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Weight Detection in the Three-point-linkage and in Trailers

by

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Introduction

As environmental protection becomes more and more important to our society, agriculture has to look for future strategies to meet this new demand.

Future plant production will be guided not only by botanic and economical, but also by ecological considerations.

One strategy with great potential for succeeding is to build up a closed loop system for environmental and yield oriented fertilizing.

Its aim is environmental protection by stopping the expert of non-consumed plant nutrients out of the soil.

Economical advantages are connected with the resulting fertilizer savings.

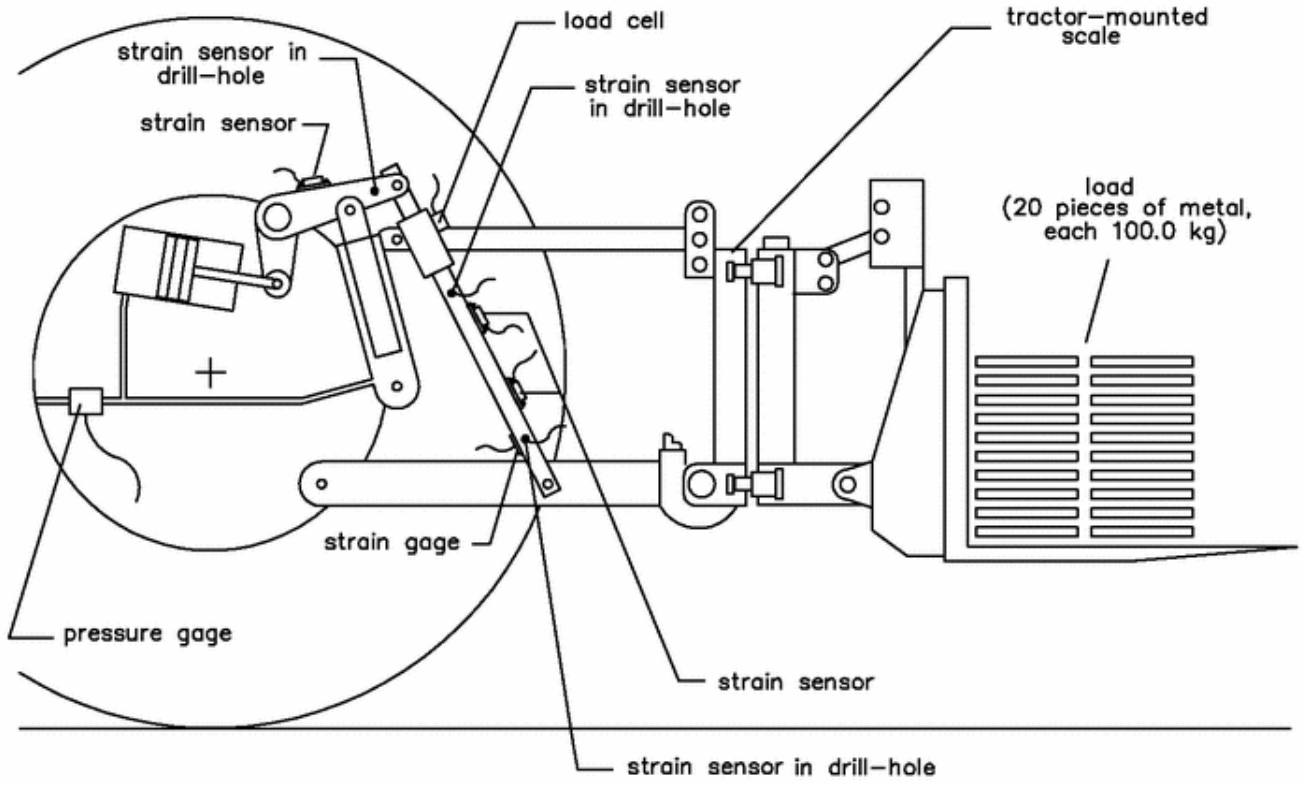
Weight detection in the three-point-linkage

