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Project: Production impacts and direct costs from PD outbreaks (SAV2) in Mid-Norway 2013-2016

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Project: Production impacts and direct costs from PD outbreaks (SAV2) in Mid-Norway 2013-2016



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Study area

Study area: SAV2 endemic area in
Mid-Norway between 2013-2016

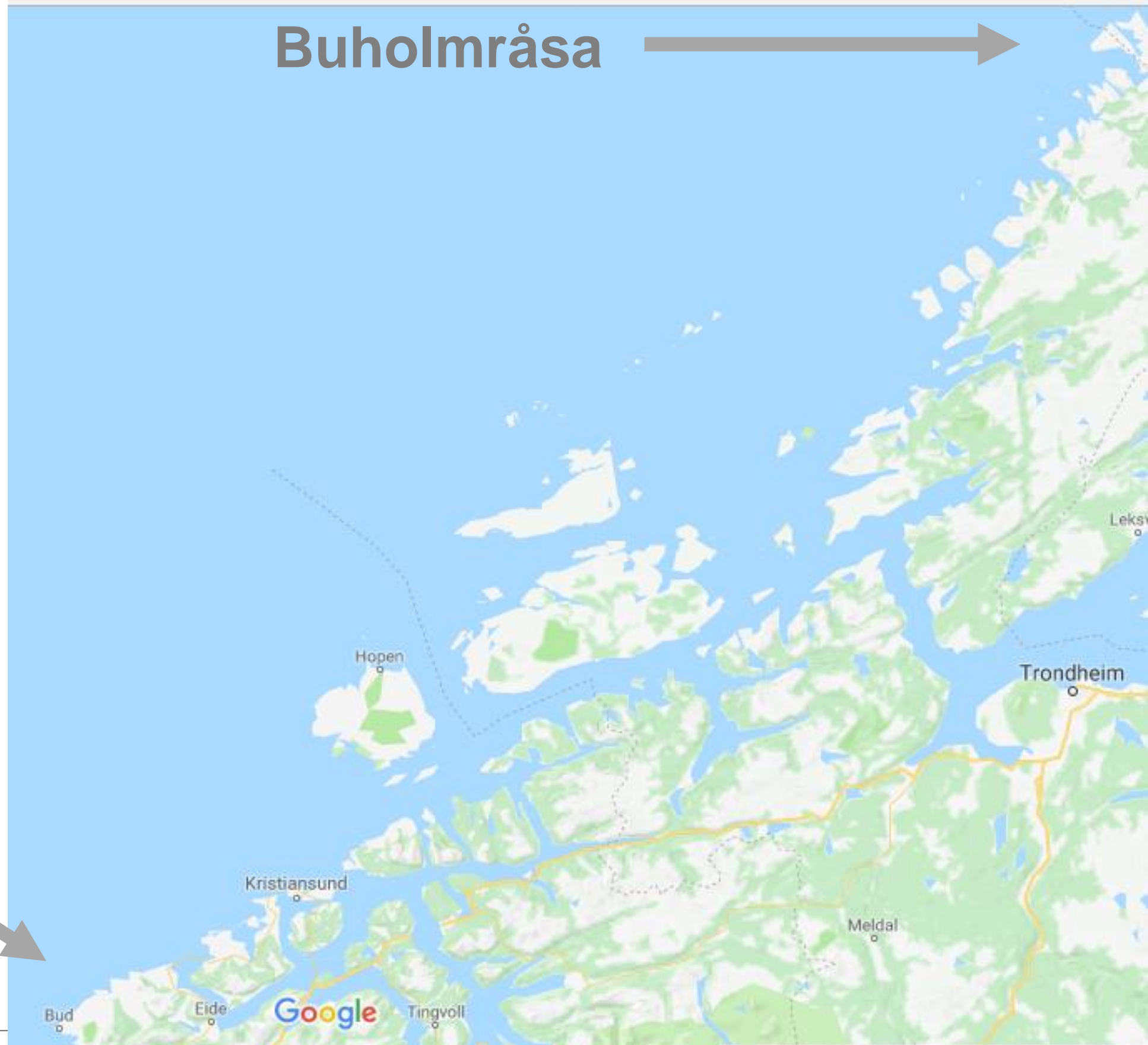
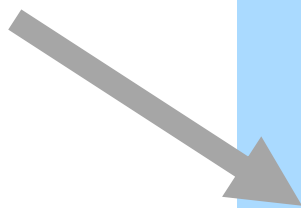


