U.S.A.I.D.

Bureau of Economic Growth, Agriculture, and Trade (EGAT)

Dairy Enterprise Initiative Final Report

Developing Sustainability of Cow Milk Production, Nicaragua
(EDH-G-00-03-00016-00)

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January 15, 2007

***In Cooperation With*:**

National Cooperative Business Association
- ***CLUSA Nicaragua***

REPROTEC S.A. Nicaragua
- ***CRIAS Nicaragua***

SARSAN
- ***Specialty Farm Services***

Alianza Amerrisque
- Cooperativa San Francisco
- Cooperativa Masaguito
- Cooperativa Santa Thomas
- Cooperativa Candelaria
- Cooperativa La Union
- Cooperativa Mayalas
- Cooperativa Agropecuarios Acoyapa
- Cooperativa La Esperanza
- Cooperativa El Manantial
- Cooperativa COOPROLECHE

Final Performance Report
October 1, 2003 – September 30, 2006

Cooperative Resources International

Subsidiaries

AgSource Cooperative Services
Verona, WI

Central Livestock Association
South St. Paul, MN

Genex
Ithaca, NY
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Tiffin, OH

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Washington, D.C. 20523

January 15, 2007

Re: Final Report, Developing Sustainability of Cow Milk Production, Nicaragua (EDH-G-00-03-00016-00)

Dear Jim:

CRI is pleased to present its Final Report for Dairy Enterprise Initiative activities. In this report, CRI has consolidated program activity reports of all CRI DEI Programs in Nicaragua. The goal of this report is to stress project dynamics and interdependencies, netting comprehensive impacts. It has been an exciting three-year program for CRI, Nicaragua's participating dairy cooperatives, and the dairy producers of the region, as we hope this report will sufficiently detail. The participating cooperatives have made substantial gains in both management and marketing development.

Through the course of this program, CRI, CLUSA Nicaragua, and partnering cooperatives and agribusinesses launched an intensive and focused dairy herd improvement (DHI-type) and producer-based HAACP program to enhance milk production and quality across the ten livestock cooperatives of the Amerisque Alliance counting a project constituency of more than 2,350 agricultural households including producers, farm workers, and cooperative and agribusiness employees, for a total of 11,750 people. Across project activities and impacts, income gains totaled $7.8 million annually in production, or $663 per capita per year.

CRI teamed cooperatives with established agribusinesses to contract dairy management, raw milk quality control, and forage production and feeding management services. Combining these essential services, cooperatives reduced the internal overhead subsidies of owning and housing seasonal production services. CLUSA Nicaragua supported further cooperative gains and efficiencies by specializing in milk and livestock grading, bulking and marketing coupled with processing, distributing, and marketing dairy products from surplus raw fluid milk.

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The pilot project would come to focus on nearly 10 farms per municipality for more than 70 cattle operations across western Nicaragua. While REPROTEC S.A. of Nicaragua was supporting industrial modern dairies in the pari-urban industrial regions of Managua and Tipetopa, they serviced nearly 30 herds with 3,500 head under controlled milk recording and herd health programs. Forming the CRIAS Division, CRI and REPROTEC enrolled 70 rural herds with 5,600 head under controlled milk recording across Nicaragua in a complete dairy herd improvement program. CRIAS would work to provide milk recording services, production analysis, herd management consulting, and routine herd health services. With the program supporting technical extension, producers, on average, culled the poorest 15 percent of the herd to raise cash resources to fund improved production services. Farms were, on average, exceeding quality livestock carrying capacities, with pastures heavily overstocked, depressing productivity. Reduction to carrying capacity netted farms an immediate 35 percent increase in production.

Additionally, and with great innovation and ingenuity, CRIAS developed and successfully implemented a commercial HAACP farm certification service. This included technical training of farm workers in milking procedures, milk equipment inspection, care and maintenance, and herd health inspection. The CRIAS HAACP farm certification program tested and maintained on-farm production standards and procedures to quality producers as grade "A" farms by Nicaraguan standards and norms to quality raw-fluid milk production procedures for export market chain supply. Participating cooperatives, with the assistance of CLUSA, would segregate farms by supply and collection routes by quality for fluid milk, export product, and domestic product supplies based upon raw milk quality and farm production standards.

It is important to note, the USAID/CRI funded only milk recording and extension training; producers paid all other service fees. Herd reductions and increased production ensured that all direct services of livestock vaccinations, genetics and artificial insemination, vitamin and mineral supplementation, and routine pregnancy examinations were fully funded by service fees.

Working through joint service ventures with neighboring cooperatives and the local extension teams, extension team leaders formed Specialty Farm Services to fill the agro-service voids they had directly experienced. SFS would provide essential services in tillage, planting, harvesting, and feed storage and ensilaging. Managing more than 132 job orders annually, including the 70 pilot farms, SFS would produce, harvest, and store more than 2,000 tons of forage annually to maintain milk production and farm income throughout the year. By stabilizing the milk production and supply curve, farmers could earn higher, off-season prices and cooperatives stabilized operating income and employment through the dry-season milk supply trough.

As milk production increased in both quality and quantity, programs created new challenges in marketing additional output and promoting improved quality to earn market premiums. The CLUSA Nicaragua team supported the project specifically with more than 345 training sessions in 2006 as it assisted cooperatives in designing internal product controls, collection center and processing HAACP plans, HAACP team training, and product branding. Major cooperative achievements under CLUSA support responsibility were in designing individual brands to reflect enhanced quality control from farm to fork, and accessing regional export markets and outlets, particularly in Honduras and El Salvador. The CLUSA team cooperative leadership, in their single greatest achievement and contribution, ensured that while raw milk quantity and quality increased, its marketing and branding support avoided a localized market glut and prices kept pace with the region, staving off price collapses and minimizing seasonal downturns.

The uniqueness and success of the CRI-CLUSA DEI Model was to emphasize a pilot initiative and the division of labor in farm-to-fork production and quality control. Participating farms enrolled in a comprehensive dairy management program of farm carrying capacity, herd health, genetic performance, and forage and feed management, and worker training coupled with commodity chain quality performance and successful marketing. This program uniquely and fully integrated the value-added commodity chain by linking production, bulking, and processing into a single premium product line.

On behalf of program participants and project personnel, CRI would like to thank U.S.A.I.D. for the opportunity to participate in the Dairy Enterprise Initiative, for U.S.A.I.D.'s continued and unwavering support of this important agricultural sector, and your staff's technical support in project activities. Through this project, CRI has endeavored to reflect the most positive aims and aspirations of U.S. economic development intervention (while enabling beneficiaries to mark their own achievements) to build their farms, their cooperatives, their community, and their sector with indelible personal pride.

If you have any questions or comments about this final performance report, please do not hesitate to contact me.

Sincerely,

Keith Heikes

Keith A. Heikes
Vice President
International Programs

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Preface: What Is the Matter with Nicaragua?

In *The Road to Hell*, career aid worker Michael Maren offers this insight, "Vietnam had sowed within us enough suspicion of our own culture to have us looking for answers to the world's problems in other cultures."[1] Reinforced by peripheral cold war conflicts of the 1980s and the war on terror, the self-imposed embargo of US-based economic growth archetypes has swept a cornucopia of development models from the table. The very system generating sufficient surplus wealth to fund development is deemed unsuitable for export. Donors adapt Kenyan models to Malawi, translate them to Central America, re-export them to Somalia, and finally recycle them in Kenya for the next funding cycle. Pounding a fist to the table, the Nicaraguan-based NGO chief of party reminds an upstart U.S. agribusiness PVO that this is *not* the U.S. But, he continues, let me tell you what we did—what *worked*—in Ethiopia, and why it can work here. U.S. aid dollars are fine—even an entitlement, but not U.S. production, business, and market models.

In *An Empire of Wealth*, John S. Gordon lists the three key inventions that would ultimately define the U.S.: 1) the printing press [access to information], 2) the full-rigged ship [access to markets], and 3) double-entry accounting [access to capital][2]. All invented prior to its founding, the U.S. would uniquely integrate and employ them as a *system*—Franklin's press printing Payne's ideas, Hancock's sloop, *Liberty,* freighting colonial farm produce, Hamilton's ledger managing French loans and Spanish dollars. The donor community met the development challenges of Nicaragua by distributing computers, branding agricultural products, and gifting technology transfers, subsidized loans, and salaries—providing access to information, markets, and capital. Still Nicaragua, like much of the developing world, lags behind in sustained rates of economic growth. Why? What did the U.S. have that Nicaragua does not? The answer: Alger, Brandies, Carver, Ford, McCormick, and Taylor—the homegrown innovators, the *human* capital and upward mobility model, and as Professor H. W. Brands explains, their common *obsession for efficiency.*[3]

Through his *Ragged Dick* series, Horatio Alger would not only inspire the indigent child to rise from the lower class, but challenged society to value the homegrown entrepreneur and encourage upward mobility. The *vaquero*, the *campesino*, the *granjero*, has practical application knowledge, ideas, and innovations; all are undervalued and underemployed, as donors duplicitously observe the domestic social class structure. Often confused with the "farmer" as an owner-operator, the Nicaraguan "producer" is a landlord-employer—lord and don. Nicaraguan agriculture remains feudal; the campesino is vassal, sharecropper, and tenant.

In the 1910 Eastern Rate Case, future Supreme Court Associate Justice Louis Brandies would represent New York merchants challenging a railroad pool petition to the Interstate Commerce Commission for a five percent rate increase. Citing Frederick Taylor's *The Principles of Scientific Management*, Brandies would successfully argue that if the railroads were required to publicly open their books and submit to an external audit, auditors could readily identify more than five percent in cost savings. The Eastern Rate Case became the watershed adaptation and mainstreaming of double-entry accounting in capital firm management, impressed scientific management upon the business monolith, and gave rise to the certified public accounting (CPA) profession, the quarterly and annual financial reports, and fueled sweeping reforms culminating in the Federal Reserve to stabilize investment, banking, and currency.

If *producers* demand premiums from consumers and subsidies from governments and institutional aid, then those deriving the benefits of a more affordable and sustainable food supply should pay these dividends to production but, as Brandies did argue, only after the producers open their books and an independent audit of the cost of production is known—or in the case of Nicaragua, only after the producers first *keep* books. In Nicaraguan development, cost of production controls and scientific management was off the table. Development is tasked to pool and market each day's non-standardized food commodity production at a premium—to source and access the cooperative and the producer's information, market, and capital needs.

Scientist, extension worker, conservationist, inventor, and innovator George Washington Carver is the U.S. model personified that Maren would abandon. Born an enslaved houseboy, the rise of the raggedy Carver lifted all around him as he learned for, from, and with the sharecroppers and tenant farmers. With the ambitious goal of alleviating poverty, Carver first labored to save the soil by dismantling mono-cropping to wean a culture off cotton crop dependency. To do this, he would discover 300 applications for peanuts, soybeans, sweet potatoes, and their byproducts to change market dynamics and stimulate demand for crops to restore the soil. In a horse drawn wagon stacked with wooden benches, Carver's mobile school went directly to the poor—not the plantation owners. Carver believed in the lower class, their ability to learn, to adapt, to innovate, to overcome. The Nicaraguan NGOs would feed the poorest of the poor, inoculate them, even clothe them, but failed to comprehend the campesino's sharecropper status, anticipate their educational needs, and appreciate and cultivate their practical knowledge. As Carver did demonstrate, the underclass is the fertile seedbed of ingenuity, invention, and innovation—it is hungrier.

KFC "Colonel" Harland Sanders said, "Feed the rich and you will get poor, feed the poor and you will get rich." Born to farming families, sharing a disdain for farm work and a Carver-esque affinity for the agrarian underclass, Henry Ford would harness mass production in production for the masses and Cyrus McCormick would combine grain harvesting tasks into the reaper and become the man who made bread cheap. Ford gave U.S. business the standardization model, driving down per unit costs 90 percent below competitors. McCormick slashed the production cost of a bushel of wheat 75 percent, from 3 labor hours to .75 hours per bushel. Cheaper food increases discretionary income, stimulating industrial consumer trends, creating employment and economic expansion. Nicaraguan NGOs have emphasized premium niche markets—feeding the rich. Still, with only one-third the retail outlets, Duncan Donuts sells more coffee than Starbucks. As Henry Ford realized, the underclass is the largest market and the least served.

Fired from Bethlehem Steel for his meticulous and overly analytical predilections, Frederick Wilson Taylor would go on to author *Shop Management* and *The Principles of Scientific Management*. In his own obsession for efficiency, Taylor secretly followed workers home to observe their routines, living conditions, and motivations. The success of scientific management would be in understanding the worker and matching incentives to motivations. In development, the motivations of project beneficiaries have been decided for them. Development works to increase living standards—income—by increasing productivity to keep pace with the cost of living. Beneficiaries measure improved living standards by less work for the same living standard—inflationary farm-gate or *premium* prices for stagnant productivity.

Carnegie said, "Show me your cost sheet. It is more interesting to know how well or how cheaply you have done this thing than how much money you have made, because the one [money and profits] is a temporary result due possibly to special conditions of trade, the other [the costs] means a permanency that will go on with the works as long as they last."[3] The Germans invented the automobile, the French perfected bread, and the British developed the cavity magnetron (microwave), but the United States made them affordable and delivered them to the masses, adapting them as living standard staples and democratizing luxuries as everyday conveniences. McDonald's is not French cuisine, but it is consistent and affordable the world over, Coca Cola is the most recognized international trademark, and cheap U.S. bread is sliced.

The CRI *Dairy Enterprise Initiative* in Nicaragua would emphasize the three key elements of development and economic growth, access to information, markets, and capital as an integrated, functioning production agriculture system. In a departure from conventional, contemporary development models, CRI would support farm worker access to information, access to mass consumer markets, and production accounting to access capital by attracting investment. CRI would emphasize upward mobility in agribusiness creation and on-farm management, consumer preference in product development, and the cost sheets, *because profits are a temporary result due possibly to special conditions of trade and the costs mean a permanency that will go on with the agribusiness, the farm, and the cooperative as long as they last.*

Technical Program Report
Dairy Enterprise Initiative
Bureau of Economic Growth, Agriculture and Trade (EGAT)
United States Agency for International Development (USAID)

Developing Sustainability of Cow Milk Production, Nicaragua

1. Project Number: EDH-G-00-03-00016-00 (CRI 9387)

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3. Subcontract Organization: Cooperative League of the U.S.A.

dba National Cooperative Business Association

Executive Summary

In 2005, Nicaragua produced 613,000 tons of milk and 74,000 tons of beef to mark a 300 and 143 percent recovery, respectively, to pre-Mitch levels. From 1997 to 2005, cattle farm receipts rose 153 percent from $117 to $297 million annually, while livestock exports climbed 157 percent from $53 to $136 million annually. With sector growth of $180 million in real dollars, the 19 percent annual rate is five times that of real GDP growth. Comparatively, production in staple agricultural export commodities, including coffee; groundnuts; sugar; and vegetables, recovered to 129 percent of pre-Mitch levels. Since 1997, primary produce farm receipts are down 13 percent from $230 to $200 million annually and export income fell 21 percent from $217 to $171 million, marking an average sector decline of 1.6 percent annually.[1]

Over eight years, through five successive initiatives, USAID has committed $3.2 million and CRI, livestock producers, cooperatives, and agribusinesses have leveraged an additional $1 million in investment to support livestock sector rehabilitation in Nicaragua. This one-time $4.2 million investment has netted $7.8 million annually in combined livestock sector production income and cooperative processing savings across a project constituency of more than 2,350 agricultural households including producers, farm workers, and cooperative and agribusiness employees. Reaching 11,750 people, USAID-CRI invested $272 per person earning $663 per project capita per year. Establishing the program objectives listed, the CRI-CLUSA team achieved the following results:

- ***Improve Yields:*** *Core producer participants will achieve 1,400 kilos per cow per 305-day lactation.* More than 60 herds, totaling 5,800 cows and 36,400 hectares, were enrolled in the pilot program completing 516 production field studies. With a national average of 689 liters and a cooperative baseline of 904 liters per lactation per cow, core participants achieved average production of 2,967 liters per cow, per lactation, with the top herd reaching 4,460 liters and the top cow 6,816 liters.

- ***Lower Production Costs:*** *Average cost of milk production 85 percent of farm gate milk prices.* Cooperatives paid on average $0.23 per liter. The average Nicaraguan cow costs $262 annually in maintenance, grossing $156 in milk sales (at 689 liters) and $97 in calf sales, for a total of $253 or a $9 loss per head. At the cooperative herd baseline average at 904 liters, cows generated $204 in milk sales, $97 in calf sales per lactation, totaling $302 or $40 net income per cow, with milk costs of production at $0.29 per liter, or 27 percent over farm-gate milk prices. Improved genetics increasing costs by $56 to $318 per lactation, raised milk production to 1,541 liters, with milk sales of $350 and calf sales increasing to $108, and cost of milk production accounted for 91 percent of farm gate prices. Intensive management methods added $166 per head in livestock management for a total of $484, increasing milk production to 3,000 liters grossing $681 in sales, with the cost of production 71 percent of farm gate prices. Including calf sales at $108 per lactation, production per cow rose from $253 to $789 per year with net receipts up from $40 in the cooperative baseline to $305.

- ***Increase Income:*** *Demonstrate not less than 15 percent profit retention by core participants.* While the intensive management systems increased operating expenses per cow $222, output offsets reduced the cost of production per liter from $0.29 to $0.16. Farm profit retention ranging between 18 to 29 percent was equal to current interest rates of 17 to 30 percent; insuring livestock production was competitive in capital investment markets. The $222 in new production costs across the nearly 70 farms and 6,000 head generated $3.1 million in additional milk sales and $1.3 million in *new* agribusiness employment and farm investment. Across the cooperatives, 250 milking parlor-corrals were constructed, 500 metric tons of silo capacity was installed, and three new agribusinesses were formed to cultivate more than 1,000 hectares, harvest and store 2,000 tons of feed, and perform 14,763 inseminations; 275 embryo transfers; and 61 monthly herd health (4,000 head) exams annually.

[1] All figures in constant (real) 2005 U.S. dollars; Source FAOSTAT, faostat.org, CIA World Factbook, www.cia.gov/cia/publications/factbook.html

- ***Increase Quality:*** *Qualify core producer participants at Grade "A" (Class I) milk.*
  At the beginning of USAID/CRI DEI Programs, only 35 percent of farms qualified as Grade "A". Previous programs increased compliance to 58 percent. In this final program, 65 percent of participants are certified compliant, with *Good Milking and Cow Management Practices* norms meeting Grade "A" industry standards. This meets current market demand and processing capacity for fluid *Class I* milk (packaged whole, skim, and reduced fat milk in retail markets and school lunch programs). Grade B and C farms limited by electrification and transportation infrastructure continue to supply a remunerative Class II and III market in cream, cheese, and dry or powdered milk. CRI/CLUSA trained 37 Ministry of Agriculture and Livestock dairy food inspectors, 38 field technicians in livestock HACCP maintenance, and 129 producers supplying Class I fluid milk product lines in farm HACCP compliance.

- ***Business Capacity:*** *Cooperatives will demonstrate plant capacity utilization of 85 percent.*
  Among core industrialized cooperative plants through previous DEI Programs, CRI increased plant utilization from 36 percent to 70 percent. Production project gains totaled 37,414 liters per day across participating cooperatives, utilizing 93.5 percent of pre-project capacity, generating $8,500 per day in new livestock economic activity. One cooperative, securing direct outside financing, opened a 30,000 liter per day facility. Additionally, the private El Salvadorian firm NICALAC opened a 200,000 liter plant, siphoning off non-member raw milk supplies. While plant capacity expanded through unforeseen externalities, participating cooperative capacity utilization averaged 78 percent at project end.

- ***Internal Controls:*** *Participating cooperatives will reduce overhead costs by not less than 15 percent.*
  Among core industrialized cooperatives through previous DEI Programs, CRI reduced operating expenses and overhead by 22 percent with plant utilization, improved farm-gate quality, and liquidation of internally subsidized business units. CRI/CLUSA expanded this program across the ten cooperatives of Alianza Amerrisque. Pre-industrial cooperatives had not established overhead or cost baselines to reliably determine savings. CRI/CLUSA provided training and established cost and profit analysis systems (ASIS Program), formatting and designing primary documents to include balance sheets, income statements, and annex costs of merchandise produced and sold. Cost and overhead were more effectively controlled and brought in line with comparable industrial cooperative units.

- ***Quality Control:*** *Cooperative Alliance aggregate product will qualify for export.*
  In compliance with 2003 USFDA regulations, Hazardous Analysis and Critical Control Point (HACCP) plans were developed and implemented in the four industrialized cooperative processing plants in the Alliance. The HACCP program has lead to 3.6 tons of sustained cheese exports per day (36 tons of fluid milk equal to project daily production gains) valued at $2,540 per ton or $9,144 per day ($2.7 million annually) in foreign capital receipts.

- ***Producer Service Capacity:*** *Cooperatives will demonstrate 85 percent producer services utilization.*
  While there was no baseline producer service capacity utilization, the primary goal of this objective was to individually analyze cooperative cost centers and business units for impact and efficiency. Production support units (farm equipment, veterinarian care and A.I., cooperative stores and outlets, credit unions, extension, and marketing) not utilized at or above 85 percent of capacity or membership were designated to be liquidated, phased out, and outsourced to reduce overhead and internal subsidies. Reducing the cooperative business portfolio to dairy product processing with concentration on marketing and an emphasis on collective bargaining to outsource essential production services resulted in significant cost of production savings for member producers, while focused marketing increased processed commodity sales. Cooperative business unit liquidation saved cooperatives $113,300 and saved producers $206,000 ($319,000) annually in internal subsidies, producer user fees, and production costs—$354 per member farm per year.

- ***Marketing Capacity:*** *Cooperative Alliance will provide marketing services to member cooperatives.* CRI/CLUSA provided Alliance training in product development, branding, market research, and marketing. The Alliance managed annual product promotions through national agricultural and product fairs and domestic and regional marketing initiatives.

- ***Value Added Processing:*** *Cooperative value-added dollar value will achieve regional values ($224).* In the immediate pre-project period, Nicaragua dairy exports averaged $308 per ton (based upon milk equivalency), earning only $108 in value-added income over the cost of raw fluid milk ($200 per ton). At the project conclusion, cooperative exports earned $507 per milk ton, with $227 paid to producers and $280 earned in cooperative value-added processing, exceeding the goal of $224 per fluid milk ton.

- ***Quality Control:*** *The cooperative Alliance will coordinate standardized quality control mechanisms.* A 100-member cooperative Alliance panel participated in the quality control forum to establish quality control standards and mechanisms. CRI/CLUSA trained cooperative extension agents in farm HACCP monitoring and provided HACCP kits for basic animal husbandry, farm milk quality control testing, livestock traceability, and milk production testing and control. Cooperative Alliance agents and MAGFOR inspectors supported by CRI/CLUSA observers inspected farms and herds and awarded "*Certificates of Compliance*" to qualified producers. Certified producers were segregated by milk collection routes and product line.

- ***Processing Capacity:*** *Cooperative Alliance will promote 80 percent of all milk is pasteurized.* CRI/CLUSA provided support and training in plant planning, design, and specification compliance to ensure operational feasibility, economic sustainability, export market access, and regulatory conformity. Product pasteurization and handling norms were established and provided for quality control norms and monitoring mechanisms. Industrial plants are currently pasteurizing the bulk of raw product.

- ***Business Capacity:*** *Promote existing cooperative brand, establish new product lines, and wholesale.* Two registered trademarks for dairy projects have been established within the Alliance, RIOLACT and SENOR QUESO in Nicaragua, with registration pending in Central America. The Alliance, with the aid of CRI/CLUSA, was instrumental in passing and supporting Cooperatives Law #449, which will strengthen business and institutional aspects of the Alliance.

- ***Contract Compliance:*** *The Cooperative Alliance will facilitate collective bargaining.* Especially through the leadership of the larger processing cooperatives, the Amerrisque Alliance moved strongly toward stronger bargaining positions with buyers and suppliers. By improving product quality and cost accounting methods, the negotiating capacity of these plants is improved. More precise and timely information on inventories, demand and costs, and high-quality value-added products have permitted these cooperatives to compete successfully in transparent, lucrative sectors.

- ***Brokering Access:*** *The cooperative association will increase access to markets and affordable credit.* CRI/CLUSA has facilitated contacts with new dairy processors such as NICALAC to help diversify and expand the fluid milk client base for cooperatives. The Alliance HACCP standard will be critical in securing significant supply share. Detailed further, later in this report, the Alliance's primary impact in investment was to standardize farm financial records, categorize and prioritize investment, support farm business planning, and effectively reduce credit demand. The Alliance did not manage or process any aggregated farm improvement or operating loans.

- ***Maximizing Service Capacity:*** *Consolidate cooperative dairy producer services.* Primary production input and supply services were liquidated and outsourced to established and newly organized agribusiness firms to effectively reduce cooperative overhead and minimize production costs to the producer. Extension services were incorporated as user-fee services.