Two major categories of weighing equipment can be distinguished:

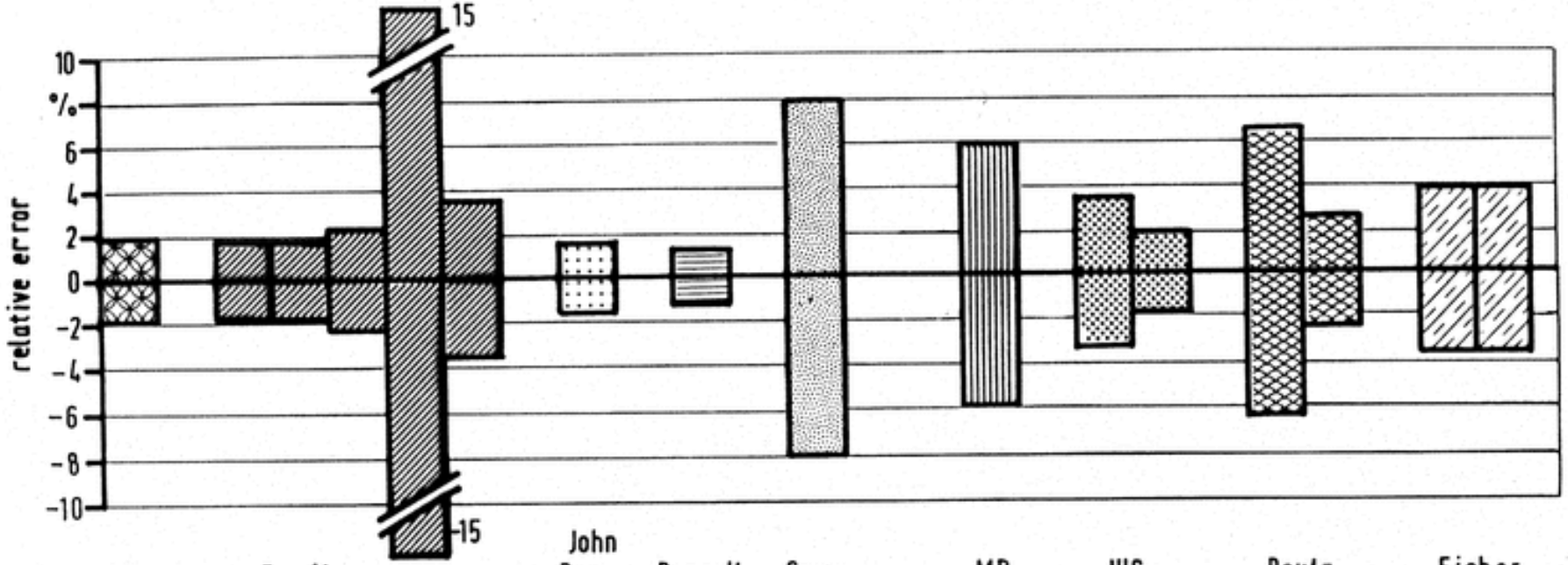
1. The stand-alone systems, represented by the three-point-coupled scales

2. Integrated systems in the three-point-linkage for example sensor applications

- for the hydraulic pressure,
- the rockshaft arms and
- the lift links.



