Philippine Dairy Buffalo Breeding Program

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Project Development Officer IV
Philippine Carabao Center

Workshop on Breeding for Milk Production in Tropical / Non-Temperate Environments

Nov 5-6, 2014 Chang Mai Thailand
Philippine Carabao Center
Science City of Munoz, Nueva Ecija

National Headquarters & Genepool
Livestock Agencies in the Philippines

<table>
<thead>
<tr>
<th>Agency</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Philippine Carabao Center</strong></td>
<td>Conserve, propagate and promote the carabao as a source of draft animal power, meat, milk, and hide to benefit the rural farmers</td>
</tr>
<tr>
<td><strong>Bureau of Animal Industry</strong></td>
<td>Enhance performance of livestock and poultry sector thru program implementation, prescription of regulatory standards and provision of technical services.</td>
</tr>
<tr>
<td><strong>National Dairy Authority</strong></td>
<td>Development of the Philippine dairy industry through policy direction and program implementation via enterprise dev’t and herd build-up for dairy cattle</td>
</tr>
</tbody>
</table>
# Livestock Agencies in the Philippines

<table>
<thead>
<tr>
<th>Agency</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Meat Inspection Services</td>
<td>promulgate and implement policies, procedures, guidelines, rules and regulations governing post production flow of livestock and meat and meat products</td>
</tr>
<tr>
<td>Bureau of Agricultural Research</td>
<td>coordinates and funds agricultural research and development activities, develops partnerships with local and international research organizations, strengthens institutional capabilities, manages knowledge</td>
</tr>
</tbody>
</table>
ENHANCING PHILIPPINE LIVESTOCK SECTOR PERFORMANCE THROUGH IMPROVED RESEARCH AND DEVELOPMENT CAPABILITIES
## Value of Production*

<table>
<thead>
<tr>
<th>Sub-Sector</th>
<th>In Million Pesos</th>
<th>Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2012</td>
<td>2013</td>
</tr>
<tr>
<td>Crops</td>
<td>797,731.05</td>
<td>814,744.90</td>
</tr>
<tr>
<td>Livestock</td>
<td>214,318.36</td>
<td>233,221.02</td>
</tr>
<tr>
<td>Poultry</td>
<td>167,033.71</td>
<td>174,237.43</td>
</tr>
<tr>
<td>Fisheries</td>
<td>232,606.92</td>
<td>239,083.00</td>
</tr>
</tbody>
</table>

* At current price

Source: Bureau of Agriculture Statistics, 2013
Performance of Agriculture, 2013
Value at Current Price, Billion Pesos

- Fishery: 239.1 billion pesos (17.96%)
- Poultry: 174.2 billion pesos (14.76%)
- Livestock: 233.2 billion pesos (16.23%)
- Agricultural Crops: 814.7 billion pesos (51.05%)

Source: Bureau of Agriculture Statistics, 2013
Livestock & Poultry: 
Value of Production by Commodity* 
2013

<table>
<thead>
<tr>
<th>Sub-sector</th>
<th>In Million, Pesos</th>
<th>Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2012</td>
<td>2013</td>
</tr>
<tr>
<td>LIVESTOCK</td>
<td>214,318.36</td>
<td>233,221.02</td>
</tr>
<tr>
<td>Carabao</td>
<td>10,013.94</td>
<td>10,190.80</td>
</tr>
<tr>
<td>Cattle</td>
<td>21,547.66</td>
<td>22,496.36</td>
</tr>
<tr>
<td>Hog</td>
<td>174,507.48</td>
<td>191,920.77</td>
</tr>
<tr>
<td>Goat</td>
<td>7,689.33</td>
<td>8,020.92</td>
</tr>
<tr>
<td>Dairy</td>
<td>559.96</td>
<td>592.17</td>
</tr>
<tr>
<td>Poultry</td>
<td>167,033.71</td>
<td>174,237.43</td>
</tr>
<tr>
<td>Chicken</td>
<td>123,695.14</td>
<td>129,701.72</td>
</tr>
<tr>
<td>Duck</td>
<td>2,587.83</td>
<td>2,664.71</td>
</tr>
<tr>
<td>Chicken Eggs</td>
<td>37,555.23</td>
<td>38,346.69</td>
</tr>
<tr>
<td>Duck Eggs</td>
<td>3,195.50</td>
<td>3,524.32</td>
</tr>
</tbody>
</table>

* At current price

Source: Bureau of Agriculture Statistics, 2013
THE PHILIPPINE DAIRY SITUATIONER
Dairy, 2013

Volume of Production:
- 14.46 thousand metric tons
- 0.01 % of total livestock production

