COLLECTION & USES OF RICE STRAW IN THE MEKONG RIVER DELTA, VIETNAM

Presentation by

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PART I

RICE PRODUCTION IN VIETNAM
BACKGROUND OF VIETNAM

Total population (persons): 92 million
Total land area (hectares): 33 million
Land area for rice production (hectares): 3.8 mil.
Area of rice production (hectares/year): 7.44 mil.

* Role of rice production
  - Staple food for Vietnamese
  - Jobs for 63% of the total labor force
  - National food security
  - Base for industrial development
<table>
<thead>
<tr>
<th>Year</th>
<th>Exported volume (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989</td>
<td>1,400,000</td>
</tr>
<tr>
<td>1996</td>
<td>3,234,000</td>
</tr>
<tr>
<td>2004</td>
<td>4,063,000</td>
</tr>
<tr>
<td>2007</td>
<td>4,443,000</td>
</tr>
<tr>
<td>2008</td>
<td>4,769,000</td>
</tr>
<tr>
<td>2009</td>
<td>6,052,596</td>
</tr>
<tr>
<td>2010</td>
<td>6,800,000</td>
</tr>
<tr>
<td>2011</td>
<td>7,000,000</td>
</tr>
<tr>
<td>2012</td>
<td>8,000,000</td>
</tr>
<tr>
<td>2013</td>
<td>6,739,000</td>
</tr>
<tr>
<td>2014</td>
<td>6,500,000</td>
</tr>
<tr>
<td>2015</td>
<td>6,568,000</td>
</tr>
</tbody>
</table>

(Source: Vietnam Food Association (VFA), 2016)
* 3.9 mil. hectares of the natural land including 3.8 hectares of the agricultural land
* 1.9 mil. hectares for rice production with # 3.8 mil. hectares of rice crops/year
* Paddy output: > 24 mil. tons/year, occupying > 50% of the total country output
* Milled rice export: 90 - 95% of the total country export
* Aver. rice farming household size: 1.1 hectares. In which
  - 113,190 households (7.7%) own less than 0.2 hectares
  - 449,886 households (30.64%) own 0.21-0.5 hectares.
* Popular farming models: 3 rice crops/year, Rice-rice-vegetables, Rice-fish or Rice-shrimp
PART II

VALUES OF RICE STRAW
## COMPARISON OF ELEMENTS BETWEEN DIFFERENT MATERIALS

<table>
<thead>
<tr>
<th>Elements(% db)</th>
<th>Husk</th>
<th>Straw</th>
<th>Wood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon</td>
<td>38,7</td>
<td>37,7</td>
<td>48,0</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>5,0</td>
<td>5,0</td>
<td>6,5</td>
</tr>
<tr>
<td>Oxygen</td>
<td>36,0</td>
<td>37,5</td>
<td>43,0</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>0,5</td>
<td>0,6</td>
<td>0,5</td>
</tr>
<tr>
<td>Sulphur</td>
<td>0,1</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Ash</td>
<td>19,6</td>
<td>19,2</td>
<td>2,0</td>
</tr>
</tbody>
</table>

### Nutritional values (kg/ton)

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>P$_2$O$_5$</th>
<th>K$_2$O</th>
<th>Mg</th>
<th>Ca</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paddy grain</td>
<td>10,5</td>
<td>4,6</td>
<td>3,0</td>
<td>1,5</td>
<td>0,5</td>
</tr>
<tr>
<td>Rice straw</td>
<td>7,0</td>
<td>2,3</td>
<td>17,5</td>
<td>2,0</td>
<td>3,5</td>
</tr>
</tbody>
</table>
PART III

INVESTIGATION ON USES OF RICE STRAW IN THE MEKONG RIVER DELTA
CONTENTS, METHODS & SCOPES OF THE INVESTIGATION

* Contents of the investigation:
  - Rice straw for mushroom production
  - Rice straw for fertilizer production
  - Rice straw for animal feed
  - Rice straw for other purposes

* Method of the investigation:
  - Collection of secondary information combined with a survey and personal interviews with specialists
* Scopes of the investigation:

- Ho Chi Minh City: Trang Sinh mushroom company, at the Hi-tech Agricultural Park;

- Trang Bang Dist., Tay Ninh province: M.D Genetic Organic Milk Join Stock Company;

- Cu Chi Dist., Ho Chi Minh City: Dairy farms of Duc Den and Sau Hen, Thanh Binh animal husbandry, trading, production and service enterprise;

- Cho Gao Dist., Tien Giang province: VietGAP Dragon Fruit Co-operative and another one Trading Enterprise of Rice straw and Cassava by-products at Quon Long village;

