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Peru, Factor 6: Sustainable Agriculture

## **Peru: Use of Sustainable Agriculture Techniques to Preserve and Gain Arable Land for Rural Agricultural Usage**

### *Introduction*

Located in South America and bordering the South Pacific Ocean, Peru is sandwiched between a potpourri of neighboring countries: Columbia and Ecuador to the north, Chile to the south, and Brazil and Bolivia lying to the east. Peru is a land of diverse climates and landscapes, with a steep mountainous region in the center, a stretch of arid desert hugging the coast, and rich forested lowlands and mountains in the east. Its sundry geographical zones make Peru a highly important agricultural nation, affording it the capability of being the producer of 120 domesticated plants, with the potato being the most important. (“Peru-Agriculture”).

On the economic side, Peru stands out from its fellow neighbors, possessing one of the fastest growing economies and having paved for itself a steady path upward through macroeconomic stability, high growth rates, low inflation, and prudent fiscal policies, allowing it to clock an average GDP growth per year of 6.4% through the years of 2000-2012, and a growth of 5% in 2013 (“Peru Overview”). Unfortunately though, the benefits of Peru’s recent rapid economic growth are not enjoyed by all of its citizens. Peru possesses a dual economy with a subsistence sector, isolated in its mountainous interior by poor infrastructure and communications, and a relatively modern, well-off sector which exists on the coastal plains (“Background on Peru”). This dichotomy between rural and urban areas has resulted in much political and social inequity, leaving much to be desired for in pastoral and agrarian locations. Approximately 36.2% of Peru’s population – 10 million people – is still under the poverty line, and 12.6% - almost 3 million people - are in extreme poverty. At the rural level, extreme poverty is at a shocking level of 25%, more than double the national average of 7% (“Peru: Overview”).

### *A Subsistence Farm Family and Its Components*

The average Peruvian family places strong import on the principles of kinship and family, believing in a common unity and purpose. A typical rural family household will consist of 4.9 people, while a typical urban family household will consist of slightly over 5.1 people, the nation’s average (Coutsoukis). Although this may seem like an incongruity for the classic rural family image, it is understandable since most rural families have suffered heavy migration of family members away from the highlands and into coastal farms, selva colonizations, and farms. Traditionally, the Peruvian family and its affairs have been heavily centered around the father figure who acts as the main authority of the household, acting as a strict disciplinarian and carefully managing the budget, while representing the image of the family (Coutsoukis). However, the wife will defer to her husband and follows him, but she possesses considerable control over her own affairs, and manages property and marketing, in addition to raising children and cooking meals.

A typical Peruvian diet in the rural highlands will consist mostly of potatoes along with some other Andean tubers (ex. oca and ulluco), grains – most commonly quinoa, and protein coming from the meat of various livestock like llamas and chickens. Whereas in coastal areas, a traditional style of cooking called *criollo* is popular, with fresh seafood, rice, cassava, and various vegetables (“Daily Life and Social Customs”). However, many Peruvians - 11million people, approximately 38% - are unable to cover their minimum daily calories intake of 2,100 Kcal. Moreover, 18% of children under five are victims of chronic undernutrition and over 37% have anemia, resulting in 11% of children dying before reaching the age of five (“Peru: Overview”). For those children who make it past the age of 5, about a quarter of 6-14

year olds work, often at dangerous construction and mining sites to earn extra money for their families (“South America: Peru”). These children, if even enrolled in school, either temporarily or permanently drop out, resulting in minimal educational exposure, with generally less than 10% passing reading comprehension and math tests. This lack of education is also reflected in the high rates of illiteracy among the women living in rural Peru. (“Rural Poverty in Peru.”) In contrast, urban cities have vastly improved educational programs, with children there passing tests with rates almost 30% higher than rural areas. Jose Rivero, a consultant on education said, “The gap between the rural and urban worlds is enormous.” (Salazar) Yet another problem in rural Peru is the lack of access to adequate health care. Peru has a decentralized health care system with five different sectors working to provide health services (“Peru.”) There has been a recent increase in the amount of health care workers, but there is an inequitable distribution of them, with coastal cities receiving the bulk and rural areas getting minimal attention. The government has implemented more policies and a universal health insurance plan, yet these pose no significant help to the problem of health care in agrarian areas, where access to medical professionals is rare on occasion. For instance, 34% of Peruvians suffer from chronic illnesses, but only 52.2% of them receive some form of treatment (Goldberg). When in need of serious medical help, there are health centers, but none at a comfortable distance, and the wait is often long.

