SEABASED

SEABASED MEASURES IN
BALTIC SEA NUTRIENT MANAGEMENT

Pilot:
Nutrients from Sea to Field

26.1.2021

What did we do?

- Irrigation of fields with nutrient-rich brackish water from bays with bad ecological status
- Win-win solution
- Summer 2019 and 2020
- Monitoring: bay water, irrigation water, ley (grass), soil, and groundwater

Pilot sites

Kaldersfjärden

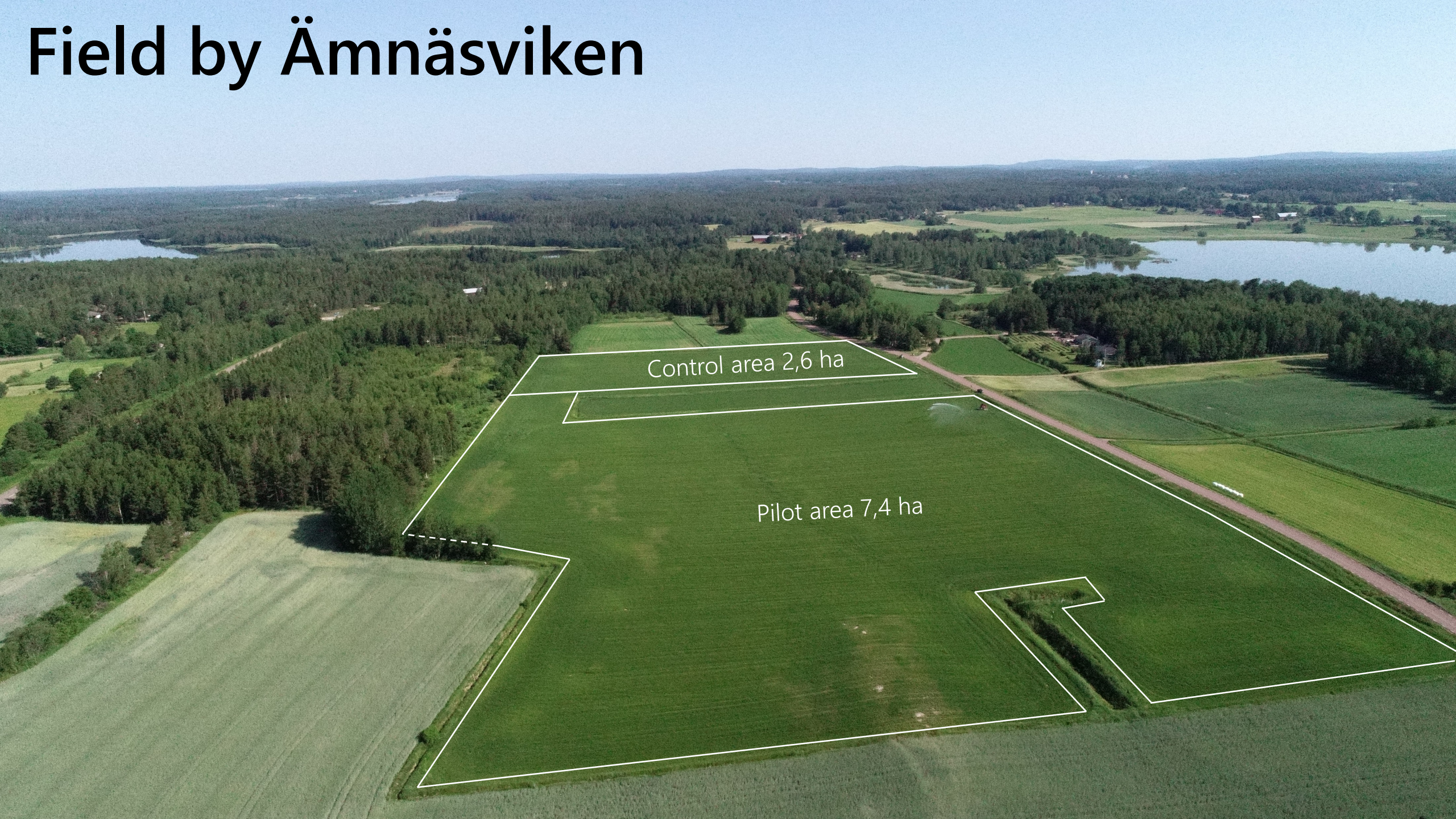
- Max depth 6.3 m
- Stratified
- Organic ley
- No fertilization
- Water inlet at 3,5 m
- Irrigation:
  2019, 4 x 40 mm
  2020, 4 x 40 mm

