Outline

- Background
- Steps of Area Frame Implementation
- Area Frame Construction
- Field Survey
- Data Communication and Data Analysis
- Results Presentation
- Conclusion
- Further Development
The existing rice area estimate is based on reporting system and assimilated from sub-district to central level that subjects to bias results and take a long time.

There is a will of government (President Office for Development Control, MoA, and CBS) to improve the existing method of rice statistics in respect to accuracy and timeline.

We have experience on developing area frame sampling approach for rice area estimate.

Rapid development of remote sensing, GIS, and communication system encourage to develop ‘sampling frame of square segment by points’.

I believe that this method is an appropriate approach for Indonesian agricultural statistics.

**Area Frame Sampling Experience in Indonesia**

1998-2002:
- Segment size: 100 Ha
- Survey method: Land cover delineation on segment area
- Data delivery: postal services
- Data analysis: GIS processing
- Implementation time: 4 weeks

2005-2007:
- Segment size: 25 Ha
- Survey method: Land cover delineation on segment area
- Data delivery: postal services
- Data analysis: GIS processing
- Implementation time: 3 weeks

2008-2012:
- Segment size: 25 Ha
- Survey method: land cover observation on sample point
- Data delivery: SMS gateway
- Data analysis: numerical calculation
- Implementation time: 1 week
Steps of Area Frame Implementation

Area Frame Construction
• Stratification of AoI
• Sample size Definition
• Sample segment extraction

Survey Preparation
• Survey equipments (field map, aerial photo/image, GPS, Survey Form)
• Surveyor (training)

Field survey
Observe and record growing stages of rice in each sample point

Field data delivery

Data analysis and results presentation

Area Frame Construction
Stratification of AoI
(West Java and Banten Provinces)

Tool:
• GIS software
• digital landuse map

Strata:
S-1 (bright green): rice field
S-2 (dark green): possible rice field (dry land arable)
S-0 (white): non-agriculture land (forest, plantation)

Extraction of sample segments steps by 'systematic random sampling'
1. Griding AoI by 10 km x 10 km
2. Sub-gridding by 500 m x 500m
3. Random start extraction-1: 2.5 % (10 segments/grid)
4. Replicate the pattern of extracted sample segment to other grids

Definition of Dimension
• Segment size: (500x500) m²
• Sample size: 1 %
RESULT OF SAMPLE SEGMENT EXTRACTION
‘SYSTEMATIC RANDOM SAMPLING’

Next Step: Overlay between strata map and extracted sample segment map

Overlay: Strata Vs Sample Segment

Next step:
• sample segments on S-0 are eliminated
• select 1 % sample segment (4 segments/grid) systematically (no. 1,2,3,4)
• 1 km distance threshold.
Distribution map of extracted sample segments (1 %)  
West Java and Banten Provinces

Cropping based on District administration

• 54 extracted sample segments
• Each extracted segment is divided into small cells (100 m x 100 m size)
• The center of the cell as observation point
• In order to know sub-district and village location, the selected sample segments are plotted on thematic map
• Each segment is equipped by aerial photo or satellite image to make easier looking for segment and observation point
• Field survey time window is 2-month
SEGMENT PLOT ON THE THEMATIC MAP

How to make segment ID on data base
• Each segment has bottom-left geographical coordinate
• Segment number
  32: Province Code
  17: District Code
  741: Grid number
  02: sequence of randomization

How to look for segment location in the field
• Identify sub-district and village
• Identify an efficient road to go
• Identify other physical feature on the map

SEGMENT PLOT ON THE IMAGE

How to reach observation point
• Identify physical feature on the image (road, settlement, rice field, irrigation canal, dyke, etc)
• Define from where to start field survey
• Define observation point location

Note:
Image guidance is easier to find location in the field compared GPS guidance
Field Survey

Objective
To derive the existing rice growing stages on the observation point

Activities
- Define observation point location
- Observe and record rice growing stages on the survey form
- Recapitulate the number of growing stages
- Fill in SMS form based on the recapitulation result
- Send the field data by HP

Visualization of rice growing stages
Structure of SMS Communication System
Estimator of extrapolation

Sample to population

\[ \bar{P}_j = \frac{1}{n_j} \sum_{i=1}^{n_j} p_{ij} \]

\[ \delta^2_{\bar{P}_j} = \frac{1}{n_j(n_j - 1)} \sum_{i=1}^{n_j} (p_{ij} - \bar{P}_j)^2 \]

\[ A_j = D_j \bar{P}_j \quad \text{Var}(A_j) = D_j^2 \delta^2_{\bar{P}_j} \]

\[ A = \sum_{j=1}^{m} A_j \]

