

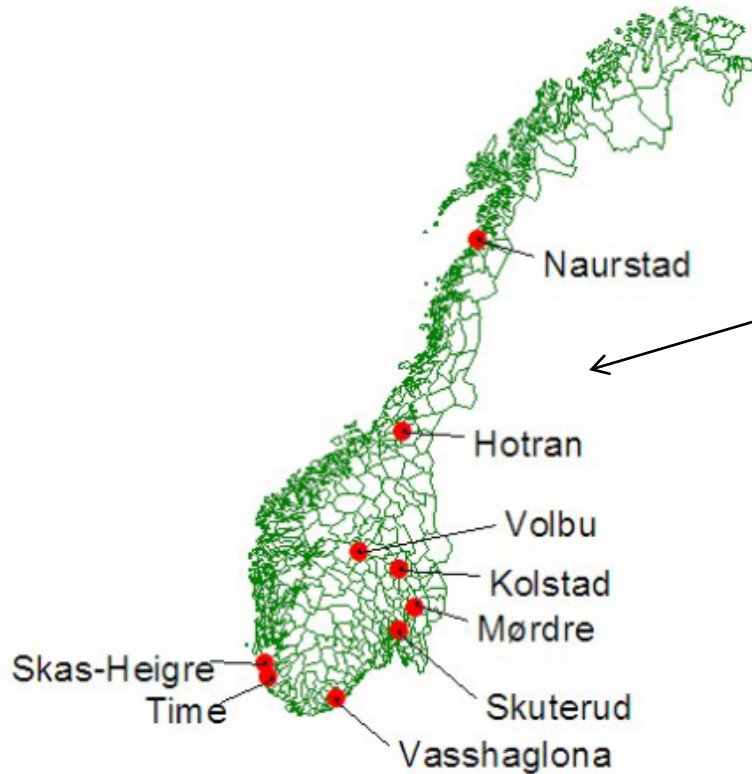
Long term monitoring of agricultural dominated catchment - Experiences from the Norwegian Agricultural Monitoring programme (JOVA)

Johannes Deelstra and Line Meinert Rød

Bioforsk - Soil and Environment



Environmental monitoring program in Norway (JOVA)



Monitoring elements

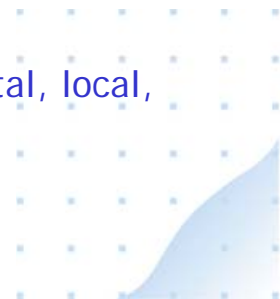
Collect information concerning

- Runoff, nutrient, soil, pesticide losses from agricultural dominated catchments under different climatological conditions, land use, agricultural practices and soil types

- Give information to

- authorities (Agricultural, Environmental, local, (inter)national.)
- farmers
- others

JOVA started at the initiative of MOE, MOA and EPA-Norway in beginning of 90's



Environmental monitoring program in Norway (JOVA) Catchment description



Catchment	Area (ha)	Temp (°C)	Prec (mm)	Soil type	Major crop
Skuterud	449	5.5	785	Silty loam	Cereals
Mørdre	680	4.3	665	Silt and clay	Cereals
Kolstad	308	4.2	585	Humic loam	Cereals
Hotran	1940	5.3	892	Silty l./clay	Cereals, grass
Naurstad	146	4.5	1020	Bog/fine sand	Grass
Skas-Heigre	2930	7.7	1180	Clay/sand/	Grass, cereals
Volbu	168	1.6	575	Silty sand	Grass
Vasshaglona	65	6.9	1230	Sand	Veg., pot., cereals
Time	1140	7.2	1189	Silty sand	Grass
Grimestad	177	7.3	1080	Silty sand	Cereals, grass





Environmental monitoring program in Norway (JOVA Bioforsk)



Discharge measurement using
Crump weir, V-notch

Water sampling and analysis (TDS,
 N_{tot} , P_{tot} , others)

Hourly recording of;
water level (h) → discharge,
 $T_{air,water}$, Pr, EC, pH

- Downloading of data on a daily basis
- Control routines -> database
- Database -> automatic report generation



Environmental monitoring program in Norway (JOVA)



Additional data collection

Farming practices, for each individual farmer field;

