENT OF SOCIAL ACCEPTABILITY OF YOGURT CONSUMPTION AND PERTINENT SOCIO-CULTURAL ISSUES By: Silvia Marroquin-Ponce

Objectives:

The objectives of this internship are to explore and assess the social acceptability of yogurt consumption and pertinent socio-cultural issues in Rwanda. As well as to determine the needs of the community in order to establish a successful probiotic yogurt operation in urban Kigali, Rwanda in hopes of creating more opportunities for further development and growth of the project all over the country in both rural and urban settings.

Methods:

1. Meet with various different organizations in order to discuss social and cultural aspects of Rwandan society.
2. Conduct surveys on nutrition with the general population and specific groups.
3. Explore food security and consumption patterns.
4. Explore and assess the overall consumption and attitudes towards dairy products within the general public.
5. Explore the acceptability and feasibility of livestock ownership (mainly cows) in Rwandan society.
6. Explore the relationship between the general population and People Living With HIV/AIDS.
7. Explore the acceptability of women-run organizations

Results:

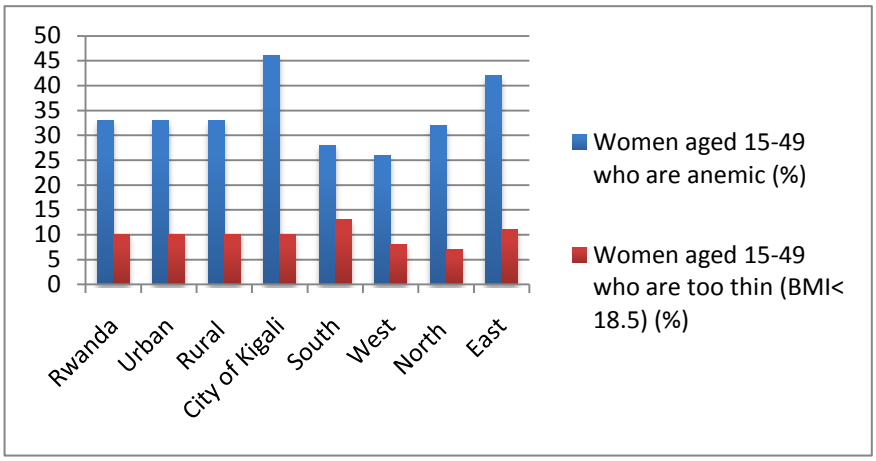
Food consumption patterns and behavior especially in respect to dairy products:

The data in most surveys executed suggests that the majority of the Rwandan population eats one to two times daily. The time of meals varies as well, but for those who eat twice daily, it is typically during the mid day and evening hours, and for those who eat once a day it is most commonly in the afternoon. Although some people do eat three times a day it is not necessarily the norm.

It has been found that these meals are small and mostly comprised of fruits and vegetables such as beans, potatoes, sweet potatoes, tomatoes, pineapples and banana's. Eating rice is also very common and somewhat inexpensive. On the contrary, meat can be very expensive; therefore it is not always available to everyone. On average it has been found that the general population eats one to three servings of meat a week. Milk and milk products are being consumed more recently as there has been more emphasis on the importance of consuming dairy. Most common, is cow's milk averaging up to 500 ml to 1L per person in the family over the span of a week, although yogurt and cheese are becoming more typical as well.

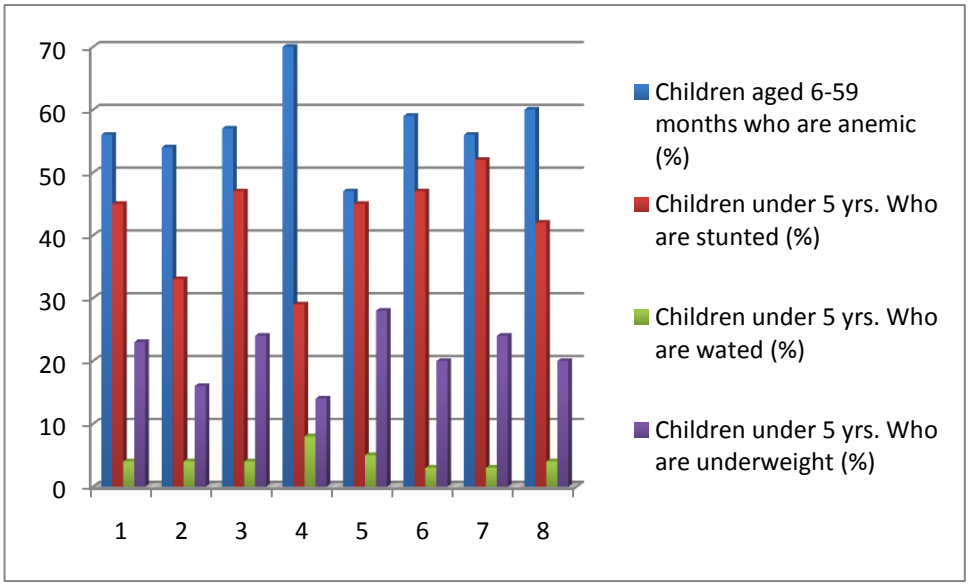
While examining a few local records regarding the general nutritional status of women, as seen in figure 1.1 and 1.3, show that after a poll done in 2005 the main nutrition issues relating to women and children were anemia and body mass being below average. This is largely impacted by the lack of food security issues in Rwanda.

Figure 1.1



(National Institute of Statistics of Rwanda, Sept. 2005)

Figure 1.2



(National Institute of Statistics of Rwanda, Sept. 2005)

In regards to our research and the acceptability of yogurt consumption in the local community, it has shown that yogurt consumption is acceptable in the local community but it is not necessarily affordable to all those in the general population.
The cost of yogurt and cheese is rather high, costing from 350-400 RWF for 250ml of yogurt and 3000-4000 RWF for roughly 500 gr.