Study area

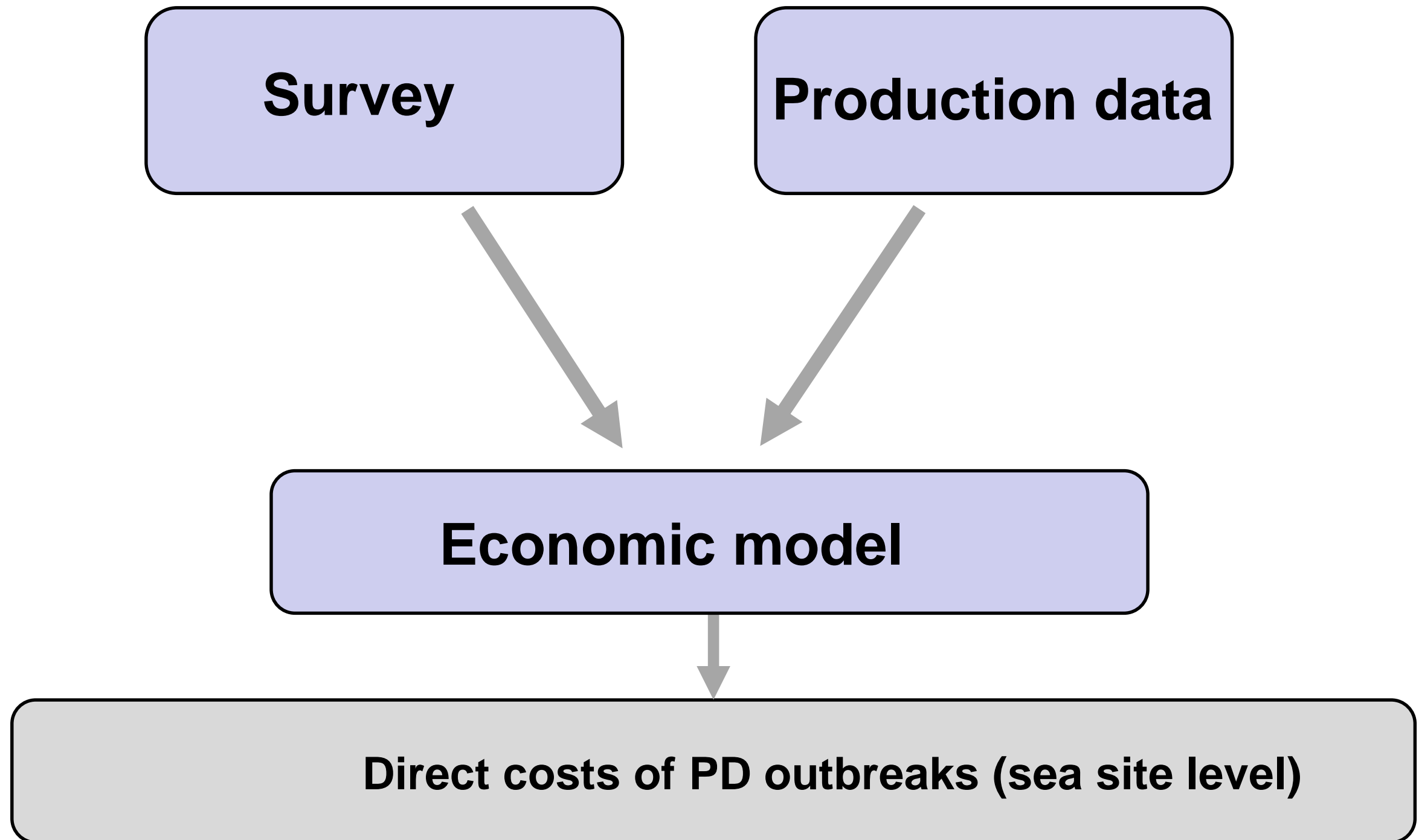
Buholmråsa



Hustadvika



Methods



Methods

Survey

Elicititation:

- Expert survey 4 salmon companies
- Experienced fish health professional and production managers
- PD-specific biological losses:
 - Most likely values (and variation) for mortality, growth reduction, bFCR, carcass downgrading
- PD-specific reclaims, management and preventive measures and associated costs
- Combined by weighted average

Methods

Production data

- 5 salmon companies
- Time series on sea cage level
- Aggregated to cumulative data on sea cage level
- Dataset merged with public PD diagnoses

Statistical analysis:

- Linear mixed regression models on aggregated data
- Outcomes → Growth, bFCR, weekly mortality (%), or downgrading (%)
- Model: Outcome ~ PD + Company + Generation

Methods

Model site to represent a typical salmon sea site in study area during 2013-16:

- 1 000 000 smolts
- bFCR 1.10
- Harvest weight 5.0 kg roundweight
- Sales prices: mean weekly sales prices per weight class (Akvaakta)
- Baseline production parameters and costs (dataset, experts, public and company data)

Economic model

Methods

Direct costs of PD outbreak:

- 2 scenarios: Production cycle with and without PD
- Partial budgeting
- Direct costs of PD = Biological losses + Preventive costs + Treatment costs + Additional costs
(Bennett 2003; Aunsmo 2010; Pettersen 2015)

Economic model



Results

Results: Production data

- 99 cohorts (81 PD+)
- 705 sea cages
- 72 sea sites
- Insufficient data on reclaims, sea lice treatments, disease diagnosis

~ 2/3 off all cohorts in study area over the study period

Results: Costs PD

Stochastic simulations of Direct costs (NOK)

PD outbreak model site based on expert survey data including variation in PD-specific effects

Direct costs (<3kg) for PD at 2 kg (roundweight)

| | Mean | 5 percentile | 95 percentile |
|--------------------------|-------------------|--------------|---------------|
| Biological losses | 11 915 756 | 5 493 600 | 18 913 923 |
| Additional costs | 587 499 | 5 822 | 1 157 013 |
| Preventive costs | 561 782 | 255 316 | 884 352 |
| Treatment costs | 0 | 0 | 0 |
| Sum | 13 065 037 | 7 079 686 | 19 573 517 |

Direct costs (>3kg) for PD at 4 kg (roundweight)

| | Mean | 5 percentile | 95 percentile |
|--------------------------|-------------------|--------------|---------------|
| Biological losses | 15 909 701 | 8 547 636 | 25 853 105 |
| Additional costs | 437 144 | (139 079) | 1 011 357 |
| Preventive costs | 561 780 | 257 271 | 886 166 |
| Treatment costs | 0 | 0 | 0 |
| Sum | 16 908 625 | 9 954 315 | 26 442 873 |

Results: Costs PD

Direct costs (NOK) PD outbreak model site (**combined data**). Deterministic.

Direct costs (<3kg) for PD at 2 kg (roundweight)

