Socioeconomic profile of Mindoro farmers: 2015 DS baseline survey results

JIC Santiago, CG Yusongco, JC Beltran, RZ Relado
Goal:

“Increase rice productivity and farm income”
Baseline Characterization of PhilRice-Mindoro Satellite Station
Rationale

A need for **baseline** data:

✓ Serve as a guide in designing, implementing and terminating project interventions

✓ Gauge socioeconomic impact and production impacts of development projects
Methodology

✔ Baseline Survey in Mindoro Occidental and Oriental

✔ 100 sample farmers from each province

✔ 2015 Dry Season (January to June Harvest)
Objectives

✓ Determine the basic socio-economic characteristics of Mindoro rice farmers

✓ Describe current production practices in the area

✓ Examine cost and profitability of rice production
Socio-economic Characteristics
Basic characteristics of a rice farmer

- Male
- 50 y/o
- Married
- 5 Household members
- at least HS education
- 22 years of farming experience
RICE FARMING is the major source of income.

Non-farm income, 19%

Non-rice income, 10%

Rice income, 71%
## Basic farm characteristics

<table>
<thead>
<tr>
<th>Item</th>
<th>Oriental Mindoro</th>
<th>Occidental Mindoro</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of rice-based farm parcels</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Size of largest parcel (ha)</td>
<td>1.40</td>
<td>1.55</td>
</tr>
</tbody>
</table>
Source of irrigation

- NIS: 47%
- STW: 17%
- Free-flowing: 12%
- Others: 11%
- Rivers/streams: 13%
Objectives

✓ Determine the basic socio-economic characteristics of Mindoro farmers

✓ Describe current production practices in the area

✓ Examine cost and profitability of rice production
Farm Inputs and Crop Management
Seed class

- NSIC Rc218
- SL-8

<table>
<thead>
<tr>
<th>Seed Class</th>
<th>Low quality inbred</th>
<th>High quality inbred</th>
<th>Hybrid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oriental Mindoro</td>
<td>24</td>
<td>50</td>
<td>26</td>
</tr>
<tr>
<td>Occidental Mindoro</td>
<td>18</td>
<td>25</td>
<td>57</td>
</tr>
<tr>
<td>n=100</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Crop establishment

- **Oriental Mindoro**
  - TPR: 55%
  - DSR: 45%
  - n=100

- **Occidental Mindoro**
  - TPR: 80%
  - DSR: 20%
  - n=100
Seeding rate

- **DSR**: 110 kg per ha, 99 kg per ha
- **TPR-inbred**: 102 kg per ha, 80 kg per ha
- **TPR-hybrid**: 15 kg per ha, 24 kg per ha

80 kg per ha
40 kg per ha
### Fertilizer use

<table>
<thead>
<tr>
<th>Province</th>
<th>N</th>
<th>P</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occidental Mindoro</td>
<td>171</td>
<td>8</td>
<td>19</td>
</tr>
<tr>
<td>Oriental Mindoro</td>
<td>101</td>
<td>10</td>
<td>20</td>
</tr>
</tbody>
</table>

Kg per ha

**Urea, complete, ammonium phosphate, ammonium sulfate, MOP**
# Pesticide (% of users)

<table>
<thead>
<tr>
<th>Item</th>
<th>Occidental Mindoro n=100</th>
<th>Oriental Mindoro n=100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herbicide</td>
<td>76</td>
<td>98</td>
</tr>
<tr>
<td>Insecticide</td>
<td>94</td>
<td>77</td>
</tr>
<tr>
<td>Fungicide</td>
<td>20</td>
<td>16</td>
</tr>
<tr>
<td>Other pesticides</td>
<td>44</td>
<td>83</td>
</tr>
</tbody>
</table>
# Labor (man-days/ha)

<table>
<thead>
<tr>
<th>Farm activity</th>
<th>Oriental Mindoro</th>
<th>Occidental Mindoro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land preparation</td>
<td>9.70</td>
<td>11.04</td>
</tr>
<tr>
<td>Crop establishment</td>
<td>12.43</td>
<td>26.91</td>
</tr>
<tr>
<td>Crop care &amp; maintenance</td>
<td>12.15</td>
<td>17.34</td>
</tr>
<tr>
<td>Harvesting and Threshing</td>
<td>7.56</td>
<td>6.70</td>
</tr>
</tbody>
</table>

## Total labor (man-days/ha)

Oriental Mindoro: **47.15** | Occidental Mindoro: **66.48**
Mechanization (Combine-harvester)

Distribution of CH by DA

- Oriental Mindoro: 67%
- Occidental Mindoro: 88%

$n=100$ for both regions.
Objectives

✔ Determine the basic socio-economic characteristics of Mindoro farmers

✔ Describe current production practices in the area

✔ Examine cost and profitability of rice production
Cost and returns
## Gross income from rice farming

<table>
<thead>
<tr>
<th>Item</th>
<th>Occidental Mindoro</th>
<th>Oriental Mindoro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield (mt/ha)</td>
<td>6.21</td>
<td>5.5</td>
</tr>
<tr>
<td>Farmgate price (P/kg)</td>
<td>16.05</td>
<td>15.61</td>
</tr>
<tr>
<td>Gross income (P/ha)</td>
<td>₱99,711</td>
<td>₱86,023</td>
</tr>
</tbody>
</table>
Cost distribution (Occidental Mindoro)

- Labor, 25%
- Fertilizer, 18%
- Pesticides, 5%
- Land Rent, 17%
- Animal, Machine, Fuel & Oil, 10%
- Irrigation, 5%
- Interest on Capital, 4%
- Seeds, 8%
- Other, 8%

Total: P62,636
Cost distribution
(Oriental Mindoro)

- Land Rent, 26%
- Labor, 26%
- Fertilizer, 15%
- Animal, Machine, Fuel & Oil, 9%
- Irrigation, 5%
- Interest on Capital, 2%
- Other, 7%
- Seeds, 5%

Total: P61,298
### Profitability (Occidental Mindoro)