- Lai Vung Dist., Dong Thap province: 2 mushroom producing farms, 1 mushroom trader and another one trader of mushroom spawn;

- Thot Not Dist., Can Tho City: A farmer/trader of in-door mushroom production, and trading of rice straw and mushroom; 1 dairy co-operative and another 3 dairy farms;

- Soc Trang province: 3 dairy farms, 1 milk collection co-operative, 1 trader of rice straw, and another one mushroom processing company for export.
BURNING RICE STRAW AFTER HARVEST IN THE MEKONG RIVER DELTA
### EFFECTS OF BURNING OF RICE STRAW IN THE FIELD ON LOSSES OF ITS ELEMENTS

<table>
<thead>
<tr>
<th>Rice straw and its elements</th>
<th>Output per hectare after harvest (kg)</th>
<th>Losses due to burning of rice straw in the field (%)</th>
<th>Remaining of elements in the field (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice straw</td>
<td>6,000</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>N</td>
<td>51.5</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>P&lt;sub&gt;2&lt;/sub&gt;O&lt;sub&gt;5&lt;/sub&gt;</td>
<td>25.4</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>K&lt;sub&gt;2&lt;/sub&gt;O</td>
<td>137.4</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>Ca, Mg, Si</td>
<td>100</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>
EFFECT OF BURING RICE STRAW ON ROAD TRANSPORTATION AND NATURAL ENVIRONMENT
Mushroom production in banana plantation in Lai Vung district of Dong Thap province
IN-DOOR MUSHROOM PRODUCTION FOR HIGHER INCOME

- In-door mushroom production in Thot Not district of Can Tho province;

- Investment cost for mushroom production house is 6,500 US$/500m²
IN-DOOR AUTOMATIC CONTROL FOR MUSHROOM PRODUCTION IN CAN THO CITY
MUSHROOM PRODUCTION IN THE MEKONG RIVER DELTA, VIETNAM

- Vietnam is one of the 5 biggest mushroom producing countries in the world due to a plentiful materials of rice straw, saw dust, sugarcane, etc.

- Vietnam produces about 250,000 tons of mushroom per year with export value of US$ 25-30 million, mainly from Eastern provinces and the Mekong river delta

- Average selling price of freshly harvested mushroom is US$ 1.7/kg

- Export price of salted mushroom is US$ 1,790/ton

- Average profit from out-door mushroom production in the Mekong river delta is about US$ 0.5/m².cycle

- 20-30 million tons of rice straw produced annually in the Mekong river delta can produce about 2 million tons of mushroom with a total value of US$ 1 billion.
## Presently Popular Mushroom Producing Methods in the Mekong River Delta

### Out-Door Production
- **Advantage**
  - Lowest investment cost
- **Disadvantages**
  - Out of control of production conditions (temperature, moisture and pH)
  - Lowest yield
  - High harvest cost
  - Only one cycle in dry season per year
  - Annual changes of production sites

### Semi-In-Door Production (In Trees Plantations or With Roofs)
- **Advantages**
  - Better control of production conditions compared to out-door production
  - Less labor cost in harvest
- **Disadvantages**
  - Annual changes of production sites

### In-Door Production
- **Advantages**
  - The best control of production conditions with highest yield
  - Production year around (7-9 cycles/year with 35-40 days/cycle)
  - Less chemical application and higher mushroom quality
  - Lowest labor cost in harvest
  - No change of production site
  - The most efficient use of land for production
- **Disadvantages**
  - Highest investment cost
MUSHROOM PROCESSING IN THE MEKONG RIVER DELTA

Selling price of fresh mushroom: 50,000 – 55,000 VND/kg

Mushroom processing in Soc Trang province
<table>
<thead>
<tr>
<th>Criteria for Comparison</th>
<th>Out-door production</th>
<th>In-door production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial investment cost (US$)</td>
<td>0</td>
<td>7,500</td>
</tr>
<tr>
<td>Number of production cycles per year</td>
<td>1 - 2</td>
<td>8 - 9</td>
</tr>
<tr>
<td>Efficiency of rice straw use (kg of mushroom/100kg of rice straw)</td>
<td>13.85 – 16.15</td>
<td>9.86</td>
</tr>
<tr>
<td>Mushroom yield (kg of mushroom/meter)</td>
<td>0.7 – 0.9</td>
<td>1.67</td>
</tr>
<tr>
<td>Production cost (US$/kg of mushroom)</td>
<td>0.8 – 1.0</td>
<td>1.4</td>
</tr>
<tr>
<td>Average selling price (US$/kg of mushroom)</td>
<td>1.2 – 1.45</td>
<td>2.0</td>
</tr>
<tr>
<td>Profit (US$/kg of mushroom)</td>
<td>0.35 – 0.50</td>
<td>0.75</td>
</tr>
<tr>
<td>Annual profit (US$/1,000 meter.year)</td>
<td>900</td>
<td>9,850</td>
</tr>
</tbody>
</table>
CONTRAIANTS IN MUSHROOM PRODUCTION IN THE MEKONG RIVER DELTA