The CRI/CLUSA team systematically 1) defined consumer demand for milk by components, quality, and time; 2) studied 30 core farms to determine optimum milk production methods in Nicaragua; 3) integrated methods at the project model farm and tested outcomes; 4) replicated a standardized milk production model managing reproduction, forage, nutrition, and herd health on 105 farms across the pilot project area; 5) financed farm improvements and innovations through internal capital resources (culling and liquidating unproductive livestock and land holdings); 6) increased pilot area milk production by 37,000 liters per day; 7) established HACCP quality control to ensure commodity consistency; 8) HACCP branded commodity products with a quality seal; and 9) opened a corresponding 36,000 liters per day market to sustain system income. Cooperatives marketed finished products grossing $507 per milk ton ($280 net), producers grossed $227 per ton ($115 net), and agribusiness grossed $76 per ton ($42 net after cost of goods sold). *The key success is production—product, commodity, producer, and cooperative—conforming to the market emphasizing quality, taste and consistency, not in consumers and the market conforming to production.*

While these gains demonstrate economic sustainability, rural income concentration, the lack of equitable employment distribution, and an unstable division of labor, these gains may *not* prove politically sustainable. Although farm receipts and net savings are quantified at national, cooperative, and pilot project levels, producer level gains remain hidden in the informal market of direct farm-gate cash sales and artisan processor side-selling—millions in product, productivity, and profits are marginalized to evade taxation, equity *"maintenance"* subsidizing surplus cooperative capacity, compulsory parochial donations, and to demand more aid ultimately. Nicaragua's *La Prensa* reports the industrial value-added chain captured only 20 percent of milk and 45 percent of beef production, while the informal sector paid, on average, 20 percent higher farm-gate prices and retailed, on average, six percent less than the formal market. The 20 percent informal-artisan market premium demonstrates the true cost of side-selling.

The 490 million tons of milk and 226,000 head of beef per year skirting Nicaragua's formal commodity markets cost the industrial urban base $305 million in value adding employment and $36.5 million in disposable income, or 112,000 industrial and service jobs. The 20 percent artisan premium is paid for through $60 million in annual tax evasion, enough to pave 12,000 of Nicaragua's 16,000 unpaved kilometers or increase educational spending 54 percent per pupil for two million school-aged children. This 20 percent premium avoids 15 percent in VAT, 2.5 percent in commodity sales tax, and 2.5 percent gross income tax. Saving 6 percent on food, Nicaraguans sacrifice employment, infrastructure, and education.

U.S. Vice President, Secretary of Agriculture, and *Wallace's Farmer,* publisher Henry A. Wallace, reminded policy makers often that, *"When former civilizations have fallen, there is a strong reason for believing that they fell because they could not achieve the necessary balance between city and country."* The CRI development challenge has been to increase farm productivity, economies of raw commodity consolidation, and efficiencies in agribusiness sales and service—*economic sustainability.* Political sustainability, however, is realized when marketing mainstreams the agrarian population into the tax base, the domestic consumer market, and a transparent public policy and democratic planning process.

Nicaragua's rural and urban populations are increasingly socioeconomic strangers. As artisan producer cooperatives access export markets, they become import consumer market dependent to maximize foreign currencies with fewer trade dollars spent domestically. Increasingly excluded from the $500 million annual agricultural trade business, urban Nicaraguans subsidize agriculture's $211 million trade surplus by importing $83 million in foodstuff annually—$13 million in dairy and beef. Like the five commodity-kings of cotton, cane, coffee, corn, and cattle of two and a half decades earlier, valued-added processing is slipping through Managua's fingers, the rural tax base is contracting, direct foreign trade is polarizing, and it is Paris 1789, Charleston 1861, St. Petersburg 1917, and Managua 1979 all over again—food and trade—proletariat versus landed gentry, rural versus urban, production versus processing, and agriculture versus industry. And always the peasant question—the serf, the slave, the vaquero, and the campesino.

Background

"...it must be said that we have a very definite and special interest in the maintenance of order and good government in Nicaragua at the present time, and that the stability, prosperity, and independence of all Central American countries can never be a matter of indifference to us." – President Calvin Coolidge, 1927.

Since cattle arrived in Central America with Spanish explorers and colonists in 1500, livestock has dominated farm receipts for five centuries, with the integration of various transitory cash crops. In the founding traditions of Spain, cattle were raised on the Central Highlands east of *Lago de Managua*. Surplus livestock would be harvested in the roundup, driven west onto the fertile coastal plain to feed on the native grasses, and fatten on white maize, rice, and tropical fruit residues on large cattle baron estates centered upon the colonial capital of Leon. All that the world knows about ranching, it learned from the Spaniard. Cattle *eat* their way to market, arriving in the celebrated running of the bulls to face bullfighting matadors.

Coffee and its companion, sugar, (following 18th Century rum) would boom in the 1800s with the decline of British sea power, colonial rejection of the British stamp and navigation acts, and Dutch trade supremacy combining to supplant tea. War, trade, and politics would introduce other commodities with a World War II and post-war cotton boom. Like the colonial cattle kings, the Leon Region would dominate with 84 percent of cotton cultivation. And, always, a river of cattle flowed through the Nicaragua commodity chain.

Nicaraguan cheese exports to the U.S. first peaked in 1911 with 68,415 pounds, while importing 33,000 pounds, for a net cheese trade of 17.5 tons annually. A 1917 U.S. Consul report notes:

> "...the production of cheese and butter is sufficient for the local demands and the former [cheese] is exported to the neighboring Central American republics in small quantities. Cheese is an important article of food for the laboring class, and the annual production probably exceeds 5,000 tons."

The expansion of cotton plantations in the 1950s drove cattle ranch expansion in the 1960s, as even greater numbers of stocker cattle were required to manage arable plains and lowland cropping. Plantation and ranch expansion placed pressure on subsistent, frontier peasant settlements, driving the frontier eastward, deeper into the rainforests of the Central Southeast and up and over the Central and Northeastern Highlands. Clearing land in the peasant push east, deforestation would cause erosion, driving further eastern interior migration, with expanding ranches claiming the abandoned land.

While deforestation would be compounded by the U.S.-owned *Nicaraguan Long Leaf Pine Company* (NIPCO) paying lucrative royalties to the Somoza family to avoid costly seeding and reforestation, it is the independent pioneer frontiersman who conquers the wilderness interior, clearing and *"improving"* virgin lands to sell to advancing plantation kings and cattle barons—a symbiotic relationship in the march of agriculture and development. The pioneer is neither farmer nor rancher—not agriculturist—but speculator positioned ahead of advancing agricultural expansion.

By the early 1970's, Nicaragua was the leading U.S. fast food and pet food beef supplier with Nicaragua's largest commercial slaughterhouse and six Miami meat-packing plants all owned by President Anastasio Somoza Debayle. The Managua slaughterhouse would dress halved carcasses for export—export staging for grading and sorting premium export beef and Miami facilities would process the carcass into primal, fabricated beef cuts, and retail meats, supplying Miami's Latin immigrant market. While the Somoza family's U.S. meat processing holdings were largely a trade concession to access U.S. markets by utilizing U.S. labor, as well as food safety and inspection efficiency, they demonstrated employment exporting at the expense of Nicaragua's growing urban labor market. These Miami operations would later serve as the core community and employment base of the Nicaraguan refugees fleeing the revolution and civil war.

By 1978, Nicaragua economic and political power remained dominated by agriculture, representing 60 percent of the population and labor force, providing the traditional base of rightist, monarchial regimes—Somoza was synonymous with agriculture. The agriculture export business accounted for 40 percent of GDP and 80 percent of foreign exchange income. Since colonization, Nicaragua was a plantation and ranch society in economy and politics, and cattle the coin of the realm. Nicaragua had insatiably hewn this massive agricultural plant from difficult terrain spanning a volcanic isthmus. In any plantation-ranch economy, the leading plantation family is king.

The Somoza leadership owned an estimated 20 percent of arable land, in addition to sizeable permanent pasture holdings in the Pan-American Highlands (dubbed simply *the farm*), was heavily invested in food processing, and controlled all export-import licenses; again, Somoza *was* agriculture—and ***agriculture*** controlled the agro-industrial complex and trade with small-to-medium sized producers piggybacking on the commodity chain infrastructure of industrialized agriculture.

Somoza-era agriculture industrialized Nicaragua's integrated agricultural plant, the cattle trail meandering from mountain range to market like a commodity processing conveyor belt. Upland, weaned yearlings (stocker) cattle stocked the threshed plains, processing cotton, corn, and sugar cane residue to reduce the cost of tillage and maintain soil fertility, adding muscling and marbling. The "fed" stocker cattle were driven into feedlots to be finished by processing agricultural byproducts with cottonseed, corn and rice middling, poultry litter, and distillery waste adding back fat and trim. Contrary to conventional Central American commodity staples, Somoza would stave off international banana corporation exploits, as the fruit did not integrate into the production livestock plant that maximized highland ranges and fertile plains. With the exception of coffee to utilize permanent crop land of the Central Highlands north and east of Estelí, and the hilly volcanic region around Jinotepe, commodities would be compatible with cattle.

Tight money and credit policies, bank collapses, and mounting public debt and trade deficits are all symptoms of a greater ill. With the completion of the *Marshall Plan*, the restoration of Europe, and the resumption of international trade, world commodity prices would tumble, resulting in economic tailspins compounded by the 1972 earthquake, OPEC embargo triggering stagflation in key export markets, and increased demand for non-U.S. foreign goods to drive down staple commodity value. Under constricting market conditions, the agricultural regime tightened, displacing small-to-medium industrial coattail producers and driving rural-to-urban migration, exacerbating fomenting urban unrest, while a dwindling gentry generation subdivided the plantation-estate beyond economic viability, further displacing labor.

The collapse of cotton prices culminating in declining acreage and processing ultimately reduced demand for stocker and feeder cattle. The loss of cotton curtailed maize production utilizing parallel infrastructure, further suppressing upland (upstream) livestock prices. Under limited stocker acreage, coastal estates minimized cattle traffic to their highland pasture output, driving independent, smallholder cattle directly to the slaughter market—at 12 months older and 100 kilos lighter, with no marbling or back fat and trim; the commodity chain and livestock plant processing conveyor belt was irrevocably broken, quality declined precipitously, and beef prices fell.

From a 1917 population of just 313,000 head, the Nicaraguan cattle herd would swell to 2.8 million by 1978. By 1987, the cattle population would decline by more than 30 percent, dropping to 1.9 million head, as the herd was devastated by war (military confiscation), and the smuggling of live animals into Honduras and Costa Rica for illegal slaughter and re-imported for meat sales on the black market. The illicit cattle trailing industry, coupled with smuggling in contraband livestock commodities, would establish unregulated trade patterns long outliving the domestic and regional conflicts, and continue to hamper economic development, regulation, and enforcement to the very present day.

In 1979, urban population and non-agriculture employment surpassed rural and agricultural segments for the first time in the nation's history—culminating in revolution. In 1961, rural residents equaled agriculture households, with one agricultural worker supporting three rural inhabitants. By 2004, one agricultural worker would support six rural residents, while farm receipts had declined 54 percent, forcing 32,000 rural residents to migrate to urban areas annually and accounting for 33 percent of the metropolitan growth. The rural elite's displaced population crop would ultimately sew the seeds of its own demise and overthrow.

Table 1: Nicaragua Population, Distribution, and Employment *(By Economic Sector: 1961-2004)*

	Population (1,000)					Distribution (1,000)				Labor Force (1,000)				
Year	Total	Urban		Rural		Non Ag		Agriculture		Total	Non Ag		Agriculture	
1961	1,591	634	40%	957	60%	588	37.0%	1,003	63.0%	515	197	38.3%	318	61.7%
1969	2,055	952	46%	1,103	54%	952	46.3%	1,100	53.7%	664	318	47.9%	346	52.1%
1979	***2,829***	***1,414***	***50%***	***1,414***	***50%***	***1,641***	***58.0%***	***1,187***	***42.0%***	***957***	***567***	***59.2%***	***390***	***40.8%***
1986	3,485	1,810	52%	1,675	48%	2,297	65.9%	1,189	34.1%	1,224	821	67.1%	403	32.9%
1996	4,555	2,494	55%	2,061	45%	3,456	75.9%	1,099	24.1%	1,719	1,321	76.8%	398	23.2%
2004	5,597	3,234	58%	2,363	42%	4,594	82.1%	1,003	17.9%	2,285	1,893	82.8%	392	17.2%

On July 19, 1979, the rural-urban tension boiled over into revolution and then civil war. The mounting capital accumulation of propertied interests in agriculture and food commodities, coupled with direct international trade in consumer goods and services circumventing urban labor and small business, had all but discarded metropolitan Nicaragua and excluded them from agribusiness prosperity. Sandinistas and the Ortega Regime, seizing Somoza's 20 percent interest in Nicaragua's arable land, would expropriate hundreds of thousands of acres of "abandoned", "undeveloped", and foreclosed farmland to establish state farms and cooperatives, redistributing land to 120,000 farm families by 1985, culminating in the 1990 *piñata,* granting supporters more than 5,000 houses and hundreds of thousands of hectares. Sandinistas would attempt to stabilize the regime and solidify rule through resettlement agrarian reform and reducing surplus urban labor—dispatching the peasant vaquero and campesino from where they came. They longed for the 50/50 rural-urban split to employ and feed the urban masses of their base and earn foreign dollars to support economic growth, but COMINTERM currency failed to meet consumer demand.

Once Central America's leading economy, by 1986 the Sandinista Regime would reduce agriculture to 29 percent of GDP, now 16 percent of GDP today, and ensure, in a post-revolutionary Nicaragua, agriculture would not be a cohesive political force to challenge urban supremacy.

Cattle, however, remain the leading agricultural commodity (Table 4 below) despite systematic Sandinista decentralization. While today's Nicaraguan livestock producers have banked $1.6 billion of working capital into 3.5 million head of cattle, the minority cooperative movement has singularly dismembered the nation's agricultural plant—dividing the highland beef ranges, fertile cash crop plain, and pari-urban dairy, and industrial basin feedlot. Post-Somoza agricultural policy, underwritten by international aid, would push micro-processing and niche marketing onto the Nicaraguan frontier, enabling market defection, tax evasion, and direct rural-international trade—dividing the national political economy into rural and urban.

Private property everywhere is established as a public trust and the farmer is trustee of the nation's agricultural territory; tenure is limited by market forces, the property tax, zoning, foreclosure, eminent domain, and ultimately, revolution. The revolution gave Nicaragua new landlords, and revolutionaries paid in land are now themselves what they had once rejected—a new landed aristocracy. But, farming was not as easy as the old agricultural regime made it look and, as commodity prices tumbled, the new estates expelled labor, sacrificed quality, displaced industrial processing and trade, and grew dependent upon aid to protect meager margins. Twenty-five years later, their land tenure is now as tenuous as the exiled gentry they replaced. A generation later, public trust of Nicaragua's revolutionary landlords is waning.

Current Conditions

A once vibrant and still critical economic sector, the livestock segment had been looted by civil war, systematically disinvested and dismembered by antagonistic regimes, and ultimately devastated by hurricanes in just 17 years—suffering war, collectivization, political plunder, and natural disaster all in the span of a single generation. Peaking in 1978 on revolution-eve, Nicaragua would produce 80,000 tons of beef and 465,000 tons of milk, earning farm receipts totaling $574 million and exports of $214 million annually in livestock commodities. By 1986, at the height of the civil conflict, livestock trade would fall to its all-time low, posting a $13 million livestock trade deficit. The livestock sector virtually collapsed, with beef production down 53 percent to 37,000 tons and milk production falling 62 percent to 180,000 tons. Under democratic elections, the sector would partially recover in 1996, posting the first positive dairy export trade of $3 million after an 18-year-long average annual $20 million dairy deficit. Even as production and exports recovered, farm receipts fell to $117 million, down an additional 18 percent from the 1986 collapse.

Table 2: Nicaragua Cattle Production, Farm Income, and Trade *(Constant 2005 U.S. Dollars)*

	Annual Production (Metric Tons)		Farm Cattle Receipts (2005 Constant US Dollars)			Primary Livestock Exports (2005 Constant US Dollars)	
	Beef	Milk	Beef	Milk	Total	Beef Trade	Dairy Trade
1978	80,372	465,160	$334,583,252	$239,630,076	$574,213,328	$198,844,311	$14,973,054
1986	37,260	180,000	68,726,333	74,155,326	142,881,659	10,023,173	(23,434,938)
1997	51,879	209,136	75,191,343	41,990,014	117,181,356	49,559,611	3,323,601
2005	74,327	612,945	148,314,994	148,518,600	296,833,595	113,539,814	22,221,303

The underemployment of livestock and land leads to the unemployment of human resources. The amount of primary foodstuffs—vegetables, fruits, and oil seed crops—an economy can competitively produce and process is limited by the number of cattle on feed. In 2005, the livestock sector processed 152,000 tons of feed grade produce, recovering $27.3 million in potential food processing losses and imported and fed 36,000 tons of feed grain worth $4 million in trade. Nicaragua, however, posts annual food waste losses totaling 146,000 tons of nutrients or 2.7 percent of total agricultural output. At an average nutrient value of $93 per ton, total industrial processing income losses are $13.6 million in potential livestock feed sales, reducing industrial processor competitiveness, and constraining domestic economic growth. 146,000 tons of recycled nutrients would net 14,600 tons of milk or meat, worth an additional $14.6 million in gross farm receipts at current farm gate prices, or $1 million dollars annually in additional disposable rural income.

Table 3: Nicaragua Livestock Utilization

Year	Cattle Herd	Hectares Cultivated	Stock Rates (Hectares/Head) Arable	Stock Rates (Hectares/Head) Pasture	Carcass Yield (Kg)	Beef Crop	Milk Yield (Kg)	Calf Crop	Acreage Change	Herd Growth
1961	1,528,300	262,625	1.32	4.7	148	18.7%	815	14.2%	8.7%	4.5%
1969	2,293,100	437,995	1.58	3.0	194	18.2%	1,095	12.1%	1.0%	6.0%
1974	*2,462,378*	*499,849*	*2.28*	*2.6*	*215*	*8.9%*	*1,226*	*15.7%*	*19.1%*	*6.8%*
1978	2,783,659	505,413	1.13	2.8	196	18.0%	884	17.5%	6.0%	0.5%
1980	2,271,631	288,818	0.73	3.0	177	9.6%	825	20.8%	-41.2%	-11.2%
1990	*3,200,000*	*355,940*	*0.85*	*1.9*	*137*	*25.6%*	*790*	*13.1%*	*7.0%*	*12.5%*
2000	3,287,767	431,294	0.98	2.5	149	19.2%	704	16.5%	15.1%	14.1%
2005	3,500,000	507,236	0.99	2.4	175	17.5%	689	14.7%	14.1%	2.9%

Table 3 above demonstrates the correlation in the contraction and expansion of arable land use and cattle yields. While cattle population trend steadily upward, yield varies with acreage, the crop planted, stocking rate, and genetic variation in the herd. An increase in cropping acreage stimulates demand for stocker cattle, drawing down pasture stocks, and increasing yields as carrying capacity balances. Excess range

cattle drive down stocker cattle prices, stimulating arable land cultivation and cropping. With both farm and ranch monitoring beef and dairy prices to manage the aggregate production portfolio, domestic agricultural markets functioned more efficiently and resources were readily allocated on fluctuating market demand. If cotton was down and beef up, corn and sorghum were planted to manage higher stocking rates. When beef price is down and dairy is up, cows are retained from meat production and allocated to milk production. The 40 percent decline in arable land use in 1980, coupled with Sandinista agricultural policy and subsequent aid intervention, essentially isolated cattle to the range and disrupted market performance.

While livestock productivity has reached and even exceeded historical 1978 highs and exports have regained much of their pre-revolution global market share, gross cattle farm receipts are only 52 percent of 1978 income. With milk production up 31 percent, dairy income is down 38 percent; while beef production is down just 9 percent, beef income declined 56 percent. Translating as cheaper food for urban consumers and more cost-competitive farmers in the global market, it adversely marks a 52 percent decline in production agricultural employment and disposable rural income—driving excess, industrially-unskilled rural labor into the urban employment market. The downward pressure on wages and rising unemployment nullifies cheap food gains. Finally, export dollars, as a percent of farm-gate receipts, rose from 37 to 46 percent, with a higher percentage of food trade dollars remaining abroad in the form of imported goods.

Table 4: Gross Farm Income by Commodity Gross Receipts 1978 – 2005 (2005 US Dollars)

			Farm Gate Receipts (2005 US Dollars)				
Commodity	***Production (MT)***		***Livestock***		***Primary Crops***		***Percent Change***
	1978	***2005***	***1978***	***2005***	***1978***	***2005***	
Beef	80,372	74,327	$334,583,252	$148,314,994			-55.7%
Coffee	65,092	85,130			$320,410,766	$100,151,410	-68.7%
Cereals	374,811	848,986			310,627,974	117,861,304	-62.1%
Fruits	340,000	240,909			266,338,306	46,558,577	-82.5%
Milk	465,160	612,945	239,630,076	148,518,600			-38.0%
Sugar Cane	2,733,961	4,037,091			185,322,586	67,514,419	-63.6%
Fiber Crops	125,267	5,400			168,722,904	28,151,223	-83.3%
Eggs	33,704	20,008	123,560,128	26,257,984			-78.7%
Beans	55,480	205,664			71,670,434	130,381,982	81.9%
Pork	19,500	6,636	51,197,605	12,140,380			-76.3%
Rice	85,246	268,531			46,439,233	57,516,257	23.9%
Vegetables	44,500	35,200			40,649,351	3,015,269	-92.6%
Tobacco	3,087	2,783			30,371,471	10,153,439	-66.6%
Poultry	8,900	68,549	29,428,803	96,034,666			226.3%
Groundnuts	10,337	109,909			18,359,839	37,062,637	101.9%
Roots/Tubers	26,100	156,512			16,239,397	12,821,248	-21.0%
Sesame	5,485	9,068			4,948,887	6,465,531	30.6%
		Totals:	***$807,828,667***	***$431,266,624***	***$1,480,101,148***	***$617,653,296***	
Total Agricultural Gross Production Receipts:					***$2,258,501,012***	***$1,048,919,920***	***-53.6%***

"There is no chance of economic recovery so long as so large a population has lost its buying power," explained President Franklin Roosevelt, arguing in support of the 1933 Agriculture Adjustment Act (AAA). *"The farmer—that's the fellow you have got to build up."* Since 1978, 42 percent of Nicaragua's population identified as rural and 30 percent of the labor force categorized as agriculture have lost 54 percent of their purchasing power. For urban Nicaragua, this translates as a loss of 1.2 million consumers—equal to the 1.2 million Central American population in the U.S. and compared to the heavily targeted 200,000 Nicaraguan ex-patriot market of south Florida—or an annual $1.2 billion domestic market for production inputs and durable and consumer goods compared to the nearly $2 billion in annual ex-patriot remittances.

Sector Outlook

Among Central American countries, Nicaragua has the lowest per capita population density of agricultural land at 1.2 hectares per person. Consequently, Nicaragua has the second lowest meat carcass yield and the lowest milk yield per head. In 1999 the milk commodity chain was 305 kilometers long feeding a population of 4.9 million—16,000 people per milk chain kilometer. By 2005, Nicaragua's population would grow by nearly 600,000 people and Managua's milk collection chain would add another 600 kilometers – one kilometer for every 1,000 in population growth. With a proven livestock carrying capacity of 3.5 million head, Nicaragua is unable to add land and livestock to the existing production base. Population comparatively, is projected to rise 25 percent to seven million by 2015. An additional 1.5 million inhabitants will add 1,500 kilometers to the commodity chain. With land and livestock carrying capacity fixed, the 25 percent population rise must be offset by equal or larger gains in productivity and agricultural efficiency.

Table 5: Central America Livestock Productivity, Population, and Density

	Per Capita Supply (Kg/Year)		Population Density	Cattle Yields (Kg/Head)		Population 2005	Population 2015	Projected Growth
	Milk	Meat	(Ha/Capita)	Meat	Milk			
World	44	10	0.78	202	2,215	6,377,646	7,197,252	12.9%
North & Central America	97	32	2.30	309	4,950	512,547	574,643	12.1%
Costa Rica	53	15	0.60	236	1,372	4,250	5,030	18.4%
El Salvador	49	7	0.22	165	1,509	6,614	7,560	14.3%
Guatemala	30	6	0.31	177	712	12,661	16,197	27.9%
Honduras	73	9	0.36	221	3,410	7,099	8,762	23.4%
Mexico	90	19	1.00	210	1,441	104,931	119,618	14.0%
Nicaragua	*11*	*7*	*1.20*	*175*	*689*	*5,597*	*7,027*	*25.5%*
Panama	52	16	0.66	223	1,206	3,177	3,790	19.3%
United States	115	43	2.96	339	8,896	297,043	329,669	11.0%
Venezuela	35	19	0.84	210	1,031	26,170	31,189	19.2%

Shown in Table 5 above, Nicaragua has one of the lowest per capita supplies of milk and meat, less than 20 and 70 percent of the regional average, respectively. Only Guatemala, with its rugged mountainous interior, supplies less beef at just 6 kilos per capita, while yield per head in both milk and meat exceed that of Nicaragua. The nutritional needs supplied through the marketplace are the lead indicator of living standards, with Nicaragua the lowest of Central America. At current output, the projected 25 percent increase in population will create a 25 percent decline in living standards and inflation. Finally, the neighboring Central American states and CAFTA member yields demonstrate the possibilities and opportunities of Nicaragua's majority land and livestock holdings, with Costa Rica producing 236 kilos of beef per carcass and Honduras netting 3,410 liters per milk cow. CAFTA competitiveness and political socioeconomic stability will hinge upon Nicaragua achieving comparative productivity and efficiency.

While employment opportunities appear to drive immigration, ultimately, living standards are the primary determinant. Presently, Nicaragua has one of the most stable migrant populations of Central America at 1.17 per 1,000 residents, or just 6,548 emigrants per year. Further declines in living standards and the resulting political upheaval could potentially drive immigration upward to regional highs of 4.32 per 1,000 or an additional 24,000 immigrants per year, an 88 percent Nicaraguan emigration increase, approaching the revolution exodus, potentially accounting for 50 percent of total Central American emigration.

A daily wage in the United States will pay workers 315 ml of milk and 118 grams of meat per day compared to 30 ml and 19 grams in Nicaragua. These contrasts in living standards are the push-pull nexus of migration and their precipitous decline or stubborn stagnation are the impetuous of political and even armed revolution. Finally, the failure of food productivity and supply to keep pace with rising industrial and service sector productivity and income will ensure rising inflation.

