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Codevasf

We have the water, we have the land, we have the sun. I'd say we have a pretty good package to offer.
—Clementino de Souza Coelho, director of infrastructure, Codevasf

On the morning of November 25, 2009, Clementino de Souza Coelho could barely contain his excitement. After months of waiting, four major Brazilian government ministries had just given final permission to release the "Invitation to Bid" for Brazil's first public-private partnership (PPP) in irrigation, called Pontal. Covering more than 30,000 hectares (ha) of which about 8,000 ha were irrigable, the Pontal project was located in the semi-arid São Francisco River valley (SFV) in northeastern Brazil. As director of infrastructure for Codevasf (Company for the Development of São Francisco and Parnaíba River Valleys), a public organization charged with developing the SFV, Coelho hoped Pontal would have a transformative impact: if successful at Pontal, irrigation PPPs could potentially be replicated on as much as one million hectares throughout the SFV.

Coelho and his team had spent nearly five years planning and negotiating all aspects of the PPP contract, which offered a suite of incentives to attract private-sector investment—and modern agribusiness capabilities—to the Pontal project. The contract also stipulated that at least 25% of the land at Pontal be reserved for local farmers, who would be integrated into the agricultural production chain. The bidding documents would be published as early as mid-December, marking the start of the official countdown to the April 2010 auction, when the winning bidder would be decided. Over the next four months, potential partners and investors could ask Codevasf questions about the contract and, as allowed by Brazilian law, suggest amendments to improve it.

Pontal was located in the heart of the SFV, the poorest region in Brazil. Historically, the SFV's hot, dry climate had made life difficult for residents, causing many to migrate to urban centers in search of economic opportunity. The region gained new life after the Brazilian government constructed a giant dam and artificial lake in the 1970s. In the later 20th century, Codevasf constructed several public irrigation projects, using water from the lake to support local farmers and stimulate the economy. In some cases, these projects yielded excellent results, converting parched plains into thriving fields and orchards and spurring development of transportation, sewage, energy,

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communications, and other infrastructure. However, many of these expensive capital projects had failed to generate economic payback for smallholders or the government, causing policymakers to cease investments in new projects in the 1990s.

The impetus for Pontal stemmed from a 2004 World Bank study of irrigation in the SFV, which concluded that the projects' socioeconomic mission—sustainable agricultural production facilitating regional economic development—could not be achieved through public investment in infrastructure alone. Rather, small farmers needed a way to link to guaranteed markets for their agricultural output, as well as sufficient capital, technical support, and logistical capacity to participate in the modern production chain. Although some at Codevasf had voiced trepidation about privatizing irrigation projects, Coelho enthusiastically championed the idea, arguing that PPPs could bring private-sector efficiencies to the projects while also serving the mission of poverty reduction.

Pontal's success would ultimately depend on whether large, export-oriented agribusiness firms would be interested in bidding for the PPP. In Coelho's view, the SFV's wealth of resources—year-round sunshine and warm temperatures, an almost unlimited supply of fresh water, good transportation connections to domestic and international markets, and an abundance of labor—should, in itself, be sufficient to attract agribusiness investors. To sweeten the deal, investors in Pontal would be given the right to use the land "for free" for a period of 25 years. In exchange, the government would benefit from regional development and the subsequent increase in tax revenues, while SFV residents would enjoy greater job and income opportunities. However, in his preliminary discussions with several multinationals and cooperatives, Coelho found less enthusiasm than he had expected. Companies admired the SFV's resources, but were wary about uprooting and moving to a distant, relatively underdeveloped region of the world. There was also some skepticism from the Brazilian public, which was growing impatient with giant government expenditures after witnessing a series of irrigation projects wallow in disrepair. Some also worried that Brazil would fall victim to the trend of foreigners acquiring large swaths of land in developing countries, claiming such schemes often did little to benefit poor, local residents. Coelho was cognizant of these obstacles as he prepared for the next, and arguably most critical, phase of the PPP process: securing a private-sector partner.

Coelho was convinced that the PPP was a tremendous opportunity for a global agribusiness company, but was still unsure how to translate his passion into a message that would resonate with potential partners. Furthermore, he wanted to identify and directly market to specific companies that would be the ideal match for Pontal. But what were the most essential characteristics of the private-sector partner: Logistical capacity? Prior experience in producing and marketing irrigated crops? A track record of integrating smallholders into the production chain?

Codevasf's ability to attract the right agribusiness company could have a staggering impact on the SFV's economic future: if Pontal succeeded, PPPs would likely be replicated throughout the SFV, and even serve as a model for irrigated agricultural development in other countries. If Pontal failed, Coelho feared that Brazilian policymakers and taxpayers might be unwilling to finance another attempt at an irrigation PPP. Thus, it was imperative that Codevasf succeed the first time, at Pontal.

History of Brazilian Public Irrigation Projects

Agricultural Policy and the Social Mission

In 1965, Brazil's agricultural policy began evolving from a protectionist, interventionist regime centered on food security to a market-based approach underpinned by poverty-reduction goals. As deregulation and trade liberalization allowed Brazil's agribusiness sector to grow and modernize,

many small-scale farmers found themselves excluded from the agribusiness boom.[a] Several aspects of an industrialized agriculture system—high capital needs, a complex, coordinated supply chain, differentiated domestic and export markets, and stringent quality and safety requirements—were barriers to access for smallholders. Thus, in the 1980s and 1990s, the government instituted social policies aimed at alleviating rural poverty through land reform, family farm support and smallholder inclusion in commercial agriculture.

In northeastern Brazil, poverty-reduction programs leveraged water resources, primarily irrigation, to counter the drought and limited groundwater supply that undermined the region's farmers. Underlying many government initiatives was a "land reform" philosophy, which supported transfer of land to poor, landless residents to prevent rural depopulation and stimulate the return of poor people to rural areas; this social concern was the primary motivation behind public irrigation investments. From 1973 to 1979, the government constructed the Sobradinho dam on the São Francisco River at a cost of almost $1 billion, creating the São Francisco hydrographic bay—one of the world's largest artificial lakes, measuring nearly 350 kilometers (km) long and between 10 km and 40 km wide, and storing approximately 38 billion cubic meters of water. (See **Exhibit 1** for a map of the SFV and location of the Sobradinho dam.) By enabling both large-scale irrigation schemes and hydropower generation, the dam facilitated a level of agricultural production that was previously unimaginable in the SFV. This government investment also stimulated private-sector migration to Brazil's northeast, which in the early 2000s was producing $2 billion[b] in irrigated agriculture each year.[1]

Irrigation projects in the SFV were overseen by Codevasf, a public organization under the Ministry of National Integration that was founded in 1974.[c] Codevasf's activities aimed to improve quality of life for the SFV's rural poor: creating jobs and bolstering income opportunities, reducing emigration, alleviating the effects of dry climate, and protecting natural resources. (See **Exhibit 2** for Codevasf's mission, vision and guidelines.)