Although most people in the urban area buy most of their food, there are still a number of people who cannot afford the store costs. It is clear however, that the government is trying to put more efforts into health and nutrition in Rwanda with several programs to do with food security, especially in the rural areas to take full advantage of the fertile soil in certain parts of the country, (mainly the eastern, southern and western provinces) but also not forgetting the urban cities as well. Programs such as "**Kitchen Gardens**" have been introduced to the general population to encourage every family to have a small vegetable garden on their plot of land in order to offer themselves food security and at the same time enabling them to eat fresh foods while slowly eliminating malnutrition.

Milk Accessibility and Livestock Ownership:

Since milk availability is essential for the making of the probiotic yogurt, one of the most important elements of this project is milk availability and further the hope is that it can lead to the ownership of milking heifers. Because Rwanda is very keen on its development, the government has set in place a program called "**One Cow per Household**" or "**Girinka",** which is a program that has been implemented by the Rwandan government that aims at enabling every household, especial those living under the poverty line to own and manage a heifer. This project is beneficial to the community on several different levels.

Mainly, this animal will help the family improve their living circumstances through increased access to milk and meat production, and to counteract erosion by improving soil fertility using the manure. Although, not everyone has access to a heifer at the moment, the Rwandan population has seen many benefits to the program especially those who would otherwise have nothing. Furthermore, it also has a profound impact on the relationship between people in the community as certain qualifying citizens are given a pregnant heifer, which they

rear, and are required to give the first female cow born to the next beneficiary giving it a circular component where those who have received are later the ones who give.

Although the largest milk resource lies in the Eastern province, there is milk accessibility all over the country in both rural and urban settings, which will be beneficial wherever the project develops. As it will most likely star out in the province of Kigali, it is important that there be access to fresh milk in the nearby surrounding area.

Social acceptability of women's groups and women-lead organizations:

Rwanda's development is astounding and goes far beyond growth and expansion of the country itself, but also in many social aspects such as gender equality. There are several women's groups and women led-organizations that have taken the reins when it comes to social change, and innovative community projects. Along with women occupying a 56^{th} percentile of the government body, Rwanda will have no problem in allowing women the space to create a self sustaining project. Much like to FITI yogurt project in Mwanza, Tanzania, a group of women from various, socio and economic backgrounds will take part creating a solid foundation for the development of the project. In itself, it will be up to the women of the group and the steering committee that will be formed by community members and key stakeholders to create a democratic decision-making process and function. This will be extremely important so that this project remains sustainable within and for the community itself.

People living with HIV/AIDS, their distribution, support systems and their place in Rwandan society:

In exploring Rwandan society it has been found that although there still exists stigma relating to people living with HIV/AIDS in the world, this community does not seem to be affected and it was found that there are no major conflicts in regards to discrimination in Rwanda. There were been several organizations and groups that were addressed during the internship, and all gave the same information as far as stigma and discrimination. People living with HIV/AIDS are not seen as a negative problem or a write off, but rather people that are capable and able to better society

as any other would.

Although the prevalence rate is fairly low, this attitude is in great part to do with several ongoing and rigorous educational campaigns initiated by the government to promote equality and better relationships and camaraderie between the Rwandan people. This initiative seems to be impacting society positively as many people living with HIV/AIDS surveyed seem to feel respected by the general population. Most people surveyed felt comfortable expressing their HIV/AIDS status without reservation or fear or judgment. Instead, they feel and are seen as members of the community working towards a common goal. In this respect, the FITI yogurt project would do well in an environment such as this one and would succeed without major problems in this respect.

Conclusion:

In conclusion, the explorations and assessment of the information gathered during this internship suggests that the FITI yogurt project would do very well in this given environment.

In reaching the goals of this internship, it has been found that there are no issues with the acceptability of dairy products and yogurt in particular. Moreover, with all the government initiated campaigns and programs the FITI yogurt project will encase well with the general flow of development in Rwanda.

ASSESSMENT # 3

ASSESSMENT OF A SUCCESSFUL BUSINESS MODEL by: Nilmi Senaratna

Objectives:

To explore and document elements that are necessary for establishing a sustainable business operation model for probiotic yogurt developed at Brescia University College at the University of Western Ontario, Canada in Kigali, Rwanda.

Methods:

Explore the existing project in Tanzania and explore similar applicable distribution mechanisms for Kigali, Rwanda.

Explore marketing mechanisms in Kigali (posters, education, targeting specific groups, schools, KHI, word of mouth, newspaper, TV)

Go to the market, grocery stores and farms and compare market prices of the probiotic yogurt with similar products on the market

Explore the regulatory procedures and requirements for food and drug items in Rwanda by conducting interviews at the Kigali Health Institute, Governing bodies (mayor), Pharmacies, hospitals, doctors and nurses. RBS

Explore available markets for the product in Kigali by interviewing people living with AIDs, families, hospitals, women's groups

Explore how to finance/subsidize for vulnerable groups who cannot afford to purchase the product by interviewing governing bodies (mayor), NGOs that have been established in the area, AIDS activist groups/funding groups in Kigali, UN based groups, PSI

Accounting systems will need to be explored in order to ensure money is being circulated properly. This will be done by interviewing banking officials, women's groups and exploring the existing accounting system in Tanzania

Explore micro business support systems by speaking with local organizations and finding one that supports micro businesses with training skills and business.

Results:

WHE will assess the situation on the ground in Rwanda in order to determine the readiness of the community for a sustainable project. While working in collaboration with the Kigali Health Institute, WHE will take into the consideration the following key points to determine if the project can be sustained:

Distribution methods in Mwanza

When considering different marketing and distribution strategies in Kigali, Rwanda, it was evident that marketing and distribution strategies were similar to those noted at the existing project in Mwanza, Tanzania. Along with these strategies, some additional ideas on how to appropriately advertise the project in a larger, more developed community such as Kigali were also discovered.

Firstly, while surveying the existing project's distribution mechanisms in Mwanza, it was clear that the distribution was based on a very small-scale enterprise. The yogurt was distributed to the community surrounding the Kivulini yogurt kitchen. The customers that attended the kitchen daily for yogurt intake were those in close proximity to the Kivulini kitchen who come to buy the yogurt on foot and brought it back to their families. On the contrary, those that attended

less often lived further away from the kitchen, making a weekly visit to the kitchen when available. However, all in all, based on investigation by the WHE team in Mwanza in 2007 and by the present team, the consumption of dairy products on the Mwanza region is very low due to financial constraints. Thus the team in Mwanza decided to put together ideas on how to distribute the yogurt in different areas of Mwanza. After much talk, a consensus was reached and two options were discussed in order to effectively distribute the yogurt elsewhere in order to expand the sales further.