Table 6: Livestock Commodity Farm, Import, and Export Prices

	Milk Equivalent Prices Per Ton					Beef Prices Per Ton			
	Farm	Import	Export	% Farm $		Farm	Import	Export	$ Farm $
World	--	488	469	--		--	2,554	2,506	--
North & Central America	--	502	271	--		--	2,461	2,663	--
Costa Rica	123	402	485	25.4%		694	2,914	2,441	28.4%
El Salvador	386	400	860	44.9%		2,426	2,458	3,708	65.4%
Guatemala	--	379	428	--		--	1,944	2,024	--
Honduras	237	405	370	64.1%		1,341	2,396	1,742	77.0%
Mexico	357	331	467	76.4%		2,716	2,634	4,146	65.5%
Nicaragua	*339*	*358*	*440*	*77.1%*		*1,725*	*1,937*	*2,141*	*80.6%*
Panama	--	441	507	--		--	1,853	3,276	--
United States	300	792	242	124.2%		2,951	2,437	2,893	102.0%
Venezuela	--	298	450	--		--	1,875	2,770	--

Farm-gate commodity prices are influenced by a series of factors lead by consumer demand, quality and regulatory cost of production impacts, and the supply of land. Among countries listed in Table 6 above, Nicaragua ranks third in milk prices and fourth in beef price. El Salvador is the primary external influencer of Nicaragua livestock commodities price. With an agricultural land population density of .22 hectares per capita, El Salvador milk yields are twice that of Nicaragua, while beef yields are 6 percent less. Milk prices are 13 percent and beef prices are 29 percent higher in El Salvador than Nicaragua. While El Salvador could further increase yields through additional intensive capital investment, Nicaragua's lower population density invites a cross-border expansion of El Salvadorian food production. The Salvadorian commodity chain would drive 320 kilometers into Nicaragua, reaching Managua in 2006.

In 2002, La Presna reported government estimates there were currently 22 local semi-industrial or artisan El Salvadorian cheese factories operating across rural Nicaragua exporting commodities through parent and related domestic market firms. In early 2006, El Salvador investors opened NICALAC to supply domestic markets; purchasing milk at $339 a ton compared to raising the price of raw Salvadorian product currently at $386 a ton. Eventually, the price of milk will stabilize across the CAFTA trade area, with price variations reflecting quality, quantity, and local transpiration and operating costs.

While agricultural producers celebrated the opening of NICALAC as a market triumph for competition, the implications may prove otherwise. First, NICALAC increases commodity value adding chain overhead. Prior to NICALAC, the industrial processing chain was often operating at or below 50 percent capacity, increasing the cost per liter in shipping, handling, and processing. NICALAC will hold the commodity chain capacity utilization consistently below 50 percent, with rising overhead costs distributed to producers and consumers. Secondly, NICALAC will primarily export processed dairy products to El Salvador, directly positioning El Salvadorian consumers against Nicaraguan consumers, increasing domestic prices and contributing to inflation, while stabilizing the El Salvadorian economy and consumer inflation rate.

While increasing domestic Nicaraguan consumer prices and the cost of processing, NICALAC returns on investments and profits will return to the El Salvador economy and be credited to their gross national product. Multinational corporations operating in foreign markets and mining food commodities, defer investment in production methods, producer training, seed stock genetic improvements, and labor. Through revolution, urban Nicaraguans nationalized much of its dairy processing capacity, later privatized and sold to multinationals, only to be shrouded in investment-debt scandals and bankruptcy.

While multinational processors will drive farm-gate prices in a CAFTA environment, international retail buyouts and controls of domestic chains will drive consumer prices down, pulling commodity farm prices toward the regional lows as they market imported, standardized commodity foodstuffs and bridge the gap between the NAFTA-CAFTA regions' most productive producers and its most underserved consumers.

Needs Assessment

Introduction

Cattle are the economic oxen of the agricultural sector. From the highlands ranch and the plains feedyard to the lowland feedlot and drainage basin dairy farm, cattle touch every aspect of production agriculture sustaining frontier population, preserving soil fertility, reducing tillage, planting, and fertilizer costs, recycling nutrients, and recovering waste costs. As the only food commodities providing employment and income daily through production, processing, and marketing, dairy and beef build and maintain the production agriculture infrastructure of agricultural credit, transportation, processing, cold chains, agribusiness, and retail utilized by seasonal commodities. Nicaragua has two million arable hectares, with fewer than 700,000 hectors or 35 percent currently under cultivation. Putting Managua back to work will mean employing arable land requiring the restoration of traditional, regionally integrated domestic cattle markets. Unlocking Nicaragua's employment and income opportunities require addressing the three key issues of law, education, and policy: 1) livestock commodity standards and contracting, 2) standardizing commodity production, and 3) integrating the domestic commodity production and supply chain.

Standards: Import Alert #12-10 dated June 28, 2006, orders the "Detention without physical examination of cheese due to microbiological contamination" from 19 Nicaraguan cheese processors and export agents, several of which are direct beneficiaries of USAID programs, citing contamination and violations including salmonella, E. coli, S. Aureus, alkaline phosphates, bacteria (other), insanitary, no English, nutritional and/or ingredient labeling. Citing 2004 shipments totaling nearly 1,300 tons of cheese worth $3 million, U.S. customs seized and destroyed 804 tons valued at $2,400 per ton for a total of $1.9 million in contaminated Nicaraguan cheese product, or 65 percent of US-bound cheese exports processed by the Center for Export Transactions ***CETREX*** (*Centro de Tramites de Las Exportaciones*).

The lack of established standards, regulatory regimes, and enforcement impact more than food safety, but also limit customer loyalty and product patronage. Costa Rica's ***Dos Pinos*** controlling 85 percent of domestic commercial milk processing, is rapidly robbing Nicaraguan market share from domestic brands including Parmalat, Eskimo, and cooperative labels because of consistency and standardization. Domestic dairy products suffer dramatic seasonal variations, compounded by both producer and processor adulteration. Consumers note that domestically produced July cheese does not taste like December cheese, while during the dry season, packaged milk is reconstituted; powdered; and condensed. While within the domestic commodity chain the adage is true—bad milk drives out good milk, in the consumer market, imported quality is displacing domestic quantity. *Dos Pinos* is marketing a consistent, quality product by eliminating seasonal taste and texture variations. Its commanding cooperative milk market share has enabled Dos Pinos to implement an aggressive and effective HACCP plan from farm-to-fork with farm-to-factory inspection and oversight, standardization of the dairy herd with Holsteins and Jerseys supporting unique product lines, and requirements in dairy herd health inspections and dairy record keeping across more than 2,000 producer dairies.

The largest gains in farm income growth have been limited to the dietary staples—poultry, beans, and rice (see Table 4 above). Poultry is predominately pari-urban, intensive industrial production under tight processor control, while rice production was stimulated by absorption programs and import quotas. Cash crop gains in groundnuts and sesame have been regulated by processors and market forces through production allocation contracts to manage the supply and maintain prices by minimizing surpluses. In four of the five commodities demonstrating real income growth, growth was managed through effective market-based supply management and public policy with sound industrial processor leadership. Processors and producers negotiated quantity and quality through private treaties, forward contracting, and Nicaragua's commodity board of trade, BAGSA. This is the model to expand into for other ailing food commodities.

Standardization: Seasonal variations in food quality, quantity, and taste are a function of variation in cattle breeds, forages, concentrates, and commodity handling and processing in both dairy and beef commodities. Additionally, volatile production curve swings create inefficiencies throughout the commodity chain and invite adulteration in the production trough. The lack of established standards ensures non-standardized products, production, and processing. Cooperatives and their producers are simultaneously tapping numerous development projects while sparingly distributing improvements to individual members—rationing the technology and minimizing improvement gains. Cooperatives, for example, will indiscriminately utilize three to five different cattle breeds and an equal number of different improved forage varieties creating dramatic variation in raw milk and meat.

Unlike commodity projects in coffee, sesame, and fruits and vegetables that net standardization in raw product by controlling seed stock, fertilizers, and pesticides, livestock cooperatives have failed to manage breeding and feeding programs to standardize the raw product. Dos Pinos, like the Borden Milk Company successfully accomplished in 1895 across the New York milkshed, has effectively standardized the cattle breed, forage varieties, feeding, herd health, and raw milk management to standardize the finished product.

No less than five foreign countries and a host of international donors and NGOs have labored in livestock development programs across Nicaragua, and often simultaneously within the same producer cooperatives. With no established standards as effective guidelines to govern production and product quality control, each program promoted different breeds, feeds, and production management methodologies, resulting in excessive crossbreeding to nullify technological gains. Where livestock has fallen short of its goals, it has had no negotiated, established, and recognized product standard goal.

Integrated Intensification and Specialization: The redistribution of dairy and beef production to the Central Highlands has dramatically decreased yields and driven costly seasonality swings in commodity and consumer prices. Since the 1970's, carcass yield has declined 29 percent or 26,000 tons, with milk yields down 37 percent per cow or 407,000 annually. Additionally, maturity to production has gone from 24 months to 36 months, adding a full grazing year per head to already overstocked pastures. The rapid disappearance of livestock from commercial cropping regions has increased tillage and reduced soil fertility to drive higher fertilizer usage and costs. The highland ranges make the transportation and feeding of commercial commodity byproducts economically unfeasible, limiting food processing capacity profitability and further depressing yields and livestock commodity quality and consistency, while development subsidies to dairy production across interior departments has devastated commercial dairies in Chiltepe.

More than the economics of the divided agriculture plant is the cost in political stability and growing regional economic autonomy. As local municipalities and distant departments manage single commodities from raw to finished product, further diversify their production portfolio into nontraditional and unconventional commodities, and access regional and international markets, they invariably challenge national supremacy in public policy and law. While development projects gifted processing capacity in dairy, beef, and food staples wholesale to the departments of Boaco, Leon, Chontales, and Matagalpa, to raise depressed farm income, they reduced urban employment and reoriented local trade to El Salvador, Honduras, and the USA, even as Somoza had done. Moreover, once economically integrated departments with Boaco-Chontales steers fed in Leon-Chinadega and processed in Managua have attempted to develop their own dairy, beef, and fruits and vegetables production and processing capacities. Divided, they are increasingly inefficient, uncompetitive, and politically destabilizing. Highland dairy co-ops and grass-finished beef became the economic Band-Aid for the agriculture plant collapse as NGOs focused on individual, local ills.

The goal of development, particularly in Nicaragua, should have been to understand the production system—the entire agriculture plant—and make it better, more efficient, equitable, competitive, and fully integrated to ensure stability. In an integrated agriculture plant, Poseltega maize growers are stakeholders in Camoapa cattle breeders, and Chiltepe dairyman stakeholders in Leon sesame growers.

The Models:

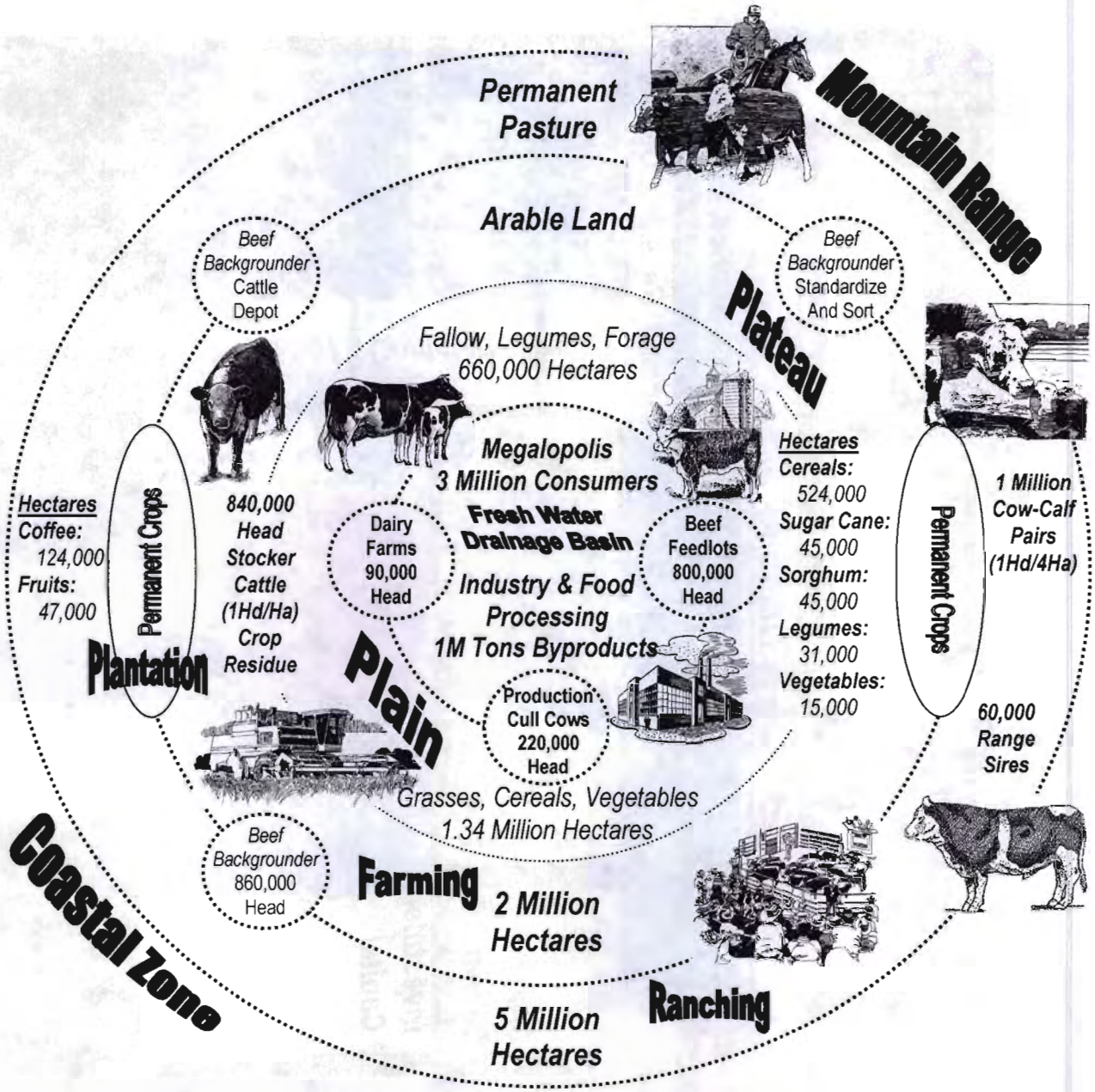
- ***The Agricultural Plant and Foodshed***
- ***The Agro-Industrial Project Business Model***
- ***Integrated Agribusiness Model***

Understanding The Agricultural Plant and the Foodshed Model

The agricultural plant model considers the entire national agricultural area from mountain to megalopolis, its level of integrated production, and the interdependency of livestock and commercial, cash crop production. With the largest agricultural territory of the Central American isthmus, Nicaragua's nearly five million hectares of permanent pasture, two million arable hectares, and 3.5 million head of cattle account for 36 percent of Central American pasture, 33 percent of arable land, 28 percent of the regional cattle herd, and 66 percent of livestock exports in volume and sales. As the former bread and beef basket of Central America, Nicaragua now ranks second in beef production (19%), fourth in milk production (7%), fourth in export price per ton, and fourth in domestic per capita consumption—making Nicaragua fourth in quality, competitiveness, agricultural plant productivity and food shed efficiency, and last in capital stock equity.

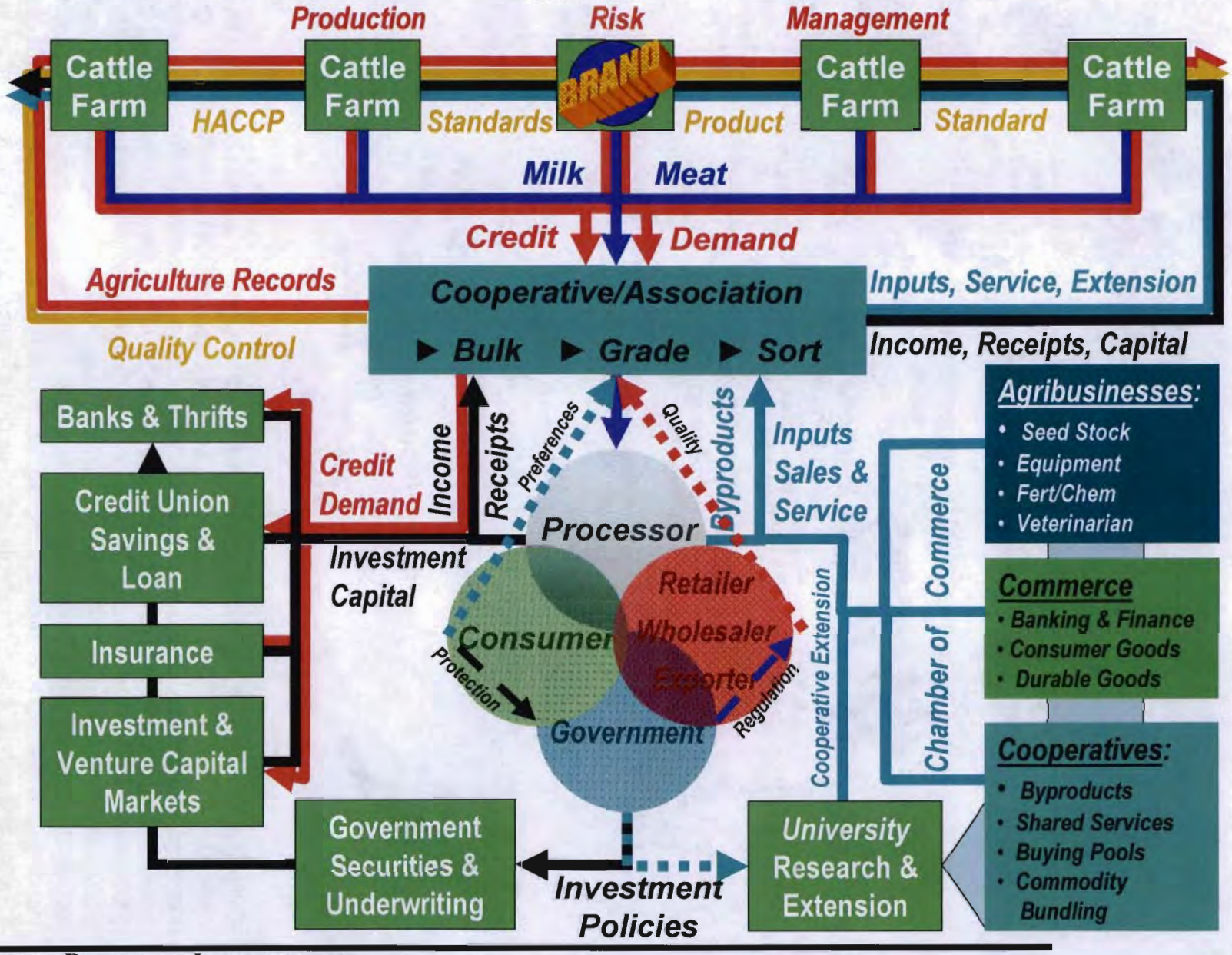
- *Pasture Management*: Mountain ranges and interior highlands are composed of shallow top soil suffering low soil moisture, rapid drainage, and highly seasonal precipitation proving unsuitable to primary food and fiber crops, while abounding in grass. 64 percent of earth's land mass and 68 percent of Nicaragua is natural pasture grasses. Production density, carrying capacity, infrastructure, lack of market access, and grass quality limit alternative commodities such as dairy and finished beef production. It requires three to five hectares of permanent pasture to support one animal unit (cow and calf). Highlands are best suited to producing production livestock; with nurse cows building calves with sufficient frame (bone structure) to support increased meat yield on plains and lowland grazing, highland grasses contain insufficient protein and energy for rapid muscle and fat development. Under optimal management, 1 million production head manage Nicaragua's 5 million pasture hectares, producing 860,000 head of weaned calves and production replacements for 90,000 milk cows in urban milksheds, producing 260,000 tons of live weight gain ($516 million) and 630,000 tons of milk ($176 million), for total gross ranch receipts of $692 million or $138 per hectare annually.
- *Plateau Management*: The topographical relief dividing mountain and plain, the plateau, enjoys highland climate, light topsoil, marginally arable land, and the headwaters of upland drainage. These headwaters sprout the highland depots for upland agricultural commodities. The backgrounder is the livestock depot, grazing and transitioning weaned calves onto moderately improved, cultivated grasses and introducing local commodity byproducts. Receiving 850,000 head annually, backgrounder depots net 100 pounds per head or nearly 43,000 tons of live weight gain to earn depots $85 million annually.
- *Plains Management*: Sparse population, medium soil, and normal precipitation ensure primary cereal grain and fiber production, grossing 5 to 9 tons of produce and 6 tons of crop residue per hectare, with 33 percent of total acreage lain fallow. Residue grazing maximizes residual nutrients compared to burning or tillage costs, adding $35 per hectare. Averaging 2.3 intensively managed and fallow hectares per head, 840,000 feeder cattle will manage 2 million arable hectares, enabling commercial crop operations to rotate 33 percent of farmland through the two-year production–one-year fallow management cycle. The 840,000 head will net cash crop farms 168,000 tons of live weight gain for supplement cash-crop farm receipts totaling $336 million or $168 per hectare.
- *Drainage Basin Management*: Human and industrial dependence upon freshwater mass them in the drainage basins. Upstream erosion has ensured rich heavy soils suitable for intensive food crops. The amount of primary foodstuffs—vegetables, fruits, and oil seed crops—an economy can produce is limited by the amount of nutrient waste economically disposed of by the industry. The 800,000 head of feeder cattle and 90,000 head of dairy cattle can process 1 million tons of commodity byproducts and feed grade produce at finishing, producing 40,000 tons in meat gain ($80 million) and 453,600 tons of milk ($126 million) for total gross feedlot and farm receipts of $206 million and earn processors a $93 million disposal supplemental. As processors recover waste costs, this translates into higher commodity prices for staple foodstuffs, more effective produce grading, and higher food quality.

Figure 1: The Agricultural Plant and the Foodshed Model



Cattle have been the historical and still current leading source of farm income, with beef ranked first and dairy fourth in 1978 and, today, dairy ranking first and beef second in farm commodity receipts. Current income parity in dairy and beef is a function of the dual purpose cattle management-market system, as these two commodities are produced by the same herds, farms, and households, totaling nearly $300 million. From a national herd of 3.5 million head with 900,000 production females and an estimated 36,000 range sires producing 652,000 calves annually, Nicaragua harvests 607,000 head for slaughter and live export and 45,000 production replacements, yielding 613,000 tons of milk and 90,000 tons of meat. Including its 5 million tons of cereals, fruits, vegetables, and fiber, the Nicaraguan agricultural plant is operating at less than 50 percent capacity and 30 percent efficiency. It should produce 11 million tons of primary crop produce; 860,000 head of cattle; 275,000 tons of beef; and 630,000 tons of milk. Dairy and beef farm receipts alone would total $716 million compared to the current $296 million.

Figure 2: The Agro-Industrial Project Business Model



Model Assumptions: Methodology and Organization

Economic organization is a process begun by consumers to externalize living costs—employing retailers, processors, government, and ultimately producers to differentiate choice, standardize products, regulate product integrity, promote price stability, and provide a safe, sustainable food supply.

Every marketplace begins with *consumers*. Inundated with choice, consumers designate *retailers* through patronage and preference to negotiate with producer-suppliers, to aggregate supply, manage quality, quantity, consistency, and supply, and sort choices. As urban market gatekeeper seeking to further externalize costs, retailers select *processors* from the artisan pool to standardize raw commodities as packaged food products. The consumer-retailer-processor dynamic constitutes a formal economy regulating supply and demand based on preference and creates a government regulating consumer protection and quality and promoting price stability and full employment. Though porous, preferences and regulatory action form the framework of the free market and a barrier to unfair trade and unqualified product, shifting market inefficiencies and driving excess costs back up the value-added chain from the consumer to the cow, extracting material gain from waste and inefficiency.

Leveraging an aggregated retail consumer base and sales receipts (market share), often aided by government, *processors* (marketplace) organizes producers into cooperatives to further externalize standardization and transaction costs, shifting bulking, grading and sorting to the producer group. Processors pay a premium not to exceed current commodity transaction costs, continuing to shift costs upstream and passing savings onto consumers.

The cooperative's job is staging—to bulk, grade, sort, and standardize raw commodities for further processing. The more efficient the cooperative stages and standardizes raw commodities, the larger the premium it passes onto producers or the more competitive its bulked price to processors. Like the consumer, retailer, and processor chain, the cooperative externalizes staging and standardizing costs by standardizing member farms through the Hazardous Analysis and Critical Control Point plan (HACCP) requiring producers to deliver a more uniform commodity conforming to demand curves.

The *brand* begins on the farm. A social contract in the marketplace, a brand translates consumer preferences into product and then commodity specifications. Rippling upstream through the chain, the consumer, retailer, processor, and cooperative have effectively shifted product standard costs to the producer. To standardize the commodity, the cooperative will standardize member farms with uniform livestock species and breed, grasses and forage, livestock housing and milking procedures, reproduction, health, and nutrition management programs, and timing calving cycles to product demand cycles. The price mechanism manages commodity specifications and supply curves, while cooperative membership and HAACP regulates commodity quality and consistency. Farm level quality control and production standardization compliance defines and drives investment capital needs.