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RETURNS</strong></td>
<td></td>
</tr>
<tr>
<td>Yield (kg/ha)</td>
<td>6,213</td>
</tr>
<tr>
<td>Price (Php per kg)</td>
<td>16.05</td>
</tr>
<tr>
<td>Gross Returns</td>
<td>99,711</td>
</tr>
<tr>
<td>Total Cost (Php/ha)</td>
<td>62,636</td>
</tr>
<tr>
<td>Net Income from Rice Farming</td>
<td>37,075</td>
</tr>
<tr>
<td><strong>Farmers’ Income</strong></td>
<td>54,068</td>
</tr>
<tr>
<td>Cost per unit</td>
<td>10.08</td>
</tr>
</tbody>
</table>

"Farmer’s income" is considered as the take-home pay of the farmer’s net income - net returns on own land, capital, and labor.
**Profitability (Oriental Mindoro)**

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>REturns</strong></td>
<td></td>
</tr>
<tr>
<td>Yield (kg/ha)</td>
<td>5510.6</td>
</tr>
<tr>
<td>Price (Php per kg)</td>
<td>15.6</td>
</tr>
<tr>
<td>Gross Returns</td>
<td>86,023</td>
</tr>
<tr>
<td>Total Cost (Php/ha)</td>
<td>61,298</td>
</tr>
<tr>
<td>Net Income from Rice Farming</td>
<td>24,725</td>
</tr>
<tr>
<td><strong>Farmers' Income</strong></td>
<td>45,860</td>
</tr>
<tr>
<td>Cost per unit</td>
<td>11.12</td>
</tr>
</tbody>
</table>

“Farmer’s income” is considered as the take-home pay of the farmer, which is the net income plus net returns on own land, capital, and labor.
Do they need a PhilRice satellite station?
YES...
Rice farmers are dependent on rice farming.

RICE FARMING
is the major source of income.

Rice income, 71%
Non-farm income, 19%
Non-rice income, 10%

Rice farmers are dependent on rice farming.
Mindoro is an island.
PhilRice satellite station can offer:

1. Technical knowledge
2. Technology
3. Access to other agencies
There is still room for improvements.
Palaycheck System

1. Seeds
2. Land
3. Planting
4. Planting
5. Nutrient
6. Water
7. Pest
8. Harvest

Seeding rate
AWD
LCC
MOET
Intermittent irrigation
Thank you!! ☺
End of presentation
Progress in rice farming...
Combining harvester: 
Its impact in rice farming

Socioeconomic Impact of Adopting Rice Combine Harvester in the Philippines
IAArida, JCBeltran, FHBordey, IRTanzo, RZRelado, RBMalasa, and MJTAntivo
Rice farming in the Philippines:

- Labor and capital intensive
- Labor shortage

Source: RBFHS 2011-2012
Towards agricultural mechanization:

- Significantly reduces production cost, higher profits and lower prices
- Eliminates problems on unavailability of laborers during peak seasons
- Problem: Low adoption rate
In 2011-2012:

- **0.33% (WS)** and **0.68% (DS)** adoption

- Labor requirement is significantly lower

- Labor and power cost not significantly different

Source: RBFHS 2011-2012
Objectives:

1. To assess the perception and level of awareness on combine harvester;
2. To determine the social welfare effects of combine harvester adoption; and
3. To assess the impact of combine harvester adoption on the productivity and profitability.
Data and Sources

- **Duration:** March 2015 to December 2016
- **Project sites:** Nueva Ecija, Isabela, Tarlac, Pangasinan, & Cagayan
- **450** sample respondents/cropping season
- **Reference period:** 2015 (DS and WS)

**Category:**

1. User
2. Non-User
% of machine users in harvesting

Data and Sources

Source: RBFHS 2011-2012
Analytical Procedure

A. KIs/FGDs/Surveys

B. Descriptive Statistics

C. Partial Budget Analysis

Preliminary results on DS 2015
RESULTS

Socio-demographic profile

55 years old
(Mean)

25 years
(Mean years in farming experience)
RESULTS
Socio-demographic profile

9 years
(Mean years of schooling)

57%
(Participation in rice-related trainings)
Socioeconomic Impact of Adopting Rice Combine Harvester in the Philippines

Perception and awareness

- Reaper 52%
- “Halimaw” 38%
- Combine 17%

- Fast performance
- Appearance and mechanism
- Affects manual laborers
Sources of information

- Co-farmers: 59%
- Service providers: 20%
- Promotion: 9%
- Others: 12%
Willingness to adopt or continue to adopt

<table>
<thead>
<tr>
<th></th>
<th>USER</th>
<th>NON-USER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cag</td>
<td>89%</td>
<td>51%</td>
</tr>
<tr>
<td>Isa</td>
<td>100%</td>
<td>21%</td>
</tr>
<tr>
<td>NE</td>
<td>91%</td>
<td>39%</td>
</tr>
<tr>
<td>Pang</td>
<td>93%</td>
<td>39%</td>
</tr>
<tr>
<td>Tar</td>
<td>91%</td>
<td>51%</td>
</tr>
</tbody>
</table>

- More than 80% are willing to adopt again among users
- Surprisingly, only 21% non-users are willing to adopt in Isabela
Advantages of using combine

- **44%** - Fast performance and convenience
- **30%** - Decreases labor costs
- **17%** - Unavailability of manual harvesters
- **14%** - Prevents crop losses
- **5%** - Reduces postharvest losses
Disadvantages of using combine

- **42%** - Affects manual harvesters
- **16%** - Not applicable in the area
- **5%** - Smaller farm area

Other adverse reasons for non-adoption:

- Damages the field
- Low quality of palay harvested by combine
- Postharvest losses
- Affordability of machine custom fee
Other issues of using combine

- 12% - Increases costs on land preparation
- 64% - Increases costs on transplanting
Socioeconomic Impact of Adopting Rice Combine Harvester in the Philippines

Social impact

- Extremely affected: 49%
- Very affected: 33%
- Somewhat affected: 11%
- Slightly affected: 5%
- Not affected: 1%
- No response: 1%
### Comparison of labor use (MD/ha)