Value of Production:
- 437.85 million pesos
- 0.04% of total agriculture
- 0.07 % of total livestock and poultry
- 41st rank in contribution to economy

Total Inventory
- Dairy Cattle – 21,067 heads
- Dairy Carabao – 16,364 heads
- Dairy Goat – 1,638 heads
Average farm gate price of milk
Cattle = P19/kg
Carabao = P45.50/kg

<table>
<thead>
<tr>
<th>Animal type / Source</th>
<th>Animals on the milk line</th>
<th>Prod'n (LME* in '000 L)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>As of 2013</td>
<td>% change (13/12)</td>
</tr>
<tr>
<td>Cattle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooperatives</td>
<td>2,054</td>
<td>(19.8)</td>
</tr>
<tr>
<td>Govt. Owned-Institutional</td>
<td>353</td>
<td>57.6</td>
</tr>
<tr>
<td>Commercial/Private</td>
<td>1,223</td>
<td>9.4</td>
</tr>
<tr>
<td>Dairy Multiplier Farms</td>
<td>2,051</td>
<td>34.1</td>
</tr>
<tr>
<td>Carabao</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooperatives</td>
<td>886</td>
<td>2.7</td>
</tr>
<tr>
<td>Govt. Owned-Institutional</td>
<td>636</td>
<td>2.6</td>
</tr>
<tr>
<td>Commercial/Private</td>
<td>162</td>
<td>5.2</td>
</tr>
<tr>
<td>Individual</td>
<td>3,200</td>
<td>1.8</td>
</tr>
<tr>
<td>Goat</td>
<td>1,372</td>
<td>120.2</td>
</tr>
</tbody>
</table>
Average milk prod’n performance

- Large variation in milk prod’n
  - Swamp type – 1 to 2 kg/day/L
  - Crossbred – 4 to 6 kg/day/L
  - Riverine – 6 to 8 kg/day/L

- 305D Lactation - <600 kg to >3,000 kg/L
- Peak yield - <5kg to 19.8kg
- % cows with failed lactation (FTM)
  - 9.9% in 1997 to 2.6% in 2007

- Average fat and protein percentage
  - Protein – 4.1%, Fat – 7.5%
Govt. initiated breeding program for Philippine dairy buffaloes

- Purebred selection
- Performance testing
- Cryobanking/frozen semen storage
- AI program/Bull loan program
- Village-based recording system
- Production of dairy crossbreds and continuous backcrossing
- CBED
Govt. initiated breeding program for Philippine dairy buffaloes

Frozen semen

- Nucleus, riverine buffaloes
- Multipier farms/institutional herds
- Dairy cooperatives/individual carabao farmers with riverine, crossbreds and swamp buffaloes

Bull loan
Breeding Program for purebred riverine buffaloes

Evaluation of Dam and Sires performance

Ranking of Offspring

Selection of Offspring

Female

Replacement

Loan/sell

Cull

Male

Candidate Bull for Semen Production

Bull for natural mating

Loan/sell

Cull

Breeding (Natural mating/AI)

Production of Offspring

Heifer calves for rearing

Bull calves for rearing

Evaluation of daughters’ performance

Senior AI Bull

Cows from coops

Waiting bulls
Animal recording system

- PCC Institutional herds
  - 10 participating herds
- 2010- Village-based recording system
  - National Impact Zone (NIZ).
    - Dairy cooperatives
      - Enrolled 11 coops
      - 222 dairy farmer
      - 532 dairy cows
      - 2,409 milk samples
Data being collected

- Basic Information
  - Animal Identification
  - Sire and Dam
  - Date of Birth
  - Sex

- Calving events
  - Calving dates, Calf Sex, Abortion/Stillbirth
Data being collected

- Breeding and Reproduction Record
  - Mating Dates (AI/Natural)
  - Actual Sire Used
  - Estrus Date/Sign of Estrus
  - Reproductive examination (PD)

- Milk test day records
  - Milk Yield (AM and PM)
  - Milk Components (Fat%, Prot%, SCC)
  - Daily milk yield
Genetic evaluation for dairy buffaloes

- Multi-trait random regression test day model for milk, fat and protein yield
  - Higher estimates of heritability
  - Account for systematic environmental effects on the actual day of recording
  - Allow individual cows’ lactation curve to deviate from the average
  - Can also be used to select for lactation persistency
Genetic correlations and heritabilities for milk yield and milk component traits at different days in milk estimated by multi-trait random regression model from first parity test day records of Philippine dairy buffaloes

