DISTRIBUTIONAL EQUITY IN THE FACE OF SCARCITY:
A case study of irrigating Peru's desert

by

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Water has a "hybrid" nature, meaning it is co-produced by a variety of social processes, which, in turn, are also shaped by the physical hydrology of water. Thus, drought is far more complex than merely the number of gallons of water in an aquifer, and our understanding of it needs to be decentered from hydrology. This research is a case study of an extensive water project in La Libertad, Peru, known as Chavimochic, in an effort to determine what factors (other than hydrology) influence allocation of water. The primary research question asked: Do capital-intensive water projects like Chavimochic actually further exacerbate power inequalities as protectionists argue, and if so, how do the interplay of the various forces driving Chavimochic and the resulting asparagus industry, affect Chavimochic's ability to relieve rural poverty? The role politics plays in influencing water projects is widely acknowledged, and was found to be a factor in Peru as well. Additionally, the study argues that three factors have been undervalued and overlooked in understanding equitable water distribution: land holdings, technology, and labor dynamics.

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Introduction

"The Drought Isn't Going Away. What You Can Do" reads the headline of a New York Times article from October of 2016—the middle of the most severe drought California has experienced in the last century.[1] Analysis using NASA satellite data estimates that California's aquifers are so over-exploited that it would take 11 trillion gallons to replenish them—around 1.5 times the largest reservoir in the United States.[2] Governor Jerry Brown declared the drought a state of emergency two years prior, in January of 2014, and only recently ended it in April 2017. "Take shorter showers," the article plead, "reuse wastewater" and "improve efficiency"—the age old classics of water conservation. While these domestic-oriented, quick-fixes did reduce California's water use by more than 22 percent between 2015 and 2017, such advice overshadows systemic issues which shape the politics of drought far more than household practices. Droughts are a fundamental characteristic of the arid climate; as Zilberman et al. (2014) note, "California is basically a desert state that invented itself by water."[3] Nonetheless, the state is America's largest agricultural producer and allocates 80 percent of their total water supply to the agricultural sector.[4]

Peru, too, devotes 80 percent of their water resources to the agricultural sector, despite the fact that its most densely cultivated regions are arid deserts much like

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[1] Daniel Griffin and Kevin J. Anchukaitis, "How Unusual Is the 2012-2014 California Drought?," *Geophysical Research Letters* 41, no. 24 (2014); Mike McPhate, "California Today: The Drought Isn't Going Away. What You Can Do.," *The New York Times* 2016.
[2] NASA, "Nasa Analysis: 11 Trillion Gallons to Replenish California Drought Losses," *National Aeronautics and Space Administration* (2014).
[3] David Zilberman et al., "Individual and Institutional Responses to the Drought: The Case of California Agriculture," *Contemporary Water Research and Education* 121, no. 1 (2011).
[4] Ibid.

southern California.[5] In an effort to expand farmland and increase productivity, Peru began an extensive irrigation project in the coastal region of La Libertad in 1986. The project, though not yet finished, has created an economic boom in the region by providing jobs, electricity, potable water, and irrigation to over 74,000 hectares. Yet, improved access to water has not entirely won the region's fight against drought nor poverty. This is because access (or lack of access) to water is not merely a product of environmental processes, of precipitation and temperatures; rather, water availability is actively shaped by human consumption patterns and political ideologies.

Water has a "hybrid" nature, meaning it is co-produced by a variety of social processes, which, in turn, are also shaped by the physical hydrology of water.[6] Thus, drought is far more complex than merely the number of gallons of water in an aquifer, and our understanding of it needs to be decentered from hydrology. A growing body of literature has recognized this "hybrid nature" of water and thus emphasized the need to address underlying power dynamics such as political and economic influences in order to understand not only drought, but also equitable water distribution in general.[7] While

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[5] Douglas Olson, "Recursos Hídricos," in *Peru: La Oportunidad De Un País Diferente: Próspero, Equitativo Y Gobernable* (Washington, DC: World Bank, 2006).

[6] Jessica Budds and Leonith Hinojosa, "Restructuring and Rescaling Water Governance in Mining Contexts: The Co-Production of Waterscapes in Peru," *Water Alternatives* 5, no. 1 (2012); Mark Carey et al., "Toward Hydro-Social Modeling: Mergin Human Variables and the Social Sciences with Climate-Glacier Runoff Models (Santa River, Peru)," *Hydrology* 518 (2014).

[7] Rutgerd Boelens and Jeroen Vos, "The Danger of Naturalizing Water Policy Concepts: Water Productivity and Efficiency Discourses from Field Irrigation to Virtual Water Trade," *Agricultural Water Management* 108 (2012); Budds and Hinojosa; Jeffery Bury et al., "New Geographies of Water and Climate Change in Peru: Coupled Natural and Social Transformations in the Santa River Watershed," *Association of American Geographers* 2, no. 103 (2013); Carey et al; Barbara Lynch, "Can the Technocrats Calm Peru's Troubled Waters?," *NACLA Report on the Americas* 47, no. 4 (2015); Lyla Mehta, "Water and Human Development: Capabilities, Entitlements and Power," in *Background Paper for the 2006 Human Development Report 'Beyond Scarcity: Power, Poverty and the Global Water Crisis'.* (New York: United Nations Development Programme, 2006); Erik Swyngedouw, "Modernity and

these two factors are integral to understanding water distribution, three factors have been undervalued and overlooked: land holdings, labor supply, and infrastructure. In order to understand how these three factors play a role in water distribution, section one describes the case study, problem and research questions. Section two lays the analytical framework for the study by illustrating the ways in which politics and, of course, hydrological processes determine water policies. Section three delves into the three more nuanced determinants of land holdings, technology, and labor supply, with regard specifically to the case study. Lastly, the discussion addresses how these three factors can deepen our understanding of not only agriculture in arid regions, but of equitable water distribution especially in times of drought.

Case Study: La Libertad, Peru

The Chavimochic water project in Peru functions as a case study through which to illustrate how land holdings, technology, and labor supply impact water availability and distribution, especially in times of scarcity. The immense irrigation project, known as Chavimochic, spans more than 280 kilometers along the north-western coast of La Libertad. The project diverts water from the Santa River, which runs along the southern Ancash-Libertad boarder, via the mother canal to pipe water northward into four valleys: Chao, Virú, Moche, and Chicama (hence the name Cha-Vi-Mo-Chic).[8] Each of these valleys is sustained by their own respective rivers and agriculture has been present

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Hybridity: Nature, Regeneracionismo, and the Production of the Spanish Waterscape 1890-1930," *Association of American Geographers* 89, no. 3 (1999); *Social Power and the Urbanization of Water: Flows of Power* (New York, New York: Oxford University Press, 2004); "Power, Water and Money: Exploring the Nexus," *United Nations Development Report Background Paper* 14 (2006); "The Political Economy and Political Ecology of the Hydro-Social Cycle," *Contemporary Water Research and Education*, no. 142 (2009).