The São Francisco Valley

The SFV comprised the São Francisco River basin (634,000 sq. km), in the states of Minas Gerais, Bahia, Pernambuco, Alagoas and Sergipe, and the Parnaíba River basin (330,000 sq. km), in Piauí and Maranhão. Of 360,000 ha of potentially irrigable land in the SFV, 120,000 ha were under irrigation in 2009. Thousands of small-scale producers and about 100 large companies produced an array of crops, primarily fruit, in the region, most of which was consumed domestically. Although just a fraction of the fruit produced in the SFV was actually processed there, there was some production of dried fruit, juice, and wine. In August 2009, PepsiCo announced it was acquiring Amacoco, a coconut water producer with a plant in Petrolina, in the state of Pernambuco. The area around Petrolina and Juazeiro, municipalities seated on either side of the São Francisco River, had fast become one of Brazil's main fruit-export hubs. In fact, their combined population had tripled since 1980, to 600,000, as a result of the growing regional agribusiness presence. In 2008, annual fresh fruit exports from the

[a] In 1995, nearly 50% of Brazil's farms covered fewer than 10 ha, but collectively comprised only 2.2% of landholdings in the country; in contrast, the 2.2% of farms with 500-plus ha comprised nearly 57% of total landholdings. Fabio R. Chaddad and Marcos S. Jank, "The Evolution of Agricultural Policies and Agribusiness Development in Brazil," *Choices* 21, no. 2 (2nd Quarter 2006): 88, http:/ / www.choicesmagazine.org/ 2006-2/ tilling/ 2006-2-08.htm, accessed October 2009.

[b] Figure pertains to the entire semi-arid region, of which the SFV is only a part.

[c] Other public organizations focused on irrigated development operated in the SFV before being replaced by Codevasf in 1974.

Petrolina-Juazeiro region totaled $300 million.[2] (See **Appendix** for more on agribusiness companies in the SFV and **Exhibit 3** for fruit production data.)

Landscape and climate With an abundance of freshwater and 3,000 hours of sunshine each year, the SFV boasted ideal conditions for year-round crop production. Located at about 8° latitude, the region had a semi-arid, warm climate, with temperatures ranging from 25ºC to 30ºC (26ºC average). Average monthly rainfall and evaporation were 44 millimeters (mm) and 7.5 mm, respectively, and air humidity was 67%. Rainfall was highest from November to April, peaking in March at more than 120 mm and dipping as low as 5 mm in August and September. The stable climate meant that planting and harvest cycles were not restricted to seasonal weather patterns; instead, producers could take advantage of ideal market windows, planning harvests for periods when prices were highest and competition from European and North American producers minimal. For example, grapes could be harvested twice annually in the SFV, compared to once yearly in other grape-producing regions.[d] Mangos were exported to the U.S. from August to November—after Mexico's mango-export season ended and before Peru's and Ecuador's began.

Agriculture production Crops produced in the SFV included banana, coconut, guava, grapes, lemon, mango, melon, onion, orange, passion fruit, papaya, sugarcane, tomato, and watermelon. In addition, Embrapa (the Brazilian Agricultural Research Corporation) had a research program underway to develop additional crop varieties specifically for the environment of the SFV, including almonds, apples, olives, pears and prunes. "California has more than 40 different cultures that are well developed and adapted to its climate conditions. We aim to reach at least 30 in the coming years," said Coelho. Fruit production had increased significantly from 2005 to 2008, with an average of 9,000 ha planted each year. As of 2005, guava, grapes, mangos, and sugarcane were the SFV's primary crops, and grapes and mangos were the top exports. In 2005, the SFV produced 32% of table grapes and 17% all grapes in Brazil, and 95% of Brazil's grape exports,[3] as well as 32% of the country's mangos and 90% of mango exports. Sugarcane production had also been successful, with yields of 120 tons per ha compared to an average yield in Brazil of 80 tons per ha in 2009.[4]

Transportation infrastructure Although much of the SFV was rural and remote, its transportation infrastructure was relatively robust. Large carrier planes flew in and out of the Petrolina International Airport. The airport was equipped to export perishables, with climate-controlled capacity for 100,000 fruit boxes, and offered direct flights to the U.S. and Europe, enabling cheaper freight costs as well as shorter travel time—which was an advantage for perishable products. Salvador, the closest port to Petrolina and Juazeiro, was accessible via road and railway. Several additional ports in the northeast were accessible from Petrolina and Juazeiro by road or railway, including Pecém (Fortaleza), Recife, São Luis, and Natal, at a distance of 900 km, 715 km, 1,200 km, and 850 km, respectively.

Various roads linked Petrolina and Juazeiro to major seaports and urban centers, though many were unpaved and poorly maintained. By road, the distance to Rio de Janeiro was 1,928 km and to São Paulo, 2,241 km. In 2009, the federal government was investing in waterway and railway transportation infrastructure to improve the region's logistical environment. (See **Exhibit 4** for transportation distances and costs from Petrolina and Juazeiro to various ports.)

Commercial costs In the SFV, the cost of land varied depending on location, soil quality, and degree of agriculture capacity: empty lots cost between $580 and $5,800 per ha, while land equipped with irrigation equipment or under cultivation was more expensive. Yearly water costs were

[d] As of 2009, two harvests did not result in greater total annual production, but provided a risk management safety-net in case one harvest was compromised.

approximately $41.40 per ha, plus a variable charge of $0.032 per cubic meter of water used.[5] Daily labor costs were around $12 per laborer. (See **Exhibit 5** for a sample of approximate irrigation water costs in different countries.)

Despite the SFV's diverse transportation infrastructure, freight costs were relatively high due to poor road quality. In 2005, transporting a refrigerated container 770 km, the distance from Petrolina to Recife, took 15 hours. The average cost of transporting a 15-ton, 40-foot grape container from Petrolina to Salvador, the closest port, was $1,000. In 2004, close to 39% of mangos and 57% of grapes from the SFV were exported through Salvador; delays at the port were common, which could damage perishable freight. Tariffs varied by port, but averaged about $300 in 2005. Exporting a container of ready-to-distribute produce in 2005 from an SFV farm (or packing location) to a destination similar to Rotterdam, the Netherlands, or Tilbury, UK, ranged from $5,300 to $5,900. Ocean freight accounted for close to 75% of logistics costs, domestic transport for around 20%, and domestic and overseas port costs for the remainder.[6]

Irrigation Projects in the SFV

From the late 1960s to mid-1990s, Codevasf built 28 irrigation projects in the SFV, typically reserving 50% of the irrigated land for local small-scale farmers (see **Exhibit 6** for locations of Codevasf irrigation projects). Projects ranged in size from 5,000 ha to 80,000 ha, averaging about 10,000 ha. The cost per hectare of developing public irrigation projects varied according to the type of technology (e.g., surface, sprinkler, and micro-irrigation), but typically averaged $10,000 to $15,000.[7]

The Traditional Model

Historically, Codevasf purchased non-improved land for public irrigation projects inexpensively from private owners. Codevasf was responsible for constructing a project's entire infrastructure, including the irrigation system (e.g., water canals and pumps), roads, energy infrastructure, and administrative buildings. Once construction was complete, the project's land was parceled into 5-ha lots, which were licensed to smallholders through land reform schemes, and the remaining area was divided into 5-ha to 200-ha lots, which were sold at public auction to the highest bidders. Codevasf made water and energy available up to the perimeter of producers' property, while producers were responsible for constructing the irrigation system (underground or surface piping and pumps) inside their lots. Until the project was fully constructed and populated, Codevasf was in charge of operating and maintaining (O&M) the common infrastructure, including canals and drainage systems, buildings, and other assets, and for providing technical agricultural assistance to the small producers. To recover the investment cost of the common irrigation system, Codevasf charged producers fees based on lot size, typically $13 to $56 per ha per year. In addition, producers paid fees to cover O&M costs, which were based on the volume of water consumed (fees ranged from $8 to $60 per thousand cubic meters).[8] Lastly, producers paid energy fees to the project's utilities provider.

