Problem Statement

Problematique
How did government-induced innovations develop the traditional community-based carabao dairy industry?

Sub-query
What were the outcomes of the innovations introduced in terms of carabao-dairy entrepreneurial development, particularly, its effects on the carabao milk supply and demand sectors and on the linkages of the players in the industry?

Objectives
Determine the traditional business to business (B2B) characteristics describing the transactional and relational linkages of supply and demand sectors in the industry.
Describe the dynamics of interaction between the supply and demand entities of the carabao milk chain.
Determine the significance of the institutional factors in the forging of nexus among the sectoral players of the traditional community-based dairy industry.
Configure the carabao milk chain, approximate particular predictors of sustainability and identify areas of potential replication.
Provide recommendations and policy proposals to fill in the knowledge gaps and address problems besetting the government sponsored innovation.
Methodology

Data Collection: Survey via Structured Questionnaire; Interviews of KIs and other RPs; conduct of FGDs with the use of GIS; Secondary and Historical Data Research

Sampling Method: Purposive based on proximity factor, convergence of players; recommendations of PCC & Bulacan Provincial Government

Instrumentation: Structured Questionnaire in Likert Scale Format for the milk producers and consumers; GIS for KIs from the Milk Producing and the Milk Processing Sectors; SGF for FGD of Milk producing cooperatives and a group of chairpersons of cooperatives

Language: The SQs were translated into Filipino
# Analytical Techniques:

Primary Data Review; Activity and Process Analysis; Qualitative Data Review and Analysis; Historical Documents Examination and Study; Cross-tabulation of primary quantitative and qualitative data gathered; Evaluation and Discussion of responses, perceptions, views and comments from FGD, KIs & RPs; Chain Analysis; Triangulation

<table>
<thead>
<tr>
<th>Respondents</th>
<th>Data Gathering</th>
<th>Nueva Ecija (Milk Producer)</th>
<th>Bulacan (Pastillas Processor)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent Individual</td>
<td>Q, GIS</td>
<td>64</td>
<td>12</td>
</tr>
<tr>
<td>Coop-Based</td>
<td>Q,GIS</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Cooperatives</td>
<td>GIS, FGD</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Institutional</td>
<td>GIS</td>
<td>1 (PCC at CLSU)</td>
<td>1 (Research Office, BASC)</td>
</tr>
<tr>
<td>Academic/Research</td>
<td></td>
<td>2 (Coop Office &amp; DTI)</td>
<td>2 (Prov. Vet. Office and NDA)</td>
</tr>
<tr>
<td>LGU</td>
<td></td>
<td>2 (NEFEDCO &amp; CLSU Techno-Demo Farm)</td>
<td>1 (Carabao Upgrading Project, Bulacan)</td>
</tr>
<tr>
<td>Project-Based</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commercial</td>
<td>Q,GIS</td>
<td>3 (Ocampo’s, Andreas and Sevilla’s)</td>
<td></td>
</tr>
<tr>
<td>Semi-Commercial</td>
<td>GIS</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Milk Agents and/or Collectors</td>
<td>GIS</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

**Treatment of Data:**
Tabulation; Ranking; Percentages and Frequencies; Use of SPSS; Chi-square; Partial Correlation; General Statistics; Historical Data Review & Analysis
Conceptual Framework

INNOVATION
Carabao Genetic Improvement

TRADITIONAL COMMUNITY-BASED DAIRY INDUSTRY

Suppliers
- NIZ-N.E.
  Carabao Milk Production

Players
- Smallhold Cooperative Institutional

INNOVATION-BASED ENTREPRENEURSHIP

- TRANSACTIONAL Characteristics
  (Business Process Management)
  - Operations
  - Production
  - Marketing
  - Financial
  - Intermediary

- RELATIONAL Practices
  (Strategic Partnership)
  - Coordination
  - Complementation

Demand
- BULACAN
  Pastillas Production

Players
- Individual Cooperative Commercial
Philippine Carabao Industry Timeline of Development

• **Junctures of Importation** in intermittent periods of time during the 20th Century beginning 1903.