<table>
<thead>
<tr>
<th>Province</th>
<th>User</th>
<th>Non-User</th>
<th>Diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cagayan</td>
<td>1.85</td>
<td>21.15</td>
<td>-19.30</td>
</tr>
<tr>
<td>Isabela</td>
<td>1.74</td>
<td>18.46</td>
<td>-16.72</td>
</tr>
<tr>
<td>Nueva Ecija</td>
<td>1.73</td>
<td>16.49</td>
<td>-14.76</td>
</tr>
<tr>
<td>Pangasinan</td>
<td>1.49</td>
<td>16.90</td>
<td>-15.41</td>
</tr>
<tr>
<td>Tarlac</td>
<td>1.61</td>
<td>14.42</td>
<td>-12.81</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>1.69</strong></td>
<td><strong>17.48</strong></td>
<td><strong>-15.80</strong></td>
</tr>
</tbody>
</table>
## Comparison of yield & costs

<table>
<thead>
<tr>
<th>Item</th>
<th>User</th>
<th>Non-User</th>
<th>Diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield (kg/ha)</td>
<td>6,073.29</td>
<td>5,595.88</td>
<td>-477.40</td>
</tr>
<tr>
<td>Total costs on HT</td>
<td>9,857.18</td>
<td>14,310.46</td>
<td>-4,453.28</td>
</tr>
</tbody>
</table>
Socioeconomic Impact of Adopting Rice Combine Harvester in the Philippines

Other issues of using combine

- 12% - Increases costs on land preparation
- 64% - Increases costs on transplanting

<table>
<thead>
<tr>
<th>Item</th>
<th>User</th>
<th>Non-User</th>
<th>Diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor cost on land preparation</td>
<td>1,739.12</td>
<td>2,103.07</td>
<td>-363.95</td>
</tr>
<tr>
<td>Labor cost on transplanting</td>
<td>7,033.20</td>
<td>7,035.81</td>
<td>-2.61</td>
</tr>
</tbody>
</table>
### Partial budget analysis

<table>
<thead>
<tr>
<th>Reduced Costs</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor cost (HT)</td>
<td>7,360.81</td>
</tr>
<tr>
<td>Labor cost (hauling)</td>
<td>225.57</td>
</tr>
<tr>
<td>Fuel and oil (HT)</td>
<td>30.88</td>
</tr>
<tr>
<td>Machine custom fee</td>
<td>35.20</td>
</tr>
<tr>
<td>(hauling)</td>
<td></td>
</tr>
<tr>
<td>Fuel &amp; oil (hauling)</td>
<td>1.51</td>
</tr>
<tr>
<td>Sacks &amp; Twine</td>
<td>339.76</td>
</tr>
<tr>
<td>Food cost (HT)</td>
<td>653.22</td>
</tr>
<tr>
<td><strong>Total reduced costs</strong></td>
<td><strong>8,646.95</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Added costs</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine custom fee</td>
<td>4,193.68</td>
</tr>
<tr>
<td>(HT)</td>
<td></td>
</tr>
<tr>
<td><strong>Total additional costs</strong></td>
<td><strong>4,193.68</strong></td>
</tr>
</tbody>
</table>

**Change in net income:** PhP 4,453.28
Summary

1. Adoption due to its performance, reduction in labor costs, labor shortage during harvesting, prevents crop losses, and reduction in PH losses.

2. Non-adoption due to displaced laborers, non-applicability in the area, smaller farm size.

3. Land preparation and transplanting costs were perceived to increase due to adoption of combine but preliminary results showed otherwise.
Summary

3. Harvesting and threshing labor requirements significantly decreased by 83 percent.

4. Harvesting and threshing labor costs significantly decreased by 18 percent.

6. Users of combine harvester receives a higher net income of PhP 4,453.28, compared to non-users.
“Biggest factors in rice farming is the high quantity of labor use and low amount of mechanization. The future of Philippines’ rice production is really on cutting out labor use out of the system. There maybe problem with practicing direct seeding or problem with people asking for more wages in transplanting, BUT these are problems that needs to be solved. If you don’t make labor cost down, you will never be out of it.”

- Dr. David C. Dawe, FAO
End of presentation.....
On-farm Survey on Dry Direct Seeded Rice in the Drought-prone Environment of Pangasinan province

Hoshie Ohno¹, Nino Banayo¹, Crisanta Bueno¹, Eden Gagelonia², Elmer Bautista², Yoichiro Kato¹

1: International Rice Research Institute (IRRI)
2: Philippine Rice Research Institute (PhilRice)
Introduction

Rainfed lowland system
- 30% of harvested area is under Rainfed in the Philippines
- **Low yield** relative to irrigated area because of drought
  Rainfed: 3.07 t/ha, Irrigated: 4.43 t/ha (Source: PSA, 2014)

Dry Direct Seeded Rice (DSR)
- DSR can **reduce water & labor requirements** compared to transplanting rice (TPR)

Germplasm x Environment x Management

Rainfed
Mechanized DSR

Multi-Purpose Seeder (MP seeder)

Courtesy of ED Gagelonia and EU Bautista
MP seeder trial at PhilRice CES

MP seeder (58 kg/ha)  Broadcasting (60 kg/ha)

<table>
<thead>
<tr>
<th>Method</th>
<th>Seeding Rate (kg/ha)</th>
<th>Population (/m²)</th>
<th>Establishment Rate (%)</th>
<th>Sowing Depth (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP seeder</td>
<td>58</td>
<td>168.9</td>
<td>78.6</td>
<td>31.4</td>
</tr>
<tr>
<td>Furrow</td>
<td>60</td>
<td>141.9</td>
<td>63.9</td>
<td>17.0</td>
</tr>
<tr>
<td>Broadcasting</td>
<td>60</td>
<td>130.4</td>
<td>58.7</td>
<td>16.3</td>
</tr>
<tr>
<td>Broadcasting</td>
<td>150</td>
<td>316.3</td>
<td>56.9</td>
<td>30.0</td>
</tr>
</tbody>
</table>

* Establishment rate (%) = actual emergence (/m²) / seeds (/m²)
Technology for DSR in rainfed