Codevasf considered projects fully operational once construction was complete and lots occupied; in other words, when the basic conditions for agricultural production were in place. At this point, Codevasf surrendered responsibility for O&M and agricultural services to an association of the project's producers. This group, called the Irrigation District, charged all producers fees for water, fixed costs, agricultural services, and O&M, while Codevasf continued to earn a small portion of collected fees to pay for amortization costs associated with the initial public investment. From the construction phase until control was handed to the Irrigation District, the typical project took 15 years

and cost about $10,000 to $15,000 per ha, including construction, O&M services, and technical assistance provided to producers. (See **Exhibit 7** for photos of irrigation structures.)

Results

Theoretically, transferring responsibility to the Irrigation District implied that a project was independently managed and economically viable, and that its producers were capable of repaying the Brazilian taxpayer over the long term. In practice, however, many transfers had fallen short of expectations. Producers failed to develop profitable agricultural enterprises and were unable to satisfy their financial obligations to the Irrigation District and Codevasf. Without adequate resources to invest in updating and maintaining equipment, projects fell into disrepair. Codevasf was forced to provide ongoing financial support, which was usually insufficient and slow-coming. Neither the Irrigation District's autonomy, nor regional economic development, were achieved.

According to analyses by Codevasf and the World Bank, several factors contributed to such failures. Many producers on the projects lacked the agricultural and managerial competencies to perform commercially, and the technical support provided by Codevasf and the Irrigation District was in short supply. Most producers grew the most common crop in the region, often for local consumption, resulting in excess production and depressed prices. Systems to commercialize production, such as finding buyers outside the area and coordinating supply chain logistics, were beyond the small producers' capabilities. Many traded only with opportunistic intermediaries, who paid low prices for goods that they then sold in wholesale and retail markets at a substantial margin. Some producers resorted to mere subsistence farming; others abandoned their land altogether or sold it to buyers looking to consolidate several lots and introduce a production system with the scale and market orientation to supply to agribusiness companies. Smallholders who had received licenses to exploit lots through land reform schemes were not legally entitled to sell their land, resulting in complicated proprietary issues inside the projects.

One example of an unsuccessful irrigation project was Jaíba, in the state of Minas Gerais. The government began constructing the project in the 1970s,[9] with the aim of creating an 80,000-ha irrigated area. However, Jaíba suffered from a poor location, far from markets and urban hubs, and from insufficient technical, managerial, and political support. By 2005, only 12,000 ha were irrigated; about 53,000 tons of produce were grown in the irrigated portion, generating $12.3 million.[10] The government investment in Jaíba had been $500 million.[11]

Coelho described the Formoso project, a 12,000-ha area in western Bahia, as yet another example of a failed investment. "Formoso has superb soils, no lack of water, and good infrastructure for irrigation and transportation," he said, "but the smallholders did not produce at a scale large enough to attract an anchor company to pack or process their production, mostly of bananas, passion fruit and mangos." Coelho explained that 50% of the project's land was idle, and that the remaining producers faced the constant threat of insolvency, causing them, too, to abandon their land. He continued, "Due to Brazilian law, the government 'retake' of such areas must be done via lawsuits, which takes, on average, no less than 10 years. The main reason for such failure is the way the lands were given away or sold, with no concern about long-term economic sustainability. This is what the federal government wants to solve with the Pontal scheme."

Despite these disappointments, there was solid evidence to suggest that irrigated agriculture could help reduce poverty and improve the economy of the SFV: some irrigation projects had performed well, generating socioeconomic returns of 16% to 19% as measured by the *Fundacíon Chile*/ World Bank standards (an index reflecting the impact of irrigation in regional socioeconomic development). An estimated one million jobs had been directly or indirectly created by public and

private irrigated agriculture.[12] The 2004 World Bank study had identified several characteristics shared by successful irrigation projects, including: participation of private-sector actors within the irrigated area; competent implementation, management, and marketing of the project; ample scale to enable commercialization; stable political and financial support from government entities; organization and coordination among producers; and access to markets.

The Public-Private Partnership Model

Following the World Bank's analysis, Codevasf reframed its objective for irrigation projects: rather than merely constructing the basic infrastructure and hoping for success, Codevasf should establish systems—primarily access to efficient supply, production, and distribution channels—to support economically viable agricultural operations over the long term. "We've learned that crop production in itself doesn't drive economic growth," explained Coelho. "For producers to earn reliable incomes, they need direct access to outside markets and logistical support that only a large agribusiness company can provide." Coelho believed the PPP model could be a sustainable, cost-effective means of bringing the competencies of commercial agribusiness to the SFV. "The only way to get social return is to get economic return," he said. "Agribusiness is a sophisticated market, and to be successful, we need to engage sophisticated players."

According to Brazilian law, PPP-eligible projects needed to fit two criteria: they had to impact the country's social and economic development, and require government investment in order to attain economic viability; both criteria applied to public irrigation projects. In 2009, Brazil had yet to attempt a PPP in irrigation, though PPPs had been employed to build roads, railways, ports, hospitals, and prisons.

Pontal

Given the political sensitivity associated with privatizing a government program—particularly one centered on poverty reduction—developing the PPP proposal had been a painstaking, protracted process. From 2004 to early 2009, Coelho and his team had defined all elements of the PPP: the roles and responsibilities of the public and private-sector partners, criteria for evaluating proposals from investors bidding for the project, stipulations to ensure smallholder inclusion, etc. Debate among Codevasf staff had sometimes been heated, "but in the end, we settled on a model that is well-balanced," Coelho said. "The contract includes lots of incentives to attract agribusiness companies, but we haven't neglected the social point of view—we're just not approaching it from the land-reform framework anymore. Basically, we had to have the guts to say, 'irrigation is not about land reform; it's about agribusiness.'"