[8] See Figure 1.

along these river channels for millennium. Nonetheless, Peruvian engineers and agriculturists had dreamt of turning the sand and scrubs outside these traditional valleys into productive farmland as far back as 1910.[9] The region is prone to floods and droughts due to El Niño and support for the project fluctuated along with the droughts. For example, in the summer of 1985, one year before the project officially began construction, the region was hit with a severe drought which limited irrigation in the four valleys of Chao, Virú, Moche, and Chicama. The Trujillo-based newspaper, *La Industria*, noted that during this drought the Chicama river flowed at only 24.2 cubic meters—225.6 cubic meters less than the previous year at the same time—which reduced agricultural productivity approximately fifty percent.[10] Conversely, in the winter of 1985, despite the oncoming drought, the city of Chimbote was flooded from irrigation overflow in the Santa district—a direct consequence of water mismanagement.[11] The floods, like previous natural floods from El Niño, increased malaria outbreaks and other water-borne diseases since the standing water attracted mosquito hatchings, thus turning an environmental crisis into a public health crisis as well.[12] As a response, editorials in *La Industria* expressed support for Chavimochic as a way to regulate water flow and mitigate the most severe impacts of droughts. Humberto Landeras Rodriguez wrote: “With faith and hope we can fight together [as La Libertad

[9] Mark Carey, "Watering the Desert, Feeding the Revolution: Velasco's Influence on Water Law and Agriculture on Peru's North-Central Coast (Chavimochic)," in *The Peculiar Revolution: Rethinking the Peruvian Experiment under Military Rule*, ed. Carlos Aguirre and Paulo Drinot (Austin, Texas: University of Texas Press, 2017).
[10] La Industria, "Aguas de ríos no alcanzan para riego de las tierras," *La Industria* 3 March 1985.
[11] Ibid.
[12] Luis Chuquipoma Muñoz, "Detectan 38 casos en valle Chicama," *La Industria* 1985.

citizens] for a great economic transformation which the region badly needs via this important irrigation project [Chavimochic]."[13]

Though the project was officially designated funding in 1980 (US $300 million over the course of twelve years), construction did not begin until 1986, urged on by droughts and water mismanagement.[14] Construction was divided into three primary phases: Phase I and II planned to improve or newly irrigate over 46,000 hectares in the valleys of Chao, Virú, and Moche; Phase III plans to improve or newly irrigate an additionally 63,000 hectares and construct the Palo Redondo Dam in an effort to further reduce natural variability and regulate water supply.[15] The first two phases concluded in the mid-1990s, while Phase III began in 2013 and is still underway as of 2017.

Such massive land expansion facilitated La Libertad's transition from a region of sugarcane *haciendas* and smallholder farmers, to industrial, export-oriented agricultural production. In fact, prior to the construction of Chavimochic, La Libertad exported an average of $45 million a year in agricultural products, which has since risen to over $550 million annually.[16] Asparagus has become a dominant crop in the region due to favorable environmental conditions and high international demand. As a non-traditional crop, it was a rarity on Peruvian farms when construction of Chavimochic began: the nation as a whole produced roughly 17,000 tons in 1986, but within ten

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[13] Humberto Landeras Rodriguez, "Sequia en el norte y el Proyecto Chavimochic," *La Industria* 20 December 1958.
[14] El Presidente de la República, "Ejecutarán Proyecto Hidroenergético Chao Virú, Moche Y Chicama," *Decreto Ley N. 22945* (1980).
[15] Proyecto Especial Chavimochic, "Infografia De Proyecto Chavimochic - III Etapa," *ProInversión*.
[16] "Boletín No. 86 Año X," *Oficina de Relaciones Públicas* (2011).

years, production increased 86% to over 127,000 tons.[17] Today, Peru is the world's top exporter of fresh and preserved asparagus, of which, 51% is grown in La Libertad.[18]

Problem

While asparagus production generated a revenue of over $411 million dollars in 2013, the largest 50 companies shared 95 percent of the export value, thus effectively concentrating the wealth in the hands of agro-industrialists.[19] Chavimochic reports typically state that their main goals are to: a) increase irrigation, which, in turn, will b) increase agricultural production and specifically agro-industrial exportation, which, subsequently, will c) boost economic productivity and raise the standard of living for inhabitants of the entire region. Specifically, Chavimochic's 2012 report published by the lead engineer, José Murgia Zannier, firstly emphasizes the need to expand irrigation and agro-industrial exports and lastly adds, as almost a side-thought or even a as a consequence of the agro-industry, that the project aims to "improve the living conditions of the inhabitants in the urban and rural sectors of the Region La Libertad."[20] In short, improving the living conditions and reducing poverty in the region relies on the assumption that the wealth generated by the largest agro-industrial corporations will trickle down to the reset of the population.

Even the original plans from the 1960s were heavily biased toward favoring economic productivity at the expense of equity. James Kus, in his 1987 study, argues

[17] Food and Agriculture Organization, "FAOSTAT: Crops Visualize Data," *FAO*.
[18] Ministerio de Agricultura y Riego, "El Sector Agrario Del Esparragos," *Ministerio de Agricultura y Riego*.
[19] Luz Días Rios, "Agro-Industries Characterization and Appraisal: Asparagus in Peru," *Food and Agriculture Organization of the United Nations*, no. 23 (2007).
[20] José Murgia Zannier, "Proyecto Especial Chavimochic," *Gobierno Regional de La Libertad*, (2012).

that the original vision of Chavimochic in 1961, as drafted by the Santa Corporation, was specifically designed to "benefit the elites of the region by improving the supply of water available to the large sugar estates and by the creation of many new *latifundias* in the new agricultural zones. The small farmer…was relegated to marginal lands in the Santa Corporation's version of the project."[21] Later that year the plan was reviewed by American engineering company Radar and Associates to determine the necessity and feasibility of the preliminary plans. Radar and Associates concluded that the project was of "extreme importance" and should be immediately funded by loans from U.S. sources on the condition that the mechanization of large farms (rather than small ones) would be the priority:

> "While there is probably a need for small farms, it is our view that the real hope of efficient production and the improvement of the living standard of the area lies in the mechanization of the farms ....The smallest farm that can be efficiently mechanized is about 28 hectares. However, with this equipment the same farmer can efficiently farm 50 hectares. The next larger mechanized operation requires a minimum farm of about 41 hectares, but will be more efficiently operated with 100 hectares except in those areas of steep slopes where small farms of 6 1/2 to 10 hectares will be provided."[22]

In this sense, Radar and Associates and the Santa Corporation were correct: large, mechanized farms are far more productive than small ones. In fact, it is Peru's continual progress toward large, mechanized farms that permitted them to become the largest asparagus exporters in the world: Peru's yields (as of 2014) are 1.5 times greater than their closest competitor, Mexico, and nearly 4 times greater than the world average.[23] Back in 2003, the director of the water project, José León Rivera, emphasized this need for privatization in order to increase productivity: "within the third phase…we have

[21] James S. Kus, "Chavimochic: A Peruvian Irrigation Project," *Conference of Latin Americanist Geographers* 13, no. 1 (1987).
[22] Ibid.
[23] Food and Agriculture Organization.; See Figure 3.

55,000 hectares of land, but only 7,000 hectares are actually cultivated. This is a great shame."[24] He goes on to suggest that in order to increase productivity, not only does Chavimochic need to expand irrigation, but the regional and federal government also need to legally support private investments and increase security for private owners. Similarly, the Union de Banco International expressed their continued support of the project in 2003 by saying that "the solution to the socioeconomic problems of the region depends, directly, on the immediate implementation of the irrigation project Chavimochic."[25] Thus, Chavimochic itself relies on the principles of trickle-down economics in order to distribute wealth throughout the region—which is inherently problematic since trickle-down economics has repeatedly proven to be an ineffective way to alleviate poverty.

The emphasis on economic and agricultural productivity overshadows issues of social justice and the subtleties associated with water distribution by focusing on a select few corporations or elite individuals in the hopes that benefits will trickle down to the rest of the population. For example, Chavimochic reports that they have benefited more than 166,000 families to date by providing potable water, jobs, and electricity—all of which have raised the standard of living in the region.[26] Yet groups such as peasant farmers and the landless poor, who have been traditionally marginalized, continue to be disadvantaged. In short, while Chavimochic has brought undeniable benefits to the region, it has done so within the framework of preexisting power dynamics, thus

[24] José León Rivera, "Se debe ampliar frontera agrícola para el Proyecto," *La Industria* 3 August 2003.
[25] Eduardo León Legendre, "Chavimochic: responsibilidad de todos los Liberteños," ibid. 7 August 2003.
[26] Chavimochic, "Chavimochic En Cifras 2000-2010," *Trujillo: Gobierno Regional La Libertad* (2012).

replicating and even exacerbating inequalities in some situations. The wealth and prosperity that the project claims to have generated for the region has not been equitably distributed via the trickle-down effect. Instead, *who* is included as a beneficiary of the water project depends in part on land holdings, technology, and labor supply since they impact how users experience water distribution and the associated benefits.