Ämnäsviken

- Max depth 2.9 m
- Wind-mixed
- Ley
- Artificial fertilizer
- Water inlet at 0,5 m
- Irrigation:
  2019, 2 x 40 mm
  2020, 1 x 35 mm and
  1 x 30 mm

Field by Kaldersfjärden

Field by Ämnäsviken



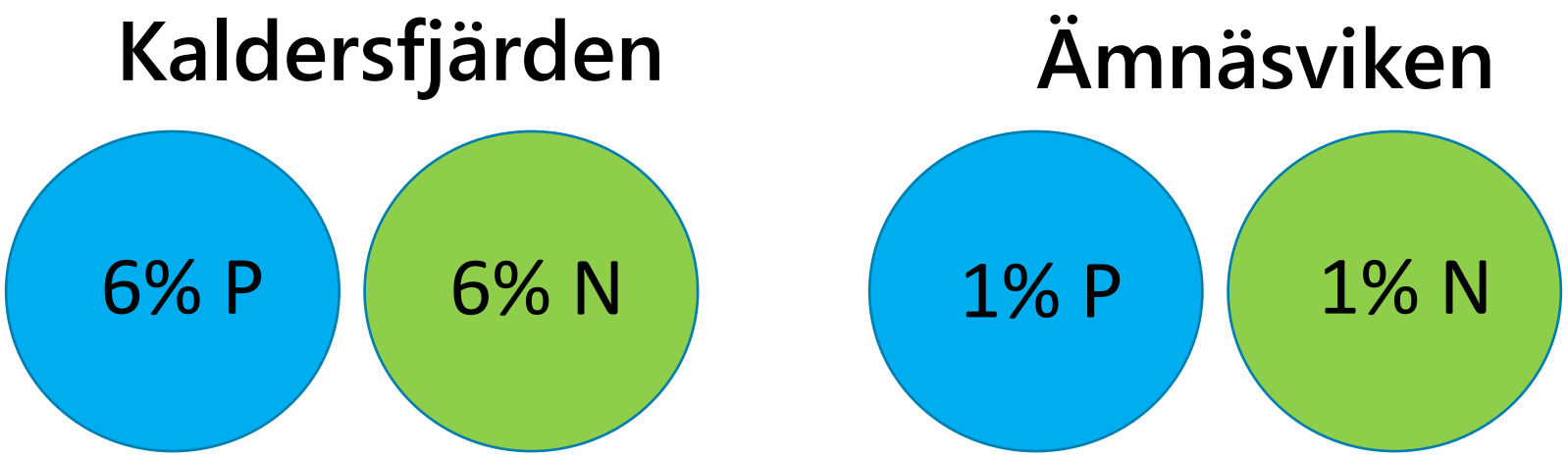
Nutrients from the sea...