<table>
<thead>
<tr>
<th>DIM</th>
<th>$h^2_{MY}$</th>
<th>$h^2_{FY}$</th>
<th>$h^2_{PY}$</th>
<th>$r_G$(my-fy)</th>
<th>$r_G$(my-py)</th>
<th>$r_G$(fy-py)</th>
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</thead>
<tbody>
<tr>
<td>30</td>
<td>0.21</td>
<td>0.14</td>
<td>0.19</td>
<td>0.85</td>
<td>0.97</td>
<td>0.83</td>
</tr>
<tr>
<td>60</td>
<td>0.34</td>
<td>0.27</td>
<td>0.26</td>
<td>0.85</td>
<td>0.98</td>
<td>0.86</td>
</tr>
<tr>
<td>90</td>
<td>0.34</td>
<td>0.26</td>
<td>0.28</td>
<td>0.87</td>
<td>0.98</td>
<td>0.72</td>
</tr>
<tr>
<td>120</td>
<td>0.37</td>
<td>0.23</td>
<td>0.28</td>
<td>0.88</td>
<td>0.98</td>
<td>0.88</td>
</tr>
<tr>
<td>150</td>
<td>0.33</td>
<td>0.20</td>
<td>0.26</td>
<td>0.90</td>
<td>0.98</td>
<td>0.89</td>
</tr>
<tr>
<td>180</td>
<td>0.30</td>
<td>0.17</td>
<td>0.24</td>
<td>0.91</td>
<td>0.97</td>
<td>0.90</td>
</tr>
<tr>
<td>210</td>
<td>0.25</td>
<td>0.14</td>
<td>0.21</td>
<td>0.91</td>
<td>0.96</td>
<td>0.91</td>
</tr>
<tr>
<td>240</td>
<td>0.23</td>
<td>0.13</td>
<td>0.19</td>
<td>0.90</td>
<td>0.94</td>
<td>0.91</td>
</tr>
<tr>
<td>270</td>
<td>0.23</td>
<td>0.13</td>
<td>0.20</td>
<td>0.86</td>
<td>0.91</td>
<td>0.90</td>
</tr>
<tr>
<td>300</td>
<td>0.22</td>
<td>0.13</td>
<td>0.19</td>
<td>0.81</td>
<td>0.88</td>
<td>0.87</td>
</tr>
</tbody>
</table>
Average EBVs of cows plotted per birth year

The genetic base was set as the average EBVs of cows born in year 2000.

\[ N = 1,644 \text{ buffaloes}, \ Cows = 1,401 \quad Sires = 133 \]
## Estimated breeding values (EBVs) of top bulls based on progeny performance from various institutional herds

<table>
<thead>
<tr>
<th>Herd</th>
<th>ID Number</th>
<th># of daughters</th>
<th>Accuracy</th>
<th>Milk yield</th>
<th>Total merit index</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>EBV305</td>
<td>Rank</td>
</tr>
<tr>
<td>LSU</td>
<td>2LSC02001</td>
<td>12</td>
<td>0.71</td>
<td>724.7</td>
<td>1</td>
</tr>
<tr>
<td>NGP</td>
<td>2GP01102</td>
<td>15</td>
<td>0.75</td>
<td>568.5</td>
<td>2</td>
</tr>
<tr>
<td>NGP</td>
<td>2GP02071</td>
<td>4</td>
<td>0.50</td>
<td>548.2</td>
<td>3</td>
</tr>
<tr>
<td>NGP</td>
<td>2GP03017</td>
<td>15</td>
<td>0.75</td>
<td>482.0</td>
<td>4</td>
</tr>
<tr>
<td>NGP</td>
<td>2GP03020</td>
<td>6</td>
<td>0.58</td>
<td>473.8</td>
<td>5</td>
</tr>
<tr>
<td>NGP</td>
<td>2GP04016</td>
<td>8</td>
<td>0.63</td>
<td>412.1</td>
<td>6</td>
</tr>
<tr>
<td>CMU</td>
<td>2CM93602</td>
<td>31</td>
<td>0.85</td>
<td>397.7</td>
<td>7</td>
</tr>
<tr>
<td>NGP</td>
<td>2GP03026</td>
<td>36</td>
<td>0.87</td>
<td>384.0</td>
<td>8</td>
</tr>
<tr>
<td>NGP</td>
<td>2GP01070</td>
<td>10</td>
<td>0.68</td>
<td>383.0</td>
<td>9</td>
</tr>
<tr>
<td>NGP</td>
<td>2GP99107</td>
<td>10</td>
<td>0.68</td>
<td>377.3</td>
<td>10</td>
</tr>
</tbody>
</table>
Enhancing mechanisms