1. What’s farmer needs to develop acceptable technology

2. Germplasm x Environment x Management
   - Rainfed
   - Drought-prone
   - Drought-tolerant variety
   - Dry Direct seeding

DSR
Less water & Labor
Not widely acceptance
On-farm trial in Umingan, Pangasinan

**Purpose**

1. **Current situation of DSR for smallholder farmer**
   - Driving-force & Constrain to shift from TPR to DSR
   - How does farmers manage in DSR

2. **Agronomic performance** of NSIC Rc348 (Sahod Ulan12) and PSB Rc10 in DSR

<table>
<thead>
<tr>
<th>Sahod Ulan12</th>
<th>Rc10</th>
</tr>
</thead>
<tbody>
<tr>
<td>103 DAS</td>
<td>106 DAS</td>
</tr>
</tbody>
</table>
Methodology

Site: Umingan, Pangasinan
3 barangays (Casilan, Sta.Rosa, Prado)
22 farmers participated
*Same 22 farmers was interviewed to identify current situation

Variety: NSIC Rc348 (Sahod Ulan 12), PSB Rc10

Management: DSR by Farmer’s practice

Measurements: Seedling rate, NDVI, SPAD, Weed scoring

Soil hydrology score: 0 (Standing water), 1 (Saturated)
2 (Moist), 3 (Dry) weekly recorded
Results

Current situation of DSR in Umingan

7 farmers (per 22 farmers) changed from TPR to DSR within 5 years

<table>
<thead>
<tr>
<th>Driving-force</th>
<th>Labor cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Water shortage (delay of rainy season)</td>
</tr>
<tr>
<td>Constrain</td>
<td>Weed</td>
</tr>
<tr>
<td></td>
<td>Scarcity of knowledge/information</td>
</tr>
</tbody>
</table>

- Some farmers use wet direct seeded rice (WSR) instead of DSR to save labor cost
How does farmers manage in DSR?

- Land preparation:
  Rotovator – hand tractor – broadcasting – hand tractor
  (Rotovator – broadcasting – hand tractor)

- Weed management

<table>
<thead>
<tr>
<th>Pre-emergence herbicide</th>
<th>3 farmers (per 22 farmers) use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-emergence herbicide</td>
<td>All farmers use once/ twice</td>
</tr>
</tbody>
</table>

- Nutrient management
  Basal application: 18-37 DAS (days after sowing)
  14-14-14 (4-9 bags/ha), urea (3-5 bags/ha) etc.

  Topdressing: around 3 weeks after basal

Farmer’s management is still on-going…
Early growth stage (30 DAS)

Establishment (no. of plants/ m²)

- SU12
- Rc10

NDVI

Mean soil hydrology score
(0: Standing water, 1: Saturated, 2: Moist, 3: Dry)

* NDVI (normalized difference vegetation index): show crop canopy reflectance

Wet  Dry
Flowering stage

SU12 is much taller than Rc10

→ concern: **Lodging**

Farmers apply much higher fertilizer than recommendation of RCM (Rice Crop Manager)

e.g.) Total = 14-14-14: 10 bags/ha

RCM = 14-14-14: 2.5 bags & urea: 2.5 bags/ha
Conclusion

DSR has been accepted by smallholder farmers in rainfed to save labor cost and address water shortage

1. There are differences in knowledge and management of DSR among farmers (They rely on own/neighbor ing experience)
   - How to introduce appropriate management to smallholder farmers

2. Mostly farmers like SU12 but concern of Sahod Ulan 12 is lodging
   - Appropriate nutrient management is required for Sahod Ulan 12
Acknowledgment

- The activity is supported in part by DA-BAR (Associated Technology Project- MP seeder project in Rainfed Lowland).

- MAO and technicians of Umingan, and all the farmers who participate.
“STATE OF FARM MECHANIZATION OF IRRIGATED LOWLAND RICE IN REGION XI”

J.C. Escario¹, D. Espiritu², M. Pinohan³ & D. Langahin³

¹SRSI Chief PDS Section-RAED, ²Chief- Agricultural Engineering Research Section, Engineer I Agricultural Engineering Research Section – Research Division Department of Agriculture Regional Field Office XI, 8000 Davao City (082) 226 36 25
Regional Profile

In 2014, Davao Region ranked 14th in terms of rice production contributing about 2.38% or 452,267.00 MT to the national output of 18,967,826 MT, according to Philippine Statistics Authority (PSA).

However, in terms of yield performance (4.36 MT/ha.), the region ranked 3rd and was more than the national average yield of 4.00 MT/hectares.

Various data on rice production and land in Region XI are readily available but for the level of mechanization for this areas has yet to be established.

This study focused on the assessment of the major farm operations that needed mechanization; 1) land preparation, 2) planting, 3) crop care and maintenance, 4) harvesting, and 5) postharvest.
General Objective:

To provide Regional Profile of the Level of Mechanization of Region XI for the proper planning, identification, and allocation of future interventions for irrigated lowland rice.

Specific Objectives:

- Establish an updated inventory on farm mechanization
- Provide updated map of the production area versus mechanization
- Provide data of level of utilization
Pre-implementation Stage

- Consolidation of the available five (5) years data of farm mechanization interventions of the DA RFO XI, other government agencies, non-government agencies and the private sector to fall part of the initial working data (data includes volume of distribution and the corresponding field capacity of the equipments).

Implementation Stage

1. Conduct series consultation and planning workshop with various stakeholders for the verification of the consolidated initial data.
2. Forging of the final master list of the various farm mechanization interventions. All data gathering and analysis will emanate from this master list.
3. Site validation of the items listed in the final master list for the various farm mechanization interventions.
4. Come up with validated data on the level of mechanization per province versus the existing land area.
5. Presentation of the validated data to the various stakeholders.
6. Establish a Regional Profile of the Level of Mechanization in Region XI.
RESULTS AND DISCUSSIONS

Total Horsepower per Farm Operations

Province of Davao del Norte

Figure 1. Highly mechanized farm operation is **Postharvest** with 35.09%.
Figure 2. **Mobile Rice Thresher** showed the greater demand on power utilization with 453 horsepower.
**LAND PREPARATION.**

In Davao del Norte, the highest power utilized of land preparation equipment was the **Power tiller and Hand Tractor with Trailer** with 58.29% horsepower being utilized.

