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### **Local Solutions to Malnutrition in the Highlands of Rural Ecuador**

Forgotten and marginalized, the Quichua Indians are the most populous ethnic group of the central Andean valley of Ecuador. Conquered over 500 years ago, these traditional people remain poor and suffer from chronic malnutrition. Yet, their ancestor's contributions to the world have been amazingly important in alleviating hunger. As the present day descendents of the Incas, their ancestors domesticated many varieties of potatoes, corn, beans, squash, and quinoa, as well as numerous other crops that still remain relatively unknown beyond the Andes. In his 1970 Nobel lecture, Norman Borlaug stated, "It is a sad fact that on this earth at this late date there are still two worlds, 'the privileged world' and 'the forgotten world'" (Borlaug 3). Tragically, for social and historical reasons the Quichua Indians of Ecuador remain in this "forgotten world", so eloquently described by Dr. Borlaug. The plight of the Quichua presents an unfortunate paradox. The central Andean valley, where the Quichua live, is agriculturally productive and home to many protein rich crops; yet the indigenous people, who cultivate and earlier domesticated these crops, remain malnourished as well as impoverished. Quinoa, a recent addition to North American diets as a protein rich grain, is a traditional food of the Quichua people, but their knowledge of the nutrition benefits from this grain have become forgotten and ignored over time (Popenoe 1). Another native crop, tarwi, an unknown legume beyond the Andes, amazingly provides the same amount of protein as the soy bean (Popenoe 185). These two crops, quinoa and tarwi, hold the promise of providing a local answer to the chronic malnutrition experienced by the majority of Quichua people. Expanded production and consumption of these two crops would provide the opportunity to improve the economic well being and health of these subsistence farm families, who today live in extreme poverty. A practical and local solution to chronic malnutrition in rural Andean Ecuador is to increase the cultivation and consumption of quinoa and tarwi through nutrition education projects that work with the women of Quichua Indian communities.

The Quichua Indians are the most numerous rural residents of Ecuador's Central Valley, however Ecuadorian Indian organizations differ with the Ecuadorian Government on the exact number of indigenous inhabitants. In 2009, the official census of Ecuador calculated the total population of Ecuador at 13,625,069, with 4,599,823 being rural inhabitants ("Ecuador: Statistics"). UNICEF states that the official 2001 Ecuadorian census certified that 843,418 people identify themselves as indigenous. This low population figure is disputed by Andean Indian organizations which assert that 33% of the national population is indigenous, setting their estimate at 4.5 million people ("Los Pueblos Indigenas en America Latina"). The true population figure of indigenous peoples probably lies somewhere between these two figures. Despite the conflicting information over the exact size, the Quichua Indians comprise a significant segment of the rural Ecuadorian Andean population.

Unfortunately the majority of rural indigenous people in Ecuador live in extreme poverty. This ethnic group represents the poorest segment of the Ecuadorian population. ("The IDB and Indigenous Peoples") According to the World Bank in 2005, 96% of indigenous Ecuadorians in the rural Andean highlands were impoverished. Sadly, related statistics of the World Bank show that 71% of this rural indigenous population suffers from extreme poverty in that they have low levels of income, low levels of food consumption, and lack access to basic services ("La Pobreza Rural en Ecuador"). To further put "extreme poverty" into perspective, UNICEF states in its Millennium Development Goals, that those in extreme poverty live on less than one US dollar a day and that they "lack at least one of the essential goods and services they require to survive, grow, and develop" (Pirozzi 1-2). Rural indigenous women are heavily burdened by the challenges of extreme poverty. These women remain in their rural villages, tending crops

and looking after the children, while their husbands migrate to the cities in search of temporary underpaid work (“La Pobreza Rural en Ecuador”). The very high rate of poverty and especially extreme poverty, at 71 percent, among the rural Quichua Indians is a tragic statistic that demands a solution.