3 kg P

31 kg N

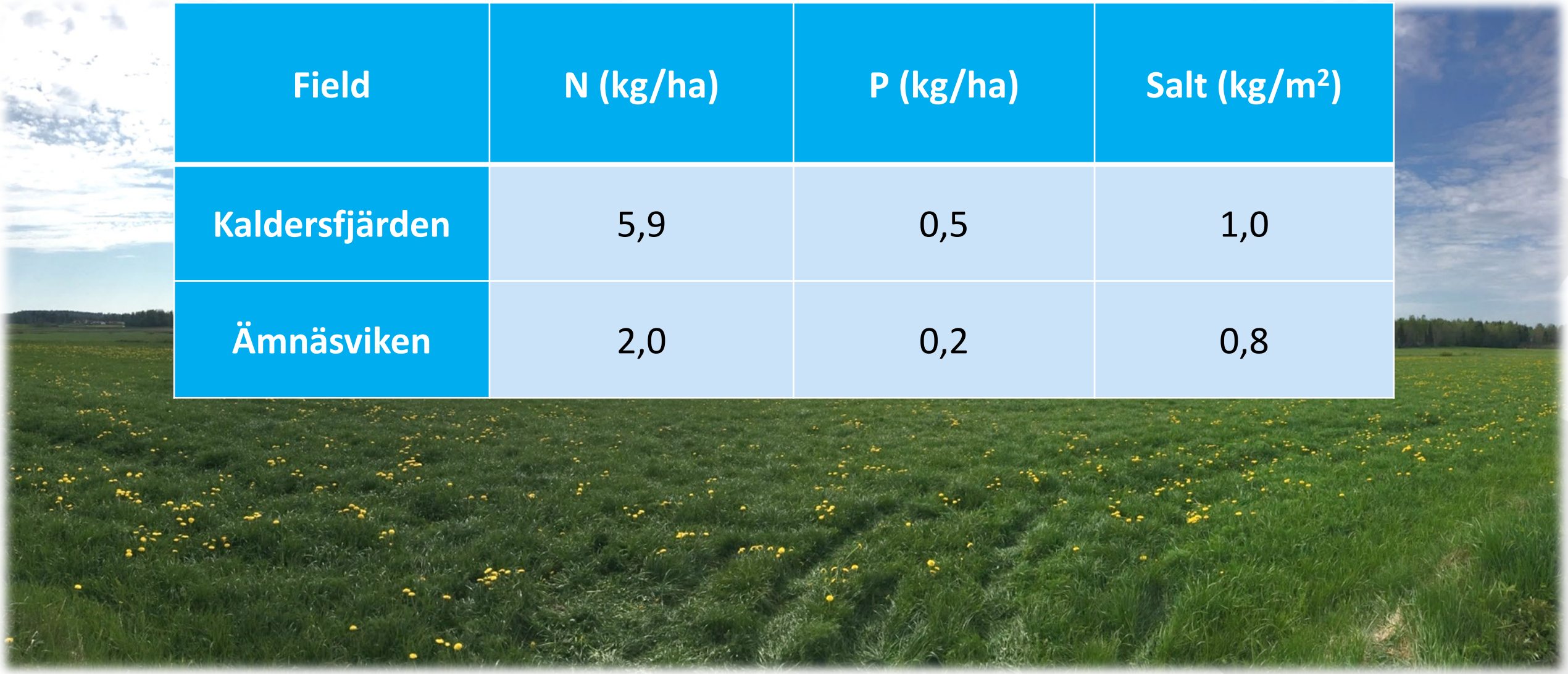
Removal vs. needed removal

- Simplified calculations made with SMHI ”Coastal Zone Model”
- Indication on N and P removal need to achieve ”good ecological status” (WFD goal)