• **Slaughter and Ban Mindset Stage** (1929-1999) providing local ordinances, policies and laws to control the slaughter of the animal.

• **Research Focused Era** which paved for funding of intensive carabao genetic research & development of technologies regarding carabao raising beginning 1975.

• **Center and Project Oriented Phase** which called for the institutionalization of centers like the PCRDC and PCC as well as the implementation of various funded projects like the CDP since 1985.
Schema of Philippine Carabao Industry Development

LEVEL OF COMMITMENT & ENGAGEMENT OF PCC

|------|------|------|------|------|------|------|---------------------|

Genetic Research Funded Projects

RA 7307 Philippine Carabao Act of 1992
Network of Centers
Infrastructure Provision
Management Quality

Institutionalization

Genetic Improvement Program (GIP)
Artificial Insemination Program (AI)
25 Dairy Module Program
Carabao-Based Enterprise Development Program (CBED)

Socio-Economic Endeavors

National/Regional Impact Zone (NIZ, RIZ)

Community Based Entrepreneurship

Primary Milk Producers’ Cooperatives
Federation of Milk Producers’ Cooperatives
Independent Smallhold Milk Producers
Individual & Commercial Milk Processors

Pastillas Processing Sector And Carabao Milk Production Sector Chain

Carabao Based Sectoral Linkages

Industry / Sectoral Link Replication

BPM 5-FIELDS SYNERGY SYSTEM MODEL OF MANAGEMENT FOR INDIVIDUAL AND/OR INDEPENDENT PLAYERS
RADIAL SYNERGY SYSTEM MODEL OF LINKAGE MANAGEMENT FOR SECTORAL AND/OR INDUSTRIAL PLAYERS

SINGLE-STEP DEMAND-DRIVEN CARABAO MILK-PASTILLAS CHAIN MODEL

DYNAMIC GERM CELL MODEL
What were the PCC initiated innovations in the development of the traditional community-based dairy industry and how were they operationalized?

- **Innovations on the Carabao**
  Research & Technology - Native Carabao Genetic Improvement as a producer of milk (GIP); Germplasm Infusion; Crossbreeding Techniques; Production Technologies

- **Operationalization and Consequences:**
  Institutionalization – RA 7307; Network of Centers; Physical Infrastructure Development; Management Quality

  **Socio-Economic Endeavors** – Transfer & Adoption of Technologies through Cooperativism (25-Dairy Module); Milk Production & Milk Processing Entrepreneurship (CBED)
What were the outcomes of the innovations introduced in terms of carabao-dairy entrepreneurial development, particularly, its effects on the carabao milk supply and demand sectors and on the linkages of the players in the industry?

**Effects on the Status of Carabao Milk Supply and Demand Sectors**

**N.E. Supply Sector**
- adequate increased in carabao milk supply
- observable product – driven marketing scheme of NIZ
- milk demand external of NIZ
- more independent milk producers got involved

**Bulacan Demand Sector**
- very high demand for carabao milk for pastillas processing
- demand was filled in by independent carabao raisers in NE, Bulacan and milk agents/collectors
- limited processing and entrepreneurial expansion
Linkages of Players in the Carabao Industry

**ORGANIZED LINKAGES**
- Smallhold Coop-based milk producers, Milk Production Cooperatives and NEFEDCO in NE
- PCC, NEFEDCO, PCC Techno-Demo Farm in NE and Commercial Processors in Bulacan

**INSIGNIFICANT LINKAGES**
- PCC and Independent Smallhold milk producers in N.E.
- PCC at CLSU, BASC, Bulacan Provincial Government,
- N.E. smallhold milk Producers and Bulacan pastillas processors
- Independent smallhold milk producers in N.E. & Individual pastillas processors in Bulacan
- Individual pastillas processors in Bulacan and Government Agencies

Chi-Square Result:
- Parallel Practices
- Significantly Different Practices
- With Matching Activities
1. Determine the traditional business to business (B2B) characteristics describing the transactional and relational linkages of supply and demand sectors in the industry.

