

The background of the entire image is a close-up, circular cross-section of a tree trunk, showing concentric growth rings in shades of light brown and tan. The text is centered over this background.

# ***TIMBER MEASUREMENTS SOCIETY***

***CENTRAL MEETING***

**APRIL 10-12, 2013, SILVER REEF HOTEL,  
FERNDALE, WASHINGTON**

The background of the slide is a close-up photograph of a wood cross-section, showing concentric growth rings in shades of light brown and tan. The rings are dense and circular, creating a textured, organic pattern.

# **Pulpwood measurement in Scandinavia**

Mats Nylinder

Swedish University of Agricultural Sciences

Uppsala Sweden

# Scandinavia



**Area 185 000 km<sup>2</sup>  
Population 6.4 million**



**Area 450 000 km<sup>2</sup>  
Population 9.4 million**

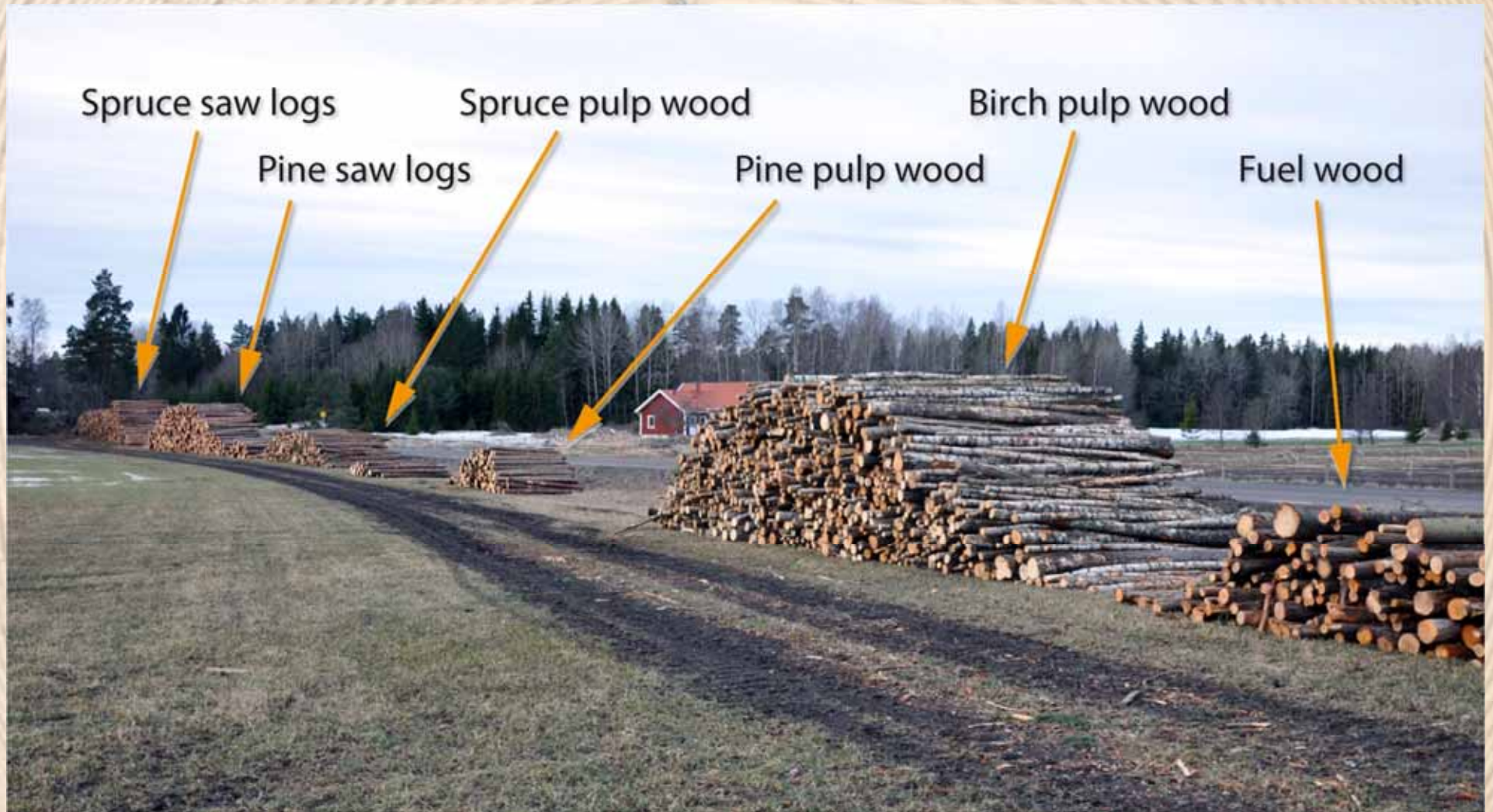


**Area 255 000 km<sup>2</sup>  
Population 3.7 million**

**Area 216 000 km<sup>2</sup>  
Population 1.5 million**

**Sweden - 2/3 of Washington, Oregon and Idaho**

# Roundwood assortments



# Shortwood



# Diameter measurement



# From forest direct to pulp mill





# Spruce



# Pine



# Birch



# Import



# Import



# Produktion of pulp

Million ton 2010

	Mechanical pulp	Chemical pulp	Total
• Finland	3.8	6.7	10.5
• Sweden	3.8	7.9	11.7
• Norway	1.2	0.7	1.9
• Total	8.8	15.3	24.1

# Utilization of round wood in Scandinavia

- **Saw logs exkl chips** 25 -35%
- **Pulpwood and sawmill chips** 60-70%
- **Fuelwood,** (Roundwood and forest residuals) 5 -10%