Statistics from the World Health Organization show a marked difference in health outcomes due to poverty and the lack of education in Ecuador. These statistics indicate that the rural indigenous population suffers disproportionately. While the average national illiteracy rate is 9%, the illiteracy rate for the indigenous population is 28.2%. The average education level in Ecuador is 7.3 years, while in the indigenous population it is only 3.3 years. Illiterate women, many of whom are Quichua Indians, have a birth rate of 3.3 children per woman, while those with higher education have a birth rate of 1.9 children per woman. The national infant mortality was 22.3 per thousand newborns in 2003. However, the infant mortality rate among illiterate mothers (the poorest of the population) was 4.6 times higher than for children born of literate mothers, bringing the infant mortality rate for illiterate mothers to 102.5 per 1000 (“Ecuador: Health Situation Analysis and Trends Summary” 2-3). The indicators for malnutrition show equally sad trends for the rural poor. From 1998 to 2000, the prevalence of short height for age (a chronic malnutrition indicator) worsened in rural areas where that indicator grew from 27% to 36% (“Ecuador: Health Situation Analysis and Trends Summary” 5). All this data presents the tragic reality of extreme poverty for the rural poor of Andean Ecuador, the majority being indigenous people. These rural poor experience high rates of illiteracy, low levels of education, and extremely high rates of infant mortality, as well as very high rates of chronic malnutrition.

Multiple threats to food security pose a serious challenge to rural highland Quichua families. Ecuador’s geography and its location on the equator make the country extremely vulnerable to natural disasters such as earthquakes, floods, droughts, and volcanic eruptions, as well as the negative impact of climate change. Mountain glaciers that provide run off for crop irrigation are receding at a rapid rate due to climate change, which will reduce crop yields dramatically in the future (“Ecuador” *World Food Programme* 1). Data collected in 2012 by Ecuador’s National Institute of Meteorology and Hydrology at Mt. Antisana indicate that Andean glaciers are now retreating at an alarming rate of 25 to 30 meters annually. This high rate of glacial retreat affects the future availability of water for crops and human consumption (The World Bank 1). In addition, many indigenous families cultivate steep mountain slopes which are prone to soil erosion and crop loss during torrential equatorial rains. Volcanic eruptions by the Tungurahua volcano, which started in 1999, continue to threaten regional crop yields with layers of dirty black ash. The most recent eruption in December of 2012 destroyed crops and caused evacuation of nearby Quichua Indian villages (BBC News). In addition to these many natural threats to food security, the Quichua Indians also suffer from Ecuador’s long history of racial exclusion that denies the indigenous population access to basic services of health, sanitation and education (“La pobreza rural en Ecuador”). The multiple food security issues caused by geography, climate change, and historical discrimination all contribute to the high rate of chronic malnutrition for these rural Andean Indians.

Sadly, chronic malnutrition appears to be increasing for the Quichua population with devastating consequences. As World Health statistics already presented show, the prevalence of short height for age, an indicator of chronic malnutrition, has greatly increased from 27% to 36% of the rural population in recent years and infant mortality for babies of illiterate women, who are 28.2% of the rural population, is calculated at 102 per 1000 newborns of illiterate mothers as recent as 2001. These indicators of poor health and malnutrition have serious consequences for the future health outcomes of this segment of the population as presented by Dr Manuel Pena of the Pan American Health Organization. Dr. Pena’s information shows that Individuals with stunting have a significantly higher risk of premature death, both in the first years of life and throughout their lifespan. Such individuals are more likely to suffer from significant infectious diseases and chronic disease problems (examples being an increased risk for heart disease, high blood pressure, diabetes and ironically, obesity). Stunting impairs mental and intellectual development, future physical performance, ability to work, and ultimately, takes a significant toll on both

the individual and social productivity of the population (Pena). With increasing chronic malnutrition, the rural Quichua population will not only experience shortened life spans, but also increased serious health risks and impaired mental and physical development.