- \( p_{ij} \): average proportion of rice in segment-\( i \), strata-\( j \)
- \( n_j \): sample size in strata-\( j \)
- \( D_j \): Total area of strata-\( j \)
- \( A_i \): Estimated rice area in strata-\( j \)
- \( A \): Total area of rice in the whole District
- \( j \): number of strata
- \( i \): Sample segment \( i \)-th
- \( \delta \): variance

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Illustration of received field data

Indramayu District, total area: 207.675 Ha
Survey period: 03 September 2012 to 16 September 2012
Total Segment: 54
Received data: 52 data
Area frame: 145.798.00 Ha

### Table: Segmentation of field data

<table>
<thead>
<tr>
<th>No.</th>
<th>Sub-district</th>
<th>Segment</th>
<th>PL</th>
<th>V1</th>
<th>V2</th>
<th>G</th>
<th>P</th>
<th>LL</th>
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</table>

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*Note: Data received on: 207.675 Ha*

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**TOTAL:** 207.675 Ha
Calculating Rice Area

Total observed points: 1,300
Total frame area: 145,750,00 Ha

<table>
<thead>
<tr>
<th>Rice growing stage</th>
<th>Total obs. point</th>
<th>Proportion (%)</th>
<th>Area (Ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Preparation (PL)</td>
<td>17</td>
<td>1,3</td>
<td>1.895</td>
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<tr>
<td>Vegetative-1 (V1)</td>
<td>17</td>
<td>1,3</td>
<td>1.895</td>
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<tr>
<td>Vegetative-2 (V2)</td>
<td>74</td>
<td>5,7</td>
<td>8.308</td>
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<td>Generative (G)</td>
<td>73</td>
<td>5,6</td>
<td>8.162</td>
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<tr>
<td>Harvest (P)</td>
<td>412</td>
<td>31,7</td>
<td>46.203</td>
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<td>Other land cover (LL)</td>
<td>340</td>
<td>26,2</td>
<td>38.187</td>
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<td>Uncultivated rice field (B)</td>
<td>367</td>
<td>28,2</td>
<td>41.102</td>
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<td>Harvest in between 2-survey (H)</td>
<td>33</td>
<td>2,5</td>
<td>3.644</td>
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<tr>
<td>Harvest next 2-month (Prediction)</td>
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<td>16.470</td>
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<td>Harvest next 4-month (Prediction)</td>
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<td>20.260</td>
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</table>

Results Presentation on http://neonet.bppt.go.id/padi
<table>
<thead>
<tr>
<th>Data Uraian</th>
<th>Nilai</th>
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<tbody>
<tr>
<td>Jumlah km²/ha data</td>
<td>52</td>
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<tr>
<td>Jumlah sebagian data</td>
<td>74</td>
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<tr>
<td>Luas kerangka sampel</td>
<td>145,750,00 Ha</td>
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<tr>
<td>Keketupatan :</td>
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<tr>
<td>Luas Panen Lahan (PL)</td>
<td>326,38 Hektar</td>
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<tr>
<td>Luas Padi Vegetatif 1 (V1)</td>
<td>224,23 Hektar</td>
</tr>
<tr>
<td>Luas Padi Vegetatif 2 (V2)</td>
<td>224,23 Hektar</td>
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<table>
<thead>
<tr>
<th>Sistem Estimasi dan Peramalan Produksi Padi</th>
<th>Provisi Jawa Barat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luas Panen Kumulatif Sampai Saat Survey</td>
<td>53,703,27 Hektar</td>
</tr>
<tr>
<td>Peramalan 2 Bulan Kedepan</td>
<td>3,924,04 Hektar</td>
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<tr>
<td>Peramalan 4 Bulan Kedepan</td>
<td>4,408,82 Hektar</td>
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<tr>
<td>Peramalan Produksi 2 Bulan Kedepan</td>
<td>24,457,87 Ton</td>
</tr>
<tr>
<td>Peramalan Produksi 4 Bulan Kedepan</td>
<td>27,063,28 Ton</td>
</tr>
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</table>
Conclusion

• Area frame of square segment by points is a simple approach to implement on rice statistics
• it is a scientifically sound approach based on statistical analysis and unbiased by subjectivity
• Saves time on frame construction and survey works
• By using SMS system for data communication allow to get near real time results
• It is based on low technology and does not need high investment costs
• implementation costs are very low once it has become a routine activity
• With slight adaptations it can be applied to other crops

Success achieved and issues for further research

• Related institutions, i.e. MoA, CBS and UKP4 (Presidential Office for Development Monitoring), give a high attention to support the method for National level implementation
• The pilot project of the method is mainly dedicated for district level, so that is still need an adaptation for up-scale or down-scale level in respect to sample size and segment size
• The method will be improved for not only rice statistics but also secondary food crops statistics
• The integration method between rice area estimate and yield estimate is a further research, where the existing sampling frame of yield estimation based on household frame would be area frame, instead.
Thank You