**Total, about 140 million m<sup>3</sup>**

# Feeding the debarking drum





# Debarkning



# Debarkning



# **The volume is the unit**

**The volume determines**

**By length and diameter under bark in Norway and Sweden - on bark in Finland.**

**Diameter in the middle of the log in Norway and Finland - in top and butt end i Sweden**

# Stack volume



# Estimation of solid volume content

Diameter

Barkthickness

Treespecies

Length/height

Frosen bark

Delimiting

Crook

Snow and ice

## Faktortabell massevirke

Januar 2009

Utgangstall									
Midtdiameter under bark	Dobbel bark i millimeter								
	6	8	10	12	14	16	18	20	22
9	58	56	54	52	50	49	47	45	43
11	59	58	56	54	53	51	49	48	46
13	61	59	58	56	55	53	52	51	49
15	63	61	60	59	57	56	55	53	52
17	64	63	62	61	59	58	57	56	55
19	66	65	64	63	62	61	60	59	58
21	67	67	66	65	64	63	62	61	60
23 og over	69	68	68	67	66	65	65	64	63

Trekk for furu -2

Lasslengde / lasshøyde			
Lasslengde	Lasshøyde		
	Under 1,50	1,50 – 2,49	2,50 over
3,00 – 3,49	+1	+2	+3
3,50 – 3,99	0	+1	+2
4,00 – 4,49	0	0	+1
4,50 og over	0	0	0

Vintertrekk (frosen bark) -1 til -2

### Opparbeiding

Svært godt	+2
Godt	+1
Normalt	0
Under normalt	-1 til -2
Dårlig	-3 til -4
Svært dårlig	-5 til -7
Avvises	Mer enn -7

(kvist, rotbein, avvirkningsavfall).

### Lessing, krok, rot

Svært godt	+2
Godt	+1
Normalt	0
Under normalt	-1 til -2
Dårlig	-3 til -4
Svært dårlig	-5 til -7
Avvises	Mer enn -7

(+ lang kjøring, god diameterblanding)

### Snø og is

Ikke snø eller is	0
Noe snø og is	-1 til -2
Mye snø og is	-3 til -7
Avvises	Mer enn -7

### Ekstraordinære forhold

Fingerskjøting, avslitt bark o.a.  
Tillegg / Fradrag %. Angi årsak i notater.