Credit and capital, like food, are commodities. The cooperative's job is staging—to bulk, grade, and sort, and to standardize raw commodities for further processing, with output infrastructure directing inputs. Tied or parallel to the quality control mechanism, banking and finance organizes the Agricultural Records Cooperative to bulk, grade, and sort credit demand. The ARC creates a standardized system of farm accounting, loan applications and terms, and production input package—livestock and genetics, pasture and forage, milking corrals, milk cans, and other production management enhancements.

The ARC bulks credit demand. The standardization and cooperative integration of member farms through HACCP quality control and ARC finance bundling fosters teamwork in compliance and enforcement among member producers at the farm level. Producers understand that their use of credit and access to commodity markets is a collective responsibility—not a right. Harnessing the peer pressure group dynamic of the producer association to produce quality product, repay loans, invest in farm improvements, and maintain qualified production facilities ensures *community credit underwriting*.

The cooperative (i.e., local producer community) pre-qualifies neighbor-member loans. If my neighbor defaults on their loan by design or disaster, interest rates for the community or group increases to recoup losses. The backbone of the U.S. farm credit system, the *Production Credit Association* (PCA) and Federal Land Banks (now merged as Farm Credit Services), the Farm Security Administration (FSA), later the Farmer's Home Administration (FHA), and now the Farm Services Agency (FSA), Co-op Bank, and rural credit unions are all cooperatives linking production agriculture and capital markets, bulking, grading, and sorting credit. When the farmer-member board *approves* a loan application, the members are collectively cosigning for an individual producer applicant. In approving loans, producer associations are guaranteeing repayment and certifying that funds are necessary, will be utilized for the purpose stated, the activity or asset funded complies with cooperative and local production methods and requirements, and assets, capital improvements, and collateral will be protected from natural disaster, fire, theft, and debtor death or disability through the collective concern and effort of the credit association—*community credit underwriting*.

Through public policy, securities, and underwriting, the government influences production by specifying commodities and production methods to be guaranteed. Government underwriting will reflect agency information and forecasts on food production, population, and food supply and demand. Cooperative credit association and governmental agency loan underwriting or *guarantees* drive down interest rates. The ARC, through routine farm inspection and standardized accounting, tracks assets, farm improvements, and production income and expenses to more efficiently service aggregated loans and credit.

As processors organized marketing cooperatives and investors organized credit associations, the chamber of commerce would build the supply and service cooperative to deliver bulked production inputs, durable and consumer goods, services and, most critically, extension. As urban population and output expands, it requires more food and greater rural and agrarian productivity, creating a trade imbalance with greater capital outflows accruing to agriculture and the accumulation of surplus industrial output. To balance rural-urban trade and capital flows—trading goods and services for food—the cooperative and extension were born. A private urban sector solution, the *cooperative* is rural-urban cooperation, and *cooperative extension* an extension of the urban main street to rural communities, chamber of commerce outreach.

Urban commerce associations first established rural offices (the *Farm Bureau* in the U.S.), as they were a chamber of commerce rural branch office or *bureau* typically housed in the court house or headquartered on county farms while working through rural town halls, organizing fairs, and direct farm consultations. Commerce first coined its emissaries to rural inhabitants "extension agents" and is fully funded by the chamber. The extension agent's job is to educate rural households and farmers in the uses and benefits of urban goods and services from irons, pressure cookers, and washing machines to automobiles, tractors, and plows, replacing the wood-fired hearth and the horse with industrially manufactured goods. Often funded jointly by competing commercial interests, the extension agent is not a sales agent, makes no brand recommendations, but instructs in uses, benefits, and applications of comparable, competing goods.

Functional extension is urban outreach and inseparably fused with industrial commerce. While the Roosevelt administration conscripted the chamber of commerce-farm bureau extension system into public service during the Great Depression and the Agriculture Adjustment Act (AAA) through federal funding, the extension system would serve commercial industrial objectives of restoring urban employment and expanding rural consumption and productivity. Its crowning achievement was the Rural Electrification Association (REA). With urban manufacturing crushed under the weight of massive durable goods inventories forcing layoffs, General Electric, Westinghouse, the chamber of commerce, and the newly independent farm bureau lobbied for rural electrification to stimulate demand for surplus and durable household goods to restore the balance of trade. Extension creates *effective demand*—teaching use and benefit—to maintain and sustain rural-urban trade and maximize parity in productivity, living standards, investment and consumption.

Approach Innovations

Dr. W. D. Dobson of the Babcock Institute notes "Many market participants in Nicaragua's dairy industry believe the challenges facing the industry are mainly marketing problems...[but] the study shows the challenges facing Nicaragua's dairy industry extend beyond marketing."[4] Humorist Will Rodgers adds cooperative marketing is a scheme "whereby if your stuff is not bringing as much as it costs to raise it, why you all go in together and take it to town. Then when you sell it you can be together to cheer each other up." Proponents, Rodgers concluded, had "diagnosed the case but left no medicine."[5]

Cooperative Orientation: T.R. Pirtle said of 19th century U.S. dairying: *"Everyone seemed to feel the creamery was a legitimate dumping ground for any old kind of cream and with each patron feeling all the others were doing it, the result was very little care or attention was given to the product. The country people felt creamery butter was good enough for city people who "knew no better"."*[6]

Antagonistic to processors and indifferent to consumers, the cooperatives stood the agro-industrial business model on its head and leveraged aid to circumvent consumer preferences, protections, and quality standards to penetrate the formal market heaping excessive production costs upon consumers. NGOs' sided with producers as a counterweight to public policy support for consumers and processors. Unable or unwilling to alter producer behavior, affect production, and standardize commodities, NGOs emphasized branding and niche markets, but as Will Rogers noted, "If advertisers spent the same amount of money on improving their products as they do on advertising, they wouldn't have to advertise."

Branding: The problem said one agriculture lender is that July cheese doesn't taste like December cheese and neither taste good. Consumer food preferences are both conceptual and perceptual—the production ethic and product appeal. Free-trade, all natural, organic, and small farmer labels certified an economic, environmental, or production input criterion—conceptual preferences and the production ethic, but none certified production outcomes for quality, taste, consistency—perceptual preferences and product appeal.

Not one food commodity cooperative had codified internal polices, defined product and commodity specifications, transcribed and enforced technical standards for production and processing. All had a brand, all had an NGO drafted marketing plan, and all were unsustainable. The best way to serve and support the producer is to represent the consumer and processor, teaching compliance rather than market maneuvering; emphasizing customer satisfaction to earn a greater portion of consumer food dollars. CRI would emphasize the consumer's perceptual preferences—quality, taste, consistency, price, and supply.

Working Capital and Cooperative Credit: Avoiding inflation, taxation, and remuneration Nicaraguan producers are liquidity averse, pouring all working capital into livestock and durable goods, increasing pressure on inflation, taxes, and prices. A CRI volunteer experienced in farm cooperative accounting found 108 cooperative members who combined owned $500,000 in surplus cattle—1,300 head of non-producing cows. Coping with interest rates of 17 percent, producers demanded low interest loans on signature credit terms. Not one cooperative credit union could produce a codified credit policy or standard loan application, not one producer a profit and loss statement, inventory of assets, or farm financial records. Accounting measures profits, and profits attract investment. CRI would emphasize standardized, transparent farm accounting to attract investment, improved capital management, and cost of production control.

Cooperative Extension: Extension workers are a known commodity drawn from cooperative, NGO, and governmental ranks. Steeped in project culture, stridently pro-producer, vested in the social status-quo and anti-formal market, food regulation, and agribusiness, *extensionistas* trained producers in zero-input production agriculture and commodity adulteration to minimize detection. Deficient in intellectual curiosity, one agent when asked why *MA AUXILIADORA* farms were so successful shrugged, "just lucky." CRI would emphasize urban market outreach and agribusiness extension training in tool use and benefits, creating effective demand for qualified inputs, and investing extension in agribusiness and paid services.

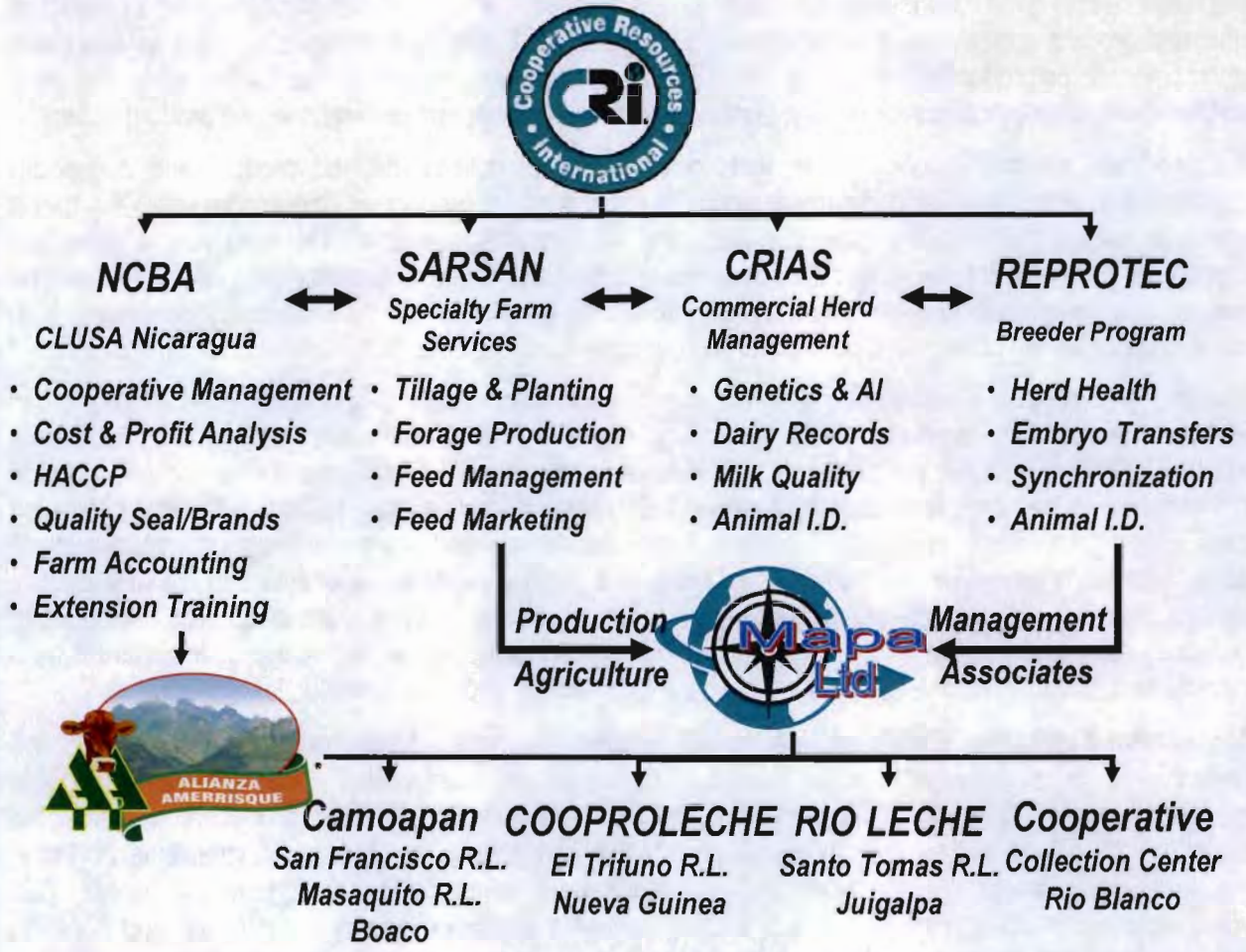
The Role of Agribusiness

PRODEGA *(Cattle Farming Rural Development Project)* Chief of Party Paul Ward opened a November 2000 donor conference stating, "If we made only one mistake in Nicaragua, it was in making the cooperatives too small." Operating in Nicaragua from 1990 through 2003, the Finish-funded PRODEGA was first on the more remote production livestock scene following the Sandinista electoral defeat.

Cuban and Soviet aid had focused on a ten-year development effort building the collectivized, industrial dairies of Chiltepe and cattle ranches, feedlots, and swine and poultry farms of Tipitapa west and east of Managua, respectively, to feed the urban population and produce food exports. To pacify the outlying municipal party faithful and stabilize rural Nicaragua, the Ortega government distributed estates to Sandinista *cell* chiefs and resettled immigrant rural peasants. With the exception of schooling abroad in the agricultural sciences (again in Cuba and the Soviet Union) for the children of ranking rural party members, no significant investment or development initiatives were supported in the rural, agrarian departments.

PRODEGA efforts to organize farmer cooperatives were limited to small, clannish groups politically and parochially homogenous, with cooperatives averaging 91 members. Cooperative-wide milk production, milk quality, and pooled supplies were too low to leverage negotiating power with industrial processors. Moreover, cooperative scale and low-input farming traditions collapsed every cooperative attempt at production services—feed milling, supply stores, farm equipment, artificial insemination, model farms and feedlots, breeding stock and production livestock replacement farms—all failing due to overhead and use.

Figure 3: Integrated Agribusiness Model



While the ***Alianza Amerrisque*** was largely the parting PRODEGA push for "scale", Ward's promise of collective bargaining advantage, much like the cooperative marketing panacea Rogers discounted, is an all too common and defective notion in development—diagnosis with no prescription, no medicine. The ten cooperatives combined pooled not less than 20 non-standardized variations of Morolique cheese, fluid milk, and cream reflecting ten individual head cheese makers, livestock, pastures, and forage management programs, and local livestock herding, milking, handling, and marketing traditions multiplied by two seasons. Like oil and water, grass-milk and silage-milk do not mix, and the pool was no pool at all.

Adding and segregating new, individual producer accounts, milk collection stops, milk cans, milk quality laboratory analysis, and farm machinery travel between farms for "scale", adds costs. Cooperatives require more milk—*standardized milk*—per producer account, farm stop, milk can, and laboratory test, and more hectares cultivated and feed tons harvested per farm job order and kilometers traveled.

With Nicaragua's surviving agribusinesses focused on the newly privatized, industrial agricultural core of the Managua basin, outlying and frontier agricultural enclaves were limited by independent cooperative and individual farm scale and receipts to access qualified agribusiness production support. Through the Cooperative Alliance, the project could sufficiently *bulk* production agriculture service demand, facilitate farmer access to professional agribusiness, and assist agribusiness in accessing farm clientele. Through established and defined HACCP plans, seal of quality, and product brand standards, agribusinesses could standardize production goods and service inputs for improved service economies of scale, service defined product market goals, and effectively engineer a standardized raw commodity in sustainable quantity.

CRI organized *SARSAN Specialty Farm Services* and *CRIAS* and supported Managua market-based *REPROTEC* to service rural Nicaragua livestock producers through MAPA (Production Agriculture Management Associates) Ltd. The MAPA model preserved individual firm integrity and identity while expanding clientele, service, and employment opportunities. The three leading agribusiness firms teaming with additional, non-project related businesses in farm supplies, seeds and fertilizers, and forage production, would contract directly with cooperatives and individual producers to provide a complete service package in livestock reproduction, herd health and nutrition management, and forage, feed, and pasture management. MAPA Ltd. functioned as a consortium organized to provide an integrated, comprehensive production livestock service portfolio, private extension, and management information systems as completely interdependent core services. The Cooperative Alliance and CRI DEI Program organized a sustainable clientele base of 105 farms, totaling nearly 11,000 head of cattle and 36,000 hectares, with 61 farms under MAPA management and 44 farms utilizing various MAPA services.

Through the *Alianza Amerrisque*, NCBA (CLUSA Nicaragua) worked directly with cooperatives and supported essential programs and cooperative liaison with relevant government agencies and collaborative NGO/PVOs in the livestock sector. NCBA work in HACCP, quality seal, and product brand development was essential in directing agribusiness production inputs and extension intervention in engineering a marketable product. Defining the Alliance's most critical role, NCBA worked to transform the Alliance into a standards enforcement agent to support and redefine market access. Managing obligatory compliance of export markets would prove critical in marketing and exporting the 37,000 liters per day gain realized by agribusiness production intensification and earning a 64 percent increase in value-added exports.

CRI project activities were directed through MAPA firms and the Cooperative Alliance with no direct CRI support to producers and individual cooperatives. Maintaining the agribusiness buffer between NGO/PVO and livestock producers and their cooperatives facilitated exit strategies, ensured commercial service sustainability, and reduced technological and economic project dependency. Producers and cooperatives readily identified throughout the course of the project with national agribusiness agents, demonstrating strong U.S. business affiliation and support. While emerging markets prefer U.S. production agriculture inputs and expertise, producers expect reputable, domestic agents daily engaged in national agriculture.

TECHNICAL
PROGRAMS

CRI Livestock Initiatives

Between 1997 and 2006, USAID and CRI would implement a series of five key initiatives rehabilitating the livestock sector to restore it to pre-Mitch, pre-civil war, and pre-revolution levels:

- ***Cooperative Development Program (CDP)*** *Small Holder Livestock Rehabilitation (11/97-05/04):* This lead program would facilitate the rehabilitation of the livestock herd, producing 13,000 genetically superior production females and herd sires to restore farm-gate output and farm labor and cow herd productivity, with offspring demonstrating a 200 percent increase over unimproved herdmates, increasing cooperative milk production 11,000 tons per year worth $2.2 million annually in farm income.
- ***Dairy Directive*** *Increasing Building Producer and Processor Capacity (9/99-06/00):* Running concurrent to the CDP, this initiative established a milk quality control laboratory to support commodity bulking and facilitate raw fluid milk grading and sorting. Participating cooperatives totaled 84 tons of daily capacity, managing $6 million worth of annual raw commodity farm output. At the beginning of the project, only 35% of cooperative members qualified as grade "A" producers, a premium of up to C$1.25 (12.5 cents) per liter or $125 per ton. After qualified laboratory grading to identify farm level contamination, 53% of producers qualified as grade "A", earning cooperative producers an additional $1.2 million in annual paid commodity premiums, raising milk income 10% cooperative-wide.
- ***Dairy Directive*** *Building Business Linkages between Producers and Processors (3/01-03/03):* Continuing to support the CDP, while building upon the previous Dairy Directive, CRI teamed with Land O' Lakes, Inc., to improve cooperative processing capacity and product development, branding, and marketing. This initiative managed the merger of two cooperatives to cut operating costs by 21%, increased cooperative membership 15%, and raised cooperative capacity utilization to 70 percent. Participating cooperatives reduced operating costs by $500,000 annually. Land O' Lakes assisted cooperatives in tapping regional markets such as El Salvador, while expanding domestic store shelf market share, increasing value-added product sales by $1 million, up 33 percent from 2001 to 2003.
- ***Dairy Enterprise Initiative:*** *Dairy Production Intensification (09/02-09/05):* This dairy initiative would work to merge inefficient cooperative production livestock services such as livestock reproduction and forage production to joint ventures and private agribusiness firms serving cooperative members and non-member producers. Where the cooperative's fleet of 5 tractors, plows, seeders, and harvesters earned on average $22,000 annually, storing 850 tons of feed at $26 a ton, SARSAN Specialty Farm Services averaged $45,000 in sales annually, storing 3,000 tons of feed, averaging $15 per ton. Utilizing improved forage bagging and baling technologies, SARSAN-SFS increased feed nutrient digestibility by 54 percent and reduced nutrient loss and decomposition to just 2 percent, grossing 12,000 tons of milk worth $2.4 million. Livestock genetics was organized into the joint venture GRP, later sold to a private agribusiness firm, and reorganized as CRIAS. CRIAS is now marketing 8,000 units of improved semen per year for $80,000 in annual sales, compared to the cooperatives' combined A.I. business unit losses of $90,000 annually.
- ***Dairy Enterprise Initiative:*** *Dairy Production Sustainability (09/03-09/06):* The capstone of livestock sector rehabilitation, this initiative links prior activities in a comprehensive production agriculture service bundle. Dairy Production Sustainability integrated producers, cooperatives, and agribusiness in an informed production-to-consumption quality and production control standard. Utilizing a centralized dairy production and farm records system housed under CRIAS, the marketplace translates consumer demand as production inputs, determining herd genetics, feed and forage, forage storage, and commodity feeds. Dairy records service provides production analysis and farm financial management services to attract investment and affordable agriculture credit. CRI, SARSAN, CRIAS, and REPROTEC successfully tested and disseminated a profitable small to medium dairy farm management model, while CLUSA partners defined quality product branding and supported cooperative administration, managing $6.8 million annually in new dairy productivity and exports.

CRI Implementation and Impact Model

Focusing on activities that met stated objectives, the CRI implementation and impact model details what worked, why it worked, and how it shaped project outcomes. This prost-project analysis is divided into three key economic development components of access to information, capital, and markets. Components are subdivided into levels or cross-cutting *phases* of micro, macro, and industrial agribusiness organization.

Table 7: Implementation Matrix

		Component 1	Component 2	Component 3
		Access to Information	**Access to Capital**	**Access to Markets**
Phase I:	**Micro-Agribusiness**	Entrepreneurial Extension	Production Model	Commodity Branding
Phase II:	**Macro-Agribusiness**	Market Extension	Business Model	Product Branding
Phase III:	**Agro-Industrial**	Cooperative Extension	Capital Improvement Model	HACCP Seal of Quality

Component 1) Access to Information: Symmetrical information sharing being essential to investment, economic development, and competitive product development and marketing, this component focuses upon the technical extension agent-centered information network. Establishing management information services, extension would effectively network tenant farmers, landholders, cooperatives, agribusinesses, lenders and investors, and consumers. Entrepreneurial extension supports production needs, market extension defines consumer demand, and cooperative extension promotes reciprocal rural-urban trade.

Component 2) Access to Capital: Pre-industrial agricultural credit is characterized by associative demand for signature credit on discretionary borrower terms. The production model standardizes production inputs, farm facilities, and management; the business model is uniform farm accounting, cash flow management, and investment strategies; and the capital improvement plan is minimal market-entry farm facility standards. Establishing standardized farm business models incorporating proven management and production models would shift the farm credit paradigm from credit-on-demand to *attracting investment.*

Component 3) Access to Markets: The artisan agricultural movement has saturated global niche markets in organic, natural, fair trade, and small farmer foods, requiring producers to achieve still higher levels of premium market differentiation. Through this graduated *commodity-product-HACCP* branding program, agribusiness reverse engineers consumer preferred products for quality, taste, consistency, and product appeal as standardized production inputs, seed stock and livestock genetics, and management practices to shift market access paradigms from producer attrition to consumer satisfaction.

Phase I) Micro-Agribusiness: Limited by overhead margins and lacking market development resources, the agro-industrial complex and established peri-urban agribusiness discount smaller, remote rural producers until organized as a serviceable and cost effective customer and supply base with standardized production and consumer needs and commodity output. In phase one, local technical extension agents build their individual micro-agribusinesses by organizing farm tenants, landholders, and commodity volumes into a serviceable clientele base providing management information services, reproduction program support, feed and nutrition management, and livestock husbandry to standardize commodities.

Phase II) Macro-Agribusiness: As local agribusiness sales and service volumes reach critical mass, they are integrated into nation-wide agribusiness firms and producer and/or marketing cooperatives to sustain economic viability, access to affordable, cutting-edge technology transfers, and ensure producer and agent competitiveness. Pooling sufficient and standardized (branded) commodities, the product is branded.

Phase III) Agro-Industrial: In the final phase, the macro-agribusinesses are organized into a working consortium (agro-commerce chamber) supporting cooperative (production, marketing, and consumer) extension, standardized production, farm businesses, and capital management models, an integrated service package or a *service portfolio bundle*, and a seal of quality, meeting international export standards.

Component 1: Access to Information

The key to an effective project exit strategy was that the CRI "shop" in Nicaragua was designed from the outset to be a functional, competitive agribusiness owned by the technical extension agents at program completion. The technical extension agent is the most underemployed project asset in development. Moving from project to project with a stable constituency in tow, extension agents function as market intermediaries, offering NGOs a ready-made beneficiary base to rapidly distribute project transfers. Conversely, extension agents are the most exploitive players in program implementation. Tasked to increase productivity and value-added earnings through training and technical services, extension agents observe rising farm incomes and cooperative profits while earning a fixed personal income.

As demand for project gifted or subsidized services exceeds supply, project technicians become rent seekers, rationing project assistance through training and service fees to earn supplemental, unreported personal income. NGOs turn a blind eye to entrepreneurial extension behavior and intermediary development agent price regulation in technology transfer markets as an employment perk or fringe benefit. This *grey-market* activity demonstrates that the extension agent and technology transfers are undervalued and producer and cooperative capacity to remunerate development program transfers are underestimated. While readily ignored by NGOs on the ground, this is true price discovery in the natural economy and healthy market activity to be embraced and cultivated in a transparent commercial environment.

Phase I) Entrepreneurial Extension: Turning project constituents into agribusiness clients, CRI identified six qualified project technical extension agents in Camoapa, Boaco; Candelaria, Chontales; Rio Blanco, Matagalpa; Santo Tomas, Juigalpa; Poseltega, Chinadega; and Nueva Guenia, Zelaya, with an established producer contact base, and supported building local, agent-owned, micro-agro-enterprises. Entrepreneurial extension agents first established commercial services to fund their business operations and technical training. Extension training would emphasize the use and benefit of agribusiness goods and service inputs.

Extension agents established primary service portfolios, ranked here by commercial service demand:

1. ***Para-Veterinarian Services:*** Livestock vaccinations and parasite control, mastitis diagnosis and control, dehorning, superficial injury treatments, and animal identification (ear-tagging and registration).
2. ***Reproduction Management:*** Genetic improvement and breeding programs, culling and selection, artificial insemination, and palpating for pregnancy examinations and heat detection.
3. ***Feed Management:*** Pasture seed selection and stand establishment, pasture mapping, fencing, stocking rates, and rotation schedules; forage seed selection, tillage and stand establishment, cultivation, harvesting, ensilaging, and feeding.
4. ***Livestock Nutrition:*** Cattle feeding programs, vitamin and mineral supplementation, nutrient feed supplements, and production lead (step) feeding recommendations (balanced rations) and analysis.
5. ***Management Information Systems:*** Herd management notebook maintenance, individual cow production, reproduction, and health records, and replacement livestock traceability.