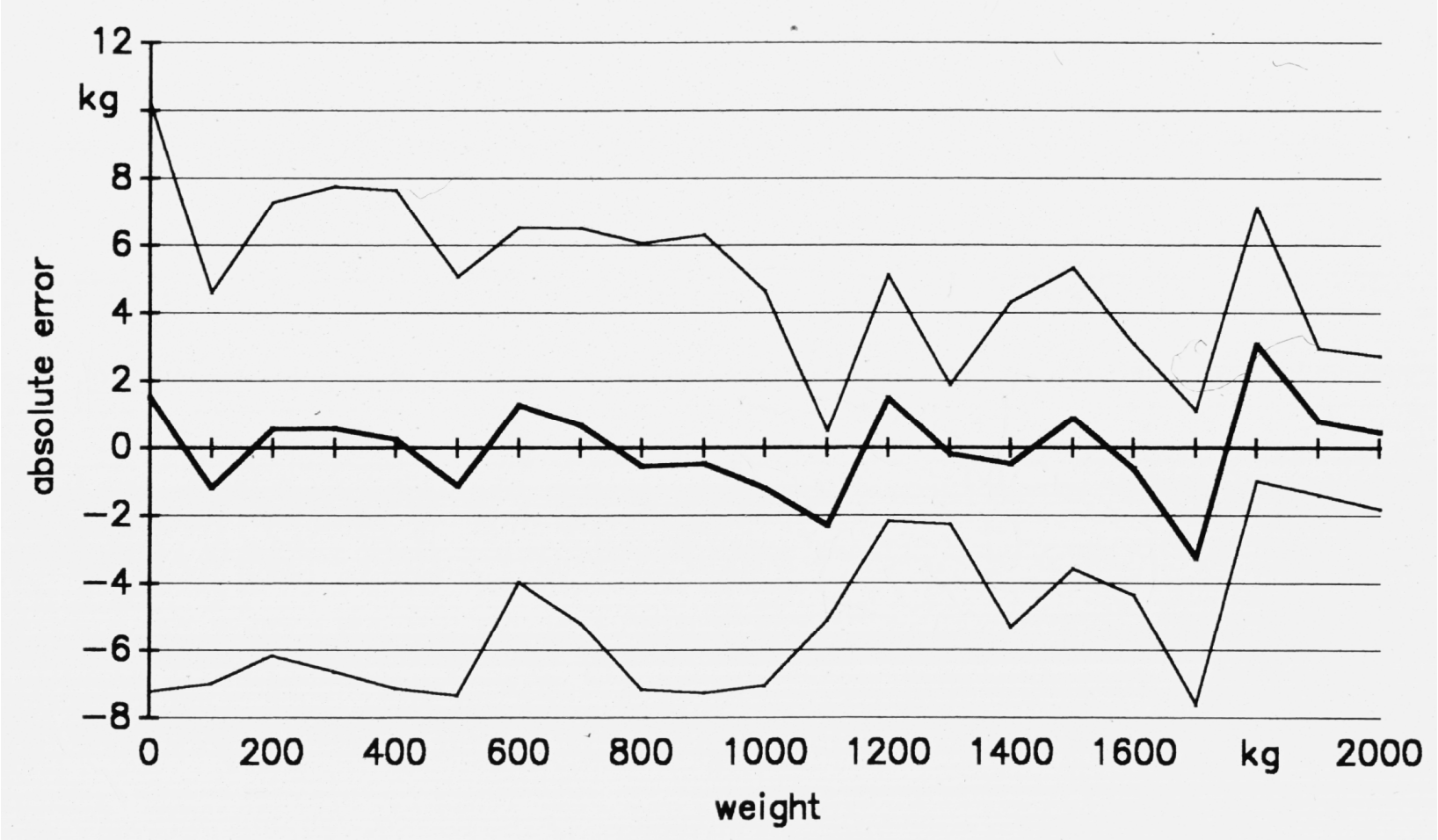
Confidence intervals (95 %) of the relative errors for the weight detection in different tractors using the hydraulic pressure