- Frozen semen production
  - 2 semen production labs
  - CASA
- 51 active bulls (swamp and riverine)
  - 400,000 semen straws in 2014
- Frozen semen storage/
  Cryobank
  - Senior bulls
  - Waiting bulls
Enhancing mechanisms

- Artificial Insemination Program
  - Creation of a critical mass of Village-based AI Technician
  - Enhancement of training facilities

- Bull Loan Program
  - Riverine bulls for use in crossbreeding
Animal Recording System for AI

**Farmer**
- Pay the farmer for the milk
- Pay the breeding service fee
- Fill up BSR & IAR
- Give copy of breeding service report

**AI Technician**
- AI Service (Bull Assignment)
- Tag cal ID #

**Individual Animal Record**

**COOP**
- Keep calving report form

**LGU**

**UNAIP**

**NIZ/ PCC at CLSU**

**Operations Unit/GIP Unit**
Animal Recording System for BULL LOAN

**Farmer**
- Pay breeding service fee

**Bull Handler**
- Fill up BSR & IAR
- Give copy of breeding service report

**Individual Animal Record**

**COOP**
- Submit farmer’s copy to recorder

**LGU**

**PCC-NIZ**
- Encode BSR, calving, animal health, milk test day

**Operations Unit/GIP Unit**
Village-Based Recording System: Implementation Plan

- Establishment of pedigree records of cows and calves born in cooperatives
- Monthly milk testing and recording
- Establishment of pedigree and performance database for analysis and report generation.
Village-Based Recording System: Milk Testing and Recording

**Materials**
- milk bucket/milk pail
- milk sampling bottle
- ice chest/styro box
- Weighing scale
- CMT paddle

**Person Working**
- Milk Supervisor (PCC)
- Milk Recorder (PCC)
- Extentionist

**Field forms**
- Individual Animal Record
- Logbooks/Notebooks
- AI/BL Receipt
- Calving Report Form
- Daily/monthly milk form
Results generated from animal recording

- Reports given within a month after each test day
  - Individual cow test day information
  - Result of CMT
  - Lactation to date, 305D lactation, total lactation.

- Annual reports
  - Listing of top ranked cows by lactation yield, fat yield, protein yield and somatic cell count and peak yield.
  - Listing of top ranked cows with best reproductive performance in terms of calving interval and services per conception.
  - Listing of top ranked cooperatives by average lactation yield, protein yield, fat yield and somatic cell count.
  - Recommendations based on analysis of reports/performance.
Purebred selection on swamp buffaloes
- Growth and meat quality

Purebred selection on dairy buffaloes
- Milk, fat and protein yield

CB 50
- Female swamp buffalo x Riverine bull
- Male CB50 sold for meat/draft

CB 75
- Female CB50 Backcrossed to Riverine bull
- Male CB75 sold for meat/draft

CB 87.5
- Female CB75 Backcrossed to Riverine bull
- Male CB75 sold for meat/draft

CB 93
- Female CB87.5 Backcrossed to Riverine bull
- Male and female CB93 with production records are enrolled in the Philippine Dairy Buffalo registry as base parents

Male and Female CB93 could be enrolled in the Philippine Dairy Buffalo Registry

Backcrossing program to increase the population of Philippine dairy buffaloes
<table>
<thead>
<tr>
<th>Parity</th>
<th>Year calved</th>
<th>Milk yield, kg</th>
<th>Fat yield, kg</th>
<th>Protein yield, kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>First parity</td>
<td>2011</td>
<td>2,730.0</td>
<td>192.5</td>
<td>108.3</td>
</tr>
<tr>
<td>Second parity</td>
<td>2012</td>
<td>2,913.6</td>
<td>193.1</td>
<td>116.2</td>
</tr>
<tr>
<td>Third parity</td>
<td>2013</td>
<td>2,621.6</td>
<td>181.8</td>
<td>109.4</td>
</tr>
<tr>
<td>Calving dates</td>
<td>Milk yield (li)</td>
<td>DIM</td>
<td>Average/day</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------</td>
<td>-----</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>September 28, 2003</td>
<td>1,817.30</td>
<td>304</td>
<td>5.98</td>
<td></td>
</tr>
<tr>
<td>December 03, 2004</td>
<td>2,127.75</td>
<td>280</td>
<td>7.60</td>
<td></td>
</tr>
<tr>
<td>December 27, 2005</td>
<td>2,410.05</td>
<td>279</td>
<td>8.64</td>
<td></td>
</tr>
<tr>
<td>March 24, 2007</td>
<td>2,485.05</td>
<td>289</td>
<td>8.60</td>
<td></td>
</tr>
</tbody>
</table>
SALAMAT PO!
Thank you!