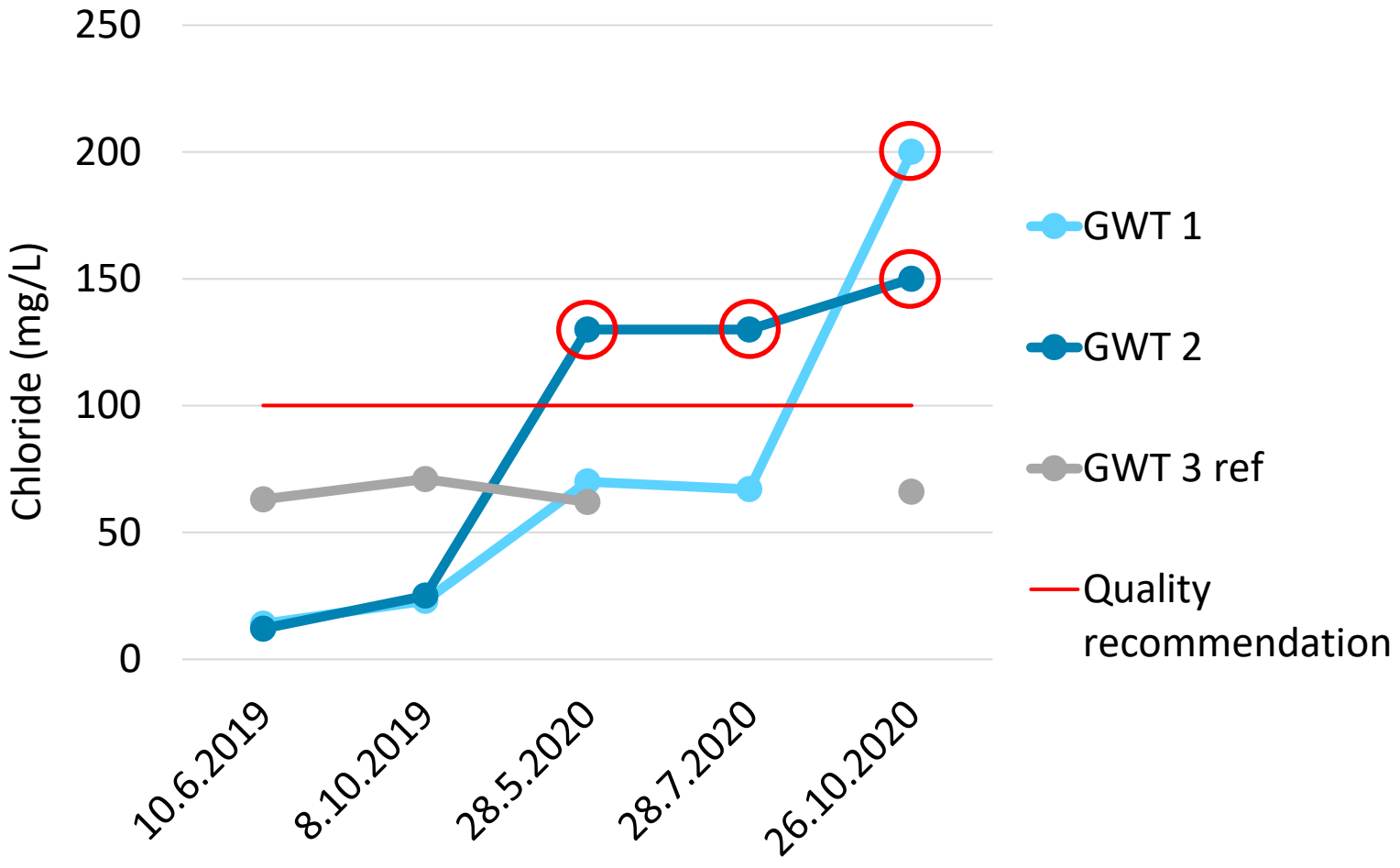


...to the fields

Field	N (kg/ha)	P (kg/ha)	Salt (kg/m^2)
Kaldersfjärden	5,9	0,5	1,0
Ämnäsviken	2,0	0,2	0,8



Groundwater analyses



Quality recommendation:
< 100 mg/L for private wells

→ Increase in chloride concentration in the groundwater at the pilot area by Ämnäsviken

Soil analyses

Soil fertility classes? → No apparent distinction between pilot and control sites

Reduction in cations? → No apparent distinction between pilot and control sites (Slight increase in Na at pilot site)

Reduction in PO_4^{3-}? → No apparent distinction between pilot and control sites (slight increase in Fe at pilot site)

Chloride accumulation? → Higher chloride content at pilot site (washes out of soil with precipitation)

Crops analyses (silage)

- Similar characteristics between pilot and control site
- Lower amount of dry matter from pilot site
- Lower content of sugar from pilot site
- Higher content of Na in silage from pilot site

SEABASED team, visit to pilot site

Increase in crop production

Bay	Production increase
Kaldersfjärden	40–170%
Ämnäsviken	60–70%

Visual results, Kaldersfjärden 2019

No irrigation

Irrigation 4 x 40 mm

Happy project coordinator and farmer

Recommendations

- Brackish water can be used for irrigation of ley, but with caution for salinization of soil and groundwater
- Investigate the run-off pattern
- Do not irrigate continuously year after year, let the soil and groundwater restore itself
- Preferably during dry summers, as a life support for crops
- If possible, collect samples for chloride analyses; soil, groundwater (wells)
- Collect soil samples more often than the regular 5-year interval

EUROPEAN UNION
European Regional
Development Fund

Interreg
Central Baltic

SEABASED
SEABASED MEASURES IN
BALTIC SEA NUTRIENT MANAGEMENT

Ålands
landskapsregering

Contact:

Annica Brink, Project Coordinator
Government of Åland
annica.brink@regeringen.ax

www.seabasedmeasures.eu

SEABASED

SEABASED MEASURES IN
BALTIC SEA NUTRIENT MANAGEMENT

CAB Östergötland- Project results

Maria Gustavsson & Kenneth Winroth

26.1.2021

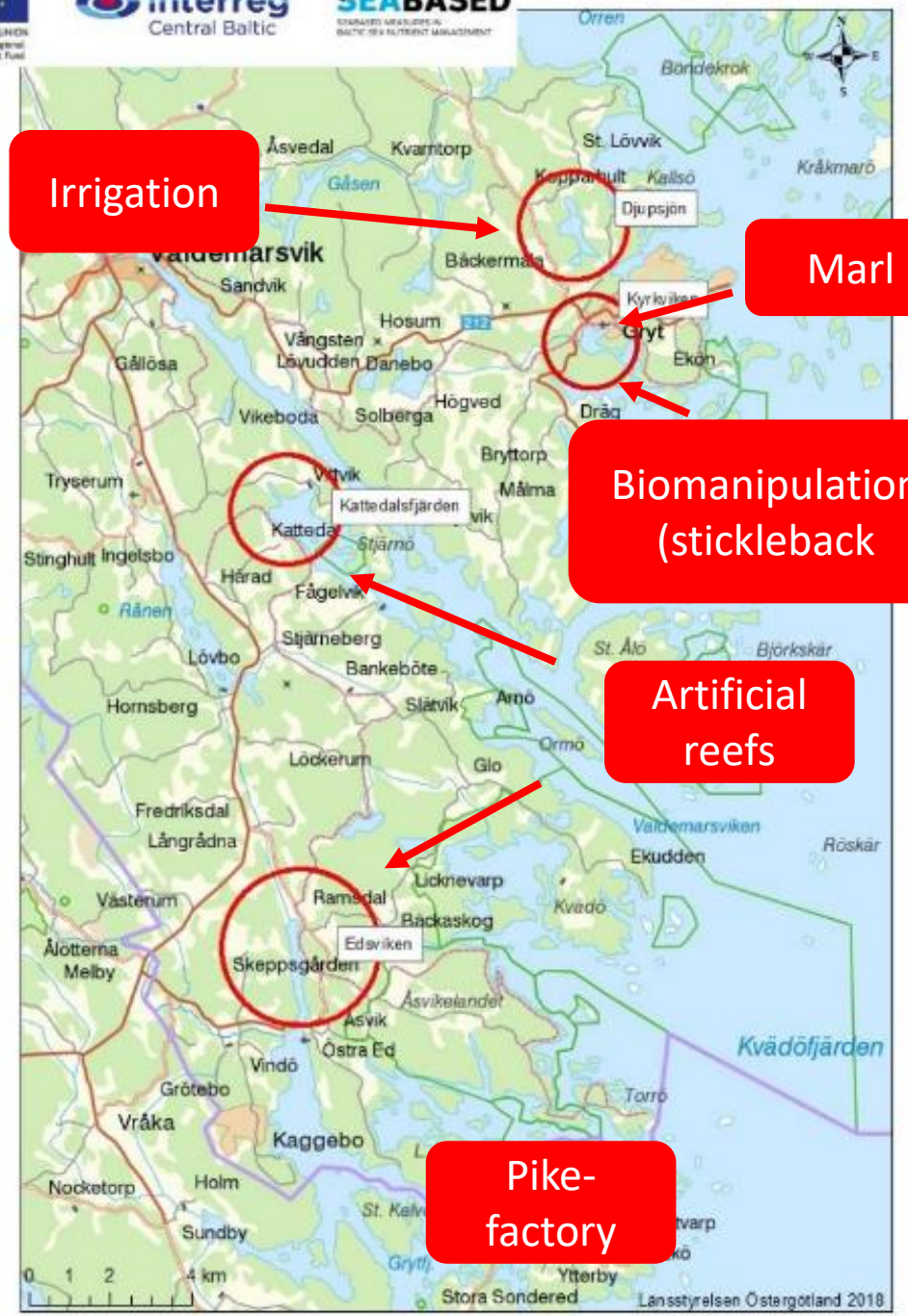
EUROPEAN UNION
European Regional Development Fund