Extension business agents received and were trained in a basic livestock husbandry kit, providing the essential tools for primary services in herd health management. Agents established service fees based upon their location and prevailing market conditions. While CRI supported micro agribusiness planning and technical training in reproduction, forage, and dairy records, CLUSA experts provided education in pasture management, mastitis control, and herd health. Technicians devoted four work days to paid services and two work days to farm tenant and producer training in production herd management.

Every paid farm consultation was a training exercise for tenant workers and attending producers. Every fee-for-service call was a learning opportunity for technicians. Maintaining the dairy herd records, CRI agribusiness agents learned what was working and could then transfer that information to other clientele and farms. Learning successful farming was more than luck and weather, the agribusiness agent became a credible source for management innovation, utilizing core project enrolled farms for quarterly field demonstration days. In their quarterly CRI business reports, agents meticulously detailed the best milking facility design, pasture species and stocking rates, forage and feed supplements, feed maturity to maximize nutrients at harvest, and feed storage. Studying individual tenant farmer and producer "tricks-of-the-trade," rather than relying on U.S. production agriculture expertise, the team disseminated indigenous, proven production techniques across their clientele base and through their agribusiness agent network to standardize production management and raw commodities through dynamic information flows.

Phase II) Market Extension: As local agribusiness agents averaged 3,000 head and a 30 herd clientele base, national agribusinesses took notice and eagerly pursued buy ins. Agents joined with REPROTEC S.A. Nicaragua of Managua to form CRIAS Nicaragua and teamed with SARSAN of Chinadega to form SARSAN Specialty Farm Services to access a nationwide service network, improved procurement capacity, and reduce administrative overhead. Through CRIAS, agents tapped a central data management and information system for dairy records, new product lines and veterinarian supplies, internal veterinarian medicine capabilities, and embryo transfer technology. Through SARSAN, agents accessed new forage production technologies, heavier farm equipment, and arable land management expertise. REPROTEC and SARSAN tapped a new service and distribution network and an expanded, organized clientele base.

More experienced in industrial processor demands and export criteria in commodity standards, national agribusiness delivered consumer market information. As local agents had studied local farming techniques for productivity and profitability, national agribusiness delivered education and the means for commodity standards—profitably producing what consumers wanted. A centralized clearinghouse for herd management information, backed by licensed veterinarian analysis, quantified 516 field test studies evaluating livestock management, breeding programs, forage and pastures, and genetics and seed selection to facilitate information access throughout the commodity chain.

Phase III) Cooperative Extension: In developing economies, agribusiness sees sales and service marketing as a zero-sum game competing for farm expenditure dollars while ignoring the interdependency of goods and services. Non-competing agribusinesses competed to the determent of their own goods and services—genetics versus seeds, vaccines versus minerals. Improved genetics require improved pastures; preventive vaccines require supplemental minerals for health maintenance. No individual firm offered a comprehensive production program—a standardized production service package.

As micro-agribusinesses specialized and vertically integrated into national macro-agribusinesses, national firms worked to horizontally integrate through an agribusiness *society* designated within the project as MAPA Ltd (Production Agriculture Management Associates). As a production support consortium of independent firms, MAPA could effectively contract with cooperatives and producers to meet real market goals. Based upon daily processing goals and producer land and livestock holdings, MAPA introduced management innovations and inputs to meet cooperative processing, product, and marketing goals.

Under looming pressure from the new NICALAC, Nicaragua's own Eskimo and Parmalat shored up long-term cooperative supply contracts with favorable credit terms. COOPROLECHE, El Trufino, and Nueva Guenia expanded capacity by 30,000 liters per day under contract with industrial processors. To meet daily processing and product goals, the MAPA team rushed in, putting 30 herds on milk recording, establishing reproduction and herd health programs, designing pasture paddocks, stocking rates and rotation schedules, and harvesting and storing over 900 hundred tons of feed to meet and sustain daily production and product goals.

Component 2: Access to Capital

Investment follows profit, security, and return. If an industry and producer or consumer group can mitigate risk by demonstrating profit, lender security, and repayment, affordable credit finds you. The capital earnings gap of loans averaging 17 to 33 percent and investment savings of three percent (less than inflation) more than reflects default rates, but indicates the lack of information in capital investment markets. Offering signature credit and junk bond rates, high interest attracts borrowers predisposed to defaulting and drives good credit risk out of the market. Information and extension would be critical.

NGOs, chief of parties, and technical extension agents do not understand working extension models. Conventional project wisdom holds that all management innovations and inputs are designed, developed, and incubated in university laboratories; *taught* to producers; and drive agribusiness sales and service portfolios. Driven by the highly lucrative *consulting* trade on training junkets delivering the latest U.S. discoveries, emphasis on training and seminar numbers exacerbates extension's one-way information tact. Extension is 60 percent learning and 40 percent teaching as the eyes and ears of university researchers.

Through producer associations and dairy records, extension agents identify a phenomenon in the general population—the top cow, highest yielding forage variety, the best feed supplement. They then examine and record all variables, attempting to isolate key factors and determinant influences. Reported back to the university, researchers attempt to manipulate these same variables under controlled conditions, further isolating cause as phenomenon becomes production practice. The publication of findings enables agribusiness to commercialize technology and informs investors on proven technology, productivity gains, and rates of return. Learning best practices on local farms, extension agents disseminate findings to other area producers, banking knows which technology to finance, and agribusiness responds to investor underwriting to deliver proven inputs. In development, extension ignores indigenous farm technology and fails to track technology transfers to inform agribusiness and investment markets on productivity gains, reducing technology transfers to commodity market value and limiting investment and maintenance.

Phase I) Production Model: Before we could teach profitable farming techniques, the CRI team first had to learn them. Identifying the top five herds among clients, extension entrepreneurs enrolled 30 herds, more than 2,000 cows, and studied more than 20 production variables including cattle breed, reproduction rates, calving cycles, pasture and forage varieties, feed supplements, water intake, stocking rates, herding patterns, milking facilities and procedures, and herdsman skill sets in the dairy herd records program. ***The key innovation of Phase I, extension agents as Ph.Ds, DVMs, engineers, and licensed technicians were the students, and illiterate tenant vaqueros, campesinos, and granjeros were the teachers.***

Humbled by monitoring 3:00 a.m. milking schedules and earning a new respect for farm labor, agribusiness agents completed 147 pre-dawn field studies in Phase I. Working often one-on-one with resident employees, extension rapidly knew more about individual farms than absentee, landlord *producers*. These new interactions would dramatically change the zero-input, lockstep extension-producer dynamic, as agribusiness agents noted lack of investment, maintenance, worker development.

The production model cataloged the best practices—production phenomenon—of 30 dairy farms, borrowing unique attributes from each to establish one standard:

- Milking parlor design
- Calving and milk production cycle
- Reproduction program and herd standardization
- Pasture, grazing, forage, and feeding management
- Herd management and milk procedures

The integrated production model was tested at Quinta Farm in Poseltega, Chinadega, managing 30 head and 40 hectares of arable and pasture land as the CRI team successfully replicated and exceeded tested field phenomenon. Integrating individual best production practices expanded productivity exponentially.

The Milking Parlor: A hybrid of numerous imported and indigenous designs, the challenges for the team were affordable construction ($1,500 limit), managed calf nursing, labor efficiency, and livestock flows for throughput productivity.

The design consisted of a corrugated tin roof, cement flooring for easy cleaning, a center feed trough with tie rail, and opposing single unit calf pens. Cows faced their calves at milking time for easier milk letdown and cow docility. Cows and calves feed from a standard ration with ready access to water. The milking parlor was designed with a retaining pen on one side for cows waiting to be milked and emptied into the main corral on the other side where cows exited after milking.

Calving and Milk Production Cycle: In Phase I testing, herds, on average, peaked first in July and, again, in October, reflecting mid- and late feed harvests and peak pasture nutrient values. The individual high record cow, however, was recorded in the month of January, second highest in February. The cow's peak production point is typically 60-90 days post-partum, demonstrated by cows calving in October and November, peaking in January and February. Producers calved cows in May and June to coincide with the rainy season and fresh surges in pasture grasses. Pastures would then peak in July, surplus grasses harvested in August and September, and resurge in October.

Fresh cows peaked higher during dry months when fed stored feeds than during the rainy season, proving late fall to early winter calving more productive and efficient than the traditional late spring calving and extensive fresh pasture management. Higher dry season production peaks were a function of cows calving in improved body condition. Dry in the later stages of pregnancy/feeding on resurging grasses, cows had sufficient stored fat to produce better milk. Calving under low body weight (negative energy balance), cows struggled to gain weight, feed their calves, produce excess milking, and return pregnant with calf.

Still, producers required daily income, the commodity chain daily raw supply, and consumers daily dairy products. Breeding for year-round calving and staggering the herd's lactation curve would further improve milk quality, which declines uniformly in later stages of lactation, and stabilize supply, income, and prices. The calving and milk production cycle would be managed through effective breeding and nutrition.

Reproduction and Herd Standardization: The parade of projects since 1990 had indiscriminately diversified the Nicaraguan cattle herd with no clear production plan and introduced a linty of management innovations to include improved pasture and forage varieties and supplement feed nutrients. These combined, incoherent applications made no gain and often encouraged declines in productivity. The mixed herd negated gains as cows responded differently to pasture and forage varieties, feed supplements, grazing, and herding practices based upon genetic predispositions.

Forage and pastures were limited by soil type, elevation, and precipitation. Bred for mountain grazing, Brown Swiss performed well on upland pastures; bred for the humid and temperate seaboard, Jerseys performed well on the coastal plain feeding on fallow grassland and crop residue, and bred for the heavy soils of the freshwater basin, Holstein were most productive on the intensive, industrial dairies surrounding Managua and Leon. All were engineered for the forages and fodder these zones and soils produced.

Matching the right breed to the right feedstuffs, to the right soil, at the right relief was only half the equation. A standardized herd was still crossed to indigenous Zebu or *Creole* (Brahman) for heat tolerance and natural resistances. Primary crosses or F1s demonstrated no response to intensive management, ensilaged feeds, and concentrate supplements requiring only dry feed to sustain minimal production during dry seasons. F2s and F3s likewise demonstrated no productivity gains under extensive manage of native grass grazing, distance herding (transhumance), and high fiber dry feeds.

An entire herd mixed across a spectrum of 90 to 10 percent Creole and crossed with Angus, Brahman, Brown Swiss, Charolais, Hereford, Holstein, Jersey, and Simmental—nearly A to Z—management was impossible. Individually, however, F2 and F3 crosses did respond to intensive management including improved pastures and forage varieties, ensilaged feeds, and supplement feed concentrates (by-products). Critical to designing an effective, organized breeding program, producers could maintain the traditional 7-15 percent Zebu bloodline for natural resistance and tolerances, breeding F3s to proven Brahman sires and maintaining three-quarter dairy breeds for intensive management and improved genetic expression.

Quinta N Majic ***Cachito*** was an F2 (second generation) crossbred Holstein sired by CRI's Magic, producing an F3 heifer calf sired by CRI Granger. During a typical dry Nicaraguan March morning, Cachito's official morning production was recorded as 14.5 liters (32 pounds). While still nursing her ***Granger*** daughter, Cachito is producing an additional 4 liters (9 pounds) per day in the afternoon milking, feeding her growing calf an estimated 10 liters (22 pounds), for a grand total of 28.5 liters (62.8 pounds) per day.

Cachito is projected to produce over 6,100 liters per year (210 day lactation), 870 percent above the current national average, a 305 percent increase over concurrent DEI herd member production levels, and a 150 percent increase over the previous liters per day production record. Calves require only 10 liters (22 pounds) to meet daily nutritional needs. Providing rapid growth for her calf, Cachito is netting a total of 18.5 liters of milk per day in salable milk, for a gross daily income contribution of C$92.5 per day.

While it had once taken two to four cows to pay farm employment expenses, only one cow is paying labor costs. This offers Nicaraguan producers a much needed 200 to 400 percent gain in farm-worker productivity to raise total farm income. Net income is determined by productivity. Productivity is measured by the amount of milk harvested per worker, the quality and quantity of milk produced by each cow and, ultimately, the volume of milk production yielded per manzana. A laborer milking ten cows, producing 5 liters, harvests 50 liters, to earn the farm C$250. If the same worker, at the same daily wage, milks eight quality cows that produce 18 liters per day, he harvests 144 liters and earns the farm C$720. Finally, eight high producing cows are worth equal to or are of greater value than the ten lower producing cattle. Herd value is determined not by the number of head in the corral, but by the productivity of that herd in liters of milk per day, calves per year, and meat yield per carcass. Documenting the cow's productivity determines its value—higher productivity means higher cow value, for increased producer equity in the livestock herd.

The Quinta N herd averaged 11.8 liters per milking (23.6 liters or 52 pounds per day), exceeding the Phase I field test average per cow production by 237 percent, while Cachito surpassed the average by 430 percent, or 23 percent above her individual herd average. These findings would prove critical in fielding the production model. To effectively utilize modern farming technology transfers, producers would have to standardize the herd by genetic level at a minimum three-quarters dairy breed (F2s); producer associations would have to standardize the dairy breed across member herds based upon soil type, pasture and forage varieties, and elevation and precipitation, and evenly distribute the reproduction and calving cycle to improve milk production and quality.

Pasture, Grazing, Forage, and Feeding Management: The critical deficiency in Nicaragua livestock rations is adequate energy with plant sugars the hardest to store. Additionally, attempting to manage excess herd numbers maximized tonnage. Overgrowing forages, fiber levels on average exceeded 65 percent, meaning cows are literally starving. Limited by fiber intakes, cows were "full" after only ingesting less than 50 percent daily nutrient requirements. Testing 10 forage species and nearly 20 varieties, CRI analyzed more than 100 test plot forage samples, with Brachiara, Jaragua, Estrella, Smooth Broome, and Sorghum scoring the highest at an optimum cutting height of 35 centimeters (1 foot) for maximum nutrient content; producers were typically harvesting at 75 to 90 (2 feet) centimeters.

The Quinta N test farm utilized the Kelly Ryan centerline bagging system. A "near zero oxygen" system, the bagger compacts chopped forages into a plastic bag seven feet in diameter at a rate of nearly one ton per foot effectively expelling the oxygen, the source of decomposition and nutrient loss. Oxygen dependent bacteria and microbes that consume plant nutrients are starved and prohibited from growing and multiplying. The machine's revolutionary design required minimal horsepower, only 65-horse, so smaller tractors, ineffective at compaction by weight, could successfully pack forages at a rate of 10 ton per hour.

Properly managed forage bags see losses minimized to 5 percent of forage organic matter compared to the customary 50-65 percent previously experienced in mound storage systems. Harvesting earlier to maximize nutrients, farmers reduced tonnage by half (75 cm down to 35 cm). Reducing forage losses through improved storage techniques, producers netted still more nutrients over traditional methods.

More than the increased productivity realized through averting waste of organic material, greater gains were realized in the value of plant material. Nutrient solubility (digestibility) moved from 2.8% in the conventional mound silos to 53.8% in silo bags. Cows could digest or process more of the nutrients in the feed, converting that to animal proteins in the form of milk and meat. Based upon CRI forage analysis, one ton of stored forage (at higher quality and solubility) is yielding an additional 4 tons of milk during the dry seasons when milk prices are peaking for both producer and consumer. Currently storing 2,000 tons annually, producers have increased milk production by 8,000 tons worth $1.6 dollars in new annual income (based upon raw milk at $200 per ton).

The optimal production model lactating feeding program included:

- Grazing-Exercise: Limited to 4 Hours Per Day
- Standardized Ration:
    - Grass Pasture (25 to 30 centimeters)
    - Corn and Sorghum Silage
    - Baled Peanut Hay
    - Soy Supplement (1 Kilogram)

Dry cows were maintained on weigh back (left over silage and concentrates in the feed trough and baled grass hay) to sustain body condition until calving.

Herd Management and Milking Procedures: The Quinta N test herd was milked daily from 4:00 a.m. to 6:00 a.m. and then pastured for two hours on alternating pasture paddocks until 8:00 a.m. Returned to the shade and dry dirt mounds of the corral for the hottest part of the day, the herd was fed dry forages with ample water. Calves are turned out with cows at 2:00 p.m. and allowed to suckle for one hour. At 3:00 p.m., cows are milked again, harvesting surplus milks from calf feedings, and cows are returned to pasture until 6:00 p.m. Silages and concentrates were fed during milking to minimize excess green feed grazing.

Nicaragua Farm Progress Field Days: With the production model successfully developed, tested, proven, agribusiness agents hosted a three-day farm progress field day at the Quinta N test farm. Field day attendees included the Vice-President and Minister of Agriculture and Forestry (MAG-FOR), USAID Managua, IICA, and numerous NGOs, and national agribusiness leaders from livestock, farm equipment, seeds and fertilizers, and farm finance sectors. More than 700 people from across Nicaragua attended over the course of the three-day event.

Attendees toured test plots, pasture paddocks, and the milking parlor and corral. Demonstrations included equipment harvesting, bagging, and bailing silage and dry forages; an afternoon milking demonstrating proper milking procedures; and the CRI training video series in dairy herd management, milk quality, reproduction, obstetrics, dairy cow nutrition, and forage production. CRI produced a special edition of its trade publication Horizons Español detailing the production model, distributed to field days attendees, producer cooperatives, and agribusinesses.

Phase II) Business Model: With the production model proven and directly demonstrated to policy makers, agribusiness, finance, and producers, the next challenge was to field the model and fund implementation. CRI would provide business planning assistance at the producer, cooperative, and agribusiness levels. The production model was going to change the way producers farmed, cooperatives were supplied, and agribusiness supported the livestock sector, requiring innovative approaches to capital asset management, service delivery, marketing, and procurement.

The Farm Business Plan: Utilizing the *Farm Business Planning Guide* developed in cooperation with Greenstone Credit Association, Farm Credit Services and the FDIC *Money Smart* Training Program, producers developed individual farm financial and management plans. Cooperative member/farmers were trained and supplied with planning documents. 105 farms completed their plans with direct CRI agribusiness agent support and 65 farms were tracked through the DEI dairy herd production records system. Through *Money Smart* training and the *Farm Business Planning Guide,* funding capital quickly materialized to self-finance.

Phase III) Capital Improvement Model: As farmers learned there would be no project subsidized loans, studied demonstrated returns, and gradually (reluctantly) disclosed assets, their equity position improved with itemization. The majority of farmers culled excess, unproductive livestock and marginal land holdings to raise sufficient capital to invest in milking parlors, improved breeding, and seeding and fertilizer, and forage storage services. Cows were culled as needed for cash flow to avoid sudden local market depression. Other farmers tapped personal savings or leveraged equity in both their farm operations and/or personal business. Through more than 20 years of, first, Soviet and then Western development aid, producers had gambled with project monies and subsidized loans while investing returns in urban businesses, U.S. dollar deposits, and foreign savings. The key success of the production model test was that the first-time farmers were willing to invest their own money, equity, and sweat into their own farms.

Producers, like investor-lenders, were not near as capital and equity poor as they were risk adverse. Understanding the integrated production model and the research of indigenous farming techniques, seeing was believing. Producers constructed 250 parlors, 517 tons of silage storage capacity, inseminated more than 14,000 cows per year, and employed over $1 million in agribusiness services.

Component 3: Access to Markets

In his monumental 1926 work *History of the Dairy Industry* studying dairying's modest, sideline origins in more than 70 countries, T.R. Pirtle notes, "...by the improvement of the quality of the cheese the consumption was increased and new markets developed. This has been the order in other countries—increased quality followed by increased consumption."[7] In 1895, the Borden Milk Company issued its standard farmer contract and farmers lined up in the early morning to sign up where in the words of one reporter, "It required no whips or chains," as farmers "scramble madly and even fight to be among the first to sign." In his book ***Mixed Harvest***, Professor Hal S. Barron recounts the Borden contract terms.

> To ensure the taste of milk, only certain mill feed could be fed, and ensilage (which permitted a longer milking season), malt grains, linseed meal, turnips, and barley sprouts were expressly forbidden. Herds were subject to inspection by a company veterinarian whose decree was final; no Holsteins were permitted, and cows had to be brushed regularly. Similarly, company barn inspectors passed judgment on stables, which had to be whitewashed and cleared of manure. The milk's temperature was strictly regulated, the milk had to be strained, and the cans were covered with a costly canvas that the company sold to the farmers for a profit; milk that grew too warm or failed to meet theses conditions was refused by milk station managers. (p. 88)

At more than 3,000 words, the *Technical Standards of Whole Raw Milk: Obligatory Technical Standards of Nicaragua* (Annex A) is scientific terminology, elemental milk composition specifications, and legalistic definitions nearly beyond the grasp of dairy producers in even mature, industrial markets. The Borden contract above was an 800 word list of simple dos and don'ts in the vernacular of the day. Thirty-eight years after founder Gail Borden first condensed milk, 33 years after *pasteurization,* and five years since the Babcock test, Borden dispensed with scientific wording in favor of a list to limit adulteration and contamination. Agents understood if farmers knew Borden internal technical standards and learned state health regulations governing dairy products, the corruption and undermining of standards were inevitable.

Farmer's believe—every farmer—their product is clean, safe, and palatable and the processor, whether private or cooperative, is cheating, falsifying analysis, skimming quality commodity components, artificially reducing premiums, and adulterating commodities as finished products. If you tell the producer that the Grade "A" milk bacteria (plate) count maximum is 8,000 and their milk was 1,000,000, they will dispute the validity of the test. Early processors in developing markets eliminated contaminants, adulterants, and product taste altering agents from production at their source—feedstuff molds, manure, and milk can rust. Much like Costa Rica's Dos Pinos today, Borden directly managed product quality control by controlling cattle breeds, feeds, herd health, farm facilities, containerization, and shipping by contract and routine inspection. This methodology would prove a strategic innovation to production model implementation.

Phase I) Commodity Branding: Cooperatives had little political will and processors little leverage to impose standards upon members and patron producers. The CRI network of local agribusiness agents, national agribusiness support, and the MAPA Ltd consortium provided cooperatives and processors with neutral third-party implementation, and the production model offered non-threatening standards enforcement under the guise of proven technology transfers and productivity enhancements. Instead of *compliance* with an abstract, scientific scale viewed as unfair trade restrictions, producers were *investing* for improved returns. Cooperatives and processors would integrate compliant invested producers into branded, premium product lines. Non-certified farms would continue to supply commodity (unbranded) products such as commodity cheese blocks sold in wholesale markets. Assigned to specific product lines, MAPA affiliated farms could effectively manage inputs and investment to a clear product goal. In shifting the quality productivity paradigm from compliance to investment in the commodity quality debate, the MAPA production model was a way out for processors, a way in for agribusiness, and improved market access for producers.

Cooperatives and collection centers enrolled 105 farms assigned to branded product lines in MAPA management programs. The base price was 18 cents per liter and below the cost of production. The premium high was 24 cents a liter and the low 22 cents per liter for a 23 cent average on volume. As noted previously, the production model cost was 16-18 cents per liter at 3,000 liters per cow, designed as equal to the base price as the *break-even point*. In Table 8 below, it is noted that the average or Class C (non-standardized) milk price from mixed herds establishes the base price, and its bulked commodity price as non-pasteurized products is only $260 per ton.

Table 8: Branded Commodity Differentials

				Price Per Ton		
Cooperative	***Farms***	***Product Line***	***Herd***	***Base***	***Premium***	***Market Price***
San Francisco	20	Packaged Milk	Holstein x Zebu	$178	$237	$593
Masaguito	20	Cheese Exports	Brown Swiss x Zebu	$178	$237	$507
COOPROLECHE	30	Bulk Fluid Milk	Holstein x Zebu	$178	$221	$400
Rio Leche	20	Cheese Exports	Holstein x Zebu	$178	$237	$507
Rio Blanco	15	Bulk Fluid Milk	Brown Swiss x Zebu	$178	$221	$400
Average		Bulk Commodity	Mixed x Creole	$178	$0.00	$260

Cooperativa San Francisco selected 40 farms to supply its branded, packaged milk line with the project certifying 20. Bagged Camoapan milk, pasteurized, homogenized, and standardized at 3 percent butterfat, sold for 59.3 cents per liter, paying producers 23.7 cents per liter. Cooperatives Masaguito and Rio Leche enrolled 20 farms each to supply their branded cheese products for export and sale through El Salvadorian outlets. Paying producers a comparable 24 cents per liter, standardized processed cheese earned 51 cents per liter. COOPROLECHE and the Rio Blanco milk collection center enrolled 30 and 15 farms, respectively, to supply Grade "A" fluid milk contracts, with industrial processors funding facility construction and improvement loans. Bulked Grade "A" whole raw milk sells for 40 cents per liter to processors, earning producers 22 cents per liter.

MAPA firms contracted individually and directly with enrolled producers while coordinating farm service support. Based upon finished product goals, region, elevation, soil type, and precipitation, CLUSA agronomists assisted local agribusiness agents in selecting pasture species and varieties, designing pasture paddocks and rotational grazing schedules and stocking rates for individual farms, providing tenant farmer training in proper pasture height and maturity for grazing. Supported by national forage seed and fertilizer dealers, SARSAN and local agents devised forage production programs utilizing mixtures of sorghum, corn, forage peanuts, and hybrid grasses satisfying livestock nutritional needs and environmental conditions. REPROTEC SA devised a reproduction program to standardize the herd by location, product, and feed source by breed and genetic level (F2-F3). CRIAS managed artificial insemination, animal identification, herd health and vaccination programs, and dairy records. Herds in each single location and unique product line were bred the same, fed the same, and milked the same.