In November 2009, Codevasf received final approval from government administrators to move forward with the Pontal PPP. Located in Petrolina about 40 km from the airport, Pontal covered 33,526 ha of which approximately 8,000 ha was irrigable, according to soil studies. Codevasf had already built a substantial portion of Pontal's common infrastructure (accounting for 70% of the total required investment), and estimated that more than half of the irrigable land could be occupied immediately or within six months of signing the contract. The private-sector partner for Pontal, which could be a Brazilian or foreign-based company, investment fund, or consortia of private entities, would be selected through a bidding process, culminating at an auction on BOVESPA, the Brazilian stock exchange, in late April 2010.

The Contract

The winning bidder, or "concessionaire," would be granted a 25-year lease of Pontal, which remained government-owned. The concessionaire paid nothing for the lease—in effect, the "land" was free—and the government would finance construction of Pontal's basic road and energy infrastructure. Within six years of signing the contract, the concessionaire had to finish constructing the common irrigation infrastructure (estimated to cost $50 million) and establish agricultural operations on the entire 8,000 ha irrigated area. It was also responsible for Pontal's water supply and O&M for the 25-year duration of the lease, costing approximately $3.8 million per year. The concessionaire—itself not necessarily an agribusiness company—could install one or more "anchor" agribusiness companies to establish agricultural operations in the project. Through this network-like approach, private-sector actors would take over numerous roles previously held by the government.

Over the 25-year lease, the government would pay up to $120 million in reimbursement to the concessionaire: about $50 million covered the cost of building the remaining irrigation infrastructure, and the balance of $70 million, when spread over 25 years, amounted to yearly payments of about $2.8 million, or $363 per irrigated hectare.[e] "Through this reimbursement scheme, the government is essentially buying high-quality, sustainable occupation and production on the land. That's what we are paying for. In return, we get economic improvements such as jobs, income and income tax, and regional development—instead of just a bunch of idle infrastructure," said Coelho. The actual reimbursement could be less than $120 million, depending on the amount proposed in the concessionaire's winning bid. The government payment was guaranteed by the PPP Guarantee Fund, an entity managed by the Bank of Brazil, which would fulfill the payments if the government defaulted.

The concessionaire could try to buy additional land around Pontal from private owners, but would not have preferential access to nearby irrigation projects. At the lease's conclusion, the government would again offer Pontal for licensing or sale, with priority given to the existing partner, as long as it matched the best terms proposed by other bidders; past agricultural investments in the project could be counted as part of its proposed payment. "This should alleviate their concern that they might lose their investment in land they do not officially 'own,'" noted Coehlo.

To preserve the social mission of public irrigation projects, the contract required at least 25% (about 2,000 ha) of the irrigated land area to be reserved for local farmers (the remaining 75% could be farmed by the anchor company itself or sub-leased to other farmers). The concessionaire would select individuals to receive lots from a list, provided by Codevasf, of about 1,500 local farmers meeting certain eligibility criteria (e.g., farmers that did not own land, had lived in the area for at least five years, and were between the ages of 18 and 50). To maximize smallholder inclusion, the contract stipulated that the lots could not exceed 20 ha; therefore, at least 100 smallholders would be integrated in the project. Lots would be physically arranged at the discretion of the concessionaire. Coelho believed grouping smallholder-held lots together would be most logistically efficient and would provide an incentive for the smallholders to organize cooperative schemes, thereby easing delivery of technical assistance and negotiation among the parties.

The anchor company (or companies) would choose what to produce on the project's lots, and was required to vertically integrate smallholders into the production chain and to train them on farming techniques and quality standards. Smallholder production could be purchased by the company at a pre-set price, or be collected, shipped, and sold on the market on behalf of the smallholder. If the company included a processing facility, it was required to buy the smallholder output to use in its

[e] There were precisely 7,717 ha of irrigable land.

production. (See **Exhibit 8** for integrated smallholders' estimated income.) Because the concessionaire could install multiple companies in the project, it was possible that smallholder integration would fall to one company, while the others would engage in more traditional sourcing. As a precedent for smallholder integration, Coelho pointed to several large producers who regularly sourced from small, local farmers: "Dole, Chiquita, Del Monte, Noboa, and Fyffes have well-established smallholder procurement systems for fruits such as banana, citrus, and raisins, and Sadia-Perdigão (the largest poultry company in Brazil) sources most of its poultry supply from smallholders," he said.

The concessionaire could collect two tariffs from the anchor company: for land, the maximum tariff was $364.24 per ha per year, and for water, $19.72 per thousand cubic meters. The tariff cap was established to protect smallholders, who would pay tariffs to the concessionaire via the anchor company. Coelho explained: "The anchor company also has the option of collecting the smallholders' irrigation tariffs through a sort of product-equivalence system—in the form of a portion of the smallholders' production—which is very fair to the small farm." The concessionaire could choose to charge less than the contractually fixed cap, or could decide not to charge tariffs at all; if the anchor company and concessionaire belonged to the same firm, the tariff would simply be an internal cost. (See **Exhibit 9** for a comparison of the PPP and traditional public irrigation project models.)

Selection

The two-step bidding process would start with a pre-qualification phase: once the bidding papers were published (as early as mid-December 2009), potential investors could dialogue with Codevasf and gather information about the contract, while Codevasf assessed the bidders' financial capacity and agribusiness experience to identify the best-qualified candidates. In the next phase, qualified candidates would submit proposals to Codevasf, including a business plan, which would be given a score—a weighted average—based on two criteria. First was the bidder's proposed integration rate: the percentage of land area—above the established 25% minimum—designated for use by smallholders (weighted at 65%). Second was the requested amount of government reimbursement (weighted at 35%). The most attractive proposals would include higher integration rates and lower reimbursement levels. Candidates whose proposals earned top scores (within 20% of the highest score) could then revise their reimbursement request (but not the integration rate) and resubmit their proposals. At the live auction in late April 2010, these final proposals would be scored, with the winning candidate achieving the highest score.

According to Coelho, the private-sector partners best-suited to support smallholder integration would be market-driven; would participate directly in organizing smallholder production by providing input and technical assistance to ensure quality control; would agree to fair-supply agreements, such as paying producers sustainable prices (i.e., high enough to allow smallholders to earn some monetary return above their production costs); and would commit to long-term contractual arrangements. Coelho described his vision of the ideal candidate:

> We want a demand-driven, global player with existing market access—this reduces our commercial risk. The ideal partner might have previous experience with irrigation—for example, a company from Australia, Chile, Spain, or California—but our main goal is to attract a partner with a special capacity to organize a productive chain, from the farm to the consumer's table. And, of course, we want someone who can easily integrate smallholders into the supply chain.

Coelho believed sugarcane, orange, and tobacco could be ideal crops to produce at Pontal, though each presented drawbacks. Sugarcane had high yields in the region and could potentially tie in to the

country's rapidly growing biofuels market; however, ethanol prices were relatively low in 2009, and efficient production required larger lots, meaning fewer smallholders would be integrated into the project. In addition, the capital investment in processing facilities was large and ethanol would need to be transported to major demand centers either inside of Brazil or through exports. Oranges were more smallholder-friendly, requiring smaller lots, more hand labor, and commanding attractive prices, but the market was already highly competitive and prices could be unstable. Tobacco was even more conducive to smallholder farming—production lots could be as small as 5 ha and market prices were high—but social biases against tobacco production could be politically unpalatable (though there was no legal restraint). Other possible crops included citrus, banana, coconuts, grapes, mangos, pineapples, passion fruit, and cotton.