Interreg
Central Baltic

LÄNSSTYRELSEN
ÖSTERGÖTLAND

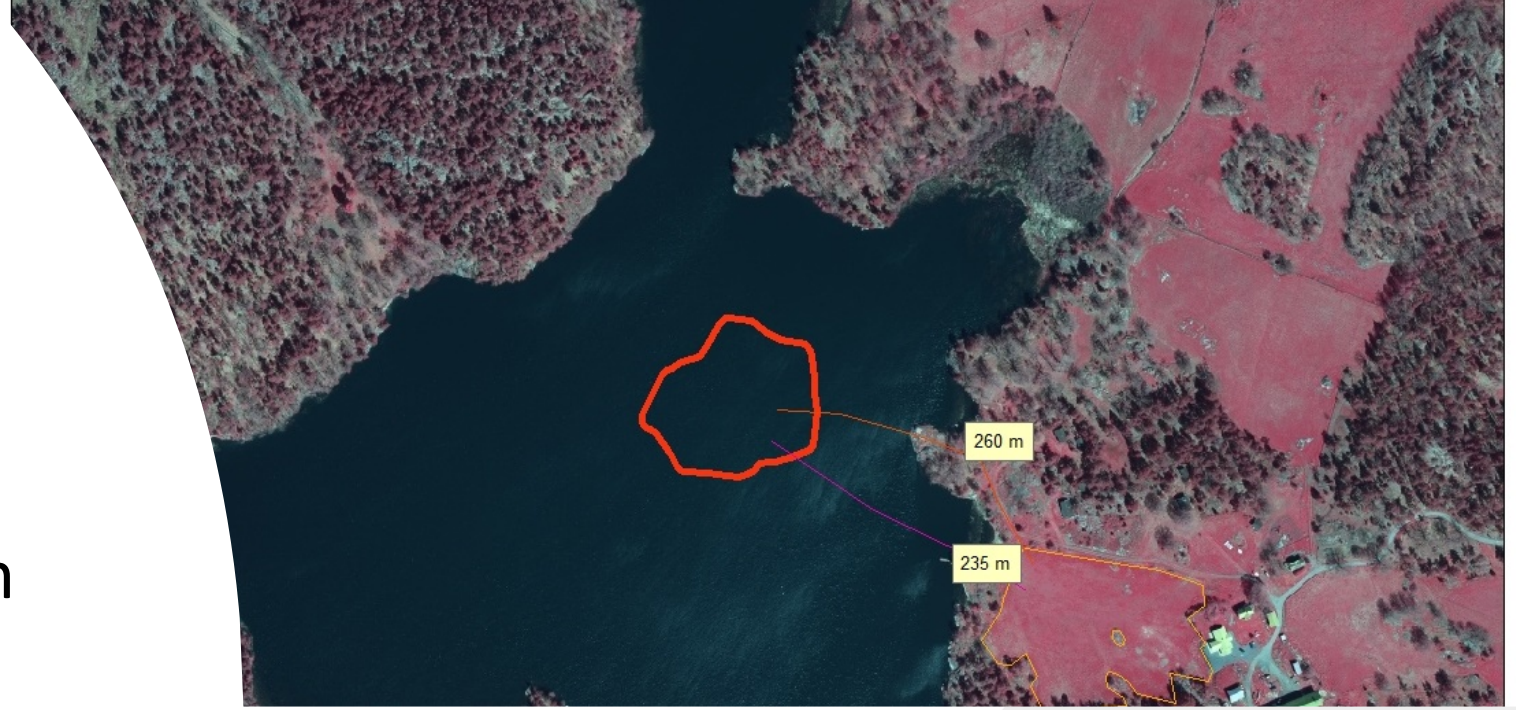
Pilot areas in Östergötland

- Kyrkviken *(SE580890-165500)*
- Djupsjön *(SE645330-155839)*
- Edsviken *(SE580250-164000)*
- Kattedalsfjärden *(SE580585-164720)*