Research Questions

Do capital-intensive water projects like Chavimochic actually further exacerbate power inequalities as protectionists argue? If so, how do the interplay of the various forces driving Chavimochic and the resulting asparagus industry—which at some points are a conflict between state-directed projects and neoliberal privatization—affect Chavimochic's ability to relieve rural poverty?

Methods

This study draws on primary sources such as the Food and Agriculture database, World Bank reports, legal documents produced by the Peruvian government, newsletters from Chavimochic, the water project, and archived newspapers from Peru, in order to understand how the variety of forces have shaped the project. Secondary sources were drawn on to build the analytical foundation for understanding water as more than a physical process, and to reconstruct some of the social impacts of the project.

The Traditional Lens

1. Environment

Of course, water *is* a hydrological process—asparagus cannot be grown in a desert without it—but the role of hydrology needs to be decentered from understanding water policy, access, and distribution. Peru perfectly exemplifies the fact that human water use—more than physical availability—determines water access: it has more fresh water per capita than anywhere else in South America, yet is the continent's most water-stressed country.[27] Such a dichotomy supports the idea that water availability is not solely dependent on physical hydrological processes, but rather co-produced through social and political institutions that determine distribution. In fact, Mehta (2006) argues that water scarcity is not a natural phenomenon, but rather is "generated through socio-political processes, through exclusions, biases, discrimination."[28] Granted, Mehta acknowledges that physical scarcity can and does exist, but it is not the *only* form of scarcity, nor even the most common. She defines three other categories: economic scarcity occurs when infrastructure is poorly managed and distributed; adaptive-capacity scarcity is driven by overconsumption and wasteful practices; and lastly, scarcity arising through socio-political processes is a product of distribution inequalities.[29] Peru specifically, has experienced all four forms of water scarcity. To name just a few examples, Chavimochic was undertaken in an effort to reduce physical scarcity; the project was then opened up to the private sector and decentralized in order to improve efficiency and resolve economic scarcity; industrial agriculturists were

[27] Olson; Anthony Bebbington and Mark Williams, "Water and Mining Conflicts in Peru," *Mountain Research and Development* 28, no. 3 (2008).
[28] Mehta.
[29] Ibid.

favored over smallholders for water allocation as a way to minimize waste and resolve adaptive-capacity scarcity; and lastly, land titling and the designation of water blocks was undertaken to minimize socio-political scarcity by redistributing resources. Since the ways in which water is used and perceived in everyday contexts varies greatly from that of a spiritual life-force to an economic good, it a difficult item to commodify. Thus, the term "waterscape" was proposed by Budds and Hinojosa (2012) in an effort to encapsulate water in terms of all its social, political, economic, and cross-temporal factors, rather than merely physical characteristics.[30]

2. Politics

In December of 2016, the U.S. District Court for the Eastern District of New York filed a criminal suit against the Brazilian corporation Odebrecht for violating international corruption laws by paying hundreds of millions of dollars in bribes to officials in at least eleven countries.[31] The U.S. Department of Justice found that by 2006 the corporation had created an entire budget devoted solely to bribes, which they referred to as the "Division of Structured Operations" and ran via an independent computer server and offshore bank accounts.[32] Odebrecht plead guilty to criminal

[30] Budds and Hinojosa.
[31] United States District Court Eastern District of New York, Robert L. Capers, and Andrew Weissmann, "United States of America against Odebrecht S.A.," *Title 18, Sections 371 and 3551 et seq.* Cr. No. 16-643 (2016).
[32] United States Department of Justice, "Obebrecht and Braskem Plead Guilty and Agree to Pay at Least $3.5 Billion in Global Penalties to Resolve Largest Foreign Bribery Case in History," *Office of Public Affairs* (2016).

charges and agreed to pay between $2.6 and 4.5 billion—making it the largest anticorruption settlement in history.[33]

In Peru specifically, Odebrecht has a long history of involvement in various sectors, which began in 1988 when the corporation was awarded a concessions agreement in conjunction with Peruvian construction firm Graña y Moreno, and the Peruvian government to begin work on a national water project known as Chavimochic.[34] In conjunction with the federal government, the first two phases were mostly completed by the late 1990s, and bidding reopened for concessions for the third and final phase of the water project.[35] In December of 2013 Odebrecht and Graña y Moreno—registered as Río Santa Consortium—won the bid once again and agreed to co-finance the project by contributing US $341 million dollars of the estimated $715 needed to complete the project.[36] The bid, which beat out European firms like Avengoa and Mota-Engil, comes as no surprise considering that Odebrecht recently plead guilty to paying $29 million in bribes to Peruvian officials between 2005 and 2014.[37] And the bribery goes back even further. Peruvian investigative journalist Melissa Pérez Huaringa found evidence that Odebrecht did, in fact, resort to bribery to win the first

[33] United States District Court Eastern District of New York, "Plea Agreement United States of America against Odebrecht S.A.," *Cr. No. 16-643* (December 2016); Nicholas Casey and Andrea Zarate, "Corruption Scandals with Brazilian Roots Cascade across Latin America," *The New York Times* 2017.
[34] Graña y Montero, "Annual Report," (2008): 28.
[35] Gobierno Regional de La Libertad, "Chavimochic Tercera Etapa Primera Fase: Informe Sobre Estudios Del Proyecto Y Gestiones Realizadas Entre 2007 Y 2008 Para Obtener La Declaratoria De Viabilidad," *Unidad Ejecutora 005* SNIP 90449 (2008).
[36] Agencia de Promoción de la Inversión Privada and Gobierno Regional de La Libertad, "Contrato De Concesión: Diseño, Construcción, Operación Y Mantenimiento De Las Obras Hidráulicas Mayores Del Proyecto Chavimochic," *Comité Prointegración de Proinversión* 1 (2013); Renato Mostacero Plasencia, "Proyecto Especial Hidroenergético Chao-Virú-Moche-Chicama (Chavimochic)," *Gobeirno Regional de La Libertad*, Trujillo (2013).
[37] Proyecto Especial Chavimochic, "Empresas Internacionales Interesadas En Iii Etapa Chavimochic," *Boletín Informativo del Proyecto Especial Chavimochic Año XII* 109 (2013); United States District Court Eastern District of New York.

concession for Chavimochic in 1988 as well.[38] Checks show that Odebrecht paid Jorge Ramos Roncero (then-President Alan García's uncle and the lead financer for the APRA political party) $1.8 million for "Proyecto Chavimochic" (see figure 2). And he was just one. Checks written from Odebrecht's "Division of Structured Operations" show 530 Peruvian recipients over the course of the years—all under aliases. Even former President Toledo has been accused of accepting $35 million in bribes during his presidency (2001-2006), which has provoked a Federal Judge in Lima to issue his arrest warrant.[39] Other than a tweet on February 12, 2017, proclaiming his innocence, Toledo has been in hiding.

As for Chavimochic, work halted indefinitely in December of 2016 as the government considered revoking Odebrecht's contract. In a statement to the press, the corporation conceded that, "we will respect the decision of the government and if it is necessary we will sell off all our concessions," thus validating whatever decision the government comes to.[40] Amid investigations and contract negotiations, current President Kuczynski conceded that while he is "completely against corruption, not everything that Odebrecht has done in Peru is corrupt," which holds a grain of truth.[41] Chavimochic would not have been possible without their investments; thousands of hectares of land would still be uncultivated desert, the city of Trujillo would have limited access to potable water, and thousands of individuals would be unemployed.

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[38] Melissa Pérez Huaringa, "Odebrecht Pagó Coimas En El Perú Desde 1988 Por Los Proyectos Charcani V Y Chavimochic," *Gran Angular* 2017.
[39] Casey and Zarate.
[40] Julio Lira Segura, "Odebrecht Paraliza Construcción De Chavimochic Y Exige a Region La Libertad Adenda Por Us $100 Millones," *Gestión* February 2017.
[41] La República, "PPK sobre obras de Odebrecht: 'No todo lo que hizo en el Perú es corrupto'" *La República* 2016.

Thus, as serious as this scandal is, it is not exceedingly surprising considering that the influential role politics plays in water policies globally is widely acknowledged.