For most rural subsistence families, their means of living is through agriculture. Many coastal farmlands are fertile lands, ripe for agricultural use yet these are often under the control of powerful, elite families. Instead, many rural families farm the intermountain Andean valleys, where there is a natural source of water from the influx of melting glaciers. The Andean ecological environment there structures the crop and livestock choices of highland farmers. At higher altitudes, specialized tubers are grown and animals graze there, while at intermediate altitudes, grains (wheat, barley, rye, corn), pulses (broad beans, peas, and lentils), and vegetables (onions, squash, carrots, hot *rococo* peppers) are sown. And at even lower altitudes, tropical fruits and crops flourish. Many farms found here are small in size, consisting of only the typical peasant household with a small surrounding property, and over 70% of them are less than 5 hectares. Each farm and its scattered *chacras*, plots of land used for gardening, vary in production and adequacy based on their locations (“People, Property, and Farming”). This system of small farms, minifundios, often trade between each other, exchanging *chacras* to obtain specific cropping areas. In selvas, the population living there are mostly the indigenous natives of the tropics. The natives mostly live off the land, hunting, fishing, and gathering to sustain themselves. But they also utilize a method of horticulture, slash-and-burn, to farm crops, exploiting a particular plot for a duration and then moving to a fresh piece of land, thus rotating through different areas. Another horticultural method surfaces during dry season, when the native farmers monocrop on open plots along the riverbank, taking advantage of the plethora of rich silt deposits.

An agrarian Peruvian family must overcome much to improve its quality of life. Many barriers stand in its way, and hinder it both economically and socially. Agricultural productivity is obstructed by a highly unequal distribution of land, with a few farmers holding land areas of 50 hectares or more whereas for the average rural farmer, their small size of farm holdings of generally less than 5 acres preclude them from harvesting anything but the most minimum subsistence. However, recent trends of the Gini coefficient, a statistical measure of the inequality of distribution, are decreasing due to various political efforts, showing an improving quality in the pattern of distribution of land, albeit slowly. The dispersed *chacras* also pose a problem because they too, are so small that their conditions only allow specific crop growth, thus limiting the range of agricultural productivity for each household. For Peru as a whole, the cultivated area equals about 49% of the potential cropland of 7.6 million hectares. Most of this potentially arable land is located in the selvas (18%) and coastland (82%), but the highland situation is drastically different. Arable land is in shortage there, so the residents respond by cultivating unsuitable land and even having livestock grazing protected areas, resulting in overcropping and overgrazing. The land cannot take this kind of sustained abuse, and overusage is estimated at about 500,000 hectares for cropping, and 2.6 million in

grazing. Thus, agricultural productivity in highlands is steadily decreasing due to poor management of the land.

Although farming is a main source of income for most Peruvian agrarian families, it is not enough to pay the bills and costs of living. Most rural women are very poor, but they play a vital role in the subsistence economy, performing as much as 80% of the family's labor by tending livestock and working on agriculture, but they also partake in other income-generating jobs, even though they face redoubtable obstacles such as gender discrimination and illiteracy. By doing all of these activities, rural women are able to free up time for their husbands to migrate in search of temporary work ("Rural Poverty in Peru"). In fact, even rural Peruvian youths are moving in large numbers to urban areas in search of work and better wages. However, although tales of child labor are common, youth employment is still very high with 18% for females and 14% for males in Lima, and showing a rising trend ("Peru: Poverty and Social Developments in Peru, 1994-1997"). Rural-born youth generally have a much harder time of securing good jobs with solid wages due to a lack of a solid primary and secondary education, resulting in below-proficient capabilities in vital work skills such as math and literacy.

Moreover, when these migrant workers travel from isolated rural parts of the Andean mountains, where three quarters of Peru's rural population resides, or from remote *selva* regions to coastal urban cities to earn wages, the journey there is often long and tough. A non-existent or highly inefficient infrastructure hinders travel between locations, limiting the access of rural and indigenous people to local markets, health care, education, employment opportunities, etc. As of 1999, only about 28% of the rural households in Peru possessed access to a road in good condition. A lack of infrastructure also inhibits communications between different parts from the country, allowing the inequity gap to increase even more as the urban areas pull away, and the rural fall behind ("Peru: Rural Infrastructure (2010)"). In the words of a 2004 Bank Survey, approximately 60% of all travel done from rural areas was to visit local markets, and for 60% of those rural households, the train came by 1-3 times per week, and was often unpredictable and unavailable. Thus, the agricultural productivity of these agrarian economies was hindered as transaction and waiting times both increased, and food started to spoil. Connected to an absence of solid infrastructure is the problem of adequate nutrition in rural areas. Although these rural families are subsisting off farmlands, they often sell off their crops and restrict their children's diets to soup (Kieltyka). Children that may seem healthy often do not get the appropriate vitamins and nutrients, stunting their growth and development, owing to the fact that many indigenous people still lack knowledge of how to properly feed children.