- Mostly traditional production methods with low yield
- Low investment capital and production technology
- Weak production management & quality control
- Low processing technology & weak diversification
- Low efficient in technical training and extension
# DEVELOPMENT IN CASTLE PRODUCTION IN VIETNAM TOWARD 2020

<table>
<thead>
<tr>
<th>PROVINCE/CITY</th>
<th>No. OF DAIRY COW/CASTLE BEFF AND MILK PRODUCTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2014</td>
</tr>
<tr>
<td>Soc Trang</td>
<td>6,000 dairy cows at 2,174 farms with a total milk production of 26 tons of fresh milk/day</td>
</tr>
<tr>
<td>Ho Chi Minh City</td>
<td>100,000 dairy cows at small dairy farms</td>
</tr>
<tr>
<td>Hanoi City</td>
<td>13,000 dairy cows</td>
</tr>
<tr>
<td>Vietnam</td>
<td>200,000 dairy cows/550,000 tons of fresh milk/year 4,720,000 dairy cows 2,580,000 buffaloes</td>
</tr>
</tbody>
</table>

(Source: Decision No. 984/QĐ-BNN-CN, dated 09/05/2014 by minister of Agriculture and Rural Development on “Approval of ‘reformation project of animal production towards an adding value increase and sustainable development”)

The 4th Regional Forum on Sustainable Agricultural Mechanization in Asia and the Pacific
PRESENT CASTLE PRODUCTION IN SOUTH VIETNAM

Slicing machine for rice straw and grass

TMR mixer for grass, rice straw, cereal grains

Milking machine

A dairy farm in My Tu District of Soc Tran
RICE STRAW FOR CASTLE PRODUCTION IN TIEN GIANG PROVINCE
RICE STRAW USED AS ORGANIC FERTILIZER

Residues of rice straw from mushroom production treated with Trichoderma to apply to crops

Rice straw residues after mushroom production used as mulching materials or fertilizer for trees and crops in Lai Vung Dist., Dong Thap province
POPULAR USES OF RICE STRAW & ITS RESIDUES IN THE MEKONG RIVER DELTA

MUSHROOM AND FERTILIZER PRODUCTION
- Mushroom
- Residues of rice straw after mushroom production used as fertilizer for crops

MULCHING MATERIALS
- For dragon trees, vegetables and other crops to keep moist, warm and to suppress weed

CASTLE FEED
- Main feed for buffaloes and beef castle
- Supplement feed for calves and cows
RICE STRAW BALERS IN THE MEKONG DELTA

JAPANESE BALER – Galan STAR
Capacity: 80 – 120 rolls/hr
- Capacity: 5 - 7 hectares/shift;
- Weight of straw rolls: 15kg/roll
MODIFIED JAPANESE BALERS

Modified Japanese baler in Soc Trang province
HAI TINH RICE STRAW COLLECTING MACHINE IN THE MEKONG RIVER DELTA
TU SANG & PHAN TAN BALERS IN THE MEKONG RIVER DELTA

Tu Sang baler

Phan Tan baler
YANMAR COMBINED HARVESTER WITH STRAW CHOPPER
RICE STRAW COLLECTING DEVICES IN THE MEKONG RIVER DELTA

Rice straw collecting device operating in Tien Giang province:
TRANSPORTATION OF RICE STRAW IN THE MEKONG RIVER DELTA

Transportation of straw rolls by trucks in Soc trang province: 215 rolls/truck

Transportation of bulk straw by boats in Kien Giang province

Transportation of straw rolls by boats in Dong Thap province
PART IV

RECOMMENDATIONS
*Recommendations on uses of straw in the Mekong river delta*

- Use up rice straw from rice production for different purposes to improve living standard of rice farmers and to reduce environmental pollution

- Utilize proper straw balers and transportation means for rice straw collection and transportation

- Use more rice straw for mushroom production, animal feed, mulching materials and fertilizer

- Diversify products processed from mushroom

- Study on use of rice straw for construction materials and handicraft products
THANK YOU VERY MUCH FOR YOUR ATTENTION

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