**CROP CARE AND MAINTENANCE.**

The province of Davao del Norte shows greater percentage of utilization on the **Open Surface Pump** with the 355 horsepower used.
**HARVESTING.**

The greatest number of utilized machineries in terms of Harvesting was the **Combine Rice Harvester**, with 300 hp delivered or 96.15%.

**PLANTING**

**Planting.**

Only Walk Behind **Mechanical Transplanter** is present in the area.
The volume of production from year 2010-2015 of the province of Davao del Norte on the irrigated palay versus the level of mechanization every year.
## Percent Area Mechanized

<table>
<thead>
<tr>
<th>Provinces</th>
<th>Actual Area Mechanized (has.)</th>
<th>Area Harvested (2015, has.)</th>
<th>Percent Area Mechanized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Davao del Norte</td>
<td>2,700.6</td>
<td>26,250</td>
<td>10.29%</td>
</tr>
<tr>
<td>Davao Oriental</td>
<td>-</td>
<td>12,043</td>
<td>-</td>
</tr>
<tr>
<td>Davao del Sur</td>
<td>-</td>
<td>25,812</td>
<td>-</td>
</tr>
<tr>
<td>Compostela Valley</td>
<td>-</td>
<td>21,046</td>
<td>-</td>
</tr>
<tr>
<td>Davao City</td>
<td>-</td>
<td>2,466</td>
<td>-</td>
</tr>
</tbody>
</table>

The percent area mechanized was derived by dividing the actual area mechanized thru survey validation in the different provinces of Davao Region to the total area harvested from Philippine Statistics Authority CY 2015.
### Percent Utilization of Farm Mechanization

<table>
<thead>
<tr>
<th>Farm Operation</th>
<th>Total Horsepower Delivered (hp)</th>
<th>Total Horsepower Utilized (hp)</th>
<th>Percent Utilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Postharvest</td>
<td>789</td>
<td>756.5</td>
<td>96%</td>
</tr>
<tr>
<td>Land Preparation</td>
<td>784</td>
<td>700</td>
<td>89%</td>
</tr>
<tr>
<td>Crop Care and Maintenance</td>
<td>401.5</td>
<td>377.5</td>
<td>94%</td>
</tr>
<tr>
<td>Harvesting</td>
<td>312</td>
<td>312</td>
<td>100%</td>
</tr>
<tr>
<td>Planting</td>
<td>9.6</td>
<td>9.6</td>
<td>100%</td>
</tr>
</tbody>
</table>

The most utilized farm operation was **Harvesting** and **Planting** yet the **Land Preparation** showed the lowest farm utilization among other major operations.
## Level of Mechanization

<table>
<thead>
<tr>
<th>Provinces</th>
<th>Total Horsepower</th>
<th>Total Area Harvested (2015, has)</th>
<th>Level of Mechanization (hp/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Davao del Norte</td>
<td>2,155.6</td>
<td>26,250</td>
<td>.0822</td>
</tr>
<tr>
<td>• Postharvest</td>
<td>756.5</td>
<td>26,250</td>
<td>.0288</td>
</tr>
<tr>
<td>• Land Preparation</td>
<td>700</td>
<td>26,250</td>
<td>.0267</td>
</tr>
<tr>
<td>• Crop Care and</td>
<td>377.5</td>
<td>26,250</td>
<td>.0144</td>
</tr>
<tr>
<td>Maintenance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Harvesting</td>
<td>312</td>
<td>26,250</td>
<td>.0119</td>
</tr>
<tr>
<td>• Planting</td>
<td>9.6</td>
<td>26,250</td>
<td>.0004</td>
</tr>
</tbody>
</table>

The highest mechanized farm operation was **Postharvest** with a level of mechanization of 0.288 hp/ha in the province of Davao del Norte; hence, **Planting** was the lowest level of mechanization with 0.0004 hp/ha.
SURVEY, VALIDATION AND CONSULTATION
THANK YOU

DEPARTMENT OF AGRICULTURE RFO XI
RESEARCH DIVISION
Regional Agricultural Engineering Research Section
RICE VALUE CHAIN ANALYSIS IN WESTERN VISAYAS

A Joint Research Project of
West Visayas State University – College of Agriculture and Forestry
and the Department of Agriculture, RFU 6

Researchers:
Dr. Eleodoro L. Alicante
Dr. Joel A. Araquil
Dr. Greta G. Gabinete
Dr. Jelly A. Brillion
Mrs. Ma. Anne S. Oren
Western Visayas is 3rd in the National Production for Palay (PSA, 2016)

Palay is one of the major agricultural crops in the region (DA, 2016)

Many rice farmers are economically below poverty level despite of government support.

Thus, there was a need to study about rice value chain analysis.
Significance of the Study

- Provided vital information to government agencies (DA, NIA, LGU’S, Academe, others)
- Basis for further study of other researchers

Objectives

1. Describe the socio-economic profile of rice farmers & traders
2. Evaluate the production practices
3. Determine the profitability of rice production and trading
4. Assess the value added in the various stakeholders
5. Characterize the marketing channel in rice
Methodology

- Respondents
- Data Collection Procedure
- Cost and Return Analysis
- Value Chain Analysis
TOP RICE PRODUCING MUNICIPALITIES PER PROVINCE IN WV (DA, 2014)

- Ibajay
- New Washington
- Kalibo
- Culasi
- Hamtic
- Sibalom
- Buanavista
- San Lorenzo
- Nueva Valencia
- Passi
- Pototan
- Dumalag
- Dumarao
- Jamindan
- Dumangas
- Bago
- Pulupandan
- Valladolid
- Cagayan de Oro
- New Washington
- Kalibo
- Culasi
- Hamtic
- Sibalom
- Buanavista
- San Lorenzo
- Nueva Valencia
- Passi
- Pototan
- Dumalag
- Dumarao
- Jamindan
- Dumangas
- Bago
- Pulupandan
- Valladolid
- Cagayan de Oro
# Results and Discussion