1. Sales by Bicycle

- The team of mamas suggested that the yogurt be sold from cooler boxes on the back of bicycles in town

2. Expanding the Breakfast Program

- The mamas are involved in a breakfast program where every morning they prepare tea, chapattis and mandazi for a nearby school where the children pay a small fee for the treats. They suggested that if more schools were involved and if the yogurt were involved in the breakfast program then they would increase their sales to the children of the community while improving the health of the children as well.

Marketing methods in Mwanza

Along with these suggestions, there were also ways discussed at the steering committee meeting of marketing the yogurt more effectively. To date in the Mwanza region, there have been posters, discussions, community meetings and extensive marketing by word of mouth about the yogurt product being sold at Kivulini kitchen.

These marketing and distribution methods were very effective in the Mwanza region as the idea of the FITI yogurt has spread to many areas and the Kivulini yogurt kitchen is well-known across the city.

Distribution methods in Kigali, Rwanda

When considering Kigali, Rwanda and methods of marketing and distribution, it is evident that the infrastructure in Kigali is much more advanced than in Mwanza. While many of the marketing and distribution methods used in Mwanza can also be effective in Kigali, there are more ways to spread the word in a more advanced society as well as a more effective way of distributing the yogurt in a larger community.

While, Kigali is a much bigger city than Mwanza, there are many things to keep in mind when looking into the distribution methods of the project. With the yogurt kitchen possibly being opened at the Biryogo Health Centre, there are many ways to distribute the yogurt to different areas in Kigali. Firstly, there would have to be an investment into either cups or paper with tin lining inside for the packaging of the yogurt. This is due to the fact that in Kigali, plastic bags and packaging have been outlawed and environmentally friendly packaging has been introduced. In this case, there would have to be more research into the proper packaging that could be used in the kitchen in order to distribute the yogurt effectively.

Next, the actual movement of the yogurt is taken into consideration. In Kigali, there are many ways of distributing the yogurt to different sites and this includes by truck, bicycle, transporting to nearby schools and also by transporting it to the local market and into town to sell for low cost. So when looking into investing into trucks for the distribution of the yogurt, there are companies that already sell the yogurt and own trucks but they do not agree with combining the FITI yogurt with their own yogurt for distribution. Therefore, it is imperative that trucking companies that offer services for the distribution of goods around Kigali are explored for future distribution of the yogurt in areas outside Kigali.

On the contrary, within Kigali, there are simple ways of distributing the yogurt to different areas as it is not a very large capital city. As in Mwanza, bicycles are widely used in and around Kigali for the transportation of goods. This is thus a good way to transport the yogurt in coolers to the local markets, to nearby villages and to the city center. It would be low-cost and efficient.

Another way to distribute to the community would be to introduce the breakfast program to the schools in Kigali. This way the yogurt is reaching the younger population as well. Just like in Mwanza, chapattis, chai and mandazi are also popular in Rwanda and thus yogurt would make

a perfect addition to the breakfast program and would benefit the children greatly. Again, bicycles would be the best source of transport for the yogurt to these events. Another way to transport the yogurt to schools that may be found further away could be motor taxis. Using a cooler and riding a motor taxi is not uncommon in Kigali and thus this could be a way to reach schools in villages that may be on the outskirts of Kigali.

Finally, when transporting goods to the city centre or the local market, it is not a complicated task. They are very close to the Biryogo Health centre, the expected kitchen for the project and thus bus rides to reach the city centre or local market would cost 120 RWF. In this case as well, motor taxis or regular bicycles would be of use when transporting the goods to nearby markets.

Marketing methods in Kigali, Rwanda

There are numerous methods of communication in the Rwandan community. Based on its growing technological developments, Rwanda has numerous newspapers that circulate daily or weekly. The main newspapers in Kigali are:

- Business Daily (English language)
- The New Times (English language)
- Imhayo Nshya (Kinyarwanda language)
- Umuseco (KinyaRwanda language)
- La Nouvelle Relève (French language)

These newspapers serve a daily purpose of providing updated information on issues like politics, the economy, society, sports and business. Due to the literacy rate being at an astonishing 60.5% of the population, these newspapers are the key to spreading the news about FITI yogurt (“Basic data”, 2008). This was already achieved on a small scale when a meeting with the minister of gender of Kigali was attended, the picture of the WHE team was put into The New Times (English language), spreading the word about the project further into the Kigali community. As for further coverage, it is imperative that articles be written to explain the benefits of FITI and to explain the objectives of WHE to the community in all three languages (Kinyarwanda, French,

and English). When exploring the most effective way of communicating to the public, it is evident that Kinyarwanda is the most common language spoken by all, French being the second most common language and thirdly, English and Kiswahili. This therefore proves that there needs to be articles written and translated in all three languages highlighting the goals of WHE in Kigali to gain the approval of the general public before introducing the yogurt.

Next, on a larger scale, there are also television stations available to broadcast the project. The main station being Rwanda Television: a large scale network that broadcast small scale stories as well as breaking news. The stations are located throughout Kigali, and a story submitted to the television station would be an effective way of communicating the projects ideals to the public. While the television station is state-controlled, Rwanda is slowly moving towards more free-press in the future and thus there is hope for news broadcasted on the Western Heads East Project in the future.

Posters were also created by the WHE team that advertised the FITI yogurt as a health product. A simple description of the idea stamped on paper was distributed to the organizations that were visited by the team. Each organization that agreed to be on board was given a copy of the marketing poster in hope that it would shed some light on the WHE project and provide a marketing tool for the team. The posters now sit in the offices of the organizations that claimed to be on board with the project and thus it provides information to the public in a different form.