Brazil's Next Agricultural Frontier?

Coelho saw game-changing potential in the PPP model, which he viewed as a lever capable of bringing 21st century agribusiness to the SFV. Sophisticated production and processing enterprises had taken root and scaled up rapidly in other regions of Brazil (a November 2005 *Economist* article noted, "Agriculture is the Cinderella of Brazil's economy").[13] By 2009, 25% of the country's GDP came from agribusiness.[14] As Coelho considered Brazil's agricultural progress over the past half-century, he hoped the SFV would be the next chapter in this series of success stories.

In 1985, after more than 21 years under military rule, Brazil saw a civilian government come into power and incrementally adopt market-oriented reforms to encourage investment, boost agricultural and industrial productivity, and stimulate exports. As multinational companies migrated to Brazil and new technologies enabled greater output, traditional agriculture was replaced by an increasingly commercial, industrial, and global industry. From 1990 to 2005, grain production grew from 58 million metric tons (MT) to 120 million MT, meat production more than doubled, from 7.5 million MT to 20.7 million MT, and agricultural exports jumped from $13 billion to $32 billion.[15] In 2008, the country was the world's top producer and exporter of coffee and sugar, and among the top five producers and exporters of soybeans, tobacco, corn, and cotton, as well as beef, poultry, and pork.[16] "We need to bring these lessons of successful agribusiness enterprises elsewhere in Brazil inside the perimeter of the irrigation projects," said Coelho. (See **Exhibit 10** for Brazilian and worldwide production of selected commodities.)

As evidence that his vision for the SFV was achievable, Coelho could point to several examples of regional agricultural transformations, including that of California's Central Valley and Brazil's center-west savannah region, or *cerrado*: both previously rural areas had evolved into booming agricultural centers with sophisticated production chains. For instance, in the *cerrado*, where land was historically inexpensive, agriculture boomed in the latter 20th century as a result of advances in seed and fertilizer technology. In 1955, just 200,000 ha of land in the *cerrado* was arable; by 2005, the region contained more than 40 million ha of arable land and was producing a significant portion of Brazil's soybean, coffee, and beef supply.[17] Over approximately the same period, the population in the *cerrado* jumped from 1.7 million to 18 million inhabitants.[18] In California's Central Valley from the 1950s to the late 1990s, irrigated land area expanded from 2.6 million ha to almost 3.6 million ha, and the value[f] of agricultural output grew from $400 million to almost $27 billion.[19] In 2009, the Central Valley encompassed six of the top seven agriculture-producing counties in California—by far the most agriculturally productive U.S. state.[20] "Brazil is already very efficient and among the most

[f] Figures for agricultural output value are in constant 1996 dollars.

competitive agricultural countries in the world," said Coelho. "So why can't we transform our poor-performing irrigated areas into islands of excellence, like California?"

In Coelho's estimation, the SFV had several attributes—climate, transportation infrastructure, labor availability, etc.—that would appeal to the international agribusiness community. But recent events had made him believe that, above all else, water may be the region's most powerful attraction.

Water

In 2007 and 2008, surging food prices brought international attention to issues of food insecurity in import-dependent countries, and to the increasing scarcity of freshwater and arable land—two resources which the SFV had in abundance. In the future, irrigated agriculture was expected to be a critical tool for feeding a world population growing at a rate of 90 million per year.[21] The United Nations' Food and Agriculture Organization (FAO) estimated that from 2001 to 2025, 80% of the incremental food supply would come from irrigated land but only 20% more water would become available to meet growing demand for food, biofuel, and other agriculture-based products (e.g., textiles).[22] Agricultural applications alone accounted for an estimated 70% of freshwater accessible for human use.[23]

Increasingly, businesses, investment firms, and governments were hedging against the risks posed by water scarcity by leasing and buying property in countries rich in arable land and water, particularly in Africa and Latin America.[g] Skeptics viewed these so-called "land grabs" negatively, claiming they jeopardized the food security of developing countries. In recent years, investors from China, India, South Korea, and Gulf nations had spent some $30 billion on securing agricultural land, primarily in Africa. For instance, China held or was acquiring agricultural land in countries such as Cuba, Mexico, Democratic Republic of Congo, Tanzania, Uganda, Zambia, and Zimbabwe; and Qatar owned or leased agricultural land in such nations as Bahrain, Burma, Indonesia, Kuwait, and the Philippines.[24] While estimates of the total land transferred to foreign ownership varied, one report claimed foreign investors sought or purchased some 15 million to 20 million ha of farmland in developing countries from 2006 to mid-2009.[25]

Next Steps

Marketing

Although Coelho was confident that the Pontal PPP was a great opportunity for large agribusiness companies, he was surprised there was not already more "buzz" about the project. "The question I cannot answer is: Why aren't some foreign companies more interested in coming to the SFV? To us, it seems like an incredible opportunity. But are we too insulated in our Brazilian point of view?" For months, Coelho had informally marketed Pontal to the agribusiness community through public hearings and private presentations, during which he had collected feedback from some Brazilian cooperatives and multinationals. Thus far, domestic companies had not shown significant interest in bidding for Pontal, but "they aren't experiencing the water scarcity faced by companies in many other countries," said Coelho, who believed the project held greater appeal for companies based in countries where water availability was a more pressing issue.

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[g] Unlike some commodities, it was typically not cost-effective to ship water from water-rich regions to dry ones. Instead, producers of water-intensive goods were more likely to move their facilities to countries flush with water resources.

Therefore, this next phase—marketing to global agribusiness—was perhaps the most critical to Pontal's success. Coelho hoped that many candidates would bid, as competition would likely drive proposed integration rates up and reimbursement levels down. To market Pontal, Coelho planned to embark on a "road show" tour to give presentations to domestic and international agribusiness players. The first presentation was scheduled for mid-January 2010, in São Paulo, followed by presentations in other Brazilian cities, the U.S., and Europe. Codevasf was also working with DENACOOP (the Ministry of Agriculture's Department of Cooperatives) to explore opportunities to partner with large cooperatives from Brazil's south and southeast. In addition, the World Bank's International Financial Corporation (IFC), which had a long history of involvement in Brazil's public irrigation projects, would be assisting in the Pontal "matchmaking" process.