## SOCIO-ECONOMIC PROFILE

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>FARMER</th>
<th>TRADER</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVE. AGE (YRS. OLD)</td>
<td>54.4</td>
<td>51.3</td>
</tr>
<tr>
<td>CIVIL STATUS</td>
<td>89.2% were married</td>
<td>More than 90% were married</td>
</tr>
<tr>
<td>AVE. NUMBER OF CHILDREN</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>EDUC. ATTAINMENT</td>
<td>47.8% have reached high school level</td>
<td>79.6% have reached college level</td>
</tr>
<tr>
<td>PRIMARY OCCUPATION</td>
<td>93.1% full time farmer</td>
<td>70.4% full time rice traders</td>
</tr>
</tbody>
</table>
Results and Discussion
Farm Profile and Farming Practices

- The average farm size in WV was 1.35 has.
- 59.6% of the farms in the region were irrigated.
- 54.5% used hand tractor while 45.5% used carabao in land preparation.
- 39.5% practiced direct seeding while 60.5% practiced transplanting
- All farmers used commercial fertilizer and chemicals
- All farmers practiced manual harvesting method
Results and Discussion
Farming Practices

- 88.8% used mechanical thresher
- Majority of farmers practiced two cropping per year
- Average yield/ha. 3.036 MT (1st crop.) & 2.767 MT (2nd crop.)
- 52.4% of palay produced was sold after harvest while the remaining palay was kept for household consumption
- Generally palay sold was picked up at farmers place

### Marketing Information

<table>
<thead>
<tr>
<th></th>
<th>Wet</th>
<th>Dry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ave. Price of Palay (Pesos)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Cropping</td>
<td>12.96</td>
<td>15.34</td>
</tr>
<tr>
<td>2nd Cropping</td>
<td>13.08</td>
<td>15.86</td>
</tr>
</tbody>
</table>

| Ave. Transport Cost (Farm Gate to Market) | ₱11.62/cav. |
## Results and Discussion

### Profitability

#### Farmer

<table>
<thead>
<tr>
<th>First Cropping</th>
<th>Pesos</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Income</td>
<td></td>
</tr>
<tr>
<td>Value of Palay</td>
<td>46,464</td>
</tr>
<tr>
<td>B. Expenses</td>
<td></td>
</tr>
<tr>
<td>1. Labor</td>
<td>14,034</td>
</tr>
<tr>
<td>2. Farm Inputs</td>
<td>10,807</td>
</tr>
<tr>
<td>Total</td>
<td>24,841</td>
</tr>
<tr>
<td>C. Net Income</td>
<td>21,623</td>
</tr>
<tr>
<td>D. ROI</td>
<td>87.0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Second Cropping</th>
<th>Pesos</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Income</td>
<td></td>
</tr>
<tr>
<td>Value of Palay</td>
<td>42,795</td>
</tr>
<tr>
<td>B. Expenses</td>
<td></td>
</tr>
<tr>
<td>1. Labor</td>
<td>12,313</td>
</tr>
<tr>
<td>2. Farm Inputs</td>
<td>11,412</td>
</tr>
<tr>
<td>Total</td>
<td>23,725</td>
</tr>
<tr>
<td>C. Net Income</td>
<td>19,070</td>
</tr>
<tr>
<td>D. ROI</td>
<td>80.4%</td>
</tr>
</tbody>
</table>

#### Trader

<table>
<thead>
<tr>
<th>First Cropping</th>
<th>Pesos</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Income</td>
<td></td>
</tr>
<tr>
<td>Value of Rice</td>
<td>950.93</td>
</tr>
<tr>
<td>B. Expenses</td>
<td></td>
</tr>
<tr>
<td>1. Value of 1 cav.</td>
<td>674.96</td>
</tr>
<tr>
<td>2. Drying, Milling, Transport</td>
<td>104.32</td>
</tr>
<tr>
<td>Total</td>
<td>779.2</td>
</tr>
<tr>
<td>C. Net Income</td>
<td>171.65</td>
</tr>
<tr>
<td>D. ROI</td>
<td>22.0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Second Cropping</th>
<th>Pesos</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Income</td>
<td></td>
</tr>
<tr>
<td>Value of Rice</td>
<td>982.87</td>
</tr>
<tr>
<td>B. Expenses</td>
<td></td>
</tr>
<tr>
<td>1. Value of 1 cav.</td>
<td>685.30</td>
</tr>
<tr>
<td>2. Drying, Milling, Transport</td>
<td>104.32</td>
</tr>
<tr>
<td>Total</td>
<td>789.62</td>
</tr>
<tr>
<td>C. Net Income</td>
<td>193.25</td>
</tr>
<tr>
<td>D. ROI</td>
<td>24.5%</td>
</tr>
</tbody>
</table>
## Results and Discussion

### Income Share of Farmer and Trader in a Cavan of Palay (1\textsuperscript{st} Cropping)

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Income Share as % of Combined Net Income</th>
<th>Percent Share of Total Expenses</th>
<th>Expense/Kg Palay</th>
<th>Net Income/Peso Expense</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmer</td>
<td>63.2</td>
<td>77.9</td>
<td>8.38</td>
<td>0.78</td>
</tr>
<tr>
<td>Trader</td>
<td>36.8</td>
<td>22.1</td>
<td>2.37</td>
<td>1.61</td>
</tr>
</tbody>
</table>

### Income Share of Farmer and Trader in a Cavan of Palay (2\textsuperscript{nd} Cropping)

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Income Share as % of Combined Net Income</th>
<th>Percent Share of Total Expenses</th>
<th>Expenses/Kg Palay</th>
<th>Net Income/Peso Expense</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmer</td>
<td>61.10</td>
<td>77.90</td>
<td>8.36</td>
<td>0.82</td>
</tr>
<tr>
<td>Trader</td>
<td>38.90</td>
<td>22.10</td>
<td>2.37</td>
<td>1.85</td>
</tr>
</tbody>
</table>
Results and Discussion

VALUE ADDED BY TRADERS/MILLERS AFTER SALE OF PALAY BY FARMERS

First Cropping

Second Cropping
RESULTS AND DISCUSSION

RICE MARKETING CHANNEL IN WESTERN VISAYAS

- National Food Authority
- Importer/Exporter
- Wholesaler/Miller
- Cooperative
- Farmer/Producer/
- Clean Rice Retailer
- Small Scale Buyers/Middlemen
- Consumer
- Small Rice Mill
Rice farmers and traders in WV were relatively old.