# Log by log measuring



# Automatic log by log measuring

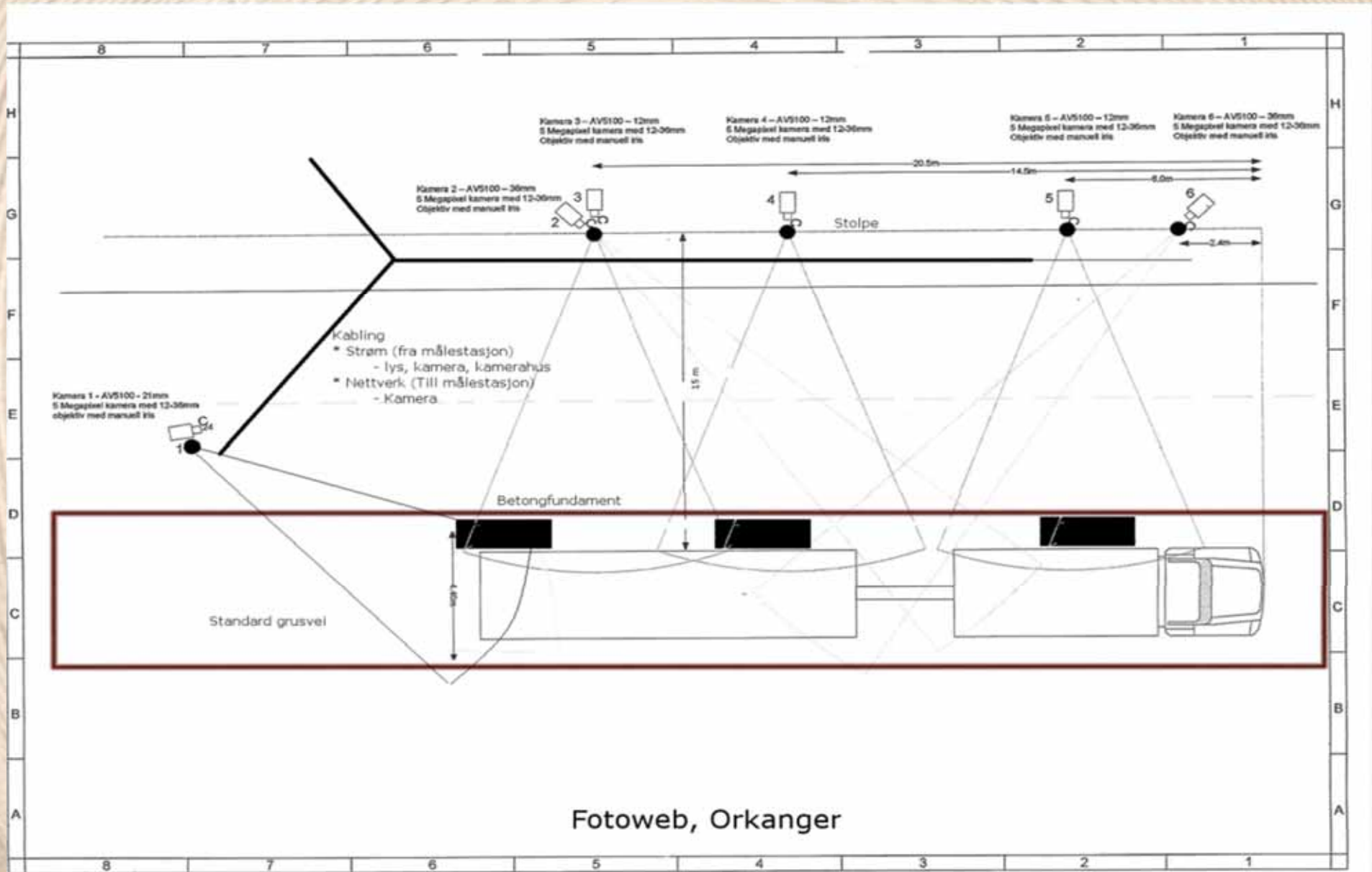


# Photo webb





# Cameras



# Photo webb

Firefox - Utfar måling

fotoweb.m3n.no/?wicket:interface=...

Mest besøkt Kom i gang Siste nyheter Nature Publishing Gro... Science News Gismag | New and Em... Virkesmåling hovedm...

**Utfar måling**

Til hovedmenyen

OPPDATERE

Ende lag 3 Lag 1 Lag 2 Lag 3 Front lag 2 Ende lag 1

**Bildeserie 333501009**  
Bilder tatt Feb 7, 2013 11:35 AM på Herre  
Tilstand: Godkjent

Lag 1 Lag 2 Lag 3

**Virkestype** Massevirke Gran

**Lasskvttering**


Kontraktnr	2012726008
Selger	62156
Kjøreordre	3
Lasskvttering	40151003
Transportnummer	79841
Registreringsnummer	
Kjøntår	360
Kjøtlr	505856