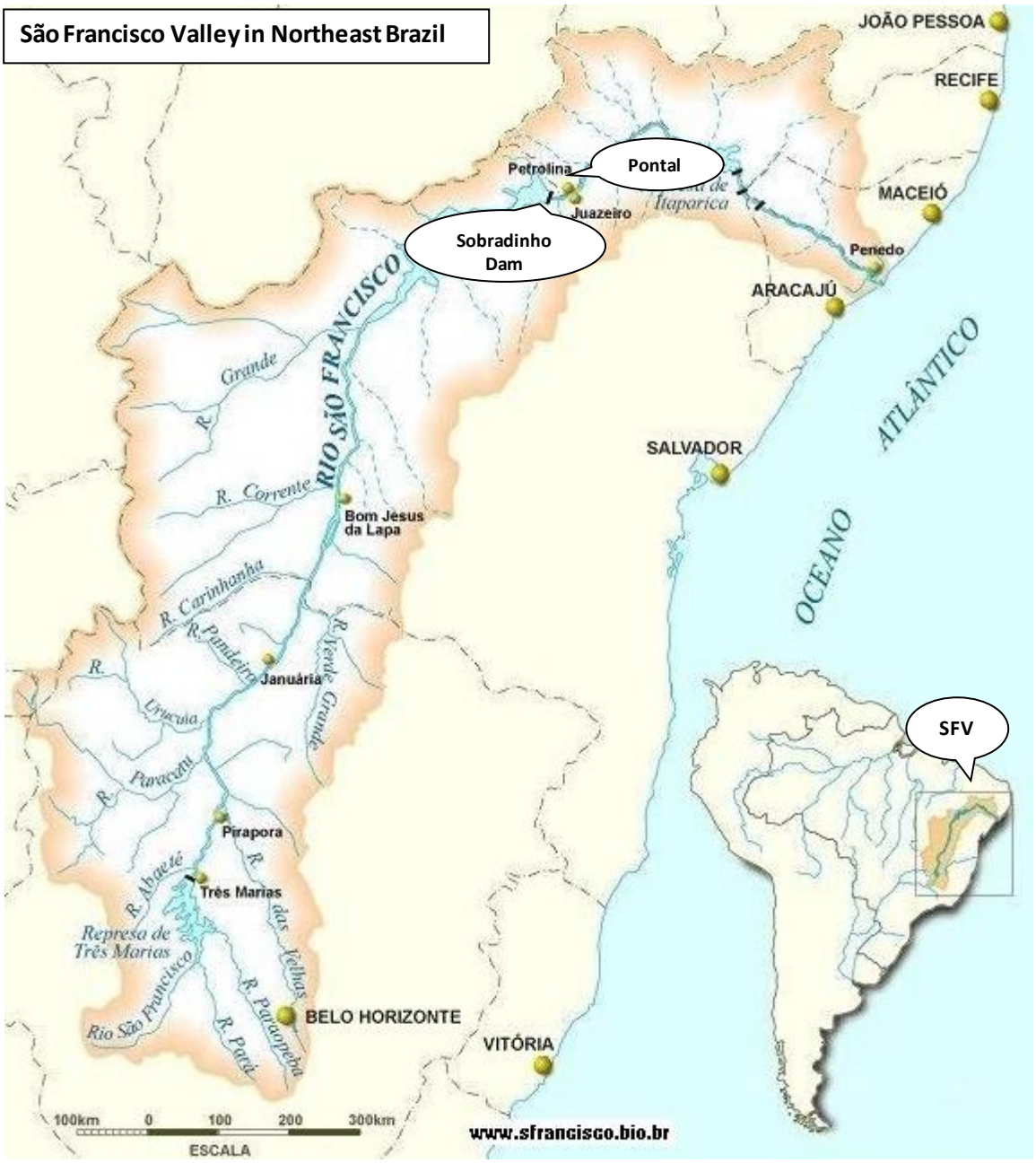
Challenges

Coelho anticipated that private-sector partners might raise certain objections. First, transporting operations to the distant, rural SFV would be a bold, drastic decision for many U.S.-, Europe-, and Asia-based producers. Although the SFV was already home to several agribusiness operations, risk-averse companies might view the region as too underdeveloped to warrant a large investment. Furthermore, because Brazil had emerged from a state-run economic regime only 50 years ago, some companies could claim that a longer track record was needed to dispel worries over government intervention; indeed, some might worry about entering a contract with the government at all, claiming it would inevitably lead to bureaucratic inefficiencies. For his part, Coelho admitted that the project had seen some delays: Codevasf had originally intended to start accepting bids in early 2008. "People were expecting this new paradigm to roll out 18 months ago, and were starting to wonder whether the government was really able to pull this off," he said. But he believed such worries were unfounded, citing the government's successful transfer of more than $1 trillion in assets and services (e.g., in telecommunications and electricity) to the private sector over the past 20 years.

There were also domestic political hurdles. Brazilian taxpayers' patience was running thin after a series of expensive public irrigation projects had failed to generate payback, but many politicians were concerned that transferring irrigation projects to the private sector would be seen as favoring industry over smallholders. Indeed, there was even skepticism among Codevasf staff about the wisdom of involving the private sector in irrigation projects, given that the objective of poverty-reduction had historically justified the public investment. A March 2005 *New York Times* article described the attitude shared by many in the SFV: ". . . the 50 million residents of [Brazil's] northeast are suspicious by nature and experience. Over the years, they have seen one project after another begun and then abandoned with a change of government, or witnessed others bring unexpected problems."[26] Furthermore, Brazilians were wary of the global "land grab" trend. In some extreme cases, foreign companies shipped in expatriates to work locally, while life remained unchanged for poor, local residents; in fact, the presence of industrial agribusiness had sometimes made it more difficult for locals, who used traditional farming techniques, to competitively produce crops. To alleviate these concerns, the Pontal contract was structured so the private-sector partner could only lease the land rather than buy it outright. Coelho thought this stipulation would satisfy some Brazilian skeptics, but he wondered how it might be perceived by potential agribusiness partners.

Coelho knew Codevasf would only have one chance to get the PPP model right. What else could he do to make sure it was a success?

Exhibit 1 The São Francisco River Valley



Source: Adapted from Piexes e Pesca no Rio São Francisco website, http:/ / www.sfrancisco.bio.br/ rio/ imagens/ bsf.jpg, accessed November 2009.

Exhibit 2a Codevasf Mission and Vision, Revised in 2009

Mission: Codevasf, associated with the Brazilian Ministry of Integration, has a mission to promote the development and revitalization of the São Francisco and Parnaíba Rivers' hydrographic bays through the sustainable use of natural resources and the conception of production activities that promote economic and social inclusion.

Vision: To be recognized nationally and internationally by people, companies and governments as a model for sustainable natural resources usage, conception of production activities, and leadership in articulation for the development of regions where it is present.

Source: Company documents.