For example, Eric Swyngendouw (2004; 2006) argues that access to, or exclusion from, water is primarily determined by power dynamics—whether they be economic, social, or political, though the spheres of influence often overlap.[42] Bridges and Perreault (2009) go so far as to argue that "environmental governance is a concept more popular than precise," by which they mean that environmental issues are inherently driven by socio-political agendas.[43] In fact, politics influences most environmental policies, not just water. For example, Piers Blaikie uses soil conservation policy to show that environmental issues and social systems are intimately interwoven in his book, *The Political Economy of Soil Erosion*.[44] Since environmental policies such as soil conservation *are* political-economic issues which reflect a definite set of assumptions, he argues, "the state is not neutral and cannot necessarily solve soil erosion problems rationally or impartially…there are always winners and losers in erosion and conservation."[45] Similarly, Helen Ingram, argues in her book *Water Politics: Change and Continuity*, capital-intensive water projects have clearly defined "winners" and "losers," based on political and economic power structures.[46] Ingram characterizes case studies of water projects in the American Southwest into two categories of state-directed and decentralized, and found that while the beneficiaries

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[42] Swyngedouw, "Power, Water and Money: Exploring the Nexus."; *Social Power and the Urbanization of Water: Flows of Power*.
[43] Gavin Bridge and Tom Perreault, "Environmental Governance," in *A Companion to Environmental Geography*, ed. N. Castree, et al. (London, UK: Wiley-Blackwell, 2009).
[44] Piers Blaikie, *The Political Economy of Soil Erosion in Developing Countries*, ed. D.J. Dwyer (London and New York: Longman Group Limited, 1985).
[45] Ibid.: 5.
[46] Helen Ingram, *Water Politics: Continuity and Change* (New Mexico: University of New Mexico, 1990): 8.

differ slightly between the two types of projects, the "losers" remain the same: the rural poor, indigenous populations, and often the environment. Thus, capital-intensive water projects serve to further exacerbate preexisting power inequalities by favoring the distribution of water among groups with political and economic power. "Policy design," Ingram concludes, "matters much less to outcomes than policy analysts suppose. The capacity of dominant interests to pursue advantages despite changes in decision making appears to be large."[47] Historian Donald Worster even goes so far as to argue that the capital-intensive water projects of the American West inhibited democracy by concentrating power and wealth in the hands of the elite.[48]

In short, water policies do not exist as neutral concepts: they are the result of particular political ideologies which prioritize certain water users and uses over others. While the recognition of political forces is vitally important in understanding water access, it is not the *only* determining factor. The acknowledgment of the influential role politics plays in capital-intensive water projects—whether it be as explicit as bribery or subtle as biased legislation—answers the first part of my research question: capital-intensive water projects such as Chavimochic reproduce existing power inequalities. Nonetheless, the extent to which they exacerbate power inequalities is determined in part by often overlooked factors such as land holdings, technology and infrastructure, and labor supply.

[47] Ibid.: 24.
[48] Donald Worster, *Rivers of Empire: Water, Aridity and Growth in the American West* (New York: Pantheon Books, 1985).

The Three Key Factors of Water Distribution

1. Land

Land ownership in Peru, like many agrarian countries, has historically created a power dynamic with large private land owners residing at the top of the hierarchy and the landless poor at the bottom. Even though urban migration has increased in recent years, nearly a quarter of Peru's population still lives in rural areas, of which 74% live below the national poverty line and rely on land as their primary resource, highlighting the fact that access to land is still a key factor to reducing poverty.[49] Yet land without water, or water without land, has far less impact on reducing poverty. As Zwarteveen and Boelens (2014) note, "in arid and semi-arid regions the wealth differences between farmers increasingly are as much or more a function of people's differential access to water as they are of differential access to land."[50] Such is the case in Peru: in 1985 Chavimochic engineer Haya de la Torre wrote that the problem in cities is "work or death"; in rural areas the problem was once "land or death" but has more recently become "water or death."[51] Land, of course is imperative to individual's livelihoods in agrarian societies—but land without water, especially in a desert, means nothing. As intensity of agricultural productivity increases in Peru, so too does tension over land and water rights—especially in rural areas where poverty is most widespread.

Therefore, one of Chavimochic's goals is to "improve the living conditions of the inhabitants of in the urban and rural sectors of the Region La Libertad" by providing

[49] INEI, "Censos De Perú," *Instituto Nacional de Estadistica e Información* (2007); The World Bank, "Poverty and Equity Database," *DataBank* (2007).
[50] Margreet Zwarteveen and Rutgerd Boelens, "Defining, Researching and Struggling for Water Justice: Some Conceptual Building Blocks for Research and Action," *Water International* 39, no. 2 (2014).
[51] Hernán Miranda Cueto, "Chavimochic, algo más que una irrigación," *La Industria* 24 March 1985.

access to water for rural populations.[52] Yet, realization of this goal is often undermined by policies favoring large land holdings over smallholders. In fact, almost none of the 54,000 hectares of newly irrigated land has ended up in the hands of small farmers.[53] Instead, 86% of the land is concentrated between 11 agro-industrial companies—one of which, Camposol, owns 23% of the land in the region (more than 10,000 hectares).[54] Even in the traditional valleys where small farmers have subsided for millennia, many have sold their land to large producers in the face of economic pressures. Thus, while Chavimochic reports that they have created more than 65,000 jobs and benefitted roughly 166,000 families, not all of these benefits have reached the rural poor of La Libertad as intended—and even when they do, the benefits are not distributed equally by any means.[55] In short, Chavimochic has improved the standard of living and relieved poverty in many situations via trickle-down economics, but has not done so uniformly nor comprehensively primarily because of unequal land distribution.

Chavimochic Antecedents

Distribution of such a valuable resource as land has been a political issue for decades: the Peruvian government has tried to redistribute and formalize land titles no less than twenty-two times since the Spanish conquest.[56] The most well-known land reform—and one of the most comprehensive in Latin America—occurred under

[52] Zannier.
[53] Ibid.; Plasencia.
[54] Zulema Burneo, "The Process of Land Concentration in Peru," *CEPES Contribution to ILC Collaborative Research Project on Commerical Pressures on Land* (2011).
[55] Gobierno Regional de La Libertad, "Proyecto Especial Chavimochic Memoria," (2013); Plasencia.
[56] Hernando De Soto, *The Mystery of Capital: Why Capitalism Triumphs in the West and Fails Everywhere Else* (New York: Basic Books, 2000): 179.

General Juan Velasco Alvarado in 1969 in an effort to more equitably redistribute arable land. Even though Chavimochic was not implemented by the Velasco administration, the agrarian reform of 1969 paved the way for its construction twenty years later by changing the power dynamics of land ownership, and ultimately, centralizing control.

In the first half of the 20th century, large *hacienda* (plantation) owners controlled roughly 70% of the nation's agricultural land yet comprised merely 0.2 percent of the population, while small farmers represented 83 percent of the population but held only 6 percent of arable land.[57] In an effort to more equitably redistribute land—and power dynamics—Velasco expropriated 7.8 million hectares of land from corporations and *hacienda* owners and transformed them into Agricultural Production Cooperatives (APCs), which were typically owned collectively by former estate employees.[58] The coastal region was particularly transformed from a region dominated by sugarcane estates to APCs. In fact, some of the first estates to be affected were Cartavio and Casa Grande sugarcane plantations in the Chicama Valley.[59] Under the new agrarian law, corporations were prohibited from possessing agricultural lands entirely, and private individuals could own no more than 150 hectares.