Public engagement activities at the Kigali Health Institute are also an effective idea for the marketing of the FITI yogurt in a way that targets students. The Kigali Health Institute is an Institute for higher learning based primarily on environmental health sciences, nutritional food sciences and nursing along with numerous other faculties. The main auditorium is an ideal location to host a presentation based on the WHE project in Kigali. It is imperative that the student population that are focussed on this type of study be aware of the benefits of the project. A public engagement activity such as a discussion or presentation would be a key to engaging the interests of the student body and thus furthering the success of the project's goals. When the students are engaged, they will take the initiative to work on the sustainability of the project and a link will be made with those who have experience in Rwanda to take over the duties of the project in order for it to become self-sustainable over time.

Another public engagement activity could be held at local schools as the children would benefits from the FITI and there would be more acceptability if they were exposed to the idea before introducing it as a breakfast program item in local schools. A discussion in classrooms, or a presentation in front of certain schools would benefit the younger community greatly.

Along with these, Rwanda has also started using billboards as a marketing tool. In Kigali and surrounding area, there can be billboards seen with various advertisements, whether it be advertising for the MTN phone company, Rwandatel or FIFA World cup Soccer in 2010. This is a valuable way of advertising an idea to the public as the billboard can advertise the FITI yogurt as a product to the community and thus attract more customers to the new kitchen site to purchase it. Along with advertising by billboards, another way that some busses like to express themselves or advertise for a company are by painting the outside of the bus a certain colour or putting a full advertisement on the side of the bus. If the project were willing to invest a small amount of money into the advertisement of the FITI yogurt on the side of a bus, it would be a useful tool in advertising the yogurt further into the Kigali community

Marketing problems/suggestions

Firstly the problem related to the issue of the marketing strategy was addressed. There were complaints that the public was not accepting the yogurt in Mwanza as there were many stigmas against the logo of Western Heads East (WHE) in Tanzania. There is a large stigma against those living with HIV and AIDs and that stigma has forced people to avoid looking or addressing the Western Heads East project. A suggestion was made that if the ribbon on the WHE logo was removed that there would be more people interested in finding out what the project was all about. When discussed afterward, it was apparent that this ribbon should be removed from the logo because the project is widely based on health benefits and not only geared towards those living with HIV and AIDs. In order to market the project and the product better and to alleviate any stigma, it was apparent that this logo should be altered accordingly so that those not living with HIV and AIDS would be more inclined to take a second look at the project's objectives.

When applying this to Kigali, it was taken into consideration but when conducting surveys to the general public, gender clubs, HIV./AIDS groups, the minister of gender and government

officials, the general consensus was that there was very little stigma in Rwanda. This was an issue that the Rwandan Government had shed light on and exposed everyone to. This therefore proved that since there was little to no stigma against those living with HIV/AIDs in Rwanda, there would not have to be any adjustments made to the logo for Western Heads East. It also showed that the project would be more accepted in Rwanda as the population was very open to help for those living with HIV/AIDs and also very understanding of the objectives of the project.

Market prices of similar products in the market

1.2 Market Prices of Dairy Products in Kigali

Milk Products/ Locations	Local Market (rwf)	Simba Supermarket (rwf)	Nakumatt Supermarket (rwf)
Milk (1L)	250-300 (Kigali) 200 (Kibouie)	560	560
Yogurt (150ml)	250	240	240
Yogurt (250ml)	350-400	340	340
Yogurt (1L)	n/a	600	600
Goat's Milk (1L)	1000		

In Kigali, the prices of all products in and around the city were very expensive, it was surprising to see prices quite high even when comparing them to Canadian (CAD) or US (USD) prices. When exploring the city of Kigali, there are two main sectors. There is the market sector where milk and yogurt are sold in small scale enterprises to the public in small stores, vendors on the street or in the local market. There is also the industrial sector where larger enterprises such as supermarkets sell the yogurt and milk to the public. The separation between the two classes in the community is palpable but when comparing the price of milk and yogurt, the findings were not as clear.

Firstly, when looking at Figure 1.2 it is evident that the price of milk is much cheaper when buying from the local market rather than the supermarkets. This may be due to packaging and distribution costs. The milk is packaged into a package that is lined with a thin layer of tin to protect the paper packaging that is used due to the outlawing of plastic packaging in Kigali. The milk at local markets is much cheaper due to the fact that the community buys the milk from a local milk provider. This specific small factory style store buys the raw milk from the farmers at low cost in bulk and then pasteurises the milk themselves and sells it to the community in amounts ranging from 1L to 4L or more. The cost for 1L of pasteurized milk from a milk producing store is much lower than the price for milk that is packaged and distributed to the supermarkets for sale in the city centre. It is clear that Western Heads East would benefit much more in buying the milk from a local milk producing store rather than the packaged milk as they are looking for the purest form of the milk in large quantities. These sites are very accessible and are found in virtually every block in Kigali as there are many cows in the city of Kigali due to the government's efforts to make sure everyone owns a cow.

When considering the idea of making the FITI yogurt by using goat's milk that is proven to be more nutritious than cow's milk, it was clear that the price of the goat's milk was much too expensive to consider in the preliminary steps in creating the WHE kitchen in Kigali. There may be more consideration in incorporating the goat's milk later on as the project progresses and becomes self-sustainable.

Moving forward to yogurt that is sold all over Kigali, it is evident that the prices for yogurt in the local market are higher in general to those that are found in the supermarkets in Kigali city centre. This could be due to the accessibility of the yogurt as more people are closer to those smaller shops than the city centre of Kigali. The distribution costs as well to transport the yogurt from the factories that make the yogurt and to transport it to the smaller shops could be another factor leading to the increase in the price. Yogurt is not sold in large quantities in the market area; it is kept at small, snack size containers such as the 150ml or 250ml. Only at the supermarket is it sold in larger packaging. The high prices of the yogurt in the local stores can therefore lead to more people investing money in the FITI yogurt as there is more benefit and the cost is low. The community that lives among the small shops that do sell the yogurt at high prices is not able to afford the yogurt and thus would be more likely to buy the FITI yogurt depending on the accessibility.