Results in Djupsjön: Irrigation

- 2 test sites, surface & bottom water
- 4 irrigations, 2 harvests



Results in Djupsjön: Irrigation

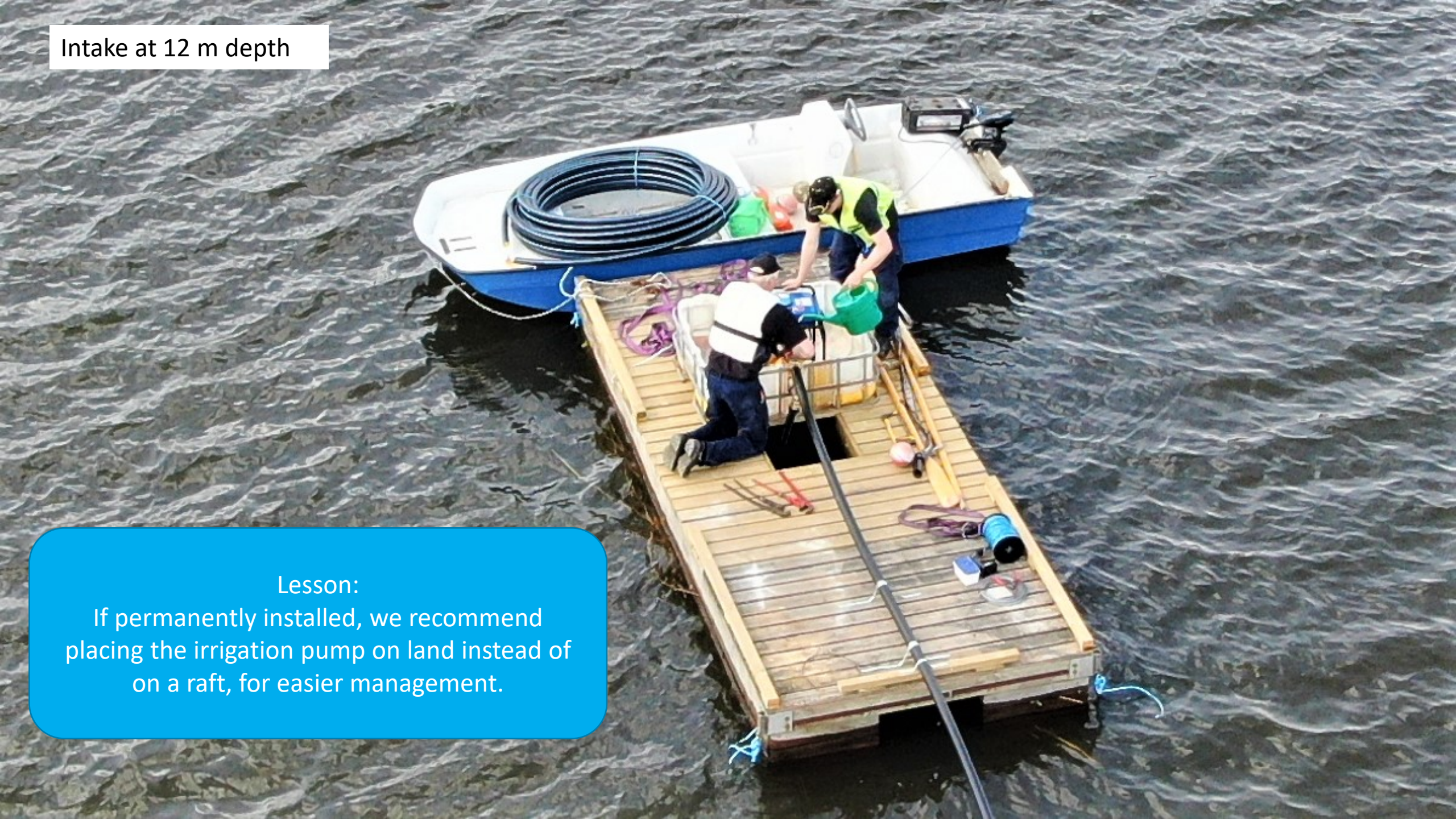
40 mm á 4 times
-> 160 liters/m^2

Phosphorous content in water	
Bottom	*Surface*
200-340 µg/l	Ca 30 µg/l
Gives	Gives
32-58 mg P/m^2	Ca 4,8 mg P/m^2
Removed from the Lake 2020	Removed from the Lake 2020
48-64 g phosphorous	Ca 7 g phosphorous

Implications	
Bottom	Surface
200-340 µg/l	Ca 30 µg/l
Per ha	Per ha
0,38-0,58 kg P/year	0,048 kg P/year
Per field (á 10 ha)	Per field (á 10 ha)
3,8-5,8 kg P/year	0,48 kg P/year

Conclusion:
Quite effective to use bottom water instead of surface water.

Intake at 12 m depth



Lesson:
If permanently installed, we recommend placing the irrigation pump on land instead of on a raft, for easier management.

EUROPEAN UNION
European Regional
Development Fund

Interreg
Central Baltic

SEABASED
SEABASED MEASURES IN
BALTIC SEA NUTRIENT MANAGEMENT

Contact:

Maria Gustavsson: maria.b.gustavsson@lansstyrelsen.se
Kenneth Winroth: kenneth.Winroth@lansstyrelsen.se

www.seabasedmeasures.eu