### Traditional B2B Transactional BPM Characteristics of Sectoral Players

<table>
<thead>
<tr>
<th>BPM Transactional Fields of Activities</th>
<th>Parallel Practices (Linkage: 27.78 %)</th>
<th>Divergent Practices (Gap: 72.22 %)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operation</strong></td>
<td>Inventory Management</td>
<td>Order Receipts and Fulfillment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Production and Resource Care</td>
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<tr>
<td></td>
<td></td>
<td>Operations Assistance and</td>
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<tr>
<td></td>
<td></td>
<td>Technical Support</td>
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<tr>
<td></td>
<td></td>
<td>Labor Management &amp; Employment</td>
</tr>
<tr>
<td><strong>Production</strong></td>
<td>Handling &amp; Processing</td>
<td>Quality Control and Certifications</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Packaging and Labeling</td>
</tr>
<tr>
<td><strong>Marketing</strong></td>
<td>Transport &amp; Distribution Delivery</td>
<td>Sales</td>
</tr>
<tr>
<td></td>
<td>Returns</td>
<td>Market and Competitions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Feedback After Sales</td>
</tr>
<tr>
<td><strong>Financial</strong></td>
<td>Other Costs (Loan Payments)</td>
<td>Billing and Payments</td>
</tr>
<tr>
<td><strong>Intermediary</strong></td>
<td>-</td>
<td>Pricing and Mark-ups</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Access to Information Technology</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and Institutional Support</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Seasons and Market</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Third-party Players</td>
</tr>
</tbody>
</table>
Relational Strategic Partnership Practices of the Sectoral Players

- Divergent and No Coordination and Complementation practices

Chi-Square Result:  
- Green: Parallel Practices  
- Orange: Significantly Different Practices
2. Describe the dynamics of interaction between the supply and demand entities of the carabao milk chain.

- self motivated, of personal concern and own initiatives of each smallhold producer and independent processor

- formalized transactional ties within the levels of institutional milk producers in N.E. & commercial processors in Bulacan

- compatible BPM practices between the sectors happen only in Inventory Management, Handling and Processing, Transport and Distribution and Delivery Returns

- no established Strategic Partnership relationship among and between the milk production and milk processing sectors
3. Determine the significance of the institutional factors in the forging of nexus among the sectoral players of the traditional community-based dairy industry.

PCC Main, NH - provided the physical and socio-economic infrastructures for the diffusion of carabao technology to NIZ community stakeholders but not among unorganized independent producers in N.E. and milk processing sectors in Bulacan

PCC at CLSU - assisted in the GIP within and outside of NIZ and in forming functional linkages among Bulacan carabao project stakeholders

NEFEDCO - facilitated the marketing of milk to commercial processors in Bulacan and other clients

LGUs, DTI, NDA, Coop Office, Provincial Veterinarian Office - helped out in technical & linkage aspects of the milk producers and processors

4. Configure the carabao milk chain, approximate particular predictors of sustainability and identify areas of potential replication.

The Carabao Milk and Pastillas Chain: a barely noticeable chain exist

Areas of Potential Replication: Carabeef and Meat Processing Sector, Carahide and Leather Processing Sector, Caramilk and Gourmet Food Sector
### Approximate Predictors of Sustainability