Most rural Ecuadorian indigenous people survive through subsistence farming. A typical subsistence Quichua Indian farm family consists of three to four generations living in two houses, surrounded by a tiny plot of land (often less than ½ acre) with mixed plantings of corn, beans, potatoes, peas and squash, as well as lesser known native crops such as quinoa and tarwi. Surviving great grand parents may live in a small room attached to one of the houses. Each of the two dwellings would house son and wife with around four children including a married daughter, her husband and baby. The typical four generation family size would be around twenty individuals (Meisch 90-91). The older generations would all be illiterate, never having attended school beyond first or second grade, if at all. Only the young children are now able to attend elementary school through sixth grade. The family would not be able to afford conventional health care; instead they rely on local medicine men, herbal remedies and midwives (Vega). Small native villages are often located on the least productive lands, high on the mountain sides. Homes are either simple cement block structures or made of rammed earth. There is no indoor plumbing and drinking water is often obtained from irrigation ditches (Vega). The single room dwellings have dirt floors, straw mats for beds, low wood stump stools for sitting, and a long simple wood bench reserved for visitors on a broad open porch. The porch serves as a workshop often containing a Spanish loom, treadle sewing machine and a mill stone for grinding corn (Collier 62). Traditionally the women took care of the children, cooked, sewed, washed clothes and spun yarn while the men cultivated crops, wove cloth and worked as laborers on large neighboring haciendas (Collier 64). Tragically, now due to the increased economic pressures of poverty, mothers are often the sole caregivers left at home in the villages to do all the chores previously done by both a husband and wife. Quichua men now migrate to Ecuador's capital, Quito, where they try to find low paid construction jobs. (Vega). A typical daily meal consists of thick soup made with ground toasted corn, potatoes and lard with a side dish of dried toasted corn kernels (Collier 80). While some Quichua Indian subsistence farmers may have a few yard chickens as well as a colony of guinea pigs (*cuy*) living in their open kitchens, meat protein from these sources is saved for special occasions and not consumed on a daily basis. The Quichua diet is primarily vegetarian. Most foods are boiled in a large pot supported by three stones over a wood fire in the kitchen area. When meat is served, the portions are very meager and the meat is used primarily as flavoring for soup. The daily diet of the Quichua subsistence family depends on successful crop yields that can vary from year to year. As previous statistics show, malnutrition is common due to food scarcity, and more specifically, from lack of protein, lack of calcium from dairy products, and lack of vitamins from green leafy vegetables. Lacking proper nutrition, the primarily vegetarian diet of these subsistence farmers contributes to their chronic malnutrition (Vega).

Traditionally vegetarian, the diet of the Andean indigenous people dates to pre-colonial times when they were part of the Inca Empire. Theirs is an agrarian tradition where protein, as well as important minerals and vitamins, has always come from plant sources. To address the nutrition deficiency of protein and calcium in a diet lacking sufficient meat and milk, those grains and legumes that are high in protein and calcium need to be selected and consumed in larger quantities. Fortunately the Quichua Indians do cultivate traditional crops that have these characteristics, but at present these grains and legumes are not consumed in sufficient quantities to meet minimum dietary needs. According to Dr. Luz Mariana Vega, a Quichua physician in Ecuador, a practical and local solution to decrease chronic malnutrition among this rural population is to provide nutrition education that encourages the cultivation and consumption of those available foods highest in complete protein and calcium (Vega). The current reliance on potatoes and corn by the indigenous population unfortunately lacks sufficient protein and calcium to meet daily nutrition requirements.

Two traditional native crops stand out as important solutions to chronic malnutrition in the rural Andean highlands. One is quinoa, which the ancient Incas considered the “mother grain” (Oelke 1). In pre-colonial times quinoa was the principal food and crop of Andean Natives, but after the Spanish Conquest the new Spanish rulers forcibly replaced this traditional crop with the European crops of wheat, barley and broad beans (Popenoe 1). Amazingly, quinoa is known as a grain having one of the highest amounts of protein and calcium per weight. Its calcium content is double that of corn, barley and wheat and its crude protein by weight is higher than that of wheat (Oelke 2). In addition, quinoa is the only grain that contains balanced amounts all of the essential amino acids as recommended by the Food and Agriculture Guidelines of the United Nations (Oelke 3). Combining quinoa with wheat, corn, barley or potatoes compliments the incomplete protein in these foods, thus nutritionally enhancing the whole meal (Popenoe 153). A second traditional crop that can significantly increase dietary protein is tarwi (known locally in Ecuador as “chochos”). Tarwi (*lupinus mutabilis*) is a member of the lupine family and produces a white bean which is similar to the soy bean in its high protein content (Popenoe 181). In a 1987 United Nations study, tarwi contained 44.3% protein and soy beans 33.4% (United Nations 15). Additionally in 1997 the Peruvian Ministry of Health listed cooked tarwi as having a high calcium content, 30 mg per 100 g (Peru 32). Dr. Luz Marina Vega suggests that increasing the consumption of both quinoa and tarwi, which are still traditionally grown and eaten throughout the Andean region, will add significant protein and calcium now lacking in the normal rural Quichua diet (Vega). The increased cultivation and consumption of quinoa and tarwi to solve chronic malnutrition provides a local solution that is traditionally acceptable to the indigenous Quichua people.

Promoting a solution to malnutrition that encourages the increased consumption of quinoa and tarwi has many elements that promise success in rural Ecuador. Quinoa and tarwi are already local foods that Andean Natives enjoy in their existing diet and these two crops are currently cultivated in limited quantities by these subsistence farmers. Successful nutrition education needs to clearly explain the benefits of eating more quinoa and tarwi and suggest adequate serving amounts. In addition, loans to these small farmers will help them acquire additional land on which to cultivate these important crops. These solutions to chronic malnutrition provide these rural farmers a way to improve their family’s daily nutrition and health themselves through individual action and responsibility. Realizing the important nutrition potential of quinoa and tarwi and increasing their consumption and cultivation will help combat the food scarcity suffered by this rural population.