- timing/rate of fertiliser application,
- crop type, sowing and harvesting, yield level,
- timing/type of tillage practices
- In addition; soil types, climatological data





Main cause of soil and nutrient loss is runoff generation after the growing season, caused by excessive rain and/or in combination with snow melt



Environmental monitoring program in Norway (JOVA)

Some results



Catchment	Runoff (mm)	Average loss (kg/ha)			Average concentrations (mg/l)		
		SS	TP	TN	SS	TP	TN
Skuterud	544	738	1.4	31	130	0.24	5.9
Mørdre	305	973	1.2	15	322	0.39	5.1
Kolstad	359	114	0.3	39	30	0.1	11.5
Hotran	732	1630	2.3	34	223	0.32	4.6
Naurstad	1135	308	1.4	12	26	0.13	1.1
Skas-Heigre	717	99	1.1	36	14	0.15	5.1
Volbu	288	46	0.2	10	13	0.06	3.7
Time	805	106	1.4	51	13	0.15	5.8
Vasshaglona	1230	1232	5.3	70	71	0.32	5.8



Characteristic for runoff generation is strong seasonality in runoff



During growing season very little runoff

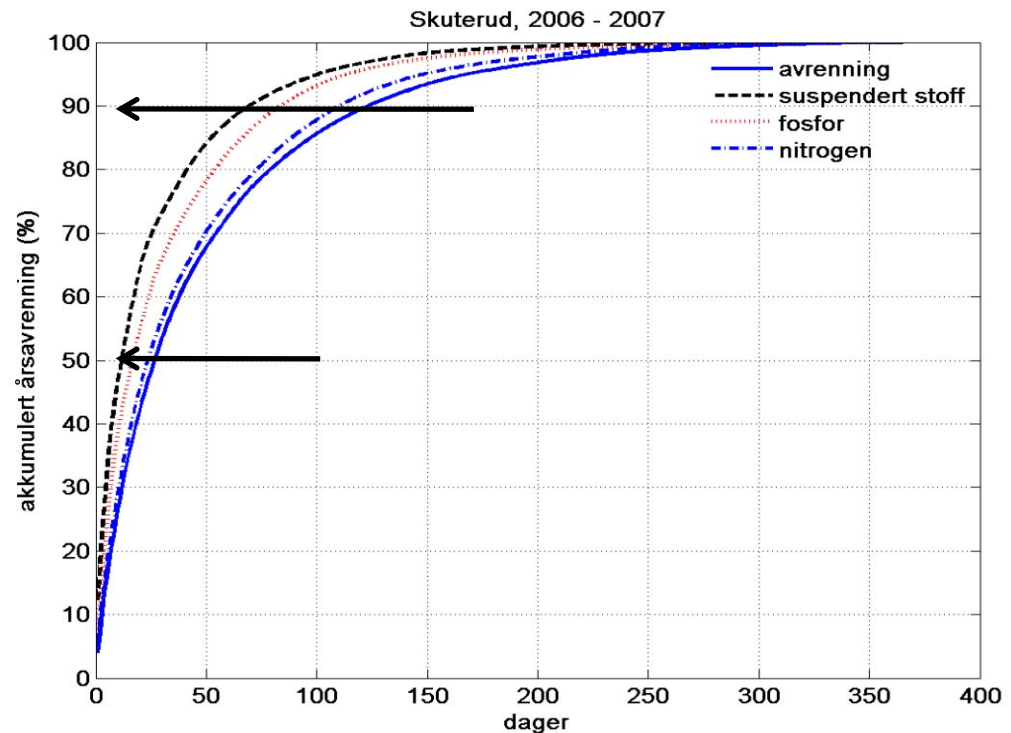
Catchment	Winter Dec - Feb	Spring Mar - Apr	<i>Summer</i> <i>May - Aug</i>	Autumn Sept - Nov
Skuterud,	0.28	0.27	<i>0.13</i>	0.33
Räpu (Est.)	0.35	0.36	<i>0.15</i>	0.15
Rägina (Est.)	0.32	0.31	<i>0.16</i>	0.21
Mellupite catchment (Lat.)	0.49	0.24	<i>0.07</i>	0.21
Mørdre	0.23	0.35	<i>0.16</i>	0.26
Kolstad	0.10	0.41	<i>0.23</i>	0.25