Exhibit 2b Codevasf Guidelines

- Promote the revitalization of the São Francisco and Parnaíba hydrographic bays
- Implement projects that strengthen local business
- Adopt environmental safeguards in production activities that potentially impact the hydrographic bays' ecosystems
- Develop and update the development plans of integrated developments for the São Francisco and Parnaíba hydrographic bays
- Implement the prioritized projects identified in the Action Plan for the development of Parnaíba bay
- Capabilities training promotion for actors involved in regional sustainable development programs
- Contribute to the water supply for the human and animal consumption, mainly by smaller construction works for serving local communities
- Insert Codevasf in the Brazilian energy production matrix stimulating production of alternative energy sources, with an emphasis on science and technology, mainly in the agricultural area, as exemplified by the bioenergy production areas
- Promote environmental sanitation with an emphasis on natural resources' quality and management
- Provide incentives for the attraction of private investments as an instrument for irrigation projects' development, as exemplified by the public private partnerships and public concessions
- Develop projects and actions with a focus on Clean Development Mechanisms
- Promote infrastructure projects supporting production, logistics, distribution and commercialization in the Companies' actuation area
- Generate revenue from specialized services such as irrigation projects consultancy and georeferenced information

Source: Company documents.

Exhibit 3 Fruit Production in Petrolina and Juazeiro, 2007

Permanent Culture	Area (ha)	Productions (tons)
Acerola	1,100	22,500
Banana	2,800	60,000
Mango	23,300	462,000
Grape	12,100	241,300
Guava	3,500	112,000
Coconut	2,300	76M fruits/yr

Source: Company documents.

Exhibit 4 Distance (km) and Cost of Transport ($/ ton)[a] from Petrolina-Juazeiro to Selected Ports

	Distance (km)	Cost of Transport ($/ton)	
		Conventional	Refrigerated
Salvador	511	27	32
Fortaleza	878	37	45
Recufe	721	38	45
Rio de Janeiro	1,928	93	111
São Paulo	2,241	108	63

Source: Company documents.

[a] Figures converted from BRL to USD (1 BRL = 0.58 USD on November 25, 2009).

Exhibit 5 Irrigation Water Charges in Selected Countries, Average and Range,[a] 2004 ($/ ha)

	Average ($/ha)	Range ($/ha)	
		Low	High
Algeria	6	5	10
Argentina	70		
Brazil	41[b]		
Canada	25	5	40
China	n/a	50	150
Columbia	40	15	70
Greece	150	90	120
Hungary	20	5	30
Italy	50	20	80
Japan	245		
Mexico	50	40	60
New Zealand	20	10	30
Spain	120	80	145
Turkey	60	20	95

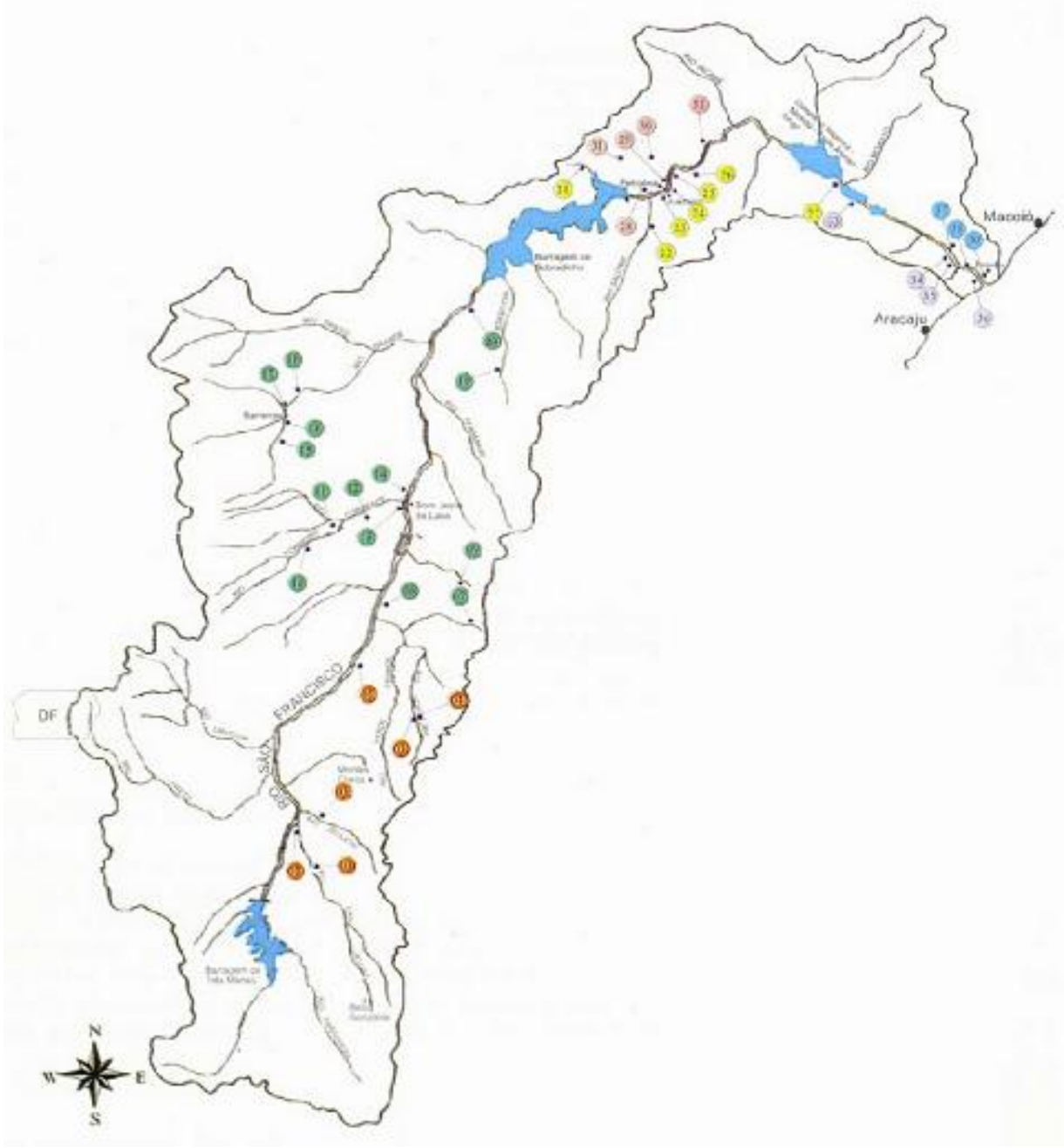
Source: Adapted from G. Cornish, B. Bosworth, and C. Perry, with collaboration of J. Burke, "Water Charging in Irrigated Agriculture—An Analysis of International Experience," Food and Agriculture Organization of the United Nations, 2004, p. 28, ftp:/ / ftp.fao.org/ agl/ aglw/ docs/ wr28e.pdf, accessed November 2009.

Note: All data is approximate and should be considered estimations. Due to significant variance in the way irrigation water costs are calculated, it is difficult to compare costs across countries, regions, and irrigation projects. For instance, charges could be based on the volume of water used, the size of the irrigated area, or a combination of several factors, and often contained one or more variable components.

[a] Range given when available.

[b] A typical water tariff in Brazil would also include a variable charge of 0.032 per cubic meter of water used. Figures for Brazil are from company documents and were converted to USD (1 BRL = 0.58 USD on November 25, 2009).