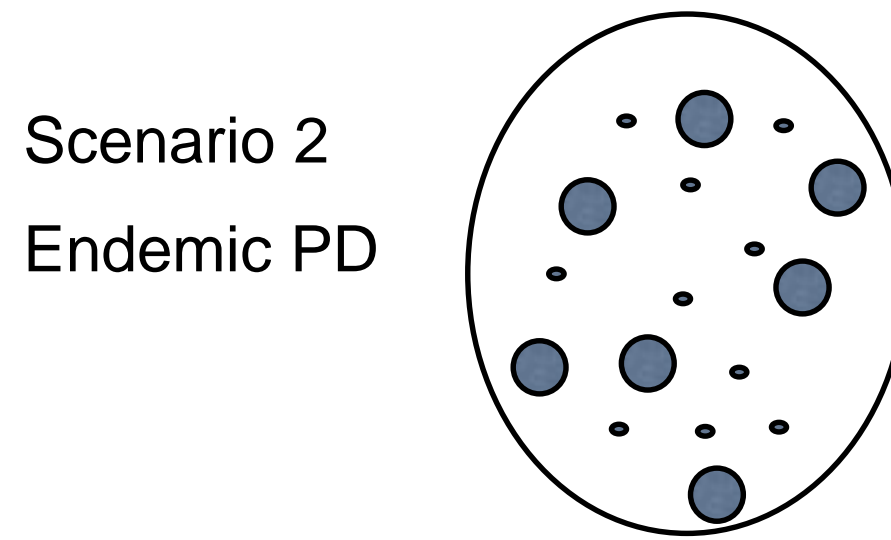
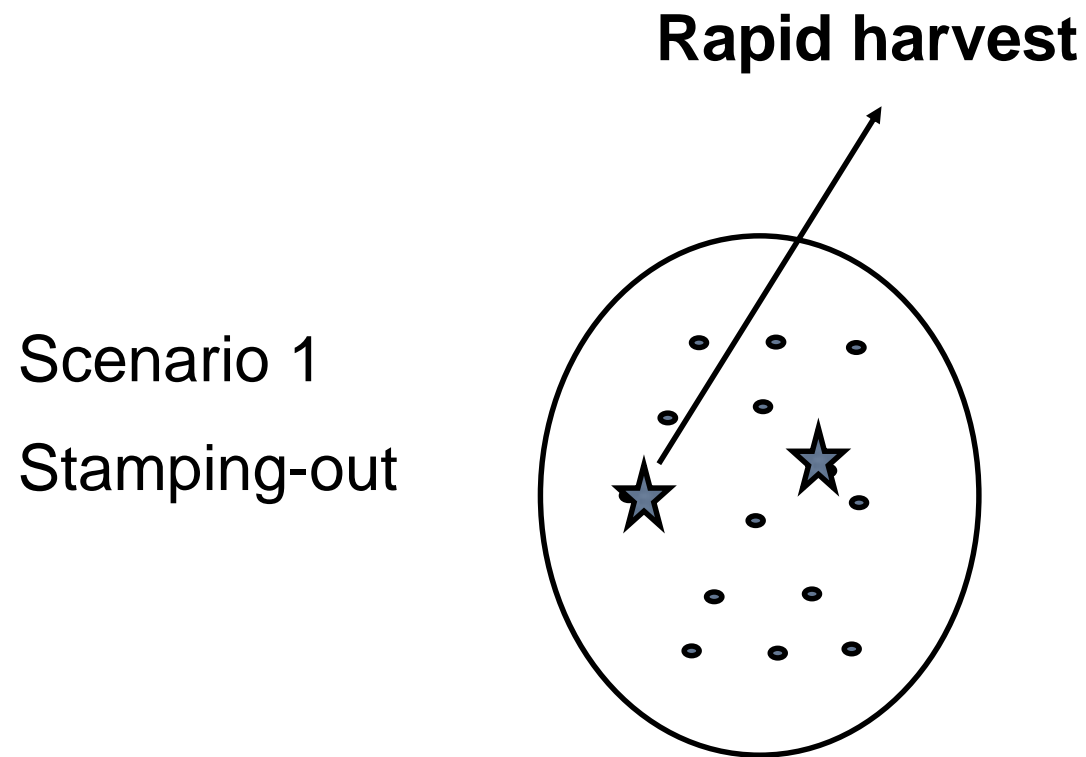
| | Mean |
|-------------------|------------|
| Biological losses | 12 653 031 |
| Additional costs | 413 827 |
| Preventive costs | 561 783 |
| Treatment costs | 0 |
| Sum | 13 628 640 |

Direct costs (>3kg) for PD at 4 kg (roundweight)

| | Mean |
|-------------------|------------|
| Biological losses | 10 804 304 |
| Additional costs | 640 847 |
| Preventive costs | 561 783 |
| Treatment costs | 0 |
| Sum | 12 006 935 |

Experts consider late outbreaks more severe, which is opposite to the statistical analysis

