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Peru: The expansion and adoption of sustainable irrigation methods

Following the endeavor to diversify the Peruvian economy, the agricultural sector of Peru has undergone considerable stress and emphasis causing it to transform the traditionally extremely arid land between the Pacific Ocean and the Andean foothills into bountiful farmland. This transformation, along with the entirety of Peru's agricultural boom, has been possible through the exploitation of water resources: resources such as tropical glacier melt water, the Piura River, and the Ica Aquifer. The abundance of Peru's water resources is reinforced by Julio F. Alegría, M. Sc., Director of Rural Water Supply and Sanitation Project for Southern Andes of Peru, in a 2007 essay, in which he writes: "Peru is an endowed country in terms of freshwater resources, with 2,046, 287 Mm3 or 77,534 m3/person-year. This ranks Peru as the 17th country of the world in terms of water availability per capita." (Alegría 5) While water is abundant nation wide, "Peru is ranked among the 30 countries confronting with the most severe water stress and scarcity (Ohlsson, 1999)" (Alegría 5). Also, agricultural production has been recently developed in the dry, arid regions of Peru, which are also water scarce. Water scarcity not only affects food security by threatening Peru's agricultural production, particularly in dry, arid regions but also by creating conflict: the international anti-poverty organization Oxfam published in their report "Water Faces New Challenges: Actors and Initiatives in Ecuador, Peru and Bolivia" that "nearly 50 percent of the 218 social conflicts recorded by the national ombudsman's office as of February 2009 were triggered by socio-environmental problems, many of them related to water management issues" (Rosales). This conflict in conjunction with water scarcity and low economic opportunity is leading to mass migration to cities and the coast, worsening already present urban water problems, such as limited availability of potable water, to an even greater extent. While Peru is endowed with abundant water resources and has had massive irrigation projects, such as the PES Program of the Subsectorial Project on Irrigation (PSI) partially funded by the World Bank, in conjunction with great agricultural emphasis, "agricultural land is only 4.3% of its territory, with some 5.5 million ha in use, of which 3.75 million ha is under rainfed agriculture and 1.75 million ha with irrigation infrastructure" (Humanchumo, Pena, Silva, and Hendriks). With about 68% of all currently farmed land without irrigation, agricultural production is not reaching its true potential and the families farming that land are less able to escape poverty. The link between irrigated farms and poverty is made clear in Hussain and Hanjra's Irrigation and Poverty Alleviation Study: "studies unfailingly document evidence of lower poverty rates in irrigated than rainfed environments…Poverty incidence in 20-30% lower in most irrigated settings" (Hussain and Hanjra). The link between irrigated lands and greater agricultural output can be seen in Peru today: "irrigated valleys of the coastal belt…account for 60 per cent of agricultural output" (IFAD), whereas the mostly non-irrigated Andean Highlands only account for twenty five percent of agricultural output. If irrigation were to be more widespread in Peru, agricultural output would increase, which would cause poverty to decrease leading to greater food security.

Agriculture accounts for nine percent of Peru's Gross Domestic Product (GDP), but employs thirty percent of Peru's workforce (IFAD). While the part that agriculture plays in context to other sectors in Peru's economy is small, the amount of people that it employs makes it a vital sector of Peru's economy. The majority of farms are small; in the Sierra, sixty three percent of the 1.2 million farms are only less than three hectares in size (IFAD). The typical rural farm family in Peru lives and works a small farm without irrigation. They also produce "basic food crops at a subsistence level" (IFAD) and do not have access to essential services. Therefore, a majority of individuals in rural areas live in poverty (IFAD); the number of rural poor amount to about 4,475,689 people. Irrigation is key to breaking the cycle of poverty, especially on small farms, and thus is essential to alleviating food insecurity as well. Small farms already have a limited output due to the land available, but with irrigation the output of even the smallest farm can be increased. While increasing the amount of irrigation among subsistence farms in Peru is essential and the ultimate way to increase food security, all irrigation systems and methods must be sustainable in practice and design. Sustainability is paramount if irrigation is going to be spread, because already “80% of total water use satisfies agriculture, largely for export” (ICIWaRM). With the essential components of sustainable practice and design, the irrigation systems of Peru will manage water so that there is enough water for all farms to use, with water still available for other uses as well. Therefore not only will food security increase substantially, particularly among the rural poor, but water scarcity will decrease.