The communal ownership of land did not, however, necessarily benefit the rural poor as intended. Firstly, it excluded migrant workers and since the cooperatives were comprised of former *hacienda* employees, the actual number of rural poor remained

[57] Maria R. Saleth, "Land Reform under Military: Agrarian Reform in Peru 1969-78," *Economic and Political Weekly* 26, no. 30 (1991); Burneo.
[58] Melanie S. Tammen, "The Drug War Vs. Land Reform in Peru: Executive Summary," *Cato Institute Policy Analysis* 156 (1991).
[59] James S. Kus, "The Sugar Cane Industry of the Chimcama Valley, Peru," *Revista Geográfica* 109 (1989).

largely fixed.[60] Wages, too, often dropped since prices for agricultural goods were regulated by the government. Rojas Senisse (1989) notes that sugar workers in the Chicama Valley saw a 74 percent decrease in their average pay between 1973 and 1978.[61] Secondly, cooperatives were indebted to the state upon their creation; the State agreed to pay former land owners 50 percent the value of their expropriated land, but the cost was assumed by the cooperatives themselves rather than the State.[62] If a cooperative did not pay annual fees to reduce their debt, the Reform included a provision which allowed the State to terminate the cooperative's contract entirely.[63] Economists John Powelson and Richard Stock argue that although the Reform freed peasants from serfdom of hacienda owners, it indebted them to the State in much the same way.[64] Thus, the Reform merely shifted the power dynamics of land holdings from *hacienda* owners to the State, while peasant farmers remained largely ignored.

Soon after the culmination of Velasco's military government in 1975, the APC's began to break apart into individual holdings of about 6 hectares per family and continued to do so throughout the 1980s.[65] Power dynamics of land shifted once again in the 1990s under neoliberal president Alberto Fujimori, who encouraged private ownership of land by eliminating the cap on maximum size of private land holdings

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[60] Ismael Muñoz Portugal, "Grupos De Regantes Y Acción Colectiva En La Distribución Del Agua En El Valle De Verú," *Debates en Sociología* 34 (2009).
[61] Hugo Rojas Senisse, *Azucar: Crisis Y Alternativa,* Instituto de Apoyo Agrario (Lima, Peru: Gráfica Aurea, 1984): 77.
[62] Saleth.
[63] Senisse: 21.
[64] John P. Powelson and Richard Stock, *The Peasant Betrayed: Agriculture and Land Reform in the Third World,* ed. Lincoln Institute of Land Policy (Boston: Oelgeschlager, Gunn, & Hain, 1987).
[65] Portugal.

(which was previously 150 hectares).[66] In short, the reform of 1969 removed land ownership from *hacienda* owners and gave the State more control over land allotments. Although the arrangement did not last, the dissolution of the cooperatives in the 1980s combined with neoliberal policies of the 1990s created an influx of private corporations looking to buy arable land. In turn, these private companies tended to cultivate export-oriented crops in order to see a return on their capital-intensive investments in land.

Land Distribution

Newly irrigated land was first auctioned off to domestic and international bidders in 1997 and has since sold over 40,000 hectares.[67] Yet despite Chavimochic's goal to reduce rural poverty, smallholders have been largely excluded from purchasing new lands because, while the price of the land itself is not extraordinarily expensive, the buyer must assume a minimum investment per hectares in order to make the land not only productive, but efficient.[68] Prices are set by state agency Promotion of Private Investment (PROINVERSIÓN) and vary depending on the plot's location and access to water.[69] The most recent auction occurred in 2008, though more are expected as phase III of Chavimochic opens up another 30,000 hectares in the Chicama valley.

Land in the traditional valleys has also been purchased by private companies, though not through auctions; rather, economics pressures and neoliberal policies have created an unequal playing field which has led many smallholders to sell their land.

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[66] El Congreso de la República, "Ley De La Inversión Privada En El Desarrollo De Las Actividades Económicas En Las Tierras Del Territorio Nacional Y De Las Comunidades Campesinas Y Nativas," *Ley N 26505* (1995).
[67] World Bank and Pedro Guerrero Salazar, "Public-Private Partnership in Peru and Water Rights," *Tracking Global Water Challenges* (2009).
[68] Ibid.
[69] Burneo.

Firstly, many of the cooperatives who could not repay their debts to the Banco Agropecuario de Fomento were foreclosed, and the land—rather than be redistributed among members of the cooperative as intended—was sold to private corporations.[70] Secondly, when the state-directed agrarian bank, Banco Agropecuario de Fomento, declared bankruptcy in 1990, farmers turned to private banks for the first time in twenty years (under the Agrarian Reform of 1969 property could not be mortgaged nor owned individually thus private banks stopped providing agricultural credit and instead the Banco Agropecuario de Fomento became the primary lender).[71] Commercial banks, unlike the State-directed bank however, strongly favored industrial agriculturists who had capital or at least collateral.[72] Only 15% of smallholders had received land titles by 1990, which severely hindered their ability to access credit, and in turn, inhibited their ability to make their land productive.[73] Although the Banco Agropecuario de Fomento has since recovered and begun re-lending to small farmers, a 2008 decree dissolved the maximum limit on private investments in the state-run Agro Banco. Previously, private investors could only control 49% of the capital, but this decree essentially opened the door to privatization of the state bank.[74] While most analysts say that very few private investors would be interested in controlling the Agro Banco, the principle of it

[70] Tatsuya Shimizu, "Structural Changes in Asparagus Production and Exports from Peru," *Institute of Developing Economies*, no. 201 (2009).
[71] Tammen.
[72] Fernando Eguren, "La Agricultura De La Costa Peruana," *Debate Agrario* 1, no. 35 (2003).
[73] Alain de Janvry, Elisabeth Sadoulet, and Wendy Wolford, "The Changing Role of the State in Latin American Land Reforms," in *Access to Land, Rural Poverty, and Public Action*, ed. Alain de Janvry, Gustavo Gordillo, and Jean-Philippe Platteau (New York: Oxford University Press, 2001).
[74] Congreso de la República and Alan Garcia Pérez, "Decreto Legislativo Que Modifica La Ley N 29064," (2008).

eliminations competition and continues the trend of favoring only industrial agriculturists (and often transnational corporations) at the expense of small farmers.[75]

In an effort to level the playing field and register the large number of extralegal landholders, a decree was issued in 1992 which created the Land Titling and Rural Registry (Spanish acronym PETT).[76] As of 2012, the program has titled approximately 55% of rural landholdings which has since increased property values for individuals and provided collateral.[77] However, Peruvian economist Hernando de Soto argues that "most legal procedures to create formal property are not geared to process extralegal proofs of ownership that lack any visible chain of title—which, of course, is the only kind of proof the poor have."[78] Thus, even though land titling and reforms have been made with the goal of giving land to the rural poor, the process often undermines the goal. Similarly, Carter and Salgado (2001) found that land titling programs on their own are insufficient instruments to equalize the playing field between smallholders and industrial agriculturists.[79] For maximum results, they must be combined with other contemporary instruments for land reform such as market-assisted reform and grassroots movements.

Granted, Chavimochic *has* improved the standard of living for thousands of people by providing jobs, potable water, and electricity—but it has done so within the

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[75] Castillo Pinto et al., "Informativo Legal Agrario: El Agro Peruano Y Los Decretos Legislativos De 2008," *CEPES* 24, no. 2 (2008).
[76] El Presidente de la República, "Ley Orgánica Del Ministerio De Agricultura," *Decreto Ley N. 25902* (1992).
[77] United States Agency of International Development, "Peru: Land Tenure and Property Rights Profile," *USAID* (2015).
[78] De Soto: 175.
[79] Michael R. Carter and Ramón Salgado, "Land Market Liberalization and the Agrarian Question in Latin America," in *The Changing Role of the State in Latin American Land Reforms*, ed. Alain de Janvry, Gustavo Gordillo, and Jean-Philippe Platteau (New York: Oxford University Press, 2001).

framework of existing power dynamics, thereby reproducing preexisting inequalities. The project is more than just a form of environmental regulation; it is an extension of contemporary land distribution policies which prioritize land holders (and, in turn, water users) based on socially constructed hierarchies. Thus, although Chavimochic aims to reduce rural poverty, some of the land distributive mechanisms it employs actually undermine the goal.