#### *Current Role of Sustainable Agricultural Practices and Its Possible Benefits*

The current role of sustainable agriculture is often overlooked and dismissed in favor of alleviating more directly evident problems such as infrastructure and malnutrition. However, sustainable agriculture practices are necessary and must be implemented to prevent land degradation and maximize resources in locations with limited land area. These methods will preserve the land, and allow for greater crop yield and safer environmental surroundings, thus boosting both ecological and economic circumstances.

In the highlands, where most of the rural population is located, the dearth of well-planned sustainable agriculture practices has the most obvious consequences. As stated before, the amount of arable land available in the highlands of Peru is limited, with many farmers possessing less than 5 hectares of land. Of that land, much is being overcropped and overgrazed, leading to a problem of overusage. As a result, mountainous land productivity has greatly diminished since colonial times, with about 30% of arable land lost due to degradation of terrace systems, established by the indigenous people who used to live there, and poor maintenance of the irrigation systems (Migongo). Sadly, most farmers seem to have no recollection of their ancestors' ancient agricultural practices that comprised of enriching and fertilizing the soil with mulch and compost to replenish the nutrients, crop rotation, and polyculture - mixed cropping techniques. Still, these mountainous areas are a highly fragile land area that must be carefully

maintained to produce the maximum agricultural results. Problems have already cropped up though, such as soil erosion resulting from heavy overgrazing, causing the vital layer of topsoil to be stripped away, and greatly reducing the land's agricultural capabilities. Farmers that used to be able to plant potatoes, carrots and other vital crops at lower altitudes must move higher and higher up the mountains each year, as soil degradation leads to loss of arable land. Yet as they move higher up, new soils up there may not be altogether suitable either for their crops, and the weather and altitude differences are not ideal for cultivation. Thus, crop production is on a decreasing trend, as the problem of scarcity of available land exacerbates.

Fortunately, new methods are being implemented to try to save the land of these Andean regions. Terrace rehabilitation is slowly gaining ground as DESCO, a Peruvian NGO based in Lima implemented its Lari terrace rehabilitation project in 1992, and by 1998, a surface area of about 1,050 hectares had already been restored. This project focused mainly on restoring existing terraces, improving irrigation networks, and introducing agro-forestry practices into the region, with the expected results of increased ecological awareness by local farmers, and an amelioration of agricultural productivity (Migongo). The terrace, an area for cultivation where land has been levelled and stabilized by a surrounding wall of stones, has been able to not only transform slopes into arable land, but also remains effective in managing water and soil erosion, and even maintaining soil humidity, reducing the risks of frosts. As for agro-forestry, that concerns farming an amalgam of annual crops such as cereals and perennial ones such as fruit trees, and this practice is strongly recommended to be included with the advancement of terrace farming. Both ecological and economic benefits can result as local farmers are able to both diversify their crop yield and replenish the nutrients of the land. Positive results of the DESCO project expressed themselves through increases in crop productivity, with a jump of 29% between 1990 (when the project started) to 1998 (when it ended) in the designated region. Crops such as quinoa, potatoes, and sweet peas showed significant increases in production with respective results of 80%, 51.6%, and 33%.

Another sustainable agricultural practice is the "multiple cropping" done by Andean peasants, who combine the planting of native crops and grains such as potatoes, maize, and quinoa with exotic crops like wheat, barley, and rye. Plots of land can be found in many different altitudes, with many varieties of crops in every plot. Crops are combined for many different reasons, with mashua and potato grown together for protection against disease, tarhui (lupine) on the edges of plots to prevent cattle damage, etc. (Salas & Tillman) These practices show that although there have already been consequences from poor management of land in the past, Andean farmers are implementing new methods and practices to alleviate damage and mitigate land degradation with spectacular results.

On the otherhand, in the *selva* regions, the indigenous people that live there have developed their own horticultural techniques. In the past, they led semi-nomadic lives, hunting game and fishing in rivers with abundant supplies. They also utilized an agricultural method known as slash-and-burn (known as *swidden* to them) to develop traditional agricultural fields, which released nutrients into the soil allowing for comfortable farming for up to 2 to 3 years. However, after those initial years, the nutrients are washed away by heavy rains and soil is depleted, causing the natives to relocate to a fresh area. However, in present day, many indigenous people live in large, fixed settlements, no longer moving from place to place. These slash-and-burn methods that used to work so well are now presenting a problem. Their new permanent settlements force them to stay in one location, making the natives cut further and further into virgin forest every year. In addition to the increasing rings of disturbed forest, families must travel longer distances, carrying bananas and cassavas back to their settlements, taking up to 2 hours or more (Park). Outside of these personal impacts, the agricultural practices of these indigenous people have resulted in much tropical deforestation and greenhouse gas emissions.