Yearly runoff and nutrient loss is generated in only limited number of days

	runoff	SS	TP	TN
%		days		
50	26	12	16	23
90	118	66	80	106
100	365	365	365	365

An example for the Skuterud catchment, Norway (4.5 km²)



Flow characteristics of catchments



catchment	spec. disch ¹		coeff. var.	
	day	hr	day	hr
Räpu	0.6	0.7	133	135
Rägina	0.4	0.5	121	122
Mellupite	1	1.2	182	188
Skuterud	2.9	5.7	209	239
Mørdre	1.7	2.8	222	245
Kolstad	1.4	2.4	182	195
Høgfooss	1.3	1.5	123	125
Lena	1.3	1.5	120	123

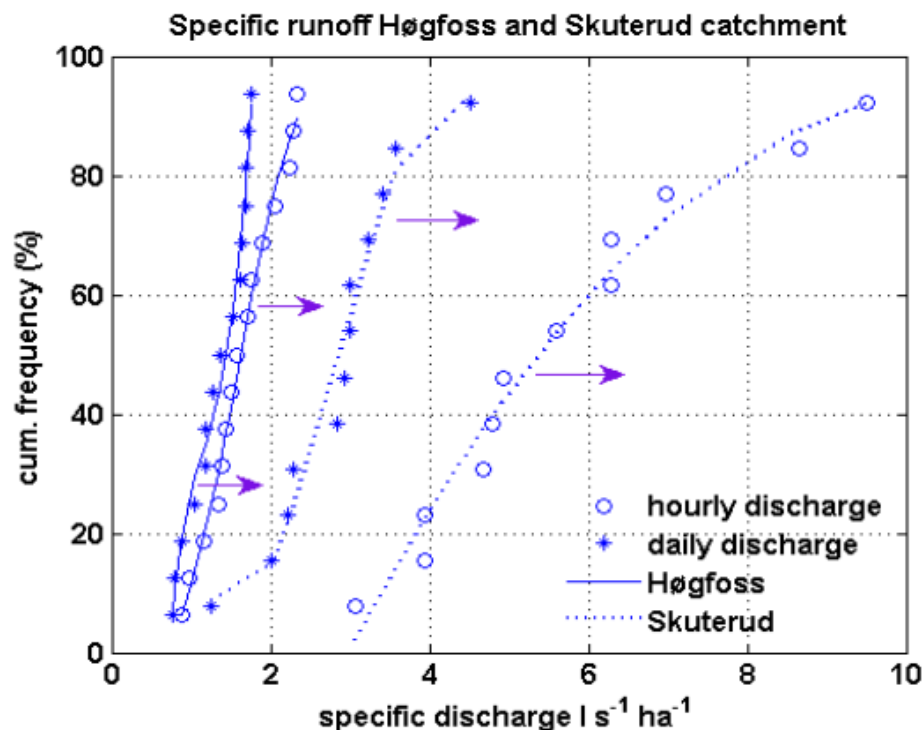
In small Norwegian catchments, yearly discharge shows a high variation, is extremely outlier prone.

This is much less pronounced in the large catchments

Latvian and Estonian catchments show less variation

¹ – specific discharge ($l\ s^{-1}\ ha^{-1}$);