Many of them were educated at least in the secondary level.

The average farm size was generally smaller with 1.35 has.

All farmers were using commercial fertilizer and chemicals.

More than 50% of palay produced was sold after harvest.

Transport cost from farm gate to market was quite high.

Rice farming in WV was considerably profitable.

Traders enjoyed a better income than farmers.

Rice trading in WV involved various key players.
Economic Efficiency of Rice Farmers in Asia and the Philippines

29th National Rice R&D Conference
September 8, 2016
OBJECTIVES

This aims to present:

- Economic Efficiency
- Yield
- Cost/kg

Determinants

Levels

Variation

Determinants

Determinants

Determinants
BACKGROUND

Farell (1957)

Economic efficiency

Technical efficiency (TE)

Allocative efficiency (AE)
1. Benchmarking the Philippine Rice Economy Relative to Major Rice-producing Countries in Asia, 2013

China (Zhejiang)
Thailand (Suphan Buri)
Vietnam (Can Tho)
India (Tamil Nadu)
Indonesia (West Java)
Philippines (Nueva Ecija)

Intensively cultivated and irrigated areas
2. Rice-Based Farm Households Survey (RBFHS), 2011-2012

33 major rice-producing provinces
2,500 rice farmers; 2 cropping seasons
July-Dec 2011 Harvest (wet season)
Jan-Jun 2012 Harvest (dry season)
ANALYTICAL PROCEDURES

1. Cobb-Douglas stochastic frontier production and cost function
2. Estimation of technical and allocative efficiency
3. Yield response function
4. Unit cost response function
5. Regression for efficiency determinants
Part I: TECHNICAL EFFICIENCY (TE)

...what is technical?
Technical efficiency – the ability of farmer to obtain maximum production using their chosen combination of inputs.

\[ \text{PRODUCTION} = \text{? kg. of N-P-K} + \text{? kg. seeding rate} + \text{? kg. Pesticide} + \text{? Hectare farm} + \text{? Seed class} + \text{? Water source} + \text{? Machine} \]
Technical efficiency – the ability of farmer to obtain maximum production using their chosen combination of inputs.

\[ \text{TE} = \frac{\text{Observed output}}{\text{Maximum possible output}} \]
Production = \( f(Farm\ Inputs) \exp(v - u) \)

- Seeds (kg)
- N-P-K (kg)
- Herbicide AI (kg)
- Insecticide AI (kg)
- Labor (md)
- Machine (day)
- Area (ha)

+ Seed class, Water source, Season
Frontier Production Function

Production = \( f(\text{Farm Inputs}) \exp(v - u) \)

\( v \) = represents the symmetric random error component

\( u \) = inefficiency \( \Rightarrow \) \( \text{TE} = \exp(-u) \)

Data limitation: Factors like climate, rainfall, and other environment factors were not included.
Technical efficiency estimates across selected Asian countries

- Philippines: 75.4%
- Indonesia: 75.7%
- India: 76.1%
- Thailand: 77.0%
- China: 77.5%
- Vietnam: 77.9%

Yield (t/ha):
- Philippines: 4.8
- Indonesia: 5.8
- India: 4.5
- Thailand: 5.2
- China: 6.8
- Vietnam: 6.9

Benchmarking the Philippine Rice Economy Relative to Major Rice-producing Countries in Asia 2013
Technical efficiency across rice-producing provinces

Highest TE:
1. Zamboanga Sibugay (82%)
2. Compostela Valley (81%)
3. Davao del Norte (81%)

Rice-Based Farm Households Survey (2011-2012)
Technical efficiency across rice-producing provinces

Lowest TE:
1. Aurora (66%)
2. Bohol (66%)
3. Maguindanao (68%)

Rice-Based Farm Households Survey (2011-2012)
...how TE and farm inputs affect the yield?
More than 70% of the variation in the composite error term is attributed to the technical inefficiency component.

Rice yield could be improved by increasing the technical efficiency of farmers.
Effect of TE and farm inputs to yield

Yield (kg/ha) =

Higher if farmer is using high quality seeds (e.g. hybrid, RS/CS)

Higher if farmer has source of irrigation (e.g. NIS/CIS, SSIS, natural source)

Higher during dry season than wet season
...what are the factors affecting TE?
Factors affecting TE

Technical Efficiency

(+) Membership in any rice-based farm organization

(+ ) Education
...what is allocative?
Agriculture in the Philippines

- Area
- Seeds
- Seeding rate
- Pesticide
- Machine
- Water source
- N-P-K
- Other inputs

Costs:

- ₱
- ₱
- ₱
- ₱
- ₱
- ₱

https://en.wikipedia.org/wiki/Agriculture_in_the_Philippines
Allocative efficiency – the ability of the farmer to choose the least-cost but technically efficient combination of inputs given the input prices.

\[ \text{COST/ KG} = \text{YIELD} + \text{SEEDS/kg.} + \text{WATER/kg.} + \text{MACHINE/hec.} + \text{PESTICIDE/kg.} \]
Allocative efficiency – the ability of the farmer to choose the least-cost but technically efficient combination of inputs given the input prices.

\[ AE = \frac{\text{Predicted minimum cost}}{\text{Observed cost}} \]
Cost = $f(\text{Input Prices, Production}) \exp(v - u)$

- Seeds (P/kg)
- N-P-K (P/kg)
- Herbicide AI (P/kg)
- Insecticide AI (P/kg)
- Labor (P/md)
- Machine (P/day)
- Land rent (P/ha)
- Production (kg)

$+$

Seed class, Water source, Season
Cost = f (Input Prices, Production) \exp(v - u)

v = represents the symmetric random error component

u = inefficiency  \Rightarrow AE = 1/\exp(u)