**Sortiment**

Målnummer	
Sort 1	102
Sort 2	0 0 %
Sort 3	0 0 %

**Mål**

Lengde	<input type="checkbox"/>
Bredde	<input type="checkbox"/>
Hayde	<input type="checkbox"/>
LM3	<input type="checkbox"/>
DB	<input type="checkbox"/>
MD	<input type="checkbox"/>
Øvrige	<input type="checkbox"/>
FM%	<input type="checkbox"/>
Vrak	<input type="checkbox"/>
Årsak	<input type="checkbox"/>
FM3	<input type="checkbox"/>



0  
Kalibrering

# Photo webb

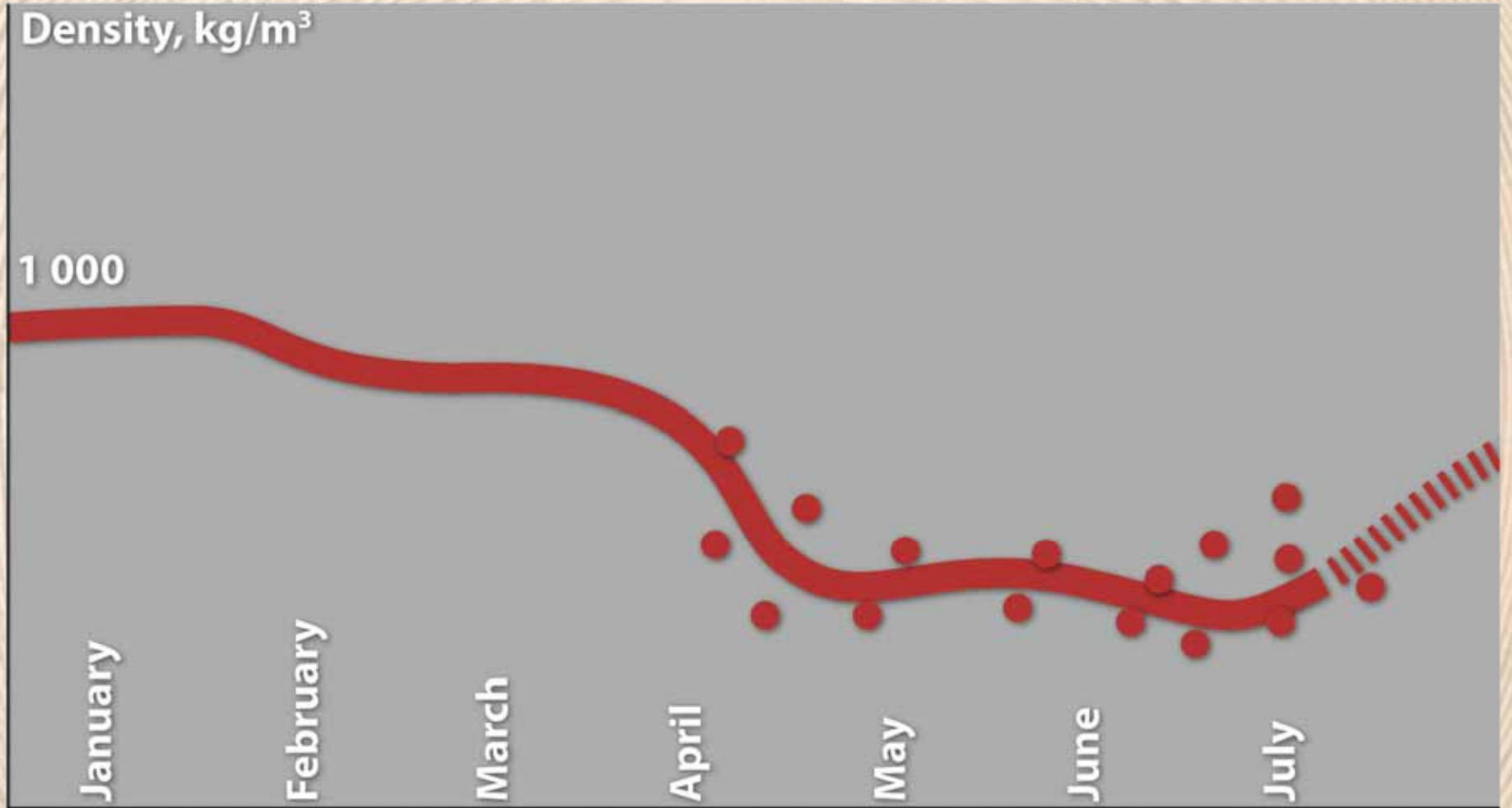




# Weight bridge



# Ton per m<sup>3</sup>



# From weight to volume

- **M<sup>3</sup>solid on bark/green ton**
- **Three methods**
  - Manual and automatic measure on log by log
  - Laser scanning of whole trucks
  - Archimedes law