Exhibit 6 Locations of Codevasf Irrigation Projects in the SFV, 2009



Source: Company documents.

Exhibit 7 Common Structures of Irrigation Projects in Brazil

Source: Company documents.

Exhibit 8 Estimated Income for Integrated Smallholder Families

Product	Farm Size (ha)	Monthly Income (est. $)
Banana	19	$867
Pineapple	17	$895
Lemon	37	$869
Sugar cane	33	$875
Citrus	35	$883
Cotton	20	$911
Semi-processed vegetables	7	$911

Source: Company documents.

Exhibit 9 Comparison of Traditional Public Irrigation Project Model and PPP Model

	Traditional Model	PPP
Land occupation	Partially occupied, with smallholder focus	Totally occupied; anchor companies to integrate smallholders
Land ownership	Private; in the case of default, government takes back the land	Public/private
Public bidding	Land-ownership transfer	Right to use land
Bidding criteria	Best price	Best quality (considers land occupation and integration plan)
Technical assistance	Public, intermittent, and insufficient	Private, constant, and qualified
Agricultural production	Subsistence (uncoordinated, underfinanced, problems with commercialization)	Coordinated value chain
Project emancipation[a]	Normally never achieved	Emancipated from the start
Implementation term	Undefined, but generally long	Pre-determined
Common infrastructure	Infrastructure: government assumes risk Land: smallholder lots through land reform; others sold to private buyers at auction	Infrastructure and land is conceded to the private sector for the lease term

Source: Company documents.

[a] Emancipation refers to a project being financially autonomous, thus achieving independence from government support.

Exhibit 10 Area, Yield, and Production of Selected Commodities, Brazil and Worldwide, 2007–2008

Commodity	Area (ha, millions)		Yield (MT/ha)		Production (MT, millions)	
	Brazil	World	Brazil	World	Brazil	World
Barley	0.10	57.24	2.65	2.32	0.27	132.84
Corn	14.70	159.93	3.99	4.95	58.60	791.87
Cottonseed	1.08	32.10	2.54	1.43	2.74	45.94
Oats	0.35	13.21	1.36	1.92	0.48	25.35
Peanut	0.12	20.87	2.63	1.55	0.30	32.39
Rice	2.87	154.71	4.20	4.18	8.20	433.42
Sorghum	0.85	42.65	2.35	1.54	2.00	65.56
Soybean	21.30	90.72	2.86	2.44	61.00	221.13
Sugar cane	7.20	22.72	75.60	69.99	491.10	1,591.00
Wheat	1.82	218.12	2.10	2.80	3.83	610.70
	Area (ha, millions)		**Yield (kg/ha)**		**Production (480 lb bales, millions)**	
Cotton	108.00	32.94	1,488.00	796.00	7.36	120.51

Source: Compiled from "Crop Explorer: Brazil: Yield, Area, Production," Foreign Agriculture Service, USDA, http:/ / www.fas.usda.gov/ wap/ current/ toc.asp; "Topical Products: World Markets and Trade—World Sugar Situation—May 2008," USDA Foreign Agriculture Service, http:/ / www.fas.usda.gov; "Sugar: World Production Supply and Distribution," USDA Foreign Agricultural Service, November 2009, http:/ / www.fas.usda.gov; and FAOSTAT, http:/ / faostat.fao.org/ site/ 567/ DesktopDefault.aspx?PageID=567#ancor; accessed December 2009.

Appendix Descriptions of Selected Agriculture Enterprises in the SFV Region

Agrovale Built on a Codevasf project in Juazeiro called Tourão, Agrovale was a sugar cane processing plant for sugar and alcohol production and energy co-generation. Agrovale's fully irrigated, 20,000 ha production area yielded more than 110 tons per ha. From every harvest, Agrovale processed 1.5 million tons of sugar cane, all of which was supplied to the state of Bahia.

Amacoco Bought by Pepsi Co. in August 2009, Amacoco was originally established in the Petrolina region to take advantage of local coconut production for coconut water. The company bought coconuts from various independent producers in an 800 ha area, and also invested in its own production areas. Amacoco's Petrolina facilities had a daily capacity 70,000 liters. While Amacoco's production transportation and product management capabilities were well developed, it still struggled to secure a stable supply flow.

Embrapa Semi-Árido Embrapa Semi-Árido was part of Embrapa, Brazil's federal agricultural research organization created in 1973. In 2009, Embrapa remained a vital source of information and support for Brazilian producers. Embrapa Semi-Árido sought viable technological, competitive and sustainable solutions to develop agribusiness in Brazil's semi-arid northeast. One of the organization's priorities was diversifying the region's cultures; for example, by testing and adapting cultures such as olives, peaches, citrus, cocoa, pear, etc.

Itacitrus and CentraJai In August 2007, CentraJai (Central of Project Jaíba Producers Associations), an association of small growers from Jaíba, Minas Gerais, partnered with Itacitrus, a producer/ distributor of limes both domestically and internationally, with the aim of bolstering the market for CentraJai members' limes—both expanding their domestic market and facilitating exports for the first time. Itacitrus managed product quality and sales on behalf of CentralJai. Since November 2007, Itacitrus commercialized most CentralJai lime production for domestic markets and all production for external markets.

Pindorama Located in the lower São Francisco River in the municipality of Coruripe, Alagoas, Pindorama was a cooperative of small growers' organizations that exemplified the insertion of small producers into agribusiness. The model was idealized by Berthlet, a French-Swiss who came in 1956 with a mission to settle families in lots, creating colonies that could use a cooperative system to exclusively produce sugar, alcohol, coconut by-products, passion fruit and acerola, as well as dairy cattle. This unique model enabled the sustainable inclusion of small producers, and was particularly notable for achieving this with sugar cane culture.

Valexport Valexport—the Orchard, Fruit, Poultry and By-products Producers and Exporters Association of São Francisco Valley—was a trade association founded in 1998 to represent producers in the Petrolina and Juazeiro area. Valexport engaged in a range of activities to promote exportation and otherwise advance the interests of SFV producers, including: forging technical and trade agreements (related to production, shipping, warehousing, etc.) with domestic and international institutions, supporting research on irrigated agriculture promoting integration of the SFV producers in fairs and expositions, supporting transportation infrastructure development, and promoting broad integration of the Brazilian fruit sector.[27] In 2009, Velxport had as members around 50 producers and exporters, representing 70% of production and 80% of exportation in the SFV region.

ViniBrasil ViniBrasil was a grape grower and wine producer that had achieved appreciable market success—and, consequently, promotion of the São Francisco Valley brand—since its 2003 founding. With the motto "New Latitude, New Attitude," the company pioneered wine production in the arid SVF: where dry conditions and uneven rainfall would otherwise inhibit wine-grape

production, ViniBrasil controlled the growing conditions, using irrigation to administer precise amounts of water, while taking advantage of the region's year-round sunshine. ViniBrasil had tested and developed several grape varieties on its 200-ha farm, and had potential to expand further as it cultivated a larger export market.

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