2. Infrastructure

In 2007, former president Alan García Pérez released a statement in which he expressed his support of large industrial agriculturists:

> "We have fallen in the trap of giving small lots of land to poor families with no money to invest, thus they come to the State to ask for fertilizer, seed, irrigation, and protected prices. This smallholder mode of production without technology is a vicious cycle of miserable poverty…If that same land sold, assembled into large plantations, this would draw technology and…make them productive with heavy investment and knowledge input from new buyers."[80]

According to the Peruvian Center for Social Studies (Spanish acronym CEPES), this statement was "anti-poor, anti-peasant, and anti-small farmer" because it encouraged the concentration of land holdings in the hands of the few despite the fact that land is often the primary resource for the rural poor.[81] Granted, industrial agriculturists are able to produce more food on less land with less water, primarily because they are able to invest in time and energy saving mechanization, unlike small farmers without access to credit. As privatization of land increased from 1986 to 2014, so too, did the yield of asparagus: from 4.5 tons per hectare to 13 tons per hectare, which is 188 percent

[80] Alan García Pérez, "El síndrome del perro del hortelano," *El Comercio* October 2007.
[81] Pinto et al.

increase.[82] Even compared to other major asparagus exporters globally, Peru's yields are unprecedented at 1.5 times greater than their closest competitor, Mexico, and nearly 4 times greater than the world average.[83]

Such high yields can be attributed, in part, to the scale of production and in part to irrigation type. Asparagus is one of Peru's only crops to be drip irrigated—the majority of which is grown by private companies who have the capital to invest in the more expensive, but water saving, technology.[84] Drip irrigation is 90 percent efficient, whereas gravity irrigation systems—which is primarily used in the traditional valleys by small farmers—have about 60 percent efficiency.[85] Thus, since drip irrigation saves more water than gravity irrigation, industrial asparagus production is generally perceived to be highly efficient. The irony, however, is that asparagus is a far more water-intensive crop than many traditional products such as maize or alfalfa—for every 100 grams of ready-to-eat asparagus, 93 grams is water—yet growing it in the desert of La Libertad, where the annual rainfall is only 152 millimeters a year, is somehow considered efficient.[86]

The Water Law of 2009 prioritizes efficient water users above less efficient ones, though efficiency is not determined solely by quantity of water consumed; rather priority is given in the following order for productive uses: 1) those with the highest

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[82] Food and Agriculture Organization.; Yield increased from 4.5 tons per hectare in 1986 to 13 tons per hectare in 2014.
[83] Ibid.; See Figure 3.
[84] Javier Sánchez Vigo, "Nutrición Y Fertilización Del Cultivo Del Espárragos," in *Módulo Integrado de Espárragos y Alcachofas* (Lima, Peru: Facultad de Agronomía, UNALM, 2005).
[85] AQUASTAT, "Perú," *Food and Agriculture Organization of the United Nations*; W.J. Davies et al., "Novel Crop Science to Improve Yield and Resource Efficiency in Water-Limited Agriculture," *Agricultural Science* 149 (2011).
[86] José Japon Quintero and Ministerio de Agricultura Pesca y Alimentación, *Cultivo Del Espárrago Para Verde*, Núm. 17/86 (Madrid, Spain: Dirección General de Investigación y Capacitación Agrarias, 1986). Climate Data, "Climate Model of La Libertad, Peru," (2012).

efficiency; 2) those who generate the most employment; 3) and those who have the least environmental impact.[87] Granted, the law prioritizes satisfying basic human needs above all else, followed by productive uses such as agriculture, mining, and energy generation, but clearly favors industrial agriculturists with high yields and job creation capacity.[88] According to both the 1969 General Water Law (Ley General de Aguas) and the more recent 2009 Water Law (Ley de Recursos Hídricos), water in Peru is defined as a public good which is property of the State and cannot be privatized.[89] In theory, all water users have equal access to water rights regardless of their economic capacity. However, critics of 2009 water law argue that its focus on promoting a "culture of efficiency" actually favors water users who can make capital-intensive investments on their land (industrial agriculturists, mining corporations, etc.) at the expense of water users who cannot (smallholders).[90] Roa-García (2014) found that the 2009 Water Law and its 2010 revision mentioned efficiency 106 times, but did not use the terms *equality* or *equity* even once.[91]

Efficiency of water is not determined by technology alone, but also by land holdings and access to credit which enables land holders to invest in modern water saving infrastructure. Yet access to land and credit is often a positive feedback loop:

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[87] Congresso de la República, "Ley De Recursos Hídricos," *Ley N 29338* (2009): Article 55.
[88] Ibid.: Article 2, 35, and 43.
[89] Ibid.; República del Perú and Ministerio de Energía y Minas, "Ley General De Aguas," *Decreto Ley N. 17752* (1969).
[90] Boelens and Vos; María Cecilia Roa-García, "Equity, Efficiency and Sustainability in the Andes: Trade-Offs in a Full World," *Water Alternatives* 7, no. 2 (2014); Milagros Sosa and Margreet Zwarteveen, "Exploring the Politics of Water Grabbing: The Case of Large Mining Operations in the Peruvian Andes," ibid. 5 (2012); Patricia Urteaga, "El Derecho Colectivo Al Agua," in *Derechos Colectivos Y Políticas Hídricas En La Región Andina*, ed. Patricia Urteaga and Rutgerd Boelens (Lima, Peru: Instituto de Estudios Peruanos, 2006); Rutgerd Boelens, "The Politics of Disciplining Water Rights," *Development and Change* 40, no. 2 (2009).
[91] Roa-García.

without one or the other it is extremely difficult to acquire in the first place, thus excluding small farmers from gaining efficiency certifications and validating their right to water. The emphasis on efficiency, in general, has overshadowed issues of equity regarding water distribution as well as the distribution of benefits delivered by Chavimochic. Furthermore, the focus on irrigation mechanization has focused on percentage of water saved, rather than on how much water is actually used per crop.

3. Labor

1993 study by Marañón argued that the asparagus industry, which was originally targeted to reduce rural poverty, had actually increased it because of low salaries, short-term and unstable employment contracts, and lack of social benefits.[92] While this may have been true during the mid 1990s, the contemporary asparagus industry is not as easily reduced. In 2010, it was reported at the International Asparagus Congress in Peru that the asparagus industry provided 120,000 rural jobs, which has improved the quality of life for many people by providing basic necessities such as running water, electricity, and improved education.[93] As of 2011, one hectare of asparagus generated, on average, 210-215 labor days per year with an average daily wage of $5.5 USD—a typical agrarian salary in Peru.[94] While daily and monthly wages for agrarian workers in Peru is debatably a livable wage, it is fairly average among countries in Latin America and the Caribbean where the average daily salary for agrarian workers in 2002 was $3.95

[92] Boris Marañón, "Obreros En La Industria Esparraguera: Valles De Chao-Virú E Ica," *CEPES Debate Agrario: Análisis y alternativas,* no. 17 (1993).
[93] Jaime de Pablo et al., "The International Asparagus Business in Peru," *Cepal Review* 1, no. 112 (2014).
[94] Edward J. Remache, "Boom or Bust? Asparagus in Peru," *Americas Quarterly* 5, no. 1 (2011).

USD.[95] Yet labor laws have tended to favor employers over employees by keeping wages low. Additionally, even when labor laws include protections for workers, enforcement is often lax.