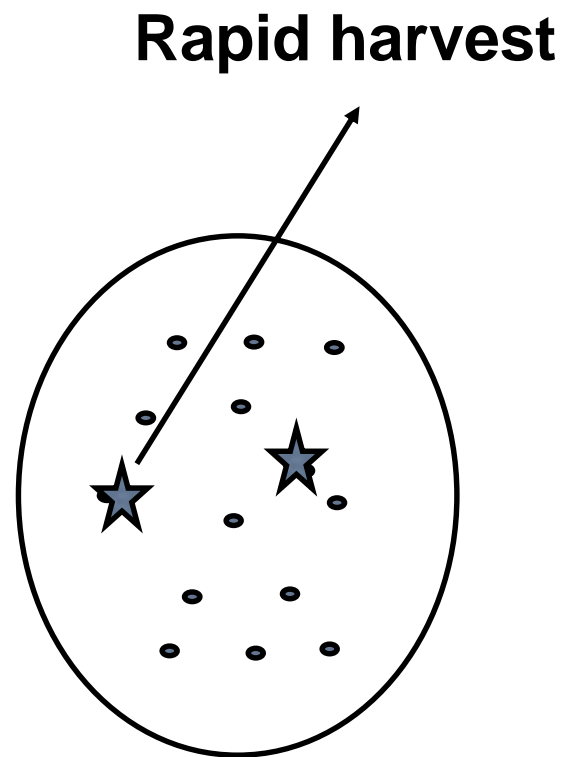
Results: Stamping out vs. endemic PD



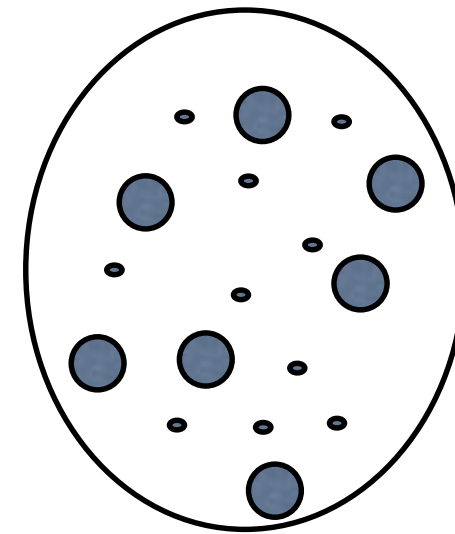
| | Survey | Combined | Proportion (PD) | Source: |
|-------------------------------------|--------|----------|-----------------|---------|
| Break-even (Proportion PD-virus) | 13,7 % | 12,4% | 82% | Dataset |

Results

Scenario 1
Stamping-out



Scenario 2
Endemic PD



Break-even
(Proportion PD-virus)