The history of irrigation in Peru is extensive and ancient, dating back to the times of the great Inca and Huari civilizations. Some modern villages, like that of Huaynacotas (Trawick), still use the ancient methods of irrigation. These ancient methods consist of communal spring fed reservoirs and gravel lined canals, which carry water down the sides of the mountains onto terraced farmland. While some villages continue to rely on traditional methods of irrigation, prosperous commercial farms have embraced newer methods of irrigation based on recent advances in technology. While ancient and modern methods of irrigation are being used often adjacent to one another, in order to truly combat the poverty common in arid Peru, subsistence farmers will need to combine modern, even rudimentary technology and traditional methods. In the coastal deserts the new method of water collection of “Fog Catching” is allowing villages to collect the water found in the fog onto nets and then transport the collected water into communal reservoirs (Fields). Successful “Fog Catching” Projects can be seen in Bellavista, ten miles from Lima. The water collected from the nets, which can be more than 150 gallons from a single net, is used to grow Tara Trees, which produce fruit used to treat leather. The sales from the fruit have not only produced income for the village, but have also paid for the maintenance of the Fog catching nets and the fruit trees will soon begin to catch water themselves. Fog catching nets, however, cost thousands of dollars and require hard labor to set up. In order to finance the expansion of this new technology, Non-Government Organizations, (NGOs) like that of the Canadian organization of FogQuest, should work with the National Board of Users of Irrigation Districts of Peru (JNUDRP), and the National Water Authority (ANA). Ever since the completion of Peru’s Shared Vision Planning Project by the International Center for Integrated Water Resources Management under the auspices of the United Nations Education, Scientific, and Cultural Organization, the ANA has been the central power of water management in Peru with the passing of a new water law in March of 2009. Upon its founding, the ANA was given $40 million USD in loans, with the World Bank and the Inter-American Development Bank each providing half of the money. With such a large fund, the ANA has the financial resources to implement a project or plan that would spread the use of Fog Catching Nets among the poor, rural communities that occupy Peru’s driest regions. While the method of collecting fog is a modern concept, the technology required to build the nets is rudimentary: plastic nets designed for fruit trees and wooden poles. However, with proper investment in research, nets could become far more advanced, allowing for an even greater amount of water to be collected per net. Some research into fog catching nets, particularly the use of different materials for nets, has already been conducted at the Massachusetts Institute of Technology (Sutter).

Once collected, the water collected by the current model of “Fog Catching” nets is transported down a pipe to a communal reservoir of water, built of bricks and stone. The communal reservoir is an ancient method of managing water, used by Peru for thousands of years, and when combined with modern methods of irrigation, like that of fog catching nets, water scarcity is properly overcome and villages can prosper. This combination of old and new is spreading quickly, as good ideas often do, and with proper encouragement, management, and funding from the ANA and NGOs “Fog Catching” will help more lands become irrigated. Part of the encouragement to spread this new way of irrigation should come from Peru’s government or elsewhere in the form of insurance. In June of 2003, the Peruvian Government formed the Agricultural Insurance Commission, the CNSA, in order to introduce and expand “agricultural insurance so as to permit diversification into more profitable but riskier crops” (World Bank). While new forms of irrigation would not fall under the CNSA mission, some other type of insurance program should be set up so that newer, sustainable forms of irrigation can be set up without worry to the one taking the risk on sustainable agriculture: the farmer. Such insurance programs could include index or coupon policies. “Index or coupon policies use a meteorological measurement as the trigger for payments” (Spore) and are relatively simple and easy to understand, for those who are not financially literate. In other words, many of the Peruvian rural poor would be able to understand how their own insurance policy works. Index or coupon policies of insurance, however, are mainly offered for crops. If insurance for new sustainable irrigation methods was to be offered as part of an index or coupon insurance policy protecting crops, sustainable, protected irrigation could be part of a policy for crop insurance. Without worry and with insurance, farmers will be able to adopt more sustainable, efficient irrigation systems and conserve more water while being able to grow more crops and make more money. Funds for such an insurance program could come from the NGO providing the irrigation systems or nets, the Peruvian Government, or a Microfinance Institution (MFI). A majority of insured Peruvians get their insurance from an NGO or MFI (PlaNet Finance & PlaNet Guarantee), but insurance is offered through the state, particularly in the form of health insurance and social security “through public companies such as EsSlaud and the ONP (Office of Social Security Contribution), or through total or partial subsidies for sectors for lower incomes” (PlaNet Finance and PlaNet Guarantee). Despite the predominance of NGOs and MFIs in micro-insurance, the state should still support an irrigation insurance program whether it is attached to a crop insurance plan or not; government support of an insurance program or initiative would allow it to spread more quickly and expand at a more rapid rate. Therefore, NGO, MFI, and government cooperation is ultimately required. Many options exist for a sustainable irrigation insurance plan with cooperation among NGOs, MFIs, and the government. One option is found in New Zealand (Henderson): the New Zealand government, to save money on social service costs, has contracts with certain NGOs in exchange for the providing of social services. If such a plan were to be implemented in Peru, NGOs would receive state funding in exchange for establishing sustainable irrigation systems on small farms with insurance plans. Another such option involves the utilization of the bureaucracy of water governance in Peru; as part of a Farmer Protection Program, the state could encourage microinsurance products for farmers through the use of rural water associations. Beginning in August of 2008, La Positiva, a Peruvian insurance company that offers agricultural insurance, made “use of the irrigation service network to distribute its products” (Microinsurance Innovation Facility) of life insurance by not only using contacts of the associations, but also by paying the JNUDRP “five percent for the sale of the microinsurance product” (Microinsurance Innovation Facility). Yet another option for an irrigation microinsurance project with state support could be modeled after Oxfam America’s program called the Horn of Africa Risk Transfer for Adaptation (HARITA). HARITA offers weather insurance for crops, but offers two options to pay for premiums: money or labor. If farmers choose to pay with labor, they work on irrigation projects for the community. Ethiopia’s Ministry of Agriculture encourages the program and aims for all farmers to have insurance (Kebede). A program in Peru could offer the option of labor as well as a means of paying for premiums; this would allow those who could not afford the premiums to participate in an insurance program to get insurance and subsequently create or have sustainable irrigation. Fortunately, the state of Peru is one of the few states to have explicit microinsurance legislation, starting with SBS Resolution number 215-2007 passed in February 2007 (PlaNet Finance and PlaNet Guarantee). With such a ready environment for further development in the microinsurance sector, the option of state supported microinsurance in agriculture to encourage sustainable irrigation technologies and techniques is full of many choices of implementation and success.