While agribusiness and local agents were focused on mounting job orders, CLUSA Nicaragua (NCBA) stepped up shoulder producer and labor training. CLUSA's Managua-based extension agents would conduct cooperative seminars and on-farm training in milk quality management, proper milking procedures, mastitis control, pasture management and grazing, and hazardous analysis and critical control point (HACCP) management, detailed further in following components.

Phase II) Product Branding: A key program assignment for CLUSA Nicaragua, the challenge remained to convey to the consumer the quality measures taken—to tell the production model story, the cooperative care, the producer pride, the tenant farmer skill, and agribusiness involvement in every homogenized glass of milk, processed slice of cheese, and pasteurized pour of cream. While cooperatives and NGOs were adept at "packaging" and labeling, few could differentiate logos from *brands*.

A brand tells a story—where the product came from, how it was made, who produced and processed it, and conforms to an established standard, conforming to consumer preferences in taste, consistency, and safety. The package catches the consumer's eye, the label tells consumers what product is in the package, but the brand tells consumers what went into the product.

Two registered trademarks for dairy products have been established among the alliance: RIOLACT (registered in Nicaragua and in El Salvador) and SENOR QUESO. The RIOLACT label is already selling 52,000 pounds of Quesillo and 38,000 pounds of Morolique monthly.

While established cooperatives re-inaugurated their brands under HACCP and MAPA standards, CLUSA assisted COOPROLECHA, COOPEAGROSTO, Rio Lecha, and San Felipe certify to their plants to Amerrisque norms and develop their unique brands. They received training in fundamental marketing aspects, including how to conduct market niche identification studies; the administrative function of management in commerce; how to be competitive; which products are right for national and international markets; how to export successfully, including aspects of quality, presentation, and document processing for exportation; and how to create strategic alliances for market positioning.

Cheeses such as Quesillo and Morolique have great acceptance in Nicaragua and Central America. CLUSA/CRI has provided training in marketing in these products in the Santo Tomas and Nueva Guinea cooperatives, and has assisted in the development of a chain of local retail outlets for their products in their respective areas. In addition, CLUSA/CRI has supplied a refrigerated display case to a retail store in Santo Tomas. These cooperatives are also marketing their cheese products in the Small Farmer store at the CLUSA offices in Managua.

Reverse Engineering: CRI/CLUSA coordinated the participation of the Alliance in two national, annual fairs: the National Agriculture and Artisan Fair in the Holiday Inn in Managua, and the Friendship Fair in Juigalpa, in which dairy products were sampled and sold. Surveying consumers sampling and purchasing dairy products at food fairs, cooperatives could identify products lots of customers most preferred. Because of MAPA dairy records and the production model, cooperative managers could trace product to the source point and determine which farms, herds, breed of cattle, variety of grass and forages, soil type, feed concentrates, and stages of lactation yielded consumer preferred dairy products.

The cooperatives had been trained to keep product lot records detailing aging, press, vat and pasteurizer batches, receiving tank, collection route, producer, and can numbers, but they previously had no idea what to do with that information in product development. Discovering the consumer preference *phenomenon*, cooperatives, in partnership with agribusiness, can isolate key variables in duplicating that product. Soil, sun, and rain flavor plants, plant specie determines photosynthesis efficiency, and DNA structures protein, glucose, and fiber. Plants flavor milk and meat, genetics determine feed conversion efficiency, and breed structures protein, fats, and solids. These are the variables under cooperative, agribusiness, and producer control to make sure that July cheese tastes like December cheese and both taste good.

Phase III) HACCP Seal of Quality: While Dr. Dobson in a Babcock Institute Nicaragua market study points to the need of a quality seal, many NGOs in the livestock fall well short of sufficiently defining a legitimate quality assurance. Ideally, like the U.S. Milk Marketing Board *Real Seal,* the association of professional dairy processors *CANISLAC* would brand the HACCP seal of quality. Unlike the U.S. mandatory check-off program to fund the milk, beef, pork, and soy marketing boards, CANISLAC minor-members de-funded their own organization to avoid compliance with the Technical Standard of Whole Raw Milk (Annex A). Less preferably, CRI/CLUSA anticipated that the alliance could certify a member cooperative HACCP quality standard, but was likewise stifled by funding, political will, and cooperative member posturing over trade secrets, member confidentiality, and coveted market share.

Eskimo and Parmalat would self-certify and stamp their products with the "HACCP" acronym. Limited to their individual processing plants and primarily supplied by cooperatives and community collection centers, processor HACCP plans did not extend down to the farm level. Individual cooperatives would take the same tact, planting the quality banner firmly in the façade of the cooperative—quality control, inspection, and certification of product for export ended at the milk can receiving dock; milk collection trucks, route operators, member farms, and non-member daily cash sales were off limits to examination. Like Pirtle had noted early in the last century, it was good enough for city people who "knew no better."

The brand, HACCP plans, and seal of quality is not solely shouldered on the cleanliness of the processing plant. Cooperative and private processor food supplier certification is the sum total compliance rating of producer suppliers—the brand, HACCP, and seal manage products from *farm to fork*, cow to consumer. Particular to the issue of the quality seal, cooperatives, producers, NGOs, extension, and even COPs demonstrated a critical lack of understanding of government, the rule of law, public policy development, and regulation. Even as Parmalat and Eskimo added "HACCP Certified" to labels, all those cited above argued that no HACCP plan and quality seal could be developed and labeled until the government "passed" a law.

As the *History of the Dairy Industry* details, the marketplace developed certified milk. Pediatrician "Henry L. Coit originated the idea of "Certified Milk" in 1892...the milk to be produced under the supervision of a medical commission. The first certified milk was produced in May 1894, at Fairfield Dairy, by Stephen Francisco under the supervision of the Essex County N.J. Medical Commission."[8] There was no direct governmental legislation, sanction, or regulation. Networking medical associations to work with processors and producers to establish safe food guidelines, Coit would drive private market toward a standard. A year later New York-based Borden incorporated certified milk standards into its producer contract. Commercial milk inspectors first appeared in the commodity chain in 1895, 11 years prior to the inauguration of the Food and Drug Administration. The 1906 Food and Drug Act served only to codify as regulation the practices and policies of industrial leaders such as Borden, Swift, and Armour and provide government funding for neutral, third party inspectors in commodity livestock processing. If you are waiting on government, you are losing market share, exports, and competitiveness.

From Carnation's "Milk from contented cows," Borden's "Happiest cow on earth" Elsie, to the talking California cows proclaiming "great cheese comes from happy cows," these campaigns are more than marketing and brands, they are HACCP plans. As Pirtle notes, "sanitation, it was soon learned, had to begin with the herds and soon the requirements of the [processors] to which every farmer supplying milk must subscribe, including clean herds, clean barns, and a high class of cleanliness in all the production and handling of milk. The stables must be well lighted, utensils clean, and the elimination of all feeds that tainted milk. As the business grew, these rules became more and more exacting. It was noticeable that wherever [processors] are located, the general appearance of the farms has improved, owing to the better methods of dairying required by the [processors]. These requirements are necessary to the procuring of clean milk and clean milk is necessary to the [processing] of milk that will keep."[9] With processors self-certifying and alliance and cooperative policing paralysis, it was clearly a job for private agribusiness.

An urgent need for control mechanisms has emerged among this sector in order to assure high-quality, safe products to meet the demands for export markets. Beginning in 2003, the U.S. Food and Drug Administration requires that all food production companies comply with standards such as the HACCP system for each food product entering U.S. commerce. We conducted HACCP training to a total of 1,500 producers during the project. HACCP procedures were implemented in four milk processing cooperatives. Significant export levels have been achieved by Cooperativa Rio Leche, Santo Tomas. *Increased quality increases consumption and adds markets.*

The HACCP training implemented in these cooperatives is considered the first step in product quality control. The steps involved in a milk certification process are as follows:

1. Pre-certification-training programs, producer and processor agreements, pre-inspection training, review of production and reproduction records, dissemination, selection and implementation.
2. Certification-training, internal inspections, external audits.
3. Seal of Quality: resolution, issuance of quality seal, follow up, and monitoring.

This project led the four cooperatives into the first step of this process.

The CRI/CLUSA team also trained 37 dairy product inspectors for the Ministry of Agriculture and Livestock in the zones where the cooperatives are located. The topics covered for these training sessions included: Dairy production program overview; cheese production; laboratory analysis in the dairy industry; good Manufacturing Practice and the HACCP system in the Food Industry; and training of HACCP System auditors or verifiers. HACCP procedures have been implemented in COOPROLECHE and Santo Tomás. In Santo Tomás, Good Manufacturing Practices and the Standard Sanitary Operating Program were implemented.

Critical CLUSA training in HACCP planning and milk quality control paved the way for CRIAS to provide cooperatives commercial services in HACCP implementation and enforcement. Utilizing the production model integrating the *Technical Standards of Whole Raw Milk,* CRIAS and MAPA team affiliates, marketing milking equipment and farm supplies, produced a production goods and service bundle for Grade "A" farms supplying branded product lines.

By providing routine monthly herd tests for health, reproduction, and milk production recording, CRIAS agents tested suspect cows for mastitis, provided treatments, inspected and certified facilities and equipment for cleanliness, and marketed all stainless steel equipment including milk cans, milking pails, and strainers. Farmers were, likewise, required to use disposal, single milking use cloth fiber straining pads, and needed to provide intermediate cooling (groundwater cistern storage). Agents observed and certified proper milking procedures to include sanitary udder preparation, employee cleanliness, and use of sanitizing agents pre- and post-milking (proper use of teat dips). CRIAS would then certify product integrated producers weekly and respond to cooperative plant milk quality analysis reports to address on farm contamination. Of the 105 farms enrolled, 65 were certified compliant.

Conclusion: Lessons Learned

In September 2006 as Nicaraguan agribusinesses were poised to take the reins of working businesses, they knew they had the best post-project sustainable business model Nicaragua had ever seen—their uncertainty was duly political. SARSAN-SFS Manager Jose Sarria noted, during the 1980's, Nicaragua had suffered under a food-for-guns market, and with Sandinistas rising in the polls and Chavez interference, Nicaragua would pay food-for-oil. Under the previous Ortega regime, Nicaragua fed the regional Cuban-Soviet bloc in exchange for weapons to pacify the country and fuel uprisings in Honduras and El Salvador. As consumer goods dwindled and disappeared in the marketplace, production agriculture ground to a halt except what collective managers and party cell chiefs could extract from tenant peasants.

With only 25 percent of Venezuelan land arable, Chavez is drawn to rising Nicaraguan food exports and its vast land holdings. On November 5, 2006, Ortega won the presidency with 38 percent of the vote in a crowded field. In his inaugural address January 10, with Chavez present, Ortega vowed to 'immediately' address Nicaragua's severe energy crisis, with help from oil-rich Venezuela as both leaders would echo themes of collectivization. Venezuelan oil will not come cheap as Chavez seeks to pour Nicaraguan rations into Caracas food cooperatives and finally crush rightist landowners and end opposition.

Whether the innovations and successes of this Dairy Enterprise Initiative came too late amidst resurgence in Latin socialism will hinge upon the movement's promised moderation or *mellowing* and a shift in its antagonism toward private agriculture. Whatever the political fallout, the initiative worked, the model was effective, and stakeholders are driven to stave off collectivization. Incomes increased for producers and agribusiness, productivity is up for investors, and food supplies and safety gained dramatically for consumers. It will be harder to pry this model from the hands of agriculture—agribusiness agent, producer, vaquero, or consumer. The extension agents own their projects today and it *is not* July 1979 all over again.

The Model – Lessons and Legacy: In the final analysis, the key to sustainability and replication is identifying the phenomenon, studying the variables, and understanding what worked.

1. ***Entrepreneurial Extension:*** Extension agents invariably manage sideline project businesses. NGOs should organize local shops as businesses to continue post-project. Extension becomes agribusiness agents directly invested in the project and working toward ownership of the firm.
2. ***Parsimonious Producers:*** Acutely attuned to development projects, producers are liquidity adverse concealing surplus capital in tangible, idle assets. Producers are reluctant to free up working capital to invest in technology transfers unless thoroughly demonstrated and given proof of profitable returns under indigenous conditions and management. Producers do not take the word and demonstration of model farms enjoying unlimited project resources—a definite no sell. Quinta N was a working farm supporting owner-operator, employees, and their families with no operational or payroll subsidy.
3. ***Potemkin Cooperatives:*** Ever project savvy, cooperatives are organized and increasingly oriented to governmental and non-governmental organization to access aid. Rearranging deck chairs for official, dignitary visits, they mimic modern agriculture cooperatives for the parade of aid observers. NGOs must approach cooperatives as either remunerative consumers or suppliers to reorient cooperatives to the marketplace. Broker co-op product and leave behind a cooperative marketing firm or sell co-ops essential production input goods and services as an established agribusiness. CRI put agribusiness between itself and the cooperative for effective implementation, sustainability, and exit strategy.
4. ***Champion Consumers:*** The true friend to the farmer is the consumer advocate. Teach the producer to give the consumer what they want and you will stay on your land—economically and politically.
5. ***Train the Trainer that Trains the Tenant:*** The producer has never squatted beside a cow, wielded a hoe, or swung a machete for his daily bread. Invest technical education resources in those investing the sweat equity, business education in those keeping the books, and consumer education in those making the cheese, and the political economy, social equality, and the rule of law will grow and mature.

Nicaragua and the United States are uniquely mirrored in economic evolution and tradition—sparsely populated, interior industrial basins upon their great inland lakes, agrarian-industrial and rural-urban economic and political tensions, and their cotton, cattle, and corn kings versus consumer sovereignty. Since the first seed was sewn in Mesopotamia, the first cow domesticated on the steppes of Russia, agrarian culture was destined to be a minority, some sooner than later.

Like the confederate south plantation economy, Nicaraguan producers struggled for direct international trade, and the urban industrial core won. The post civil-war development initiatives in Nicaragua reflected all the challenges and tensions of reconstruction in the post-Antebellum South. In a dynamic employment and demographic population shift, the landed aristocracy suffered the indignation of subjugation to consumers with rural and urban elites trading rolls. Whether reconstruction or development, the roles have been one of transition through the painful throes of urban, industrial and, ultimately, service sector dominance in government, economy, and society.

This transition is a critical social, economic, and political juncture in national history and the people will ride the revolution-civil war see-saw between the political right and left until the transition is done correctly. However accidental, with malice toward none, charity for all, with firmness in the right, the United States would eventually get reconstruction right. After a decade of centrist governments, Nicaragua continues to teeter on shifting factions because, after reconciliation, its most critical work in reconstruction remains undone—Nicaragua has yet to deal with its rural peasantry, land tenure, and idle capital; the standard refrain of *agrarian* or *land reform*.

15 Manzanas and a Caballo: The sharecropper system was little improvement over slavery, but a necessary evil in transition of reconstruction to stem the tide of freedmen refugees and wholesale labor exodus. A contemptible existence, it, at the very least, did not throw farm labor into roadside, makeshift camps in the off season even as Nicaraguan coffee workers are driven to plastic lean-tos post harvest. Reconstruction promised freedmen 40 acres and a mule, a pledge not realized until the Farm Resettlement Administration of the New Deal era. The challenge for government was too buy out landholders and thereby save the banking system, salvage the landowners' entrepreneurial skills, and enable freedmen and white sharecroppers, alike, to legally obtain title law and local ordnances, and finally access agricultural credit. Dealing with centuries of social class structure and not race, in 1861 Tsar Alexander II emancipated Russian serfs through a bond issue paying the aristocracy for landholdings to be repaid by farmer mortgages—preserving banking and lending and infusing capital into the economy by mortgaging the land.

Through the Farm Resettlement Administration, the Farm Security Administration, and the Federal Land Bank, the U.S. government would buy up idle land and directly finance or grant loan guarantees to tenant sharecroppers. The old plantation families would join the new ruling urban elite. Flush with capital from land sales in the throes of the depression, they would venture into the mercantile trade and agribusiness serving the new landholders. The urban business class absorbed is formal political rival as a new middle class rose upon the land. Plantation kings, turned bourgeoisie, would organize former tenants into clientele through rural retail outlets and cooperatives.

Development in Nicaragua is owed a simple solution. Productivity under the tenant system has in 1979 and its restoration today again reached its peak. Turn the land over to the tenants and productivity will rise. Underwritten by tenant property liens, the landlord *producer* payout is sheltered through urban business investment with windfall capital creating jobs and increased demand for quality foodstuffs. While land remains untenured, but owned, it evades taxation and drains capital stock deposits. Moving the producer off and tenants up creates a propertied middle class, expands capital, grows the tax base, raises productivity, and creates employment. Nicaragua requires *market-based agrarian and land reform*, with tenant farmers deserving direct technical and business training support—a capable, entrepreneurial group, here-to-date untapped, waiting for its opportunity to unleash the productivity and growth of a nation.

Table 9: Final Impact Indicators

Table 9.1: Production and Productivity Impacts (All Figures to Date)

	Investment		Annual	Gross Income	
	USAID	*Business/Farm*	**Services**	*Annual*	*LOP*
Herd Management					
Reproduction (AI/ET):	$19,735	$88,416	14,736	$236,208	$354,312
Herd Health:	1,815	87,500	60,000	350,000	525,000
Dairy Records:	13,848	14,250	57,000	57,000	85,500
HACCP Certification:	0	12,600	70	$7,876	11,813
Animal Identification:	3,000	1,500	5,100	$5,100	7,650
Sub Total:	***$38,398***	***$204,266***	***136,906***	***$656,184***	***$984,275***
Forage Production					
Seeds, Fert., Pesticides	0	$197,645	2,463 Ha	$308,480	$925,440
Pasture Management:	0	135,000	36,000 Ha	270,000	810,000
Cooperative Farm Equip.	0	0	2,463 Ha	9,236	27,709
Forage Silage	$52,585	$48,816	3,000 MT	72,000	216,000
Sub Total:	***$52,585***	***$381,461***	***$434,046***	***$659,716***	***$1,979,149***
	Total Gross Farm Fees-for-Service Paid:			***$1,315,900***	***$2,963,424***
Commodity Production					
Fluid Milk Sales	0	$1,572,960	5,424 MT	$1,247,520	$3,742,560
Milk Sales Gain	0	-257,060	12,576 MT	$2,854,752	4,282,128
Meat Production	0	0	2,000 MT	840,000	2,520,000
Sub Total:	***0***	***$1,315,900***	***20,000 MT***	***$4,942,272***	***$10,544,688***
	Farm Marketing Gross (Less Cost of Goods Sold):			***$3,626,372***	***$7,581,264***
Commodity Processing					
Dairy Processors	0	$4,086,000	18,000 MT	$9,126,000	$17,008,488
Beef Processors	0	$3,510,000	3,600 MT	10,800,000	21,303,000
Sub Total:	***0***	***$7,596,000***	***21,600 MT***	***$19,926,000***	***$38,311,488***
	Marketing Gross (Less Cost of Goods Sold):			***$12,330,000***	***$28,036,800***

Farm Investments:			
Pilot Farm Employment	0	$756,000	70 Farms @ 3 Employees @ $300/Month
Milking Parlors	0	$375,000	250 Parlors @ $1,500
Farmstead Maintenance	0	$252,000	70 Farms @ 3,000/Year Maintenance & Equipment
Silage Capacity	0	$59,455	517 Tons of Capacity @ $115/Ton
Total Farm Investment:		***$1,442,455***	

Key Assumptions: The above table includes only capital improvements, investments, and cost of goods sold. With the exception of farm investments, cost and income does not include wages, maintenance, or operating expenses.

In "commodity production" it is important to note that the farm business expenses (cost of production) shows fluid milk sales at $1.5 million with "milk sales gain" posting a -$257,060 decline. Producers actually reduced their operating costs by $257,060 while utilizing project management. Altering production expenditure behavior was the key to maximizing return on expenses.

Table 9.2: Person Level Impacts – DEI Participant Beneficiaries

Cooperative, Association, Foundation, and Businesses	Member Patrons	Farm Employees	Cooperative Employees	Total Households	Liters Per Day
Cooproleche del Triunfo	237	355	56	648	49,250
El Manantial De San Pedro	150	225	45	420	5,700
Foundation Andemos	124	186	8	318	6,000
La Candelaria de Camalapa	95	143	20	258	2,671
Lacteos Consales	67	101	22	190	6,600
Lacteos San Benito	30	45	5	80	2,800
La Union de Cuapa	85	128	15	228	3,200
Mayales de Juigalpa	120	180	35	335	3,000
Masguito, Rancho Rojo	235	353	70	658	22,000
Productores de Acoyapa	85	128	8	221	4,000
Quesera Mi Esperanza	60	90	12	162	6,000
Quesera Paso Real	150	225	16	391	8,000
Rios de Leche de Santo Tomas	180	270	93	543	20,000
San Felipe, Boaco	145	218	40	403	4,000
San Francisco de Asis, Camoapa	105	158	94	357	22,415
Totals:	1,868	2,805	539	5,212	165,636

Table 9.3: DEI Extension Programs

Activity – Workshop	Sessions			Participants		
	CLUSA	CRI	Total	CLUSA	CRI	Total
Dairy Genetics and Reproduction Management	–	30	30	–	633	633
Product Development, Branding, Marketing	16	–	16	213	–	213
Farm Financial Planning and Dairy Records	–	13	13	–	267	267
Mastitis Control	7	–	7	69	–	69
Milk Quality	5	3	8	83	98	181
Livestock and Dairy Herd Management	–	6	6	–	142	142
Human Nutrition and Dairy in the Diet	–	18	18	–	885	885
Livestock Disease Control	4	–	4	73	–	73
Cooperative Board Training	2	–	2	18	–	18
Field Demonstration Days and Producer Exhibitions	2	7	9	22	671	693
Pasture Management	2	–	2	9	–	9
Forage (Silage Production)	2	–	2	7	–	7
Dairy Facility Management	1	–	1	4	–	4
International Dairy Short Course	–	1	1	–	7	7
Food Shed Management*	–	1	1	–	7	7
Farm Consultations*	235	403	638	235	403	638
Farm Production Studies	–	517	130	–	70	31
Totals:	**276**	**999**	**1,275**	**733**	**3183**	**3,910**

Annex A

Technical Standard of Whole Raw Milk

Obligatory Technical Standards of Nicaragua

National Commission of Technical Norms and Quality, Ministry of Development, Industry and Commerce

The obligatory technical standards of Nicaragua 03 027—99 of whole, raw milk: It has been prepared by the work group of the committee for lactose and the committee of food in its elaboration, the following people participated:

Rito Aguilar	Ministry of Agriculture and Forestry (MAG-FOR)
Luis Carrion Sequeira	National Union of Agriculturists and Cattleman (UNAG)
Gustavo Rosales	Ministry of Health (MINSA)
Leonardo Garcia	Institute of Rural Development (IDR/Milk Project)
Ronald Blandon	National Cattleman's Commission of Nicaragua (CONAGAN)
Solon Guerrero	Federation of Cattlemen Associations (FAGANIC)
Jorge Cuarda	UNILECHE
Ariel Campos Toledo	Cattle Project (PRODEGA)
Ana Isabel Zambra	Jose Niebrorowski Foundation
Bilberto Solis	Chamber of Commerce of Nicaragua
Nicolas Escobar	PARMALAT La Perfecta S.A.
Miguel Mendoza Hurtado	Cooperativa San Francisco Lacteos Camopan
Luis Saballos	Ministry of Industrial and Commercial Development (MIFIC/CATYME)
Ninoska Granja	Association of Queseros of Boaco
Ulises Miranda	Cooperative Santo Tomas, Chontales
Danilo Nunez	Ministry of Industry and Commercial Development
Noemi Solano	(MIFIC/CNPE)

These standards were approved by the work group in its last session December 14, 1999.

1. Objectives:

This normative establishes requirements that whole raw milk should meet.

2. Field of application:

Whole milk that is going to be processed, whether packaged, commercialized or consumed, in the national territory should submit itself to the following dispositions of this norm, and the complimentary dispositions that the sanitary authority develops or dictates.

3. Definitions:

3.1 ***Milk***: Is the product of normal secretions from the mammary glad of healthy bovine animals, milk obtained by daily milk in an uninterrupted manner and hygienic way.
3.2. ***Whole Raw Milk***: Non-altered, non-adulterated, from a hygienic, regular milking from healthy cows that does not contain colostrums, and without color, odor, and abnormal consistencies.
3.3. ***Adulterated Milk***: Milk that has been subtracted, added, or replaced in a partial or total way, the natural elements which constitute milk, or added estranged elements to it, in such conditions that may affect human or animal health; or, the modification of its physical chemistry and/or characteristics.
3.4. ***Cleaned (Hygienic) Milk***: The end product obtained by a process of pasteurization, irradiation, ultra-pasteurization, or sterilization.
3.5. ***Falsified Milk***: That of general appearance and characteristics of the legitimate product, protected or not by a registered brand, which is defined by such as the brand without originate or proceed from its legitimate processors.
3.6. ***Intermediary***: Individuals that buys the milk from the producer with the objective to supply establishments to which this norm applies and/or refers to.
3.7. ***Establishment***: Defined as establishments, the plants for the cooling or collection centers, plants for hygienic processing, plants for dehydrating and/or powder, plants for the development of products, depots, and places where milk is sold.
3.8. ***Herd***: A group of bovine cattle destined for milking or the production of beef.
3.9. ***Colostrums***: The milk harvested from the cow that is not fit for human consumption. This product is obtained 15 days before and 8 days post-partum.

4.0 Farms

4.1 ***Location:***

4.1.1 Herd Location: The herds destined for milk production and consumption should function in the rural areas.
Note: The sanitary authority specifies for reasons of convenience and without prejudice to the compliance of the written requirements of the sanitary character, can authorize specialty (permits) for the functioning of temporal herds in the urban areas, or delegate this function to offices throughout the country.