Once of the most significant labor laws, the Law for the Promotion of the Agricultural Sector, was passed in 2000 by Fujimori in an effort to further promote efficiency and productivity. Essentially, the law created a separate set of labor laws for agrarian workers as compared to non-agrarian workers, which favored agroindustry employers by reducing labor costs.[96] It was also around this time that auctions for new lands began to become more competitive as private investment increased in the region. While it did mandate an increase in the minimum daily wage to 4.95 USD (16 Nuevos Soles) and mandated overtime pay, it also weakened worker's rights by: a) terminating workers yearly bonus by saying it was included in the increased daily wage; b) halving vacation time to 15 days for agrarian workers (as compared to 30 days for all non-agrarian workers); c) reducing the amount agrarian workers' pay into health insurance from 9% to 4%; d) limiting access to health insurance and social security to only workers who work for more than three consecutive months or 4 non-consecutive months within the calendar year; and d) increasing the flexibility of employee-employer contracts. Of all the changes, the last is arguably the most impactful, because it allows employers to dismiss or suspend workers at any time, creating a high level of job insecurity. As of 2012 there were 210,299 agroindustry workers signed to contracts of

[95] Francisco García Pascual, "El Ajuste Estructural Neoliberal en el Sector Agrario Latinoamericano en la Era de la Globalización," *Europa de Estudios Latinoamericanos y del Caribe* 75, no. 1 (2003).
[96] El Congresso de la República and Presiente Fujimori, "Ley que Aprueba las Normas de Promoción Del Sector Agrario," *N. 27360* (2000).

indeterminate amounts of time—all of which faced a high level of job insecurity.[97] As one such worker expressed to *La Republica* newspaper in 2010, "I wanted to take out a loan and finish school, but in this line of work nobody feels safe. At any moment they could kick me to the curb."[98]

The law was originally set to expire in 2010, but because of its success in increasing private investments, it was extended until 2021. Over the course of the ten years during which the new law had been in place (2000-2010), the yield of asparagus produced per hectare increased by 1.36 times, suggesting that labor laws do have at least some level of impact on productivity, and ultimately, on private investments.[99] The extension of the law, however, did not pass without backlash from workers, lawyers, and even government officials. In 2003, then President Toledo declared a state of emergency for thirty days when various workers, including those in the agricultural sector, went on strike and blocked vital highways in an effort to increase wages and decrease unfair taxation in the agriculture industry.[100] Then in 2007, the College of Lawyers of Ica (Colegio de Abogados de Ica) argued in court that the Promotion of the Agricultural Sector was unconstitutional because it permitted the discrimination in the workplace by legalizing the payment of fewer social benefits to agro workers as compared to employees in other sectors.[101] A year-long case ensued to determine the law's constitutionality, during which the Director of Prevention and Solution of Labor

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[97] Rubén A. Valarde Flores, "Condiciones Laborales y Cadena Productiva en la Agroexportación en la Provincia De Virú, Región La Libertad," *Instituto de Estudios Sindicales* (2014).
[98] La República, "El caso Camposol," *La República* 2010.
[99] Food and Agriculture Organization, "Crops and Livestock Products: Peru," *FAOSTAT* (2014).
[100] BBC, "Perú: Estado De Emergencia," *BBC Mundo* 2003.
[101] Colegio de Abogados de Ica et al., "Sentencia del Pleno Jurisdiccional del Tribunal Constitucional," *Proceso de Inconstitucionalidad Ley N. 27360* (2007).

Conflicts and Social Responsibility within the Ministry of Labor, Enrique Fernández-Maldonado Mujica, came out with a statement also condemning it as unconstitutional: "In Peru, labor discrimination has been legalized with the approval of a parallel ('promotional') labor regime in favor of private activity."[102] Nonetheless, in 2008, the courts ruled that the Promotion of the Agricultural Sector was constitutional, thus keeping it in place at least until 2021 when it will be reassessed.[103]

On the whole, the Law is a direct manifestation of the ideological political shift from a state-controlled agriculture system with set prices, small, collectively owned farms, and one state-owned bank (Banco Agrario), to a neoliberal agricultural system based on private investments, large plots of land with modern technology, and a focus on high inputs and high outputs. This is not to say that the modernization of Peru's agriculture system has only worsened working conditions—protective laws have been passed but actual enforcement of such laws is less known. For example, in 2002 individual labor rights were enacted under the Law on Days of Work, Hours, and Overtime which set overtime regulations, maximum hours, and minimum age requirements. Small-scale improvements in labor rights continued in 2005 when the government established Regulations on Safety and Health in the Workplace, which recognized minimum safety requirements and put in place rights and responsibilities for employees and employers. Similarly, in 2003, collective labor rights were passed under Collective Labor Relations, which gave workers the right to collective association, bargaining, and the right to strike, which has been met with a some degrees of success.

[102] Enrique Fernández-Maldonado Mujica, "Derechos Laborales y los Acuerdos de Libre Comercio," *Globalizacion con Equidad* (2008): 49.
[103] Sara Campos Torres, "Tribunal Constitucional Declara Infundada Acción de Inconstitucionalidad Que Cuestiona la Validez del Régimen Laboral Agrario," *Gaceta Jurídica* (2008).

In 1993, a study by Boris Marañon found that unions were virtually inexistent in La Libertad due to a variety of factors including fear of retribution by employers, lack of materials for organizing, lack of experience, and short employment times.[104] Since then, unions have increased but have been met with varying degrees of success. For instance, when the employees of Agricola Virú formed a union in 2005 they received, as part of their employment, masks, gloves, and work clothes (however, only people in operations and sanitation have thus far received these benefits, though Agricola Virú says they plan to extend the benefits to field workers eventually).[105] On the other end of the spectrum, Camposol was accused of unjustly and massively firing union workers in 2008.[106] Although the union busting was declared illegal by the 2003 Collective Labor Relations, the case is ongoing and was openly condemned in Europe's Permanent People's Tribunal (PPT), which is a non-legally binding watchdog organization for human rights.

In total, Peru's labor dynamics not only favor industrial producers, but they also influence water distribution. As previously discussed, Peru's water law of 2009 prioritizes efficient water users who generate employment and produce more food per hectare. Thus, despite the labor conditions, companies like Camposol have an upper hand in receiving access to water over small farmers who do not hire employees.

[104] Marañón.
[105] Flores.
[106] Wil Hout, *EU Strategies on Governance Reform between Development and State-Building* (New York, NY: Routledge, 2013); Elsa Chanduví Jaña, "A New Way to Violate Human Rights," *Latin American Press* 2008.

Discussion

The evolution of land rights, water rights, labor laws, and international trade agreements has shifted Peru's agricultural system from favoring the communal hacienda system and individual land holdings to favoring export-oriented industrial agriculturalists—which are often times transnational corporations. Despite the seeming difference between the two structures, marginalized groups actually remained the same in both situations: peasant farmers and the landless poor continue to be disregarded since they are not deemed "efficient" nor "productive" in the sense that agro exporters are.

It is clear that politics plays a role in shaping water policies—whether it be as blatant as bribery or as subtle as biased labor laws—but the extent to which those policies exacerbate preexisting inequalities often depends on land holdings, infrastructure (e.g. type of irrigation), and labor supply. These factors are vital in understanding not only the equality of water distribution, but also the politics of drought globally—especially in the face of climate change. Peru's specific case of irrigating a desert is actually quite common and the modes of thinking about water there can be transferred to most other arid and semi-arid regions of the world. For example, California's drought from 2014-2017 can be better understood in terms of human consumption patterns if these factors are taken into consideration. Similarly, Iran's 2001 drought was the worst in recent history even though rainfall was not exceptionally low, thus causing many to rethink the drought in terms of mismanagement rather than environmental processes.[107] Indonesia, too, has continued to face an inability to

[107] Richard C. Foltz, "Iran's Water Crisis: Cultural, Political, and Ethical Dimensions," *Agricultural and Environmental Ethics* 15, no. 4 (2002).

efficiently distribute water resources, and has turned to the partnerships with the private sector, which have been advocated as "pro-poor" water suppliers by creating new water distribution channels. 2007 study by Bakker, however, argues that quite the opposite occurs in practice: the private partnership preferentially targets middle and upper-income households and ignored traditionally marginalized groups.[108] Rethinking how land is distributed in this situation could actually improve water distribution by providing a more holistic understanding of water use.

In short, the human forces which transformed Peru's desert—like California's—into farmland cannot be overlooked, especially as pressure for water intensifies due to climate change and population growth. Our understanding of water availability needs to be decentered from hydrology in order to understand the more nuanced factors that shape the equality of water distribution. Additionally, the discourse of, and emphasis on, efficiency has placed too much faith in market-forces and overlooked traditional power dynamics, which in turn, are replicated in water distribution mechanisms, intentionally or unintentionally.

[108] Karen Bakker, "Trickle Down? Private Sector Participation and the Pro-Poor Water Supply Debate in Jakarta, Indonesia," *Geoforum* 38, no. 5 (2007).