# Automatic measuring, log by log





# Laser scanning

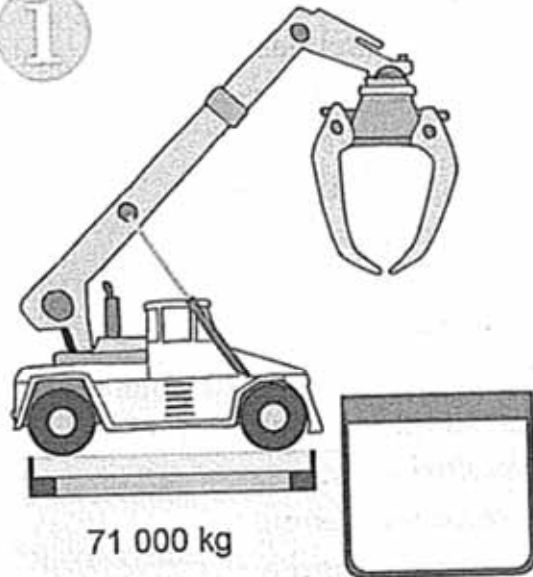


# Laser scanning



# Archimedes princip

1

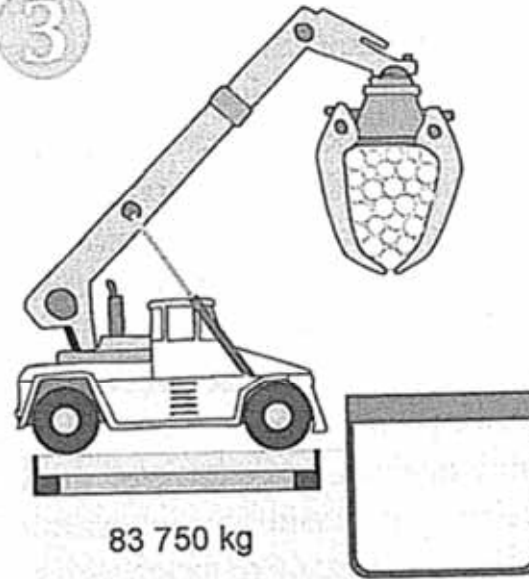


71 000 kg

Siltavaaka

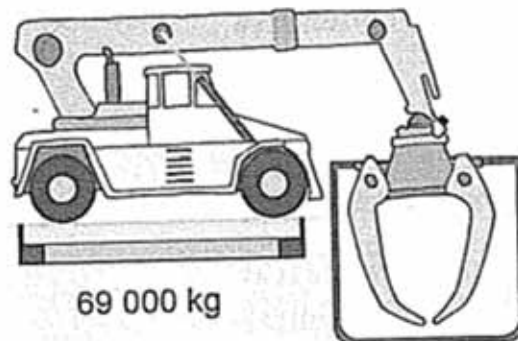
Upotusallas

3



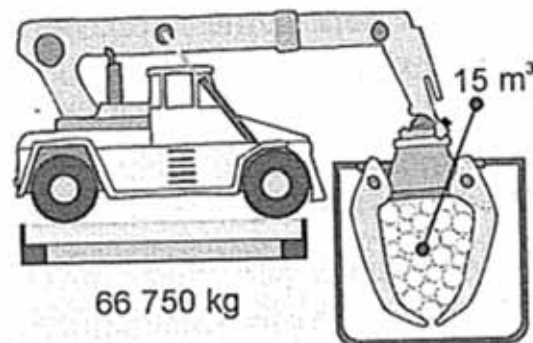
83 750 kg

2



69 000 kg

4



66 750 kg

15 m<sup>3</sup>







**For a grapple**



# Accuracy and precision

- The accuracy is normally 1-2% and the difference is adjusted on monthly or yearly basis.
- The precision is calculated as the standard deviation for the percentage difference between online measuring of a pile and the control measuring. The standard deviation is 5-8%



A close-up photograph of a tree trunk cross-section, showing concentric growth rings. The text "Thank you!" is overlaid in the center in a bold, black, sans-serif font. The wood has a light tan color with darker, more pronounced rings. The text is centered horizontally and vertically, with a bounding box of approximately [308, 404, 692, 498].

**Thank you!**