As an alternative to this detrimental farming method, the Acaté Amazon Conservation has started a permaculture farm nearby the villages of indigenous people. Permaculture farms are said to be holistic

systems that are “consciously designed landscapes which mimic the patterns and relationships found in nature, while yielding an abundance of food, fiber and energy (shelter, medicine) for provision of local needs.” (Park) They act as agricultural practices that will not only farm the land and produce higher and more nutritious crop yields, but will also detain deforestation of rainforest by replenishing nutrients in the land, allowing it to be able to continuously produce food instead of being depleted and abandoned. Examples of permaculture in action include the banana circles or basins placed close to homes for easy disposal of kitchen wastes and ashes in the center, which eventually release nutrients to the growing bananas. Chickens, kept near the house, can also add guano or poop as fertilizer. Another instance is the contour swales, which is a contour row cropping system that plants nitrogen-fixing tree species and crops on contour, a level line perpendicular to the hill side, to prevent soil erosion by slowing down the path of water. These practices have been hesitantly adopted by a few indigenous people, and their efforts are slowly bearing fruit. As news of their success with these sustainable agricultural methods circulates, it is hopeful that other groups will also take the initiative for action and mirror these practices.

#### *Other Major Issues That Will Affect Sustainable Agriculture*

Sustainable agriculture is tied into many other areas as well. For example, irrigation is one of those factors who are closely intertwined with implementation of sustainable agricultural methods. For areas like the Andean mountains that lack water, it is important to have better irrigation structures that can transport large quantities of usable water from areas inundated with excess such as *selva* and coastal regions. Water can transform dry, arid regions into fertile, arable farmland, increasing the amount of available areas to farm (“Irrigation in Peru”). Sustainable agriculture can then step in and maintain these lands, keeping them fertile and arable with a steady source of water nearby. In fact, the Olmos massive irrigation project is working toward this goal, and is currently underway and will soon be completed. 85% percent complete, this project is to take water from the Huancabamba River and divert it to dry areas, bringing irrigation to 43, 500 hectares, thus increasing the amount of cultivable land by 38,000 hectares (Andina). A whole stretch of new, fertile land will be ripe for the taking, and it is important then to realize that sustainable agricultural methods must be utilized to keep this land in peak condition.

Climate volatility is another factor that plays a close role with sustainable agriculture. Especially in Peru, there is a diverse climate and topography from coastal wetlands to arid deserts to mountainous highlands and to rich rainforests. These different climates all pose their own specific problems that differ from area to area, requiring a detailed attention to different land and soil types. Sustainable agriculture can help maintain the lands in these different climates, causing only minimal interference on the behalf of natural ecosystems and terrain (“Maximizing Resilience to Minimize Vulnerability”). Moreover, recent climate changes have started to occur, posing a major problem for many indigenous communities. Less rain is falling, more wind is present, and the bitter morning cold varies greatly with the scorching afternoon sun. “The weather changes very suddenly and it may rain at any time,” says Chiquenayra-Quispe, a local weatherman (Caramel). Such volatile climate change poses an even greater need for the usage of sustainable agriculture, as it is necessary to take every preventive step to protect the land, especially during these unpredictable situations. Sustainable agriculture can also prepare us for drastic, unexpected climate fluctuations by keeping our land under high maintenance.

#### *Recommendations for Effectively Addressing Sustainable Agriculture*

Clearly, the need for effective methods for sustainable agriculture exists, so that agrarian Peruvians can maximize the potential of their land and increase crop yield. The best way to increase usage of sustainable agricultural methods is through efficient use of nitrogen fertilizers which can augment crop production, efficient water-use – making sure that all land is fertile and appropriately humid, careful disease and pest control – watching out for pathogens that may attack crops and livestock and weeding out invading plants, maintaining and restoring soil fertility, and sustainable livestock production – careful regulation of grazing patterns to protect land (Cassman, Matson, Naylor, Polasky, & Tilman). However, all these techniques require that the rural and indigenous people of Peru become more well-versed in and more

knowledgeable of sustainable agriculture, so that they too, can develop an appreciation for the land and care for it carefully.