While some lands require new systems of irrigation, other lands are home to large commercial farms with irrigation systems dependent on technology and over exploited water resources. If more irrigation is needed, current irrigation practices and technology need to be more efficient and utilize every drop of water. In the Palpa Valley, a study was conducted around 2007, by Ralf Hesse and Jussi Baade of Friedrich-Schiller-Universitat, that concluded that there was irrigation-related sedimentation in the valley: “case study A results in a minimum sedimentation rate of 1.4-2.5 mm per irrigation season” (Hesse and Baade). This rate of sedimentation is caused by the use of sediment-laden river water by irrigation. While the study was only conducted five years ago in the Palpa Valley of southern Peru, sedimentation is a current problem faced by irrigation systems all over Peru, particularly because of the state of most of the water in Peru: most of Peru's water is laden with sediments, often due to the mining exploits that are so common in Peru (Bebbington and Williams) and because of sediment runoff from other farms going into the rivers. Sedimentation has many negative effects, such as taking away nutrients and degrading fish habitats (Shock and Welch), but the most important effect to the agricultural sector is that of making irrigation schemes fail in their entirety: "Irrigation schemes can fail if the sediment load of the water supply is higher than the capacity of the irrigation canals to transport sediment" (FAO). True, sedimentation has some positive effects like that of new sources of nutrients for some farms, but for other farms sedimentation also means that sediment is running off carrying nutrients essential for plant growth and reducing soil levels. In order to control sedimentation and to increase the sustainability of irrigation, once again new methods of irrigation must be encouraged and efficiently used. One such method of irrigation that should be encouraged is a Tailwater Recovery System with a Sedimentation Pond.

Tailwater Recovery Systems "reuses irrigation water runoff on the farm. One type of tailwater recovery system involves the use of a sedimentation pond. Irrigation runoff water is directed to a pond, sediment is allowed to settle out, and the water is then returned to the irrigation system. Sediment is periodically removed from the pond and returned to fields" (Shock and Welch). By using a Tailwater Recovery System with a Sedimentation Pond, less water would need to be withdrawn to water fields, some sediment could be reused as fertilizer, and less sediment would be discharged from farms into rivers. Tailwater Recovery Systems with a Sedimentation Pond do require a buried pipeline that carries tailwater to the sedimentation pond and a motor and a pond to pump water from the pond back into the irrigation system. These new additions would amount to considerable costs, but would save money in the long run by reducing the amount of water needed to water fields and the amount of fertilizer needed for fields. In addition to Tailwater Recovery Systems with Sedimentation Ponds, "Sediment excluders/extractors at the headworks of irrigation systems can mitigate this effect to some extent" (FAO) and therefore should be installed. By using the technology of the sediment excluders/extractors along with the addition of a Tailwater Recovery System with a Sedimentation Pond, irrigation systems used by commercial farms would be more efficient. Other efficient, innovative methods of irrigation have been previously proposed, like that of Drip Irrigation. Drip "or micro-irrigation, technology uses a network of plastic pipes to carry a low flow of water under low pressure to plants" (Wilson & Bauer); by using low pressure, water is delivered in a very efficient way which ultimately reduces the total amount of water needed to grow crops. Drip Irrigation, however, has been slow to catch on due to its cost (Schmall). To encourage the adoption of innovative systems, the insurance program proposed for the adoption of sustainable irrigation systems for rural, poor farmers should also be extended to commercial farmers or a separate incentive program should be set up for commercial famers. By providing incentives to commercial farms in exchange for adoption of newer, more sustainable practices of irrigation, commercial farms will be more likely to practice such methods. The incentives offered could be tax breaks or subsidies from the state.

Water scarcity is one of Peru's most critical problems: it is limiting agricultural production, creating social conflict, and contributing to poverty. If water scarcity is truly to be addressed, irrigation should be encouraged to be spread to the small subsistence farms of rural Peru and modified on large commercial farms. By spreading irrigation to rural Peru, water will be more easily accessed and used, allowing for greater agricultural production, greater income for farmers and thus greater food security. While spreading irrigation is the ultimate way to improve food security, all irrigation in Peru must be sustainable and efficient so that there is enough water for all uses. The commercial farms of Peru especially require a sustainable emphasis, which is why new, innovative irrigation systems should be encouraged. If there is to be a true improvement in food security and progress in the UN Millennium Goal of eradicating hunger in Peru, the issues of water scarcity and irrigation must be addressed and understood as implicitly linked.

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