4.1.2 General requirements of the farms: All farms whose objective is the production of milk should have a fixed stable or a place a place designed for the milking activity.

4.2 Animal Health:

4.2.1 The bovines destined (maintained) for milk production should be healthy, free of communicable and trans-specie diseases, mastitis, and other contagious diseases.

4.2.2 Diagnosis of Brucellosis and Tuberculosis: Should be done in the development of official dispositions of animal, or for other reasons, and will be certified by medical vets subscribed at the Ministry of Agriculture.

4.2.3 Mastitis testing should be conducted in a permanent way in all milk cows, and when the health authorities deem it convenient.

4.2.4 The bovines submitted to the application of drugs for medication, secreted or evacuated in the milk, can be reincorporated into the milk utilized for human consumption after 72 hours after the conclusion and suspension of treatment.

4.3 Classification of Farms:

4.3.1 In conformity with the requirements and conditions of minimum sanitary conditions established in the present norm, the farms will be classified as: A) first category, B) second category.

4.3.2 Requirements for farms A) First Category: A) First Category farms should have the following minimum requirements:

A. A fixed stable constructed over an easy drainage terrain that allows the realization of this activity in good sanitary conditions.

B. Supply of abundant water, potable, or hygienic;

C. Supply of at least one of the following sections
   1. Milking Facility
   2. For Cooling, Packaging (with pasteurization), and storage of milk
   3. Laboratory (necessary for field tests)

D. Installations should be conveniently (naturally?) illuminated and ventilated.

E. Fixed Stables should have appropriate manure disposal, conveniently protected, isolated to eliminate contamination, and comply with the technical requirements of control manure, control of insects and rodents. The milking sites should have disposition for adequate milking from the hygienic and sanitary point of view.

F. Adequate sanitary services, sewers and waste water (effluent).

G. Condition of Mechanical Equipment for milking

H. The utensils and equipment having contact with the milk should be of an inert material that allows easy washing and disinfection after each use.

I. The substances used for washing and disinfecting of materials named in the prior item should be approved by the sanitary entity. Solutions with chlorine components, concentration of pure chlorine should be of 50 PPM, and a maximum of 200 PPM.

J. Disposal of technical assistance provided by medical veterinarians and zootechnicians subscribed at the first funding entity with the means to guarantee to compliance of animal health programs.

K. A sanitary license emitted by the corresponding parental entity is required.

L. Disposal of the vector control program, disposal of adequate procedural water component.

4.3.2.1 Destination of the milk produced in the A) First Category Whole raw milk produced in these farms can be destined to:

A. For human consumption directly in the localities or regions, or the raw milk originating from these farms,

B. Lactose establishments (Note: milk produced and cooled in farms of the first category, without the requirements established for such a product should have the same destination of the raw milk, common or produced, on the farms of the second category).

4.3.3 Requirements for B) Second Category Farms: The farms of B) second category must comply with the following minimum requirements:

A. Have fixed stables or milk sites;
B. Disposal of treated water;
C. Disposal of filtering of the milk (paper filters, strainers of stainless steel, plastic or aluminum).
D. Established barns or sites for milking, manure should be removed daily and for its final disposal. Previous treatment will be required to avoid insects and rodents.
E. The utensils and equipment having contact with the milk should be of an inert material that allows washing and disinfection after each use.
F. Substances for washing and disinfection of materials mentioned in prior articles should be approved by the corresponding sanitary authority.
G. Vector Control Program
H. Adequate waste water disposal.

4.3.3.1 Destination of Milk from Farms of B) Second Category: Whole raw milk of farms of B) Second Category may be destined to:

A. Plants for its hyginization and powdering of milk as well as plants that process lactose products, with the exception of depots and outlets (for direct consumption).

B. To direct human consumption in localities or regions where the raw milk comes from farms of the first category and the hygiene milk is not enough. (Bad milk driving out good).

5.0 Cooling Procedure and Destination of Milk:

5.1 Milk cooling may be done at farms of the A) first category, B) second category at the milk plants and at the collection centers.

5.2 Cooling of milk in farms of the A) first category, is the process at which the milk produced on these farms, immediately after milking, with the use of a cold curtain, or any other method approved by the sanitary authority, the degree of temperature should be between 4 and 2 Celsius.

5.3 Cooling of milk in second category farms:

5.3.1 It is understood that cooling of milk in B) second category farms in practice or procedures, technical or not, authorized and accepted by the perspective sanitary entity who produced milk is submitted with the objective to achieve a degree of temperature to avoid alteration, taking

into consideration aspects such as the ambient temperature, distance between farms and destination plants, and the systems of transportation.

5.4 Milk cooling plants and collection centers:

5.4.1 It is to be understood that the cooling plants and collection centers to which the milk is submitted to by farms of the first category with the objective to achieve a temperature between 2 and 4 degrees Celsius by the utilization of equipment of tubular cooling or plates or another system of adequate capacity or speed for the cooling of milk to be approved by the corresponding sanitary entity.

6.0 Cooling Plants and/or Collection Centers:

6.1 The plants for cooling and collecting milk are establishments designed for the collection of milk from farms of the A) first and B) second category with the means submitting to the previous control, filtration, cooling, and transport.

6.2 Requirements for installations:

6.2.1 The plants for cooling and central collection, require for their installations, the following conditions:

A. Buildings located in isolated places from focuses of contaminations and insalubrities.

B. Buildings free (proof) of insects and rodents with washable floors and materials and adequate drainage levels (inclines).

C. Sufficient potable water and adequate installations for the necessary different services or sections.

D. Buildings with provided sanitary systems, adequate for the disposal of waste water.

E. Adequate illumination and ventilation according to the judgment (inspection) of the sanitary authorities.

F. Adequate system for treatment of residual waters.

6.3 Requirements for Operation (Functioning)

6.3.1 Cooling plants and collection centers require for operation the following:

A. Paved patio, asphalt or similar, milk receiving area;

B. Milk receiving platform;

C. Area to process, cool and store milk, conveniently separated from other sections or services, and the ambient exterior;

D. Area for direct filling of cold milk in a isometric tank;

E. Area to wash and disinfect milk cans;

F. Area designed for the physical and chemical analysis of the milk;

G. Machinery room

H. Independent dressing rooms for men and women;

I. Sanitary services, independent for men and women;

J. Warehouse or depot

K. Offices

L. Cafeteria

6.3.1.1 Different sections should be preserved in optimal conditions of cleanliness, provide sinks, towels (clean and dry) and soap.

6.3.1.2 With the exception of warehouse, depots, machinery rooms, and offices, all other sections must be easy washing and disinfecting, and all floors must be impermeable.

6.4 Minimum Equipment:

6.4.1 Cooling plants or collection centers require for functioning, the following minimum equipment:

A. A scale to weigh milk or a receiving tank;
B. Cooling equipment, tubular, plate, curtain, approved by the sanitary entity corresponding with sufficient capacity for the received milk at 2 to 4 degrees Celsius;
C. Stainless steel thermal tank, with agitator and thermometer for the storage of cooled milk;
D. Steam boiler
E. Adequate washing and disinfection equipment (system) for all equipment in contact with milk;
F. Can washer (vapor, mechanical, or manual);
G. Backup energy plant (for emergencies).

6.5 Equipment Requirements

6.5.1 In addition to complying with the standards in the legal dispositions above, occupational and environmental health, all equipment in the cooling plants, must meet the following requirements:

A. Fabricated of sanitary and hygienic material, designed in such a way to be disassembled in an easy way to permit inspection and cleaning;
B. Permanent protection against any form or type of contamination;
C. A good and constant state of maintenance, function, and cleanliness.

6.6 Herd Registration and Origination of Milk

6.6.1 Milk cooling plants and collection centers may only process milk from herds that have been previously subscribed or subscribed to the respective plants with the indication of their location, name of the herd, and legal representative, approximate volume of milk to be submitted daily to the plant and the means of transportation to be utilized, and the farm category which he belongs.

6.7 Destination of Milk

6.7.1 Cooled milk at the plant or collection center may only be destined to the plant for processing or powdering as well as to the plants which make dairy products, with the exception of depots and outlets.

7.0 Characteristics

7.1.1 Raw milk must have the following physical and chemical characteristics:

Requirements	Minimum	Maximum
Density at 15 Celsius (Gravity Specifications)	1.03000	1.0330
Fat % (m/m)	3.0	--
Total Solids	11.3	--
Total Solids non-Fat	8.30	--
Lactic Acid (% m/v)	0.13	0.16
Ph	6.6	6.7
Methyl Blue Test (In Hours)		
Fluid Milk	6.5	--
Pasteurized Milk	4.0	7.0

Large Impurities (Sediments) (mg/500 cm3)	--	4.0
Cryoscopy Index (Individual receipts for farms)	-0.530 C (-0.550 H)	-0.510 C (-0.530 H)
Refraction Index	nD 20 1.3420	--
Lactometer Index	8.4 L	--
Alcohol Test	Milk will not coagulate for the addition of volume of alcohol equal to 68% of alcohol in weight or 75% in volume	
Preservatives (presence)	Negative	
Adulterants	Negative	
Neutralizers	Negative	

The cryoscope index may also be expressed in Horteret degrees.

Special Conditions:

- Absences of such substances, preservatives, drugs or traces of medication, toxic substances, residues of insecticides and pesticides, will be taken into consideration by the official national norms, or in its defect by the international norms FAO, OMS, or adopted by other competent entities of sanitation.
- Absence of colostrums, blood, or other strange elements within the suspension.

When utilizing a thermo-lactodensimeter calibrated differently from 15 degrees Celsius, take into consideration the equivalences, according to the approved table provided by the competent authorities.

7.1.2 Organoleptic Characteristics:

Aspect: Liquid without visible dirtiness
Color: White, to a yellowish white
Odor: Characteristic, without strange odors
Flavor: Lightly sweet characteristics

7.1.3 Microbial Characteristics

Whole raw milk from cows, according to its microbiological characteristics, will be classified by the following classes:

a) Class A: With a number of microorganisms, non-pathogen, of 400,000 col/ml
b) Class B: With the number of microorganisms, non-pathogen, of 1,000,000 col/ml
c) Grade A Milk:
   a. Before Pasteurization 80,000 Ufc/ml
   b. Should not contain higher than 100 Ufc/ml

8.0 Transportation and Distribution

8.1 The transportation of raw milk destined for establishments of and for the production of dairy products, should be in:

a) Milk Cans

b) Appropriate containers

8.2 Transportation of Milk Cans: Cans destined for transportation of raw milk require for the utilization, the following conditions:

a) Should be an alloy of stainless steal and aluminum, designed in such a way to facilitate its washing and disinfection. Cans of plastic material are not suitable.

b) Must have a hermetic seal made of a hygienic material approved by the sanitary authority.

8.3 Transportation in isometric tanks or cisterns: The isometric tanks destined for the transportation of raw milk should comply with the following requirements:

a) The surfaces that come in contact with the milk should be stainless steel;

b) Thermal insulation

c) Must have top (sealed hatch/porthole) and exit valve. When the tank has several compartments, each have compartment must have the various implements mentioned.

d) The openings and dimensions of tanks should allow for easy cleaning and internal disinfection.

e) Exit valves and connections to receiving tanks should be of stainless steel and other materials approved by the sanitary authority, easily disassembled and protected against any type of contamination.

f) Have a visible sign "Transportation of Milk" and the number of the sanitary transportation license.

g) Should be washed and disinfected after each and every use.

8.4 Transportation in Vehicles: Vehicles destined exclusively for the transport of milk can containing raw milk, should be covered in the superior part and have visible characteristics and legend (sign) "Transportation of Milk" and the number of the sanitary transportation license.

9.0 Proofs and Tests

9.1 Laboratory proofs and tests for official control should be practiced within 24 hours when a microbiological analysis, and within 48 hours when physical chemical analysis for raw milk.

9.2 For the farms of B) Second Category the competent sanitary authority may do testing when convenient, and any other tests, to prove the quality of whole raw milk.

9.3 For the farms of A) First Category, the competent sanitary authority there will practice routine testing of raw milk as an internal control mechanism after cooling, it should have the following tests:

a) Destined to prove the physical and chemical characteristics of raw whole milk;

b) Time of reduction of blue methyline;

c) Alcohol proof;

d) Temperature Data

e) Acidity

f) Test for Inhibiters

g) Mastitis

h) Cryoscope

i) Sediments

9.4 In cooling plants or collection centers, there will be a routine, internal control mechanism of whole raw milk, of the following:

a) At the reception platform:
   1. Alcohol test, by the practice of selective sampling of each provider
   2. Sediment by the practice of selective sampling of each provider

b) Upon transfer to the storage tank (cooling tank), and upon transfer to the isometric tank:
   1. Proof destined the totality of the physical and chemical characteristics, and the special conditions that raw milk should comply with, with the exception of the testing for drug residue, medication, and pesticides.
   2. Temperature control data

10.0 References:

a) Technical Norms, Columbia, NTC 399. Dairy Products, Whole Raw Milk
b) Directive No. 2437 of 1983, Ministry of Health, Republic of Columbia
c) Food Standards Code, FAO/OMS
d) ICAITI Standards 34 040, Fresh cow milk, non-pasteurized
e) Cuban Standards

10.1 Observation of Standards

The verification and certification of these standards should be under the administration and authority of the Ministry of Agriculture and Forestry, through the division of animal health.

11.0 Enacting and Enabling

The present obligatory standards will be enabled with obligatory character, six months after its publication, of the official newspaper, La Gaceta.

12.0 Sanctions

Non-compliance with established disposition of the present standards should be sanctioned according to the established in law 291, of basic animal health, vegetable health, and it rules in the law of Technical and Quality Standards and Regulations.

Last Line

Annex B

Farm Business Planning Guide[2]

(English Translation)

BUSINESS PLANNING FOR YOUR FARM
YOUR CHOICE FOR THE FUTURE

Business Planning is long term planning for your farm operation. This time horizon for business planning is 5-10-20 or more years. Business planning does not replace production, marketing, or capital replacement plans, rather they intertwine to become part of the business plan. The emphasis is on long term **personal** goals for your family and **business** goals for you operation.

Business planning is not an exercise to be completed once and then forgotten. Instead it is a process that is repeated at regular intervals or as the need arises. The process involves considerable detail and data about the business. As you repeat the planning process and refine or review your plan, you likely will add more detail each time the process is completed.

Farm business planning is an opportunity to understand the relationship between the farm and the family that depends on income from the operation to meet all or part of its living expenses. The business planning process allows you to reverse the relationship and better asses how changing family needs impact the business.

As farm businesses continue to grow more complex and farmers interact with more individuals, the need to have a future plan for the business also increases. Lender, regulators, employees and possible investors all have an interest in the business. Farmers who follow a business planning process likely will be prepared to work with lenders, investors, landlords or other business associates.

As you work through your Business Plan and feel you would like some assistance in your planning process, please give us a call. We have a Farm Business Consultant on staff who will be willing to work with you and your family in developing your plan for the future.

[2] The *Farm Business Planning Guide* is developed in cooperation with ***Farm Credit Services***, provided by *Greenstone Credit Association*, Clintonville, Wisconsin—a production agriculture, member-owned production Credit Corporation.

FARM BUSINESS PLANNING STEPS

1. **What is the current status of my business?**
    1. Do I have a good accounting system already in place? Does it give me the management reports necessary to make decisions on how to improve the efficiency of my operation?
    2. Do I have production planning resources (Cooperative, University, Government extension program personnel and services) to assist in making decisions on how to improve production?
    3. Am I doing everything I can today to increase income based on my current operation before I take the step to expansion? Have I had at least three years of positive net farm earnings in a row? Do I have at least a profitable average level of commodity production today?
2. **What are my interests and skills?**
    1. Having turned over the actual milking of the cows and daily management of livestock over to employees, am I willing to be involved with my property investment and concentrate on managing the whole farm operation? How do I feel about managing people and investing in employee skills development, maintaining a qualified farm accounting system and being a responsible farm credit consumer, and operating my farm assets in good stewardship?
    2. Do I have the ability to delegate authority to specialists in each area of the business?
3. **What are my expectations about the future?**
    1. What commodity price should I use for my long term projections?
    2. How do I plan to take advantage of the efficiencies offered by technology?
    3. What are the trends in the industry and how will this affect my business?
    4. Access to services and markets?
4. **What do I want to accomplish?**
    1. What size of farm operation do I want?
    2. What return on asset and return on equity do I expect to achieve from this investment? Is it higher than I can expect to achieve from other investments I can make?
5. **What opportunities exist for my farm?**
    1. Do I want to expand in the future? Does my plan include the ability to easily expand in the future?
    2. How do I plan to keep up with the latest technology and production techniques to continually increase the efficiency of my operation?
6. **How do I select the farm plan that is best for me?**
    1. The following plans would be included in this section:
        1. Production Plan
        2. Marketing Plan
        3. Financing Plan
        4. Labor Management Plan
        5. Capital budget plan including construction agreement and blueprints for farm facilities
    b. What is the availability of consulting services to help review my plan? Which ones can I use?

7. **Is my plan feasible?**
   a. This section would include the following:
      1) Cash flow projection including monthly cash flow for first 12 months of farm projects.
      2) Income projects.
      3) Balance sheet projections.
      4) Investment projections.
      5) Cow flow projections.
   b. Have I checked my projections against industry standards to determine if they are realistic?

8. **What might prevent me from implementing my plan?**
   a. This section would include sensitivity analysis based on a reduction in income, an increase in expenses and in increase in the interest of rate.
   b. What livestock management program will I use to assure that the cows I bring in to build the herd will assure me of healthy cows? What ongoing livestock management program will I employ?
   c. How do I plan to keep farm construction, improvement, and operating cost overruns to a minimum?
   d. What is the contingency plan if the production does not reach the goal within the allotted time frame?

9. **How do I monitor progress over time?**
   a. Do I have access to current industry standard information (production and financial) to measure the performance of my operation?
   b. What procedures do I have in place to deal with lack of performance?

10. **How should I prepare to document, share and revise my plan?**
    a. What is the best way to assemble all of this information to share with my lender?

ASSESS THE CURRENT SITUATION

1. Balance sheet for the past three years, including crop and livestock inventories.
2. Accrual income statement for past three years.
3. Production records for the past three years.
4. List of land resources—acres owned, acres leased, acres rented.
5. Description of buildings.
6. List of equipment – depreciation schedules.
7. Financial ratios.
8. Current ownership structure.
9. Current production–management practices:
   a. Financial Records
   b. Crop Production Records
   c. Livestock Production Records
   d. Artificial Insemination
   e. Forage Analysis
   f. Pest Control

FINANCIAL POSITION—HISTORIC

	Prior Year _____	Prior Year _____	Last Year _____	Current Year _____
ASSETS:				
Current Assets				
Intermediate Assets				
Fixed Assets				
Total Assets				
LIABILITIES:				
Current Liabilities				
Intermediate Liabilities				
Total Liabilities				
Net Worth				
Current Ratio				
Debt-to-Asset Ratio				
Equity-to-Asset Ratio				
Debt-to-Equity Ratio				
Debt per Cow				

Current Ration	=	*Current Assets divided by Current Liabilities*	:	*1*
Debt-to-Asset Ratio	=	*Total Liabilities divided by Total Assets*	:	*1*
Equity-to-Asset Ratio	=	*Net Worth divided by Total Assets*	:	*1*
Debt-to-Equity Ratio	=	*Total Liabilities divided by Net Worth*	:	*1*
Debt per Cow	=	*Total Liabilities divided by Average Number of Cows:*		*1*

EARNINGS AND CASH FLOW—HISTORIC

	Prior Year _____	Prior Year _____	Last Year _____	Current Year _____
Milk Income				
Cull Breeding Livestock				
Calves and Steers				
Crop Sales				
Government Payments				
Other Farm Income				
Total Cash Farm Income				
Purchased Feed				
Veterinarian Fees				
Artificial Insemination Fees				
Interest				
Property (Land) Taxes				
All Other Farm Expenses				
Total Cash Farm Expenses				
Net Cash Farm Income				
Depreciation				
Non-Farm Income				
Non-Farm Expenses				
Income Tax				
Family Living				
Net Cash Income				
Average Number of Cows				
Liters Milk Shipped				
Percent Cull Cows				
Milk Income Per Cow				
Total Income Per Cow				
Liters Milk Per Cow				
Price Per Liter Milk				
Purchased Feed per Cow				
Operating Expense Ratio				

Operating Expense Ratio = Operating Expense before Interest and Depreciation divided by VFP

CURRENT STATUS FARM BUSINESS

TOTAL CROP AND NON-CROP ACREAGE

	Acres Owned	Acres Leased	Total Acres
Total Acres			
Tillable Acres			
Non-Tillable Acres			
Natural Preserve			

CROPLAND USUAGE

Crop	Acreage	Typical Yield	Comments

1 Manzana = 0.744 Hectares = 1.838 Acres

1 Hectare = 1.34 Manzanas = 2.47 Acres

1 Acre = 0.54 Manzanas = 0.41 Hectares

LIVESTOCK INVENTORY:

	Head	Value Per Head	Total Value
Cows			
Pregnant Heifers			
Open Heifers			
Yearlings			
Calves			

FEED INVENTORY

Type	Quantity	Value Per Unit	Total Value

CURRENT STATUS FARM BUSINESS

List of Equipment and Buildings: (Attach Depreciation Schedule) List buildings and equipment not included on depreciation schedule.

MACHINERY:

Make	Model	Year	Value

BUILDINGS:

Description of Building	Dimension	Value

HISTORY OF OPERATION:

FINANCIAL PROGRESS:

STRENGTHS:

WEAKNESSES:

OTHER (Current Production-Management Practices):

WHERE DO I WANT TO BE?

PERSONAL GOALS:

- ***Farming:*** Satisfaction and feeling of accomplishment.
- ***Family:*** More time off, more time with family, vacation and travel, children education, children entering the business, savings, retirement.
- ***Off Farm Income:*** Employment other than farm.
- ***Grow the Business:*** Hire labor, more time to manage, make room for family members.
- ***Age of Retirement.***

BUSINESS GOALS:

Size of Farm Operation:

1. Continue as is.
2. Downsize farm operation.
3. Expand operation.

PRODUCTION GOALS:

1. Increase yields to what level.
2. Add enterprise, why diversify
3. More cows, more land, better production.
4. Timeliness—planting, harvesting, milking.

ADD SOMONE TO FARM BUSINESS (Family or Non-Family):

1. Partnership.
2. Hire Labor
3. Sell them part.
4. Gift.
5. Expand business to include them.

CURRENT STATUS FARM BUSINESS (Continued)

	Deadline Date
Short Term Personal Goals:	
Long Term Personal Goals:	
Short Term Business Goals:	
Long Term Business Goals:	

IDENTIFY AND SELECT ALTERNATIVES

What Will It Take To Accomplish Goals?

- Continue as is.
- Improve production efficiency.
- Downsize operation.
- Expand operation.

What Inputs Are Necessary To Accomplish Goals:

- Capital Needs – Land, Buildings, Equipment, and Livestock.
- Labor Needs – Family, Other.
- Training Needs—Owner, Employees.
- Management Change—Attorneys, Consultants, Accountants.

What Assets Could The Business Get Along Without?

- Non-Productive Assets.
- Assets Not Essential For Business to Operate.

CAPITAL NEEDS—BUDGET TIMETABLE

DEPRECIABLE ASSETS:

Item	Time	Lease/Purchase	Estimated Cost

LAND:

Item	Time	Lease/Purchase	Estimated Cost

FINANCE PLAN

	Loans	Interest Rate %	Payment Schedule
Short Term:			
Intermediate:			
Long Term:			

FINANCE PLAN

Job Responsibilities	Seasonal or Full Time	Who	Cost

MANAGEMETN OR OWNERSHIP STRUCTURE CHANGE

Sole Proprietorship _____

Partnership _____

Corporation _____

Is there a formal written business arrangement: Yes _____ No ____

Accountant: _____

Attorney: _____

Consultants: _____

TEST FEASIBILITY
Analysis of Variations in Income and Expense
(Most Likely and Worst Case Scenarios)

PROJECTIONS:

1. Capital Needs:
   a. Land
   b. Cattle
   c. Equipment
   d. Credit

2. Cash Flow (Can Projections Handle)
   a. Higher Interest
   b. Lower Price
   c. Cost Overrun on Expansion
   d. Drop in Production
   e. Family Draw and Labor Requirements

3. Type of ownership structure that is best.
4. Can present financial position handle additional capital needs?
5. Who will be outside investors, creditors?

6. How can I best bring someone into operation?
   a. Tax Situation:
      1) Inheritance Tax
      2) Property Sale Tax
      3) Paid Labor
   b. Management of Changed Operation—Shared? Individual?