Having these up-and-coming sustainable agriculture techniques is only half of the fight. There is no guarantee that local farmers will willingly adapt to and accept these new methods and technologies, when traditional ways of farming are a much more comfortable option. Adaptation of these farmers is necessary to promote new sustainable development and growth agriculturally, but there are many factors that contribute to the decision of farmers to make the leap of faith. A survey conducted by the Rural Industries Research and Development Corporation identifies three types of farmers: the cash-poor long-term adapters (representing 50% of those surveyed) who actively work to adapt and are usually young, healthy, but cash-deficient, the comfortable non-adapters (25%) who are relatively older and are reasonably well established socially and financially, and the transitioners (25%) who lack access to information and support services, making them incapable of adapting ("Why and How Do Farmers Adapt?"). The 50% who are not adapting or do not have the capability to cause the roadblock in change. Those who are socially and economically comfortable where they are do not feel the need to adapt or simply do not care enough. This kind of attitude can only be dealt with through efficient government policies that instruct and enforce action, causing these people to actually make an effort. The latter group who lacks resources and knowledge must be dealt in a way where their children and adults are provided with agricultural education, that can inform them of ways to make better choices in farming methods. It is also necessary to make sure that this group has the necessary funding and technology at hand to actually implement sustainable agricultural methods (Pretty). Possible cost-effective ideas for such support service are combining families into groups and delegating appropriate resources funded by humanitarian groups or the government, allowing families to rotate supplies and share costs.

A current local project in Peru called Strengthening Sustainable management of the Guano Islands, Isles, and Capes National Reserve System Project for Peru is being headed the World Bank and aims to improve overall management of coastal and marine ecosystems in the Guano Islands, Islets, and Capes National Reserve System. The goal of the project is protect natural areas and the biological diversity of species there. Active in December 6, 2013, this project is supporting agricultural, fishing and forestry while simultaneously monitoring animal production and water supply. If successful, it can be expected that agricultural capabilities in those marine areas will be significantly increased, and species there will flourish, providing a larger source of food and income for Peru as a country.

For communities, national government, and other organizations out there wishing to improve the situation of rural poverty in Peru, it is possible to aid efforts to promote sustainable agriculture in your own way. More news exposure about the agrarian problems that Peru faces today will inform people about the circumstances, and will garner more support for movements. As said before, execution of sustainable agricultural methods requires an understanding of how the land works, and a willingness to protect it. For governments, implementing educational programs concerning these topics would be a wonderful asset to increasing the knowledge about obscure yet relevant subject of sustainable agriculture. And as for the average rural family, attendance of seminars and events where it is possible to glean information about new agricultural methods is helpful in promoting sustainable agriculture. Family members will become more and more familiar with these at-first foreign concepts of land usage, and eventually proper land usage will become second-nature. Of course though, disseminating is a slow process and people are likely to resist foreigners, or those who they are unfamiliar with, telling them what to do. It would be helpful to bring in other already successful groups such as that have integrated sustainable agricultural techniques and have them be present during such informational sessions to gain the trust of local farmers. Their live testimony and existing proof of success will be more effective than speculative talk (Pretty).

Another way to parse out information effectively is to target the women of Andean communities. These women are often key supporters in their families, doing a variety of duties from aiding her husband to

overseeing crop planting to keeping the household running. Such women are actively involved in agriculture and if educated appropriately, can start causing immediate changes in the way that they work. These women are also likely to be more open-minded than their domineering husbands, as they are more used to deferring to authority and will have a sense of appreciation for thoughts of others, thus being more responsive to differing points of views. Such women can also then propose ideas to their husbands and slowly, but surely convert their households to a more environmentally beneficial agricultural approach.

### *Conclusion*

Agrarian communities in Peru are spread out across three different topographical regions: the mountainous sierras, the tropical *selvas*, and the coastal wetlands. Each have their own characteristics, standing out from one another in agricultural capabilities. In the coastal areas, arable land is abundant, and much of the wealthy are situated there. Whereas in the *selvas* and sierras, there are respectively, indigenous people and rural subsistence families. The highlands in particular lack arable land and a steady supply of water, resulting in extreme levels of poverty and malnutrition there. Unfortunately, this disparity in circumstances results in an inherent inequity between coastal urban areas and rural mountainous regions. To deal with this problem of limited arable land, it is necessary to turn to the use of sustainable agricultural methods. Through the use of various methods, land can be utilized in a more efficient, ecologically-sound manner and its full potential can be reached. Crop production can maximize, and environmental degradation is prevented. Less time can be spent on agriculture then, and more time can be utilized toward education and obtaining adequate nutrition. In a country whose economy is quickly climbing up the ranks, Peruvians have the potential to turn their country into a formidable international player with their wealth of natural resources. Through the techniques of sustainable agriculture, resources can be utilized in the most efficient manner possible and Peru truly can become a formidable force.

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