Data limitation: Factors like climate, rainfall, and other environment factors were not included.
KEY RESULTS
Allocative efficiency estimates across selected Asian countries

<table>
<thead>
<tr>
<th>Country</th>
<th>AE (%)</th>
<th>Cost (P/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>80.96%</td>
<td>8.26</td>
</tr>
<tr>
<td>Philippines</td>
<td>81.79%</td>
<td>10.81</td>
</tr>
<tr>
<td>Indonesia</td>
<td>82.01%</td>
<td>13.26</td>
</tr>
<tr>
<td>Thailand</td>
<td>82.03%</td>
<td>8.73</td>
</tr>
<tr>
<td>China</td>
<td>82.06%</td>
<td>13.62</td>
</tr>
<tr>
<td>Vietnam</td>
<td>82.43%</td>
<td>6.07</td>
</tr>
</tbody>
</table>

Benchmarking the Philippine Rice Economy Relative to Major Rice-producing Countries in Asia 2013
Allocative efficiency across rice-producing provinces

Highest AE:
1. Zamboanga del Sur (89%)
2. Ilocos Norte (87%)
3. Albay (85%)
   Compostela Valley (85%)

Rice-Based Farm Households Survey (2011-2012)
Allocative efficiency across rice-producing provinces

Lowest AE:
1. Nueva Ecija (76.9%)
2. Aurora (77.3%)
3. Bukidnon (78.3%)

Rice-Based Farm Households Survey (2011-2012)
...how AE, input prices and production affect the cost/kg?
More than **50%** of the variation in the composite error term is attributed to the cost inefficiency component.

Cost/kg could be reduced by increasing the allocative efficiency of farmers.
Effect of AE, input prices and production to the cost/kg

Cost (Php/kg) =

- Decreases as yield increases
- Lower if high quality seeds are used (hybrid, RS, CS)
- Decreases with the adoption of machine
...what are the factors affecting AE?
Factors affecting AE

Allocative Efficiency

(+) Membership in any rice-based farm organization

(-) Tenurial status
Economic efficiency of rice farmers significantly contributes to the attainment of an improved yield and reduced cost of production.
✓ Farm organization can be an avenue to extend support for farmers, and make them more technically and allocatively efficient.

✓ Farmers’ education has significant positive contribution to a higher allocative efficiency.
Yield-enhancing strategies are adoption of high quality seeds, access to irrigation, and **improved technical efficiency**.

Cost-reducing strategies are adoption of high quality seeds, machine-use, increased yield, and **improved allocative efficiency**.
Thank you.
| Variable                | Coefficient | Robust SE | z     | P>|z| |
|-------------------------|-------------|-----------|-------|-----|
| Constant                | 6.809       | 0.110     | 62.13 | 0.000 |
| Seed                    | 0.072       | 0.012     | 5.89  | 0.000 |
| N                       | 0.085       | 0.010     | 8.46  | 0.000 |
| P                       | 0.018       | 0.008     | 2.34  | 0.020 |
| K                       | -0.002      | 0.007     | -0.3  | 0.764 |
| Herbicide Al            | 0.020       | 0.004     | 4.54  | 0.000 |
| Insecticide Al          | 0.033       | 0.004     | 7.99  | 0.000 |
| Area                    | 0.576       | 0.022     | 25.64 | 0.000 |
| Labor                   | 0.186       | 0.018     | 10.49 | 0.000 |
| Machine                 | 0.013       | 0.007     | 1.89  | 0.058 |
| d_NISCIS                | 0.214       | 0.016     | 13.12 | 0.000 |
| d_SSISnat               | 0.114       | 0.017     | 6.67  | 0.000 |
| d_Hybrid                | 0.382       | 0.031     | 12.48 | 0.000 |
| d_RSCS                  | 0.124       | 0.012     | 10.59 | 0.000 |
| d_Season                | 0.077       | 0.010     | 7.54  | 0.000 |
| /lnsig2v                | -2.994      | 0.057     | -52.8 | 0.000 |
| /lnsig2u                | -2.135      | 0.059     | -36.14| 0.000 |
| sigma_v                 | 0.224       | 0.006     |       |     |
| sigma_u                 | 0.344       | 0.010     |       |     |
| sigma2                  | 0.168       | 0.006     |       |     |
| lambda                  | 1.536       | 0.014     |       |     |

Frontier Production Function Estimates
| Cost          | Coefficient | Robust SE | z     | P>|z| |
|---------------|-------------|-----------|-------|-----|
| Constant      | 2.222       | 0.125     | 17.78 | 0.000 |
| Seed          | 0.117       | 0.015     | 7.84  | 0.000 |
| N             | 0.031       | 0.009     | 3.42  | 0.001 |
| P             | -0.011      | 0.007     | -1.63 | 0.102 |
| K             | 0.012       | 0.008     | 1.44  | 0.150 |
| Herbicide AI  | 0.014       | 0.003     | 4.44  | 0.000 |
| Insecticide AI| -0.005      | 0.004     | -1.22 | 0.221 |
| Land rent     | 0.087       | 0.008     | 10.95 | 0.000 |
| Labor         | 0.024       | 0.012     | 2.06  | 0.040 |
| Machine       | -0.018      | 0.004     | -4.47 | 0.000 |
| Production    | 0.835       | 0.006     | 130.42| 0.000 |
| d_NISCIS      | -0.012      | 0.011     | -1.13 | 0.258 |
| d_SSISnat     | -0.014      | 0.012     | -1.18 | 0.239 |
| d_Hybrid      | -0.327      | 0.043     | -7.70 | 0.000 |
| d_RSCS        | -0.023      | 0.010     | -2.23 | 0.026 |
| d_Season      | -0.031      | 0.008     | -3.86 | 0.000 |
| /lnsig2v      | -3.246      | 0.057     | -57.42| 0.000 |
| /lnsig2u      | -3.087      | 0.077     | -40.16| 0.000 |
| sigma_v       | 0.197       | 0.006     |       |      |
| sigma_u       | 0.214       | 0.008     |       |      |
| sigma2        | 0.085       | 0.003     |       |      |
| lambda        | 1.083       | 0.012     |       |      |