There was a great debate when discussing the appropriate price of the FITI yogurt in the 250ml containers when considering the surrounding community. The minister of gender expressed that the yogurt could be sold for as high of a price as 150 Rwf, while Profemme expressed that the yogurt should be sold for only 100Rwf. Based on further research and surveys in certain areas surrounding the possible kitchen site, it was clear that this area would need the yogurt sold at a much lower price to be able to afford it, or else have it subsidized by funding agencies. However, the debate of the funding agencies and funding possibilities proved to be more of a challenge as the culture in Rwanda supports a higher standard of work ethic than expected.

Financing subsidizing mechanisms for people who cannot afford to purchase product

Minister of Gender

When conducting an interview with the Minister of Gender in Kigali, she stressed that there was not much available funding for the pilot of a project. She did however offer to find funding for the project personally by taking in the proposal and searching for the funding within the Rwandan government. She also suggested organizations such as UNFP, UNICEF, PSI and she also suggested possibly looking into women credit funds that the government offers for women

starting new businesses. The minister of gender would be a key player in searching for funding in Kigali.

Pro Femme

When looking into the women's organization for possible funding agencies, Therese, president of Pro Femme and former KHI Rector suggested that possible funding agencies to explore would be United Nations based organizations such as: USAID, global fund, UNFPA (gives women capacity training), UNAID, UNIFEM, UNDP and World Bank.

Deputy Mayor

When attending a meeting with deputy mayor/vice mayor of Kigali, Jeanne d'Ark Gakuba, in charge of social affairs, it was stated that if the program was to start here in Kigali, Rwanda, local sources of funding would need to be identified to fund this micro business probiotic yogurt pilot project so that in the long run, it can be sustainable. In terms of local funding agencies, she suggested PSI, a committee dedicated to preventing HIV. PSI seeks to work with the community to provide funding for different initiatives and is always interested in funding new projects. However, when PSI was investigated further, it was found that they would not have any funding available to put towards the project and only provided training skills for businesses. The deputy mayor also mentioned that those living with HIV/AIDs should not be included in those who receive the yogurt for free. She explained that in Rwanda, everyone must work for the country. The ill are not excluded from those who contribute to the development of the country. In Rwanda, whether you are healthy, ill, a woman, a man or even a criminal, everyone is expected to contribute to better their society and to better themselves. It is evident that the mind set in Rwanda is much more advanced than other African countries and that since the genocide there has been a push from the government that has affected all those in the country. The message is for everyone to move forward and for everyone to work in order to better the society they live in. This is thus the reason that the Deputy Mayor stressed that there should not be subsidizing for those living with HIV/AIDs or they will lose hope and dependence will take over. There will be a stigma or separation that occurs if those living with HIV/AIDs are given special treatment and if everyone is not treated equally. Equality is essential to keep up the standards in the country.

The government has provided all those living with HIV/AIDs with free antiretroviral drugs in order to better community health and thus people living with AIDs have been aided in a way but are still expected to fulfil their duties as Rwandan Citizens and to contribute to the growth and development of their country. In conclusion, the project itself in Rwanda will only be subsidizing the yogurt for those who cannot afford the yogurt.

RRP+/Nyarugenge District Coordinator

The Nyarugenge District is one where the possible kitchen site is located and where the project seems to be the most appropriate. When questions about funding for subsidizing the cost of yogurt for those living with HIV/AIDs and those living under the poverty line were asked, it was clear that there was a certain cultural way of going about starting up a project and asking for proper funding. The main suggestion was that the project be launched and put into place before asking for funding of any kind from local agencies. The reason behind this was clear. Many projects tend to try and launch in Kigali but many have failed. Funding agencies have thus become very sceptical and reluctant to offer any sort of financial aid for small projects that have been proposed, but have no sign of being underway. They suggested that once the funding agencies see the success of the project after it has begun, they would then be more inclined to offer their help.

They suggested that the project be started off and sustained and then proposals be sent off for approval by certain International agencies situated in Rwanda such as UNAIDS, ICW, CTRC or any other NGOs in Kigali. They also suggested that if there was not enough funding available with NGOs, grant proposals to the government can also be made as well as looking into banks in the area of micro financing to assist with the projects needs. It was also suggested that government agencies that support the welfare of children in Kigali could be looked into as they are eager to help with breakfast programs or any projects that support children. These are all possible ways of attaining funding for the needs of the project and will be looked into further.

Therefore, it was general consensus within all the organizations that were visited that the project should have a base to begin with. It needs to be implemented in the Nyarugenge District and a proposal needs to be in place and given to certain government officials such as the minister of gender to search for funding within the government. Finally, the funding will not be approved

until the project is in place and has started to benefit the community it is in. It is a necessity that the project is in full force and then funding is sought because otherwise there will be no positive response. The funding agencies need to see progress in order to invest in a project that they feel will succeed in the given environment. When the project has commenced, funding agencies associated with the United Nations, Rwandan government grants and funding agencies that support small scale enterprises can be explored and grants will be available for subsidizing those that cannot afford the yogurt at regular cost.

Copabura (Cooperative of People for Agriculture and Livestock)

The organization Copabura was a key micro business that had their unique way of going about banking. When asked how they received funds to carry on their organization, the reply given was that each member contributed money to the cooperative and they have now managed to have a collective sum of 200, 000 RWF. The amount given is equivalent to how much each family earns and the money is deposited into a bank account. With this amount, the cooperative is able to pay for the medical insurance of its members as well as assist those that are not as well off in the community who do not have access to local funds. The association also takes care of HIV orphans whose parents have died of AIDS. If however someone is interested in starting a project, all members must agree to loan the amount of money needed to that individual for the start-up and that individual must agree to pay back the money borrowed from the association. MAP was a funding agency that funded the initiatives of Copabura however the contract has discontinued and therefore funding has stopped. CHAMP is also another funding agency which used to fund HIV orphans by paying for their school fees but it no longer provides funding. These types of funding agencies can be looked into for grants and subsidizing the yogurt for those that cannot afford the yogurt.