Figures

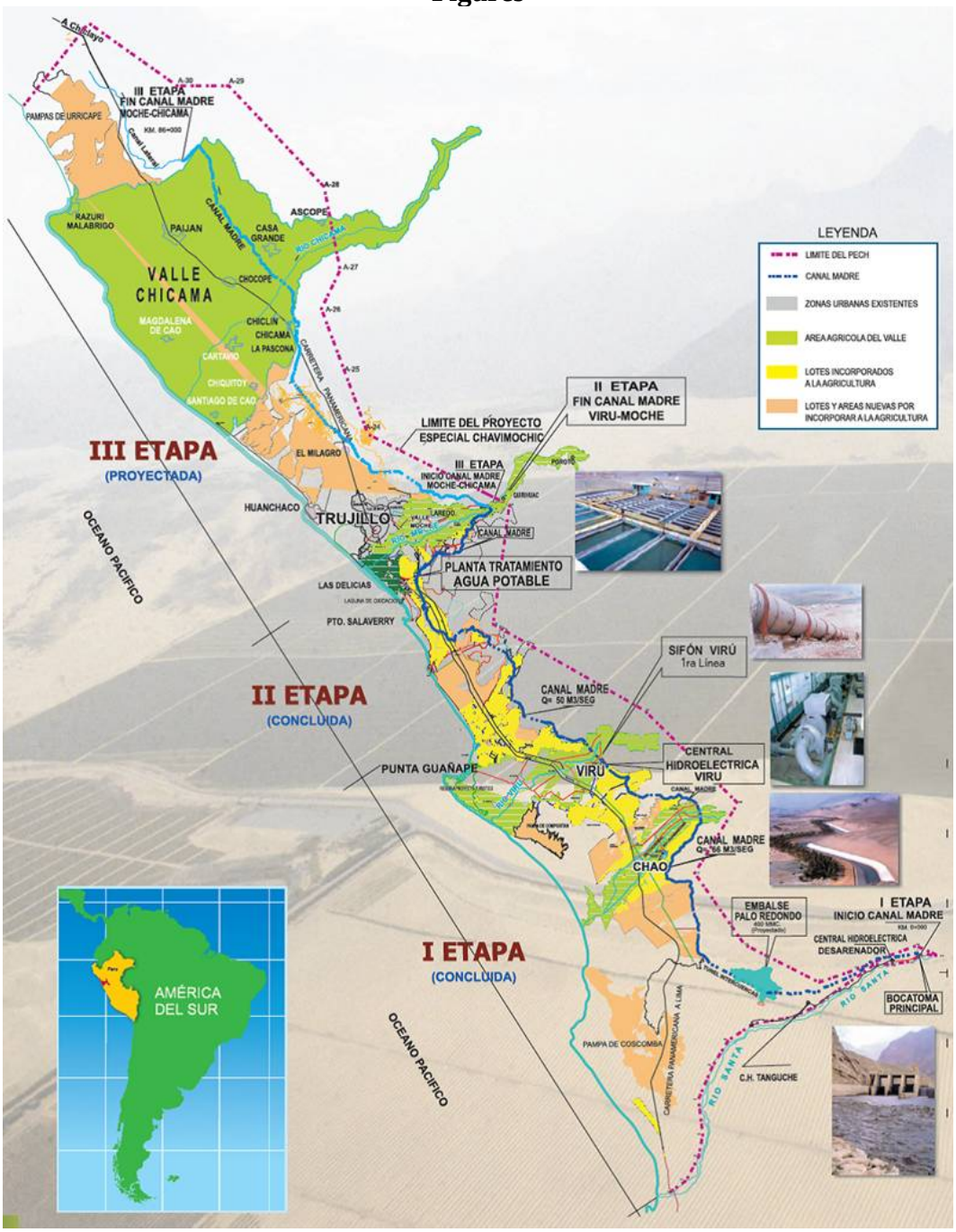
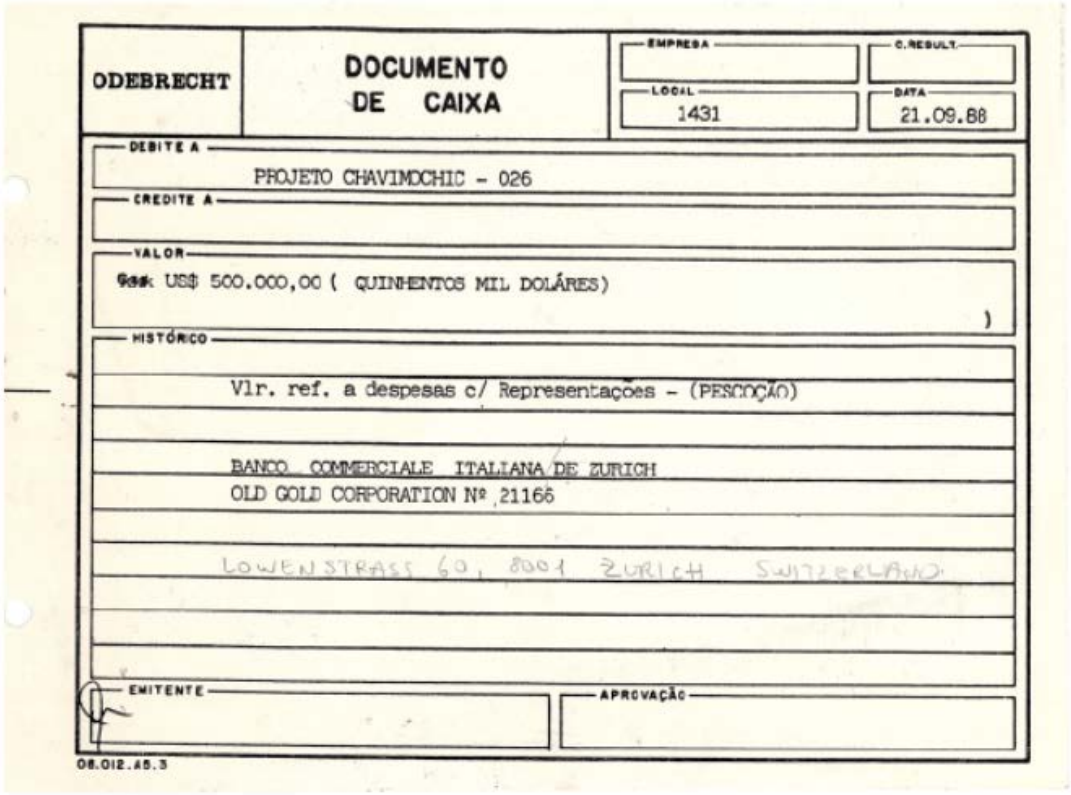


Figure 1. Chavimochic diverts water from the Santa River via the mother canal to irrigate the four northern valleys of Chao, Virú, Moche, and Chicama. “Etapa” I, II, and II correspond to the three phases of the project, of which phase III is still under construction.



ODEBRECHT

DOCUMENTO DE CAIXA

EMPRESA

C.RESULT.

LOCAL 1431

DATA 21.09.88

DEBITE A

PROJETO CHAVIMDCHIC - 026

CREDITE A

VALOR

US$ 500.000,00 (QUINHENTOS MIL DOLÁRES)

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HISTÓRICO

Vlr. ref. a despesas c/ Representações - (PESCOÇÃO)

BANCO COMMERCIALE ITALIANA DE ZURICH

OLD GOLD CORPORATION Nº 21166

LOWENSTRASS 60, 8001 ZURICH SWITZERLAND

EMITENTE

APROVAÇÃO

08.012.45.3

Figure 2. Jorge Ramos Roncero, who received a total of $1.8 million in bribes from Odebrecht, went by the codename “Pescoção” which literally means “big throat” in Portuguese, but refers to someone who involves themselves in other people’s business.

2014 Top Global Producers of Asparagus	Production (tons)	Yield (tons/hectare)	Total hectares under cultivation
#1 China	6,848,320	5.73	1,195,568
#2 Peru	377,701	13.05	28,956
#3 Mexico	170,225	9.18	18,543
#4 Germany	114,090	6.24	18,269
#5 Spain	48,814	5.32	9,175

Figure 3. While China is the largest producer of asparagus, they consume 99% domestically, thus Peru is the largest exporter. Data compiled from FAOSTAT.

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