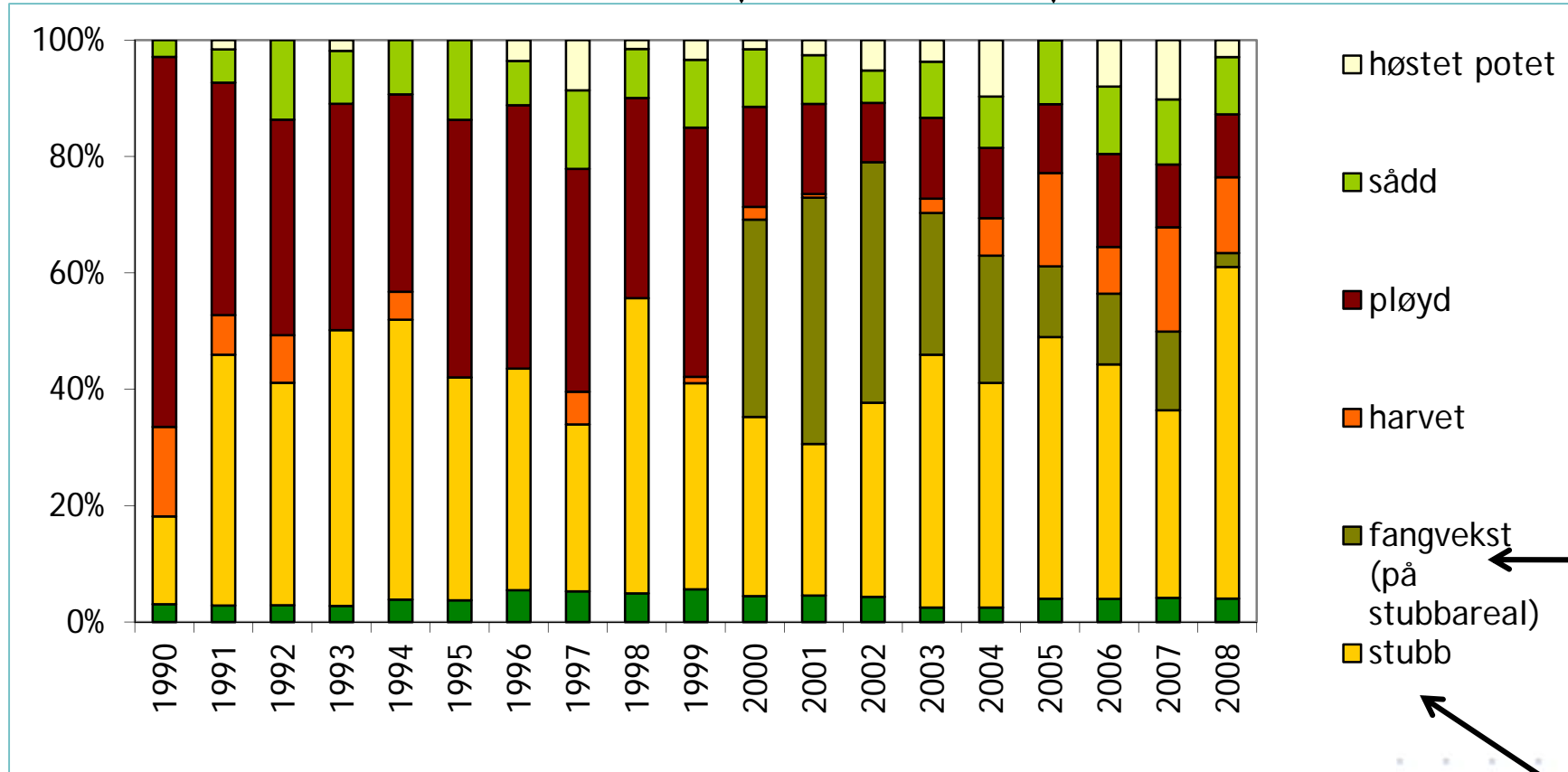
Specific discharge, calculated on average daily and hourly discharge values respectively for Skuterud (4.5 km²) and Høgfooss (300 km²)



Mørdre, soil tillage status 31. December



Subsidy and tillage method



No significant downward trends in TN, TP and SS loads

The JOVA programme



- *The JOVA programme is integrated into existing national networks*
- *Provides, on a yearly basis, relevant data to comply with both national and international obligations.*
 - *At national level the results are reported to and discussed with local and central agricultural and environmental authorities.*
 - *The data are also used to obtain the total annual nutrient load from Norwegian agriculture to the North Sea, which is part of an obligatory reporting to the OSPAR commission.*
- *The programme also provides important input to the implementation of the Water Framework Directive in Norway.*
- *The JOVA data are used in calibration and validation of models for the simulation of nutrient and soil loss.*
- *Because of the large amount of data available, the catchments often form a core element in research projects*
- *Presently the programme becomes an important asset in studies related to climate change effects on nutrient and soil loss from agricultural dominated catchments.*





Thank you for your attention