Regulatory procedures and requirements for drug items in Rwanda

This aspect of the project will have to be explored further by the following interns as there was a lack of communication with the Rwanda Bureau of Standards. Suggestions for future interns would be to investigate this organization by simply going to them and asking to speak with a

representative. Trying to get an appointment by telephone will not suffice as was discovered. In this section, it is imperative that the food and drug administration be aware of the product that is being introduced to the community in Kigali and they certify it in order for the community to have full confidence in the product. An interview with the Rector from the Kigali Health Institute, Dr. Desire Ndushabandi, a teaching assistant in Nutritional Sciences and a possible future coordinator for the project, Yves-Didier Umwengerimwiza and the Minister of Gender, all expressed that this certification should be sought before attempting to introduce the yogurt into the community. They explained that many new food products are taken to the RBS and are tested and certified and thus if this product were certified then there would be a larger market for it as it would have the government approval stamp. This is an effective way to indicate to those ready to consume it that this is a safe product and has been approved by their own government.

Available markets in Rwanda

RIAN

RIAN is an advocacy group which was founded in 2002-2003 by 10-15 women. It is located in Nyamirambo on the outskirts of the city centre, deeply embedded amongst residential buildings. Although RIAN was started by women, men have also joined and are active participants. The incorporation of men into their association was an aim in promoting gender equality. At the onset, there were 230-400 active community members, however, there is now a smaller group of active participants for many have moved away from the area. Most of the women are former prostitutes and were helped off the streets and brought together to find a deeper meaning in their lives. The president of the association is a pastor and a lecturer at the Kigali Health Institute who felt a calling to assist RIAN in their hopes to eliminate the stigma against HIV/AIDS as well as increase the motivation of the group.

RIAN members have all shown gratitude to the government as they have been granted free antiretroviral medications. Another way the government has improved their image in the eyes of those living with HIV/AIDS is by offering HIV positive pregnant women the chance of birthing HIV negative babies free of charge. The RIAN members expressed their happiness for being able to conceive healthy children. The members are very talented and have many skills,

whether it be singing, dancing or speaking many different languages, they were eager to help with any task relating to the probiotic yogurt project. The women showed significant interest in taking on this project first hand and the men expressed that they would also like to help.

It is evident that the women and men of RIAN are an interesting association and that they would be ideal candidates for this project as the group seemed to fit the necessary characteristics for the project. This self-supported association seems to be the perfect place to introduce the yogurt as the mamas were enthusiastic and eager to be included in this project. They were also skilled in many different areas and were excited to learn about the benefits of the FITI probiotic yogurt. They all expressed that they would be interested in consuming the yogurt and would buy it on a regular basis and thus it is evident that there is quite a large market when considering associations of People Living with HIV/AIDs in Rwanda as they are interested in anything that would help with their general everyday health. To them, the FITI yogurt was a great addition to the meals that they have everyday as it was such a simple supplement. Thus, this association for people living with HIV/AIDs is an available market for the FITI project.

COPABORU (Cooperative of People for Agriculture and Livestock)

The cooperative of Copabura is located in a remote village in the Western Province of Kibouie. The association consists of women and men, the young and old, people with HIV, orphans, and widows. This cooperative has two objectives, to eliminate poverty and to fight stigma associated with AIDS. The group is quite proud of their diversity and they believe this helps their group to be dynamic for they are able to address and tackle more issues than a homogeneous group. The members of the group take part in agriculture, growing tea, and raising goats and own 2 hectares of land to cultivate tea. When their goats give birth, they offer the goat to others within their cooperative that do not own a goat so they can contribute to the business. This is their way of fighting poverty.

Every member of the cooperative combines their lands together to grow their food and they visit the local market to sell their produce. Their aim in the long run is to have cows for they currently have unoccupied large area of land for grazing and they have utilized that by selling that area to cow owners.

In terms of the project taking root in this village, there are some foreseeable problems many of which are associated with the remoteness of this village. There is only one microbiology lab and this lab cultures all the bacteria and microorganisms found in this region. It would be unfeasible for the media to be cultured here for there is a greater likelihood of contamination with harmful bacteria such as *E. coli*. Furthermore, the health centre that hosts the cooperative for meetings is too far for many members to attend.

An appropriate way of incorporating this association into the project would be to include them in the market. While they may not have the means to be involved in the project due to their remote location, their nutritional status suggests that they would be ideal for the consumption of the yogurt.

When doing a poll:

Milk Consumption Results

- 1/40 drink milk once a day
- 30/40 drink milk twice a day
- 0/40 drink milk three times per day
- 1/40 drinks milk once a week
- 8/40 drink milk once a month
- In a family, each person consumes 500ml of milk

Food Consumption Results

- 39/40 eat twice a day, noon and evening meals
- 1/40 eats once a day, evening meal. Her explanation was that she has children to feed and she makes sure they eat before she can eat
- 8/40 members expressed an interest in being part of the steering committee if the project started in their village
- Each family has a kitchen garden of legumes, spinach, and cabbage

So as this survey suggests, they are not receiving the necessary amount of nutrients in one day. While many of the members drink milk twice per day, they are only eating two meals a day for the most part and thus an extra meal of the FITI yogurt would be beneficial to this group. Many of the members were interested in the project but it was concluded that because of the remoteness f the village, this would not be an area in which the project would thrive. In this case, it is necessary to find a distribution method that the yogurt could possibly be transported from the kitchen to the association's headquarters. This would make them an available market for the yogurt and would heighten the potential for the project to expand elsewhere in Rwanda.

Gitega

Next, a visit to the Gitega Health Centre proved to be a success. It is here that many people come for HIV testing. Not only does the centre provide this testing but if the patient is HIV positive, they also offer CD4+ count checks as well as counselling on Antiretroviral Drugs. Along with these, the centre also has a special prenatal care ward where they provide counselling and information on prenatal care for those living with HIV/AIDS. There were many issues that arose regarding the transference of HIV from mother to child and among them was breast milk as a vector for HIV/AIDS. The centre usually advises new mothers not to breastfeed and to feed their infants powder milk/formula milk. However, powder milk is often expensive and only those families who can afford them do purchase them. Another option the centre provides is breastfeeding until six months of age; however, this comes with restrictions. The infant cannot consume any solid foods for this is a critical time where the infant can contract HIV. The nurse mentioned if there is solid food in the gut, this can be an entry way for HIV. Therefore, mothers are advised to follow precautions to keep their baby healthy. Due to the fact that FITI probiotic yogurt would be subsidized for these underprivileged families, it seems that this is a good way for the mothers to keep their babies healthy by providing the milk product to their babies while avoiding the need to use breast milk to feed their children. It is evident that this is a healthier alternative to the breast milk option once the baby is able to eat solid food as it will be subsidized and the concern of transferring HIV to their baby will be eliminated.