#### Carabao Resource Care & Milk Production Enterprise

<table>
<thead>
<tr>
<th>Metric</th>
<th>Standards Generated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semen Production per Bull</td>
<td>1,500 straws</td>
</tr>
<tr>
<td>Post-thawing Motility (PTM)</td>
<td>30.70%</td>
</tr>
<tr>
<td>Lactation</td>
<td>227 to 245 to 266 days</td>
</tr>
<tr>
<td>Calving Interval</td>
<td>from 20.4 mos. to 14-15 months</td>
</tr>
<tr>
<td>Calf Mortality</td>
<td>11.15% to 8.59%</td>
</tr>
<tr>
<td>Weaning Period</td>
<td>7 to 5 months to 3 months</td>
</tr>
<tr>
<td>Average Birth Weight of Calf</td>
<td>37 kg.</td>
</tr>
<tr>
<td>Pregnancy Rate</td>
<td>76.6%</td>
</tr>
<tr>
<td>Bulls Loaned Out (since 2007)</td>
<td>1,242 heads per annum</td>
</tr>
<tr>
<td>Calf Drop Rate out of Bull Loan Program</td>
<td>51%</td>
</tr>
<tr>
<td>Average Calves Produced</td>
<td>295 per annum since 1999</td>
</tr>
<tr>
<td>Milk Production per carabao</td>
<td>1,330 kg to 1,535 kg per month</td>
</tr>
<tr>
<td>Average Milk Production per Farmer</td>
<td>21, 156.32 kg per month</td>
</tr>
<tr>
<td>Average Farmer Income</td>
<td>PhP 10,568.25 / lactation period; PhP 39,870 per annum</td>
</tr>
<tr>
<td>Average Female Buffalo Monitored by PCC</td>
<td>1,503 per annum</td>
</tr>
<tr>
<td>Average Number of Jobs Created through Cooperativism</td>
<td>1,189 per annum since 2007</td>
</tr>
<tr>
<td>Daily Milk Harvest</td>
<td>24.5 liters</td>
</tr>
<tr>
<td>Initial Investment</td>
<td>1 carabao; PhP 65,000.00</td>
</tr>
<tr>
<td>Milk Quality</td>
<td>from Class A to Class B</td>
</tr>
</tbody>
</table>

#### Milk Processing Enterprise

<table>
<thead>
<tr>
<th>Metric</th>
<th>Standards Generated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Range of Initial Investment</td>
<td>PhP 50,000.00 to PhP 120,000.00</td>
</tr>
<tr>
<td>Average Monthly Gross Income</td>
<td>PhP 65,000.00</td>
</tr>
<tr>
<td>Average Liters of Milk Processed</td>
<td>PhP 400 liters per day</td>
</tr>
<tr>
<td>Average Number of Jobs Created</td>
<td>6 per enterprise</td>
</tr>
</tbody>
</table>
Theoretical Contributions

A. INDUSTRY DEVELOPMENT
Dynamic Germ Cell Model of Development at Work in the Carabao Industry

B. PRO-ACTIVE ENGAGEMENT OF COMMUNITIES
Single-Step Demand-Driven Carabao Milk-Pastillas Chain Model with Infusion of PCC Innovations

C. MANAGEMENT FOR COMMUNITY DEVELOPMENT
Five-Field Radial Synergy System Model of Linkage Management of Sectoral / Industry Players
SUBSEQUENT FRAMEWORK BASED ON FINDINGS OF THE STUDY

PCC INNOVATIONS

Carabao Genetic Improvement for Milk Production
Carabao-Based Farming and Cooperative System
Carabao Milk Production and Processing Entrepreneurship

SUPPLY SECTOR
NIZ-N.E.
Fresh Milk Production

Players

Smallhold
Coop-Based
Independent

Cooperative
25 Dairy Module

Institutional
NEFEDCO
PCC at CLSU
N.E. LGUs

Demand Sector
BULACAN
Pastillas Processing

Players

Individual

Cooperative
Financial Milk Production

Commercial

Institutional
BASC Bulacan LGUs

BPM TRANSACTIONAL CHARACTERISTICS

Operations: Inventory Management
Production: Handling and Processing
Marketing: Transport and Distribution Delivery Returns
Financial: Billing and Payments
Intermediary: Milk Agents and Collectors

STRAT-P RELATIONAL PRACTICES
NONE

Single Step Carabao Milk-Pastillas Chain
5. Provide recommendations and policy proposals to fill in the knowledge gaps and address problems besetting the government-sponsored innovation.

a. Inclusion of non-cooperative member dairy farmers in the future plans of the PCC.
b. Engagement of functional BPM and Strat-P linkages between the milk production and processing sectors of the carabao industry.
c. Reconfiguration of the Carabao Milk Chain from a linear model to a synergistic one-step radial system approach.
d. Reorientation of the NIZ supply-driven (or product push) marketing design to a demand-driven (or product-pull) marketing initiative.
e. Encouragement of the involvement of the private sector.
f. Replication of the industry or sectoral development formula in other carabao-derived products.
Thank you very much...