7. Will new or changed operation meet:
   a. Personal Goals?
   b. Business Goals?

FINANCIAL POSITION--FUTURE

	Year 1	Year 2	Year 3	Year 4	Year 5
ASSETS:					
Current Assets					
Intermediate Assets					
Fixed Assets					
Total Assets					
LIABILITIES:					
Current Liabilities					
Intermediate Liabilities					
Total Liabilities					
Net Worth					
Current Ratio					
Debt-to-Asset Ratio					
Equity-to-Asset Ratio					
Debt-to-Equity Ratio					
Debt per Cow					

Current Ration	=	*Current Assets divided by Current Liabilities*	:	*1*
Debt-to-Asset Ratio	=	*Total Liabilities divided by Total Assets*	:	*1*
Equity-to-Asset Ratio	=	*Net Worth divided by Total Assets*	:	*1*
Debt-to-Equity Ratio	=	*Total Liabilities divided by Net Worth*	:	*1*
Debt per Cow	=	*Total Liabilities divided by Average Number of Cows:*		*1*

EARNINGS AND CASH FLOW—FUTURE

	Year 1	Year 2	Year 3	Year 4	Year 5
Milk Income					
Cull Breeding Livestock					
Calves and Steers					
Crop Sales					
Government Payments					
Other Farm Income					
Total Cash Farm Income					
Purchased Feed					
Veterinarian Fees					
Artificial Insemination Fees					
Interest					
Property (Land) Taxes					
All Other Farm Expenses					
Total Cash Farm Expenses					
Net Cash Farm Income					
Depreciation					
Non-Farm Income					
Non-Farm Expenses					
Income Tax					
Family Living					
Net Cash Income					
Average Number of Cows					
Liters Milk Shipped					
Percent Cull Cows					
Milk Income Per Cow					
Total Income Per Cow					
Liters Milk Per Cow					
Price Per Liter Milk					
Purchased Feed per Cow					
Operating Expense Ratio					

Operating Expense Ratio = Operating Expense before Interest and Depreciation divided by VFP

KEY DAIRY ANALYSIS FACTORS—DAIRY HERD SIZE

AVERAGE PRODUCER – USA

Production Factor	<50	50-99	100-199	>200
Liters Milk Per Cow Per Year	7,303	7,606	7,958	8,470
Milk Income Per Cow	$2,066	$2,164	$2,285	$2,460
Purchased Feed Cost Per Cow	$494	$555	$631	$613
Operating Expense Per Cow	$1,366	$1,428	$1,575	$1,908
Operating Expense Ratio	62%	63%	65%	70%
Net Farm Income Per Cow	$381	$410	$443	$377
Net Farm Income Per 40 Liters	$1.90	$1.96	$2.02	$1.62
Net Farm Earnings	$15,361	$27,835	$57,420	$124,506
Non-Farm Earnings	$16,919	$12,403	$12,457	$4,973
Family Living + Taxes	$25,041	$29,625	$49,641	$84,423
Asset Turnover Ratio	0.25	0.29	0.33	0.38
Return on Assets	1.1%	3.6%	4.6%	5.7%
Return on Equity	-4.2%	1.2%	4.4%	5.8%
Percent Owner's Equity	58.6%	56.4%	59.8%	58.9%

TOP 50% -- PROFITABILITY

Production Factor	<50	50-99	100-199	>200
Liters Milk Per Cow Per Year	7,576	7,861	8,310	8,729
Milk Income Per Cow	$2,146	$2,250	$2,386	$2,523
Purchased Feed Cost Per Cow	$509	$554	$636	$666
Operating Expense Per Cow	$1,394	$1,402	$1,625	$1,898
Operating Expense Ratio	55%	54%	59%	65%
Net Farm Income Per Cow	$726	$764	$745	$569
Net Farm Income Per 40 Liters	$3.48	$3.53	$3.26	$2.37
Net Farm Earnings	$29,880	$53,212	$98,324	$205,418
Non-Farm Earnings	$15,105	$9,489	$12,965	$3,957
Family Living + Taxes	$26,518	$32,109	$56,883	$92,193
Asset Turnover Ratio	0.31	0.32	0.37	0.38
Return on Assets	4.8%	7.4%	8.1%	7.9%
Return on Equity	5.7%	12.5%	14.8%	11.4%
Percent Owner's Equity	61.0%	62.4%	64.0%	57.7%

FINANCIAL POSITION

	Prior Year	Prior Year	Last Year	Current Year	Year 1	Year 2	Year 3	Year 4	Year 5
Current Assets									
Intermediate Assets									
Fixed Assets									
Total Assets									
Net Worth									
Current Ratio									
Debt-to-Asset Ratio									
Equity-to-Asset Ratio									
Debt-to-Equity Ratio									
Debt per Cow									

Current ratio = Current Assets divided by Current Liabilities : 1
Debt-to-Asset Ratio = Total Liabilities divided by Total Assets : 1
Equity-to-Asset Ratio = Net Worth divided by Total Assets : 1
Debt-to-Equity Ratio = Total Liabilities divided by Net Worth : 1
Debt per Cow = Total Liabilities divided by Average Number of Cows : 1

EARNINGS AND CASH FLOW

	Prior Year ____	Prior Year ____	Last Year ____	Current Year ____	Year 1 ____	Year 2 ____	Year 3 ____	Year 4 ____	Year 5 ____
Milk Income									
Cull Breeding Livestock									
Calves and Steers									
Crop Sales									
Government Payments									
Other Farm Income									
Total Cash Farm Income									
Purchased Feed									
Veterinarian Fees									
Artificial Insemination Fees									
Interest									
Property (Land) Taxes									
All Other Farm Expenses									
Total Cash Farm Expenses									
Net Cash Farm Income									
Depreciation									
Non-Farm Income									
Non-Farm Expenses									
Income Tax									
Family Living									
Net Cash Income									
Average Number of Cows									
Liters Milk Shipped									
Percent Cull Cows									
Milk Income Per Cow									
Total Income Per Cow									
Liters Milk Per Cow									
Price Per Liter Milk									
Purchased Feed per Cow									
Operating Expense Ratio									

Operating Expense Ratio = Operating Expense before Interest and Depreciation divided by VFP

Annex C

GENERAL REPORT OF PROPERTIES

1 **Maria Auxiliadora 68010012**

PERCENTAGE OF BREED COMPOSITION:

The breed composition in this property is 75% Creole and 25% Brown Swiss, and it intends to carry out crossing with Holstein this year.

TYPE OF FOOD:

The system of feeding in this farm is rotational grazing where we can find grasses like Brachiaria, India, Bombaza, Jaragua, and mineral salts are also provided.

INSTALLATION AND MILKING CONDITIONS:

There is a galley used as a milking room. Generally this galley is used in the summer time. Milking is carried out with all the corresponding measures of hygiene. The parlor is located inside the corral.

2 Las Vegas 68010004

PERCENTAGE OF BREED COMPOSITION:

The percentage of composition of this cluster is 60% Creole and 40% Brown Swiss.

TYPE OF FOOD:

Feeding in this property is based on grasses such as Brachiaria, India, Jaragua, and some natural grass (Retana, Sacatón), and mineral salts and molasses as additional supplies.

INSTALLATION AND MILKING CONDITIONS:

There is a stone corral with a galley where milking is done in summer time and a galley for winter time. It consists of feeders for cows and calves, with appropriate milking conditions and use of good hygiene.

In this property, the days of nursing or milking are approximately high because the weaning is carried out to a high age of the calf nursing.

3 Buenos Aires 68010018

PERCENTAGE OF BREED COMPOSITION:

Percentage of breed composition is 60% Creole crossed with Brown Swiss and 40% Creole with Brahman.

TYPE OF FOOD:

Generally, we find the following grasses here: Pará, Caribe, Taiwán, India, Brachiaria, and natural grasses. The feeding system is grazing, and mineral salts are used as additional supply.

INSTALLATION AND MILKING CONDITIONS:

There is a corral where milking is carried out. According to milking conditions, a galley or room is in construction, but it has to take into account that indications for milking hygiene have to be done.

4 Quinta Gloria 68010006

PERCENTAGE OF BREED COMPOSITION:

The composition percentages are 40 Brown Swiss, 30 Brown Swiss with Holstein, and 30% Brown Swiss with Creole.

TYPE OF FOOD:

Rotational grazing is carried out where we find grasses such as India, Jaragua, Brachiaria, and natural grass; silos made of grasses such as Taiwán and cane; pacas of Pasto Rastrero (Estrella, etc.) are also provided in summer time. They also feed them with mineral salts and molasses.

INSTALLATION AND MILKING CONDITIONS:

There is a milking parlor equipped with troughs and feeders for cows and calves. All activities are done correctly taking into account the practices of hygiene.

5 La Barranca 68010021

PERCENTAGE OF BREED COMPOSITION:

The composition is 40% Brahman with Creole, 15% Brown Swiss with Creole, and 45% Creole.

TYPE OF FOOD:

Rotational grazing is carried out with grasses like Gamba, Jaragua, and cattle are fed Pecutrín grass and concentrate feed supplements of peanut husks, molasses, and urea in the corrals.

INSTALLATION AND MILKING CONDITIONS:

There are three corrals for milking, with their respective troughs and feeders, and all the activities of milking hygiene are taking into account.

6 **Santa Rosa 68010013**

PERCENTAGE OF BREED COMPOSITION:

The percentages are the following: 30% Brown Swiss with Creole, 30% Holstein with Creole, 20% Brahman with Brown Swiss, and 20% Creole.

TYPE OF FOOD:

Grazing is carried out taking into account the following grasses: Brachiaria, Jaragua, and natural grasses such as Estrella and Retana, and Pecutrín, mineral salts and molasses are provided.

INSTALLATION AND MILKING CONDITIONS:

There are two corrals with their respective galleys with troughs and feeders, and the milking activities of hygiene are carried out.

7 **La Milagrosa 68010033**

PERCENTAGE OF BREED COMPOSITION:

The percentage of breed composition is the following: 15% Brown Swiss with Creole, 15% Holstein with Creole, 30% Brahman with Creole, and 40% Creole.

TYPE OF FOOD:

Grazing carried out and we find grasses like: Brachiaria, natural grasses such as Retana and Jaragua, and mineral salts are also provided.

INSTALLATION AND MILKING CONDITIONS:

There are two corrals and small galleys. Milking hygiene activities are carried out.

8 **El Carmen 68010002**

PERCENTAGE OF BREED COMPOSITION:

The composition is the following: 30% Creole with Brown Swiss, 20% Creole with Holstein, 15% Creole with Brahman, and 35% Creole.

TYPE OF FOOD:

Grazing carried out and we find grasses like: Brachiaria, India, and also natural grasses such as Retana; mineral salts are also provided and they are also are fed with fresh cut (cane) already prepared.

INSTALLATION AND MILKING CONDITIONS:

There is a corral and activities of milking hygiene are carried out.

9 **El Jicaro 68010003**

PERCENTAGE OF BREED COMPOSITION:

The composition percentage is the following: 10% Creole with Brown Swiss and 90% Creole.

TYPE OF FOOD:

Grazing is carried out and there are grasses like Brachiaria and natural grasses (Retana); mineral salts and fresh cut pastures are also provided.

INSTALLATION AND MILKING CONDITIONS:

There is a corral with galley with its respective troughs and feeders and activities of milking hygiene are carried out.

10 **La Lagartera 68010034**

PERCENTAGE OF BREED COMPOSITION:

The percentages are the following: 30% Holstein with Creole, 30% Brown Swiss with Creole, 10% Creole with Brahaman, and 30% Creole.

TYPE OF FOOD:

Grazing is carried out and we find Brachiaria grasses, Jaragua, and natural grasses. Feeding with fresh cut pastures such as cane and Taiwán, corn silos, Gallinaza, molasses, and mineral salts are also provided.

INSTALLATION AND MILKING CONDITIONS:

There are corrals and galleys with troughs and feeders, and activities of milking hygiene are carried out.

11 **San Antonio 68010011**

PERCENTAGE OF BREED COMPOSITION:

The percentages are 20% Holstein with Creole, 30% Brown Swiss with Creole, 15% Brahman with Creole and 35% Creole.

TYPE OF FOOD:

Grazing is carried out with Brachiaria, Jaragua, and natural grasses. Feeding with prepared fresh cut grass (sugar cane and Taiwán), and sugar cane silage.

INSTALLATION AND MILKING CONDITIONS:

There is a milking space with its respective troughs and feeders. Activities of milking hygiene are carried out.

12 **Sergio Arroliga 68010026**

PERCENTAGE OF BREED COMPOSITION:

The composition percentage is the following: 40% Brahman with Creole, 30% Brown Swiss with Creole, and 30% Creole.

TYPE OF FOOD:

Grazing is carried out with grasses like Brachiaria, Jaragua, natural grasses, and mineral salts are also provided.

INSTALLATION AND MILKING CONDITIONS:

There is a corral with feeders and poor activities of milking hygiene.

13 **San Isidro 68010016**

PERCENTAGE OF BREED COMPOSITION:

The percentages are 5% Brown Swiss with Creole, 5% Brahman with Creole, and 90% Creole.

TYPE OF FOOD:

Grazing is carried out with grasses like Jaragua, Retana, Brachiaria, and Bombasa.

INSTALLATION AND MILKING CONDITIONS:

There is a corral and poor activities of milking hygiene.

14 **Piedra Colorada 68010001**

PERCENTAGE OF BREED COMPOSITION:

The percentages are 40% Brown Swiss with Creole, 30% Holstein with Creole, 15% Brahman, and 15% Creole.

TYPE OF FOOD:

Grazing with Brachiaria, Aalemán, and Toledo. Feeding with fresh cut grasses as cane, and mineral salts and molasses are also provided.

INSTALLATION AND MILKING CONDITIONS:

There are corrals and milking rooms with their respective troughs and feeders and activities of milking hygiene are carried out.

15 **A. Duarte 68010027**

PERCENTAGE OF BREED COMPOSITION:

The percentages are 40% Brahman with Creole, 20% Brown Swiss with Creole, 10% Holstein with Creole, and 30% Creole.

TYPE OF FOOD:

Grazing with grasses such as India, Brachiaria, Alemán, and natural grass, as Retana. Feeding with fresh cut pastures, as cane. Gallinaza, molasses, and mineral salts are also provided.

INSTALLATION AND MILKING CONDITIONS:

There are corrals and galleys, and poor activities of milking hygiene.

16 **Alvaro Vargas 68010025**

PERCENTAGE OF BREED COMPOSITION:

The percentages are the following: 40% Brahman with Creole, 25% Brown Swiss with Creole, 15% Creole with Holstein, and 20% Creole.

TYPE OF FOOD:

Grazing with grasses such as Brachiaria, Toledo, India, natural grasses, and minerals salts supplied.

INSTALLATION AND MILKING CONDITIONS:

There are corrals with galleys with their respective feeders and troughs, and activities of milking hygiene are carried out.

17 **La Esperanza 68010017**

PERCENTAGE OF BREED COMPOSITION:

The percentages are 20% Creole with Brahman, 10% Brown Swiss, and 70% Creole.

TYPE OF FOOD:

Grazing with grasses such as Brachiaria, India, natural grass (Retana). Mineral salts are also provided.

INSTALLATION AND MILKING CONDITIONS:

There is a corral and poor activities of milking hygiene.

18: **Carlos Robleto 68010022**

PERCENTAGE OF BREED COMPOSITION:

The percentages are 30% Creole with Brown Swiss, 30% Brahman with Creole, 15% Holstein with Creole, and 25% Creole.

TYPE OF FOOD:

Grazing with grasses such as Brachiaria, Estrella, Pará, and Retana. Minerals salts are also provided.

INSTALLATION AND MILKING CONDITIONS:

There is a corral and poor activities of milking hygiene.

19 **Ramón Rivera 68010015**

PERCENTAGE OF BREED COMPOSITION:

The percentages are 40% Brahman with Creole, 20% Brown Swiss with Creole, 10% Holstein with Creole, and 30% Creole.

TYPE OF FOOD:

Grading with grasses such as Brachiaria, India, and Jaragua. Minerals salts and molasses are also provided.

INSTALLATION AND MILKING CONDITIONS:

There are corrals with parlors and feeders and troughs; poor activities of milking hygiene.

REPORT ON PROPERTIES THAT DAIRIES NO LONGER WORKS IN THE PROJECT REGISTRATION OF THE CLUSTER.

The registration project of the milk cluster developed in Camoapa began with 30 producers; these producers are members of different cooperatives such as Masiguito and San Francisco.

Each producer benefited with a book record, tagging of cows that have given birth and materials to register weighing in and every event that happened in the cluster.

Such events and weighing in are done once a month for each producer; the visit is scheduled with the producer or the person in charge of the cluster.

At the moment, we are working with 19 producers where such activities are carried out and we devote necessary time to help in some necessities or consultations of the producers related with the project or the cluster.

The other 11 producers no longer complete their registrations, this is due to the following reasons: Some of them have sold their properties or have transferred the livestock toward the north area (Matagalpa Coast), or have sold the livestock for personal necessities or for their own retirement; some producers lend their livestock to people who have the necessary grass to feed them. Because of that, it is hard to keep a record since the livestock is on different property.

Annex D:

Cooperative Statements

COOPERATIVA DE PRODUCTORES DE LECHE EL TRIUNFO, R.L.

COOPROLECHE, R.L.

Carta de Satisfacción de la Cooperativa de Productores de Leche El Triunfo, R. L. COOPROLOLECHE.

El Consejo Administrativo y Gerencia de la **Cooperativa de Productores de Leche de El Triunfo**, a través de la presente manifiesta el agradecimiento por el apoyo y la Asesoría Técnica Especializada brindada por **CLUSA/Nicaragua**, a través del **Programa de Apoyo al Desarrollo Socioeconómico de las Cooperativas miembros de la Alianza Amerrisque**, que en Coordinación con CRI Internacional hicieron posible todo el apoyo necesario a los pequeños y medianos productores asociados a esta cooperativa, en el periodo julio 2003 a agosto 2006.

De igual forma manifestamos el agradecimiento infinito por el apoyo al fortalecimiento de las capacidades administrativas, asesoría en mercadeo y el establecimiento de las bases para la aplicación de las Buenas Practicas de Manufactura y Sistemas de Control de Calidad HACCP en el Complejo Agroindustrial COOPROLECHE.

Esperamos que en un futuro a corto plazo seguir contando con la valiosa asesoría y el apoyo de parte de CLUSA/Nicaragua a los productores de esta cooperativa.

Atentamente

Agr. Rosalino Lazo Moreno.
Presidente Junta de Consejo Administración.
Cooperativa COOPROLECHE, El Triunfo.

Dado en el Triunfo, Municipio El Almendro a los 23 días del mes de Agosto de 2006.

Cc: Archivo

Dirección: Km. 259 Carretera a Nueva Guinea, El Triunfo, Municipio El Almendro
Tel.: (0) 273-3812 Telefax: (0) 273-3813 Celular: 625-5682

COOPERATIVA DE SERVICIOS AGROPECUARIOS "LA UNIÓN" R. L.

San Francisco de Cuapa.
Chontales. Nicaragua.

Carta de Satisfacción de la Cooperativa de Servicios Agropecuarios La Unión, San francisco de Cuapa, Chontales.

El Consejo Administrativo y Gerencia de la **Cooperativa de Servicios Agropecuarios La Unión de Cuapa, Chontales**, a través de la presente manifiesta el agradecimiento por el apoyo y la Asesoría Técnica Especializada brindada por **CLUSA/Nicaragua**, a través del **Programa de Apoyo al Desarrollo Socioeconómico de las Cooperativas miembros de la Alianza Amerrisque,** que en Coordinación con CRI Internacional hicieron posible todo el apoyo necesario a los pequeños y medianos productores asociados a esta cooperativa, en el periodo julio 2003 a agosto 2006.

Agradecemos por el apoyo al establecimiento de las bases para la aplicación de las Buenas Prácticas de Ordeño, con el fin de obtener una materia prima de buena calidad para su comercialización.

Esperamos que en un futuro a corto plazo seguir contando con la valiosa asesoría y el apoyo de parte de CLUSA/Nicaragua a los productores de esta cooperativa.

Atentamente

Ing. Boanerges Marín Jiménez.
Presidente Junta de Consejo Administrativo.
Cooperativa La Unión, R. L. Cuapa, Chontales.

Dado en San Francisco de Cuapa, Nicaragua a los 22 días del mes de Agosto de 2006.

Cc: Archivo

Cooperativa de Servicios Agropecuarios
El Manantial. (Cooserva. R. L.)
San Pedro de Lóvago. Chontales.

Carta de Satisfacción de la Cooperativa de Servicios Agropecuarios El Manantial, R.L San Pedro de Lóvago, Chontales.

El Consejo de Administración y Gerencia de la **Cooperativa de Servicios Agropecuarios El Manantial de San Pedro de Lóvago, Chontales**, a través de la presente manifiesta el agradecimiento por el apoyo y la Asesoría Técnica Especializada brindada por **CLUSA/Nicaragua**, a través del **Programa de Apoyo al Desarrollo Socioeconómico de las Cooperativas Miembros de la Alianza Amerrisque**, que en Coordinación con CRI Internacional hicieron posible todo el apoyo necesario a los pequeños y medianos productores asociados a esta cooperativa, en el periodo julio 2003 a agosto 2006.

Agradecemos por el apoyo al fortalecimiento de las capacidades administrativas y el establecimiento de las bases para la aplicación de las Buenas Prácticas de Ordeño, con el fin de obtener una producción de leche de buena calidad para su comercialización.

Esperamos que en un futuro a corto plazo seguir contando con la valiosa asesoría y el apoyo de parte de CLUSA/Nicaragua a los productores de esta cooperativa.

Atentamente

Ing. Yoster Miranda Guevara
Presidente de Consejo de Administración
Cooperativa El Manantial, San Pedro de Lóvago, Chontales.

Dado en San Pedro de Lóvago, Chontales a los 24 días del mes de Agosto de 2006.

Cc: Archivo

COOPERATIVA DE SERVICIOS AGROPECUARIOS MAYALES, R.L.
(COOPSERVM, R.L.)
Juigalpa, Chontales.
☎ (0) 812-2911

Carta de Satisfacción de la Cooperativa de Servicios Agropecuarios Mayales R. L. Juigalpa, Chontales.

El Consejo Administrativo y Gerencia de la **Cooperativa de Servicios Agropecuarios Mayales, Juigalpa, Chontales**, a través de la presente manifiesta el agradecimiento por el apoyo y la Asesoría Técnica Especializada brindada por **CLUSA/Nicaragua**, a través del **Programa de Apoyo al Desarrollo Socioeconómico de las Cooperativas miembros de la Alianza Amerrisque**, que en Coordinación con CRI Internacional hicieron posible todo el apoyo necesario a los pequeños y medianos productores asociados a esta cooperativa, en el periodo julio 2005 a agosto 2006.

Agradecemos por el apoyo al establecimiento de las bases para la aplicación de las Buenas Prácticas de Ordeño, con el fin de obtener una materia prima de buena calidad para su comercialización.

Esperamos que en un futuro a corto plazo seguir contando con la valiosa asesoría y el apoyo de parte de CLUSA/Nicaragua a los productores de esta cooperativa.

Atentamente

Ing. Wilmer Fernández Vargas.
Presidente Junta de Consejo Administrativo
Cooperativa Mayales R. L. Juigalpa, Chontales

Dado en Juigalpa, Chontales a los 22 días del mes de Agosto de 2006.

Cc: Archivo

Cooperativa de Servicio Agropecuaria
"San Felipe, R.L."
Boaco, Nicaragua.

Carta de Satisfacción de la Cooperativa de Servicios Agropecuarios San Felipe, R.L Boaco.

El Consejo Administrativo y Gerencia de la **Cooperativa de Servicios Agropecuarios de San Felipe de Boaco,** a través de la presente manifiesta el agradecimiento por el apoyo y la Asesoría Técnica Especializada brindada por **CLUSA/Nicaragua,** a través del **Programa de Apoyo al Desarrollo Socioeconómico de las Cooperativas miembros de la Alianza Amerrisque,** que en Coordinación con CRI Internacional hicieron posible todo el apoyo necesario a los pequeños y medianos productores asociados a esta cooperativa, en el periodo julio 2003 a agosto 2006.

Agradecemos por el apoyo al fortalecimiento de las capacidades administrativas y el establecimiento de las bases para la aplicación de las Buenas Prácticas de Ordeño, con el fin de obtener una materia prima de buena calidad para su comercialización.

Esperamos que en un futuro a corto plazo seguir contando con la valiosa asesoría y el apoyo de parte de CLUSA/Nicaragua a los productores de esta cooperativa.

Atentamente

Ing. Abilio Roque Alvizuris
Presidente Junta de Consejo Administrativo
Cooperativa San Felipe, R. L. Boaco.

Dado en Boaco, Nicaragua a los 21 días del mes de Agosto de 2006.

Cc: Archivo

Frente al parque Héroes y Mártires,
Telefax # 542- 1259 *Email: coopsanfel@ibw.com.ni*

COOPERATIVA AGROPECUARIA DE SERVICIOS
"SANTO TOMÁS", R. L.

Carta de Satisfacción de la Cooperativa de Servicios Agropecuarios Santo Tomas, Chontales.

El Consejo Administrativo y Gerencia de la **Cooperativa de Servicios Agropecuarios de Santo Tomas, Chontales**, a través de la presente manifiesta el agradecimiento por el apoyo y la Asesoría Técnica Especializada brindada por **CLUSA/Nicaragua**, a través del **Programa de Apoyo al Desarrollo Socioeconómico de las Cooperativas miembros de la Alianza Amerrisque**, que en Coordinación con CRI Internacional hicieron posible todo el apoyo necesario a los pequeños y medianos productores asociados a esta cooperativa, en el período julio 2003 a agosto 2006.

De igual forma manifestamos el agradecimiento infinito por el apoyo al fortalecimiento de las capacidades administrativas, asesoría en mercadeo y el establecimiento de las bases para la aplicación de las Buenas Practicas de Manufactura y Sistemas de Control de Calidad HACCP en la Planta Procesadora Ríos de Leche de Santo Tomas, Chontales.

Esperamos que en un futuro a corto plazo seguir contando con la valiosa asesoría y el apoyo de parte de CLUSA/Nicaragua a los productores de esta cooperativa.

Atentamente

Dr. Ronaldo Martínez Lazo.
Presidente Junta de Consejo de Administración
Cooperativa Santo Tomas, Chontales.

Dado en Santo Tomas, Chontales a los 23 días del mes de Agosto de 2006.

Cc: Archivo

Frente a Cruz Roja Santo Tomás, ☎ 519-2220, Fax: 519-2567; E-mail: coopeagro@ibw.com.ni

Annex E:

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