At the centre there is only one doctor but there are approximately 10+ nurses that shift work as the centre is open 24 hours a day, 7 days a week. The nurses provide "visites a domicile"

or ” house calls” where they pay visits to the homes of their patients and they follow up on their eating habits and their overall health and caring for their child as well as for themselves. When looking into a possible breakfast program at this centre it was evident that they provided some nutritional support for their patients but there was not enough money to support a full breakfast program as the social worker explained. They explained their system which consisted of providing the patients with protein-rich biscuits called RTF, cereals given to increase mineral and nutrient intake and SOSOMA (Soy, Sorghum and Maize) given to improve general nutrition.

Therefore, it is evident that a yogurt product would be of benefit to this health centre as there is not much provided in the area of their breakfast program. The yogurt would be a benefit to the health of those entering the centre and there would be a market in this area as there are many PLWAs and those living under the poverty level that attend this health centre.

There are also appointed “health advisors” that are living within different village communities and they refer malnourished or people living with HIV to the centre for medical assistance and support. By surveying communities and assessing each family’s financial capabilities, they are able to refer patients to better their situation by seeking medical advice for themselves and their families. This could be helpful when considering those patients that would receive subsidized yogurt. The social worker/ nurse that was interviewed was very enthusiastic about the health benefits of the probiotic yogurt and agreed that the doctor working would possibly be interested in referring patients for consumption for the yogurt as well. As the interview was completed, it was clear that this health centre was one that was interested in referring patients for the project and would provide the project with a market of those who attended the health centre and also those who were referred to take the yogurt by health advisors. This included not only those who were living with HIV/AIDS, but also those who were malnourished, men and women, infants and the elderly. So therefore, in Nyarugenge District, there was a huge available market for the FITI yogurt.

King Faisal

Next, a meeting at King Faisal hospital was attended to meet Dr. Sammy Menim, a physician who had heard about our probiotic yogurt project and knew about the benefits of probiotics. He was interested in learning more about the project. Dr. Joseph Ntarindwa and Nurse Josephine

were also in attendance. King Faisal hospital is approximately a 30-40 minute drive from the Biryogo health centre. It is a hospital that caters to wealthy or well off patients who are capable of paying the hefty fees associated with being treated at this hospital. Both doctors were in agreement that all their patients have the means to purchase yogurt at market price. The doctors expressed their interest in probiotics in general for it is a new field where many useful applications are still being discovered. This hospital does not provide food for the patients unless they are long-term care patients. They expressed that most of their patients come in, receive treatment and then return home. There is not an excessive amount of long-term patients. In this case, the idea of a yogurt distributing program or a small stand that could be set up at the hospital was addressed and the physicians agreed that this would be beneficial. It was evident that King Faisal was a hospital that was much more expensive and well off than other hospitals that were visited and thus they may have the means to provide the patients with an extra supplement. They may also be able to find funding through the government to provide them with the means to start a small stand selling the yogurt to the patients that come in for treatment. The patients would be able to pay full price for the yogurt as they are coming from a more developed area of Kigali. This idea needs more planning and more meetings with the physicians from King Faisal Hospital would be necessary to consider the ideas further. King Faisal patients and visitors would be a key market in the introduction of the yogurt to Kigali.

Profemme

Profemme is a Rwandan women's network that deals with business ventures for women. Profemme is located in Nyamirambo, the oldest district in Kigali. When asked about the market price of yogurt and its affordability to local people, Pro Femme mentioned that for many of the people, yogurt is expensive. If the yogurt were sold at low-cost, more people would be able to afford the yogurt and they would definitely be interested in buying the yogurt every day. They claimed that women doing business was very acceptable in Rwandan society as they are an umbrella organization working for women, promotion, peace and development and have seen many women-lead organizations and businesses thrive in the community. They contributed that selling the yogurt at low-cost would produce a huge local market of young children, health centres, women, men, PLWAs and local hospitals and local markets. They assured that these

groups would be greatly interested in buying the yogurt at low-cost if it would mean that they could lead a healthier lifestyle.

Accounting systems used

When looking at the accounting system used in Mwanza Tanzania, it is possible to relate the information to the system that could be used in Kigali, Rwanda as well. With the Tukwamuane women's group, there are two bank accounts that are dealt with. The first account is the Tukwamuane (Mama's) account. This account belongs to the mamas and only they have access to withdraw money or make a deposit. At one point, the project coordinator did have access to the accounts but due to scandals and theft issues, only the Mamas now have access to the account. All the funds pertaining to the project specifically in Tanzania are processed through this account and three of the Mamas have signing authority in order to make any deposits or withdrawals. When large amounts are withdrawn (approximately over $500.00 CAD) the three assigned members must sign for the transaction. This account is also a group business account that WHE and other organizations and people can transfer money into but cannot withdraw money out. The mamas have a business bank card and are able to take out money from that specific account through the teller using their bank card and group identity card. The other account is the St. Augustine University (SAUT) account. The SAUT account is for any WHE administrative funds. These funds include extra intern money, money for rent for the apartment in Mwanza and money for paying project coordinators and assistants. Only members of SAUT administration (accountants) have access to this account so WHE collaborates with them and if money is needed for administration purposes for those working on the ground in Mwanza, then cheques can be written by the accountants. In addition, there is a third account that is specifically for the interns that work with the program. This account is set up through administration in Canada, from the University of Western Ontario where WHE puts in money for intern expenses. The interns also receive a debit card to use in the host country in order to finance anything that they cannot afford or any expenses associated with the project that would require the intern to spend more money than they have. The interns are able to withdraw the funds from this account easily using the debit card from a bank machine. Occasionally funds to support the project are sent through here if interns are purchasing things for the project or for intern expenses related

to the project in any way.