Since Quichua women are the family members who remain in the villages to grow the crops and feed their families, they are the best group with whom to target nutrition education and participation in nutrition activities (Vega). One way to involve these rural women is to sponsor a series of regular informative meetings at native village community centers to encourage increased quinoa and tarwi cultivation, as well as increased consumption of these two foods. Regular meetings can also allow the women to share quinoa and tarwi recipes with each other and to explore new ways to cook these foods. Dr. Vega suggests having women mill quinoa into flour to combine this with desirable local herbal flavors for use in baking as well as in blended nutrition drinks, similar to how soy powder is used in protein drinks (Vega). Studies in Brazil have shown that adding quinoa flour to wheat flour improves the nutritional content (Varcarcel-Yamani 7). So far, nutrition projects using quinoa and tarwi flour are very limited in the Andean region. One such project was started in the mid 1990’s in the rural village of Independencia, Bolivia. Financed by the German non-profit ASW (Aktionsgemeinschaft Solidarische Welt), a women’s group organized to produce noodles out of quinoa and tarwi flour which they then marketed to the local community (Aquino). Many such small business project variations are possible to address Andean Indian malnutrition by increasing the use of quinoa and tarwi in the daily diet. Quichua women who cultivate crops and prepare their families’ meals are the best group to target with nutrition education as well as community projects that promote the increased cultivation and consumption of quinoa and tarwi to combat local malnutrition.

UNICEF has developed noble “Millennium Development Goals” to eradicate extreme poverty and hunger worldwide by 2015. While only two years remain for this goal to be accomplished, there is still time for much to be initiated and accomplished to achieve future results to end malnutrition for the rural indigenous people of Ecuador. Funding is needed to promote the benefits of quinoa and tarwi to alleviate hunger. The World Bank as well as the United Nations and UNICEF could incorporate these local foods as solutions to hunger in rural Ecuador and provide support for local initiatives by the Ecuadorian government, indigenous organizations and Non Profit Organizations (NGOs) that encourage the cultivation and consumption of quinoa and tarwi through educational projects, and programs that help the Quichua purchase additional tillable land. On another front, micro loan institutions could help indigenous Ecuadorian women’s groups finance small business initiatives to produce new food products having increased protein and calcium from locally grown quinoa and tarwi. With an increased effort and the awareness that a local solution to malnutrition is available, the “Millennium Development Goal” to end hunger and improve child health can be addressed with appropriate action for the rural indigenous people of the Ecuadorian Andes.

Alarmingly, 71 % of the rural Quichua Indian subsistence farmers in Ecuador suffer in extreme poverty, living on less than one dollar a day. Infant mortality among this group reaches over 100 deaths per 1000 newborns and chronic malnutrition plagues 36% of this rural population. Stunting, due to lack of protein and calcium, causes serious health problems and impaired mental and physical abilities in later life. These serious problems are compounded by drought, floods, earthquakes and volcanic eruptions that frequently occur in the Ecuadorian Andes as well as by global climate change that is quickly melting the region’s high mountain glaciers, a principle source of water for crop irrigation. One solution to this tragic situation is to improve daily diets by increasing the cultivation and consumption of quinoa and tarwi, protein and calcium rich native foods. These nearly forgotten foods can serve as a nutritional remedy for a “forgotten people”, as portrayed by Dr. Borlaug. Nutrition education programs that encourage indigenous women, the food providers, to cultivate and prepare these healthy food choices will significantly reduce the tragic long term effects of chronic malnutrition in future rural Ecuadorian indigenous populations. This solution respects the cultural food preferences of the recipients, uses available local resources, and can be incorporated into existing NGO and Ecuadorian government programs. Financing by The World Bank and The United Nations that focus on the expansion of quinoa and tarwi cultivation and related nutrition education will speed up this process. In addition, micro loans will help indigenous women’s groups create small business initiatives to produce foods using quinoa and tarwi in order to improve local nutrition. The implementation of nutrition education promoting increased consumption of quinoa and tarwi will significantly reduce chronic malnutrition, make significant progress toward achieving the “Millennium Development Goals” to end hunger and improve the future health of children in rural Ecuador’s large Andean Indian population.

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