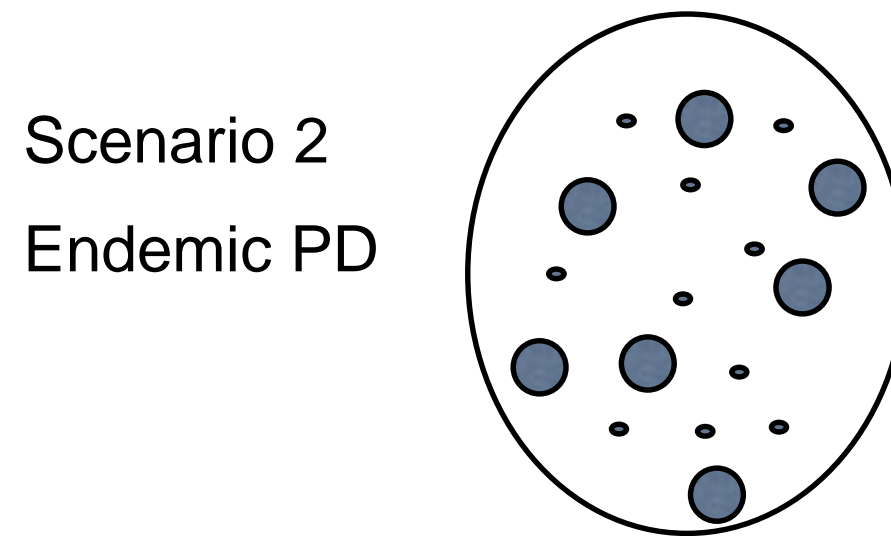
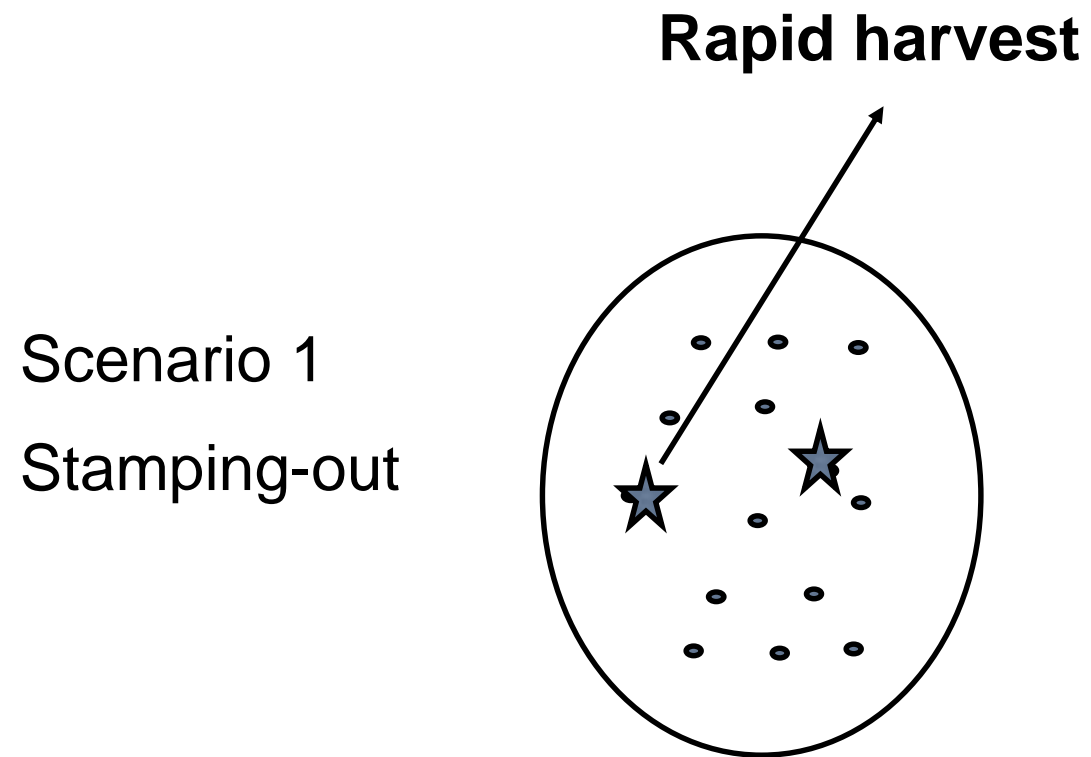
| Survey | Combined |
|--------|----------|
|--------|----------|

| | |
|--------|--------|
| 12,4 % | 11,3 % |
|--------|--------|

| Proportion (PD) | Source: |
|-----------------|---------|
|-----------------|---------|

| | |
|-----|-------------------------------|
| 74% | Public data (Havbruksdata) |
|-----|-------------------------------|

Results



| | Survey | Combined |
|-------------------------------------|--------|----------|
| Break-even (Proportion PD virus) | 10,2% | 9,3% |

| Proportion (PD) | Source: |
|--------------------|----------------------|
| 60% | Sensitivity analysis |

Summary

- Experts consider late PD outbreaks (>3 kg) most severe. Opposite to production data analysis
 - Expert may have considered only full outbreaks, or a snowball effect from early outbreaks?
- Mean direct costs PD: between 12.0 million NOK and 16.9 million NOK
 - ↓ SAV3 (Aunsmo 2010; Pettersen 2015). Supported by Jansen 2014
- Stamping-out break-even at 12-14% PD-virus detection proportion against a PD proportion of 82% in an endemic situation, and 9-10% at PD risk of 60% in endemic scenario.
 - only concerns on-site production impacts



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