WHE and SAUT receive copies of the Tukwamuane bank statement on a monthly basis so that the accounts can be audited and acts of fraud can be avoided but they do not have any access to the Tukwamuane account. WHE also monitors the SAUT account on a monthly basis again to prevent fraud and to ensure complete transparency within the project.

By keeping this information in mind and conducting research into the banking systems available in Kigali, it was evident that there were many banks available in Kigali to choose from to set up the bank accounts for the project in the future. Out of the three banks visited (Banque Commerciale de Rwanda, Banque Populaire de Rwanda and Banque National de Rwanda); it seemed that most of the general population chose to invest their funds in the Banque Populaire de Rwanda (BPR). It seemed that they were the most popular bank within the community and it was evident when doing interviews with bank tellers that it would be easier to open an account at this bank in order to do long term business than the other banks. When comparing results for each bank it was clear that this was the bank that was closest to the possible kitchen site and thus the most practical bank to start the account for the mamas of the new project. In addition, the intern bank account would also be set up in the BPR because it located all around Kigali and also in walking distance of the intern headquarters/rest house. This would facilitate the transactions needed to be made by the interns. Next, the bank account for administrative funds would still have to be explored further but a tentative place for the money to be handled would be to set up a bank account involving the Kigali Health Institute and thus with help from the Rector, this could be looked into further. As our main partners, there needs to be an account handled by them to monitor administration costs and to make sure that the money is available for the costs of the project coordinator and assistants. The same system that was used in Mwanza could legitimately be used in Kigali using different locations and different people to monitor the accounts, all relating to the project.

Micro business support systems

When looking for a solid support system for micro businesses, the most promising organization that was visited was PSI. PSI Rwanda is a non-profit, non-governmental organization which empowers vulnerable Rwandans to lead healthy lives. In collaboration with partners, PSI Rwanda improves access to affordable health products, information and services through evidence based social marketing which motivates sustained behaviour change. (Mission statement.) An interview with PSI showed that they would be key partners in training the mamas associated with the project in business management skill. This would be the first step in order for them to become familiar with business skills, training, accounting and banking. PSI expressed interest in working with the project to better the mamas understanding of the business world.

Another support system that could be looked into further would be the Banque Populaire de Rwanda where they offer micro financing for small enterprises. It is evident that this would be a key component to the launch of the project if micro credits were awarded to the mamas in order to start off their business and they worked with the bank to pay off the loan as their business thrives. This could support the small business until it launches and begins to make profit for them.

Finally, the Kigali Health Institute as the key partners in the operation will be the greatest support for the success of the project. With the students and professors on board and the great name that has been created for the Western Heads East project in Kigali by the Kigali Health Institute, the project will be a success. Dr. Desire Ndushabandi and Yves-Didier Umwengerimwiza are key leaders in the introduction of the FITI yogurt and the main support system for the interns in this business operation will come from the avid support of KHI. With access to computers, the rest house for interns and complete support for the FITI yogurt by the nutrition department, the project will thrive in Kigali, Rwanda.

Conclusion

Therefore, when discussing the idea of the Western Heads East project being introduced into Kigali, Rwanda as a business model, it is evident that there are key ways of making it a success. When considering marketing and distribution methods, technology is available in order to market and distribute the FITI yogurt into the community. In terms of funding agencies available, it was discovered that there are key stakeholders that can contribute to the project. These include the minister of gender, Profemme, the Deputy Mayor of Kigali, the Nyarugenge District Coordinator and Copabura who all have links to funding agencies and can seek grants and other information on how to secure local funding for the project. With this in mind however, it is a consensus that the yogurt will only be subsidized for those who cannot afford it based on cultural expectations, PLWA will only be subsidized if they cannot afford the yogurt. Next, the certification of the yogurt must be sought with the Rwanda Bureau of Standards and the meeting must be pushed in order to attain community approval of the FITI product. When the certification is obtained, it is imperative that local markets are available for the consumption of the yogurt and these include such associations as RIAN, Copabura, the Gitega Health centre, King Faisal Hospital, and Profemme women's group. These are key partners in order to have an available market to consume the product once it is being produced and sold to the community. Finally, when considering accounting systems, the Banque Populaire de Rwanda is the most practical bank to establish the accounting systems. Furthermore with the help of KHI, three bank accounts can be established, mimicking the banking system in Mwanza, Tanzania. One administrative account for KHI, one for the interns at the BPR and one for the mamas at BPR as well. KHI and the BPR are also serving as major Micro business support systems in collaboration with PSI who will aid the start-up of the project with business training and advertising the authenticity of the project.

In conclusion, it is evident with all the information that was found and with all the research that was conducted; the FITI yogurt project by Western Heads East will be more than successful in Kigali, Rwanda. When considering the findings, there is more than enough funding, support and general excitement for the project to begin in Kigali. More research will have to be conducted further to establish the infrastructure and build the project further, but the key partners are present and involved and the key stakeholders are ready to take on the project. The main

components are in place and thus the project will be a success when introduced into Kigali, Rwanda.

Conclusion

When one thinks about Rwanda, it is inevitable to think about the genocide that took over 1 million Rwanda lives. Though Rwandan suffered greatly due to the 1994 genocide, positive change can be observed today in all parts of Rwanda. During our visit to the Kigali memorial museum, the phrase that resonated and still remains with us today was, “never again”. Never again is the proclamation heard from Rwandans when they talk about genocide and how many of their families, relatives, and friends perished. Never again will such atrocities happen in Rwandan soils. Hence, the people of Rwanda are forward thinkers and are very interested in moving forward, in making something of themselves, in creating opportunities, and in educating the next generation. There is a certain atmosphere of patriotism felt from Rwandans when they talk about their country. They possess a love for their country that words alone cannot express. There is also transparency when visiting government officials, health centers, and hospitals. Most importantly, there is peace! When walking down the streets of Kigali, many different people from different backgrounds and races are all walking together and conversing peacefully. There is acceptance and the need to progress forward and not to constantly lament on past events. Therefore, Rwanda is a country that is suitable and conducive to establishing a sustainable probiotic yogurt project.

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