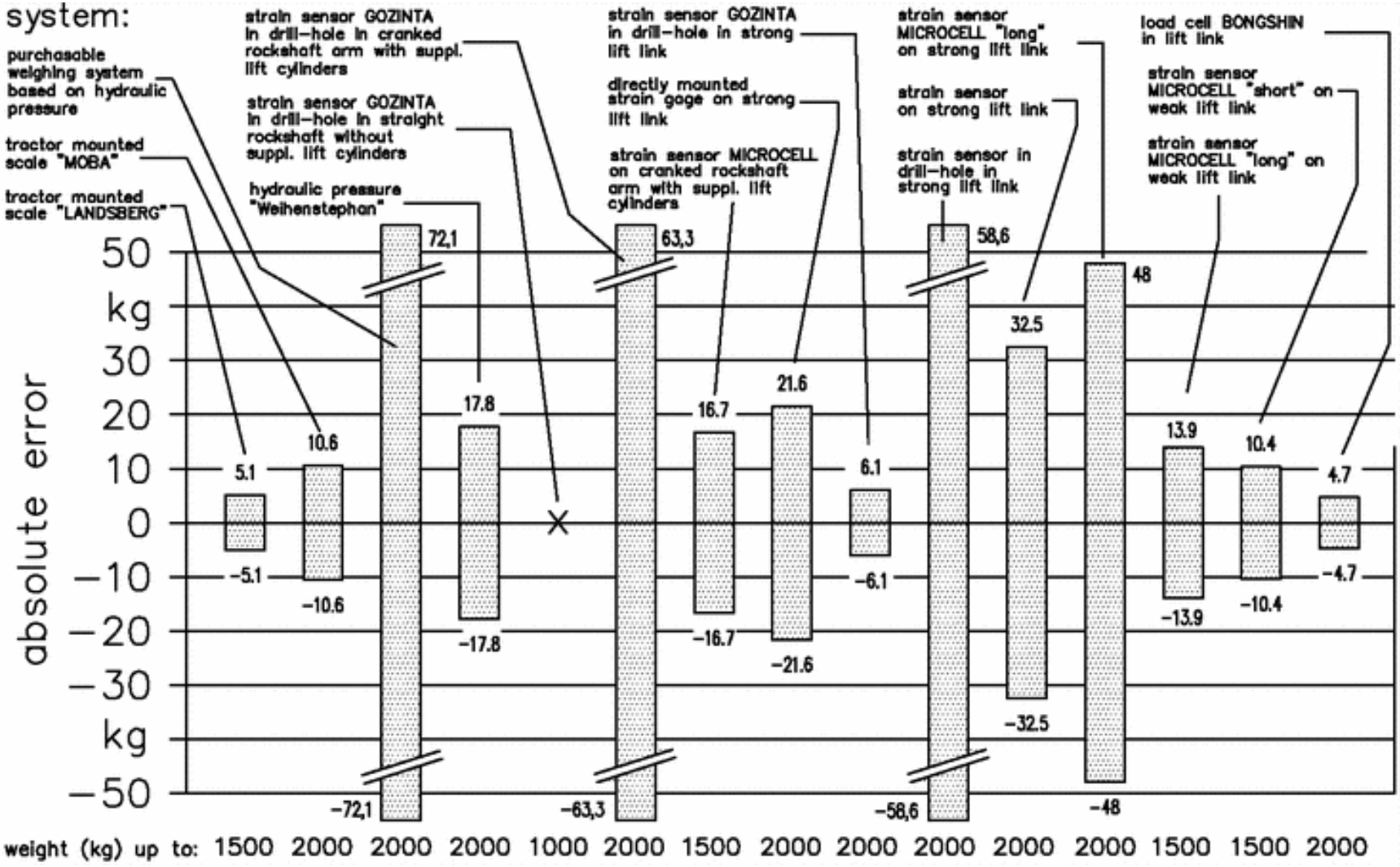
make	MF	Fendt					John Deere	Renault	Same	MB	IHC		Deutz		Eicher	
model	3065	380 GTA	312 LSA	306 LSA	255 GT	102 LS	3350	TX 133	Explorer 70	700	856	1246	DX 4-50	DX 110	3125 turbo	Wolan I
sensor	P9V	P9V	P9V	P9V	P9V	P9V	P9V	P9V	P9V	P9V	P9V	P9V	P9V	P9V	P9V	P9V
EHR ①	+	-	+	-	-	-	+	-	-	-	-	-	-	-	-	-
age (h)	5	180	5	1300	283	2800	8	1200	460	370	630	1700	10	2800	269	4870

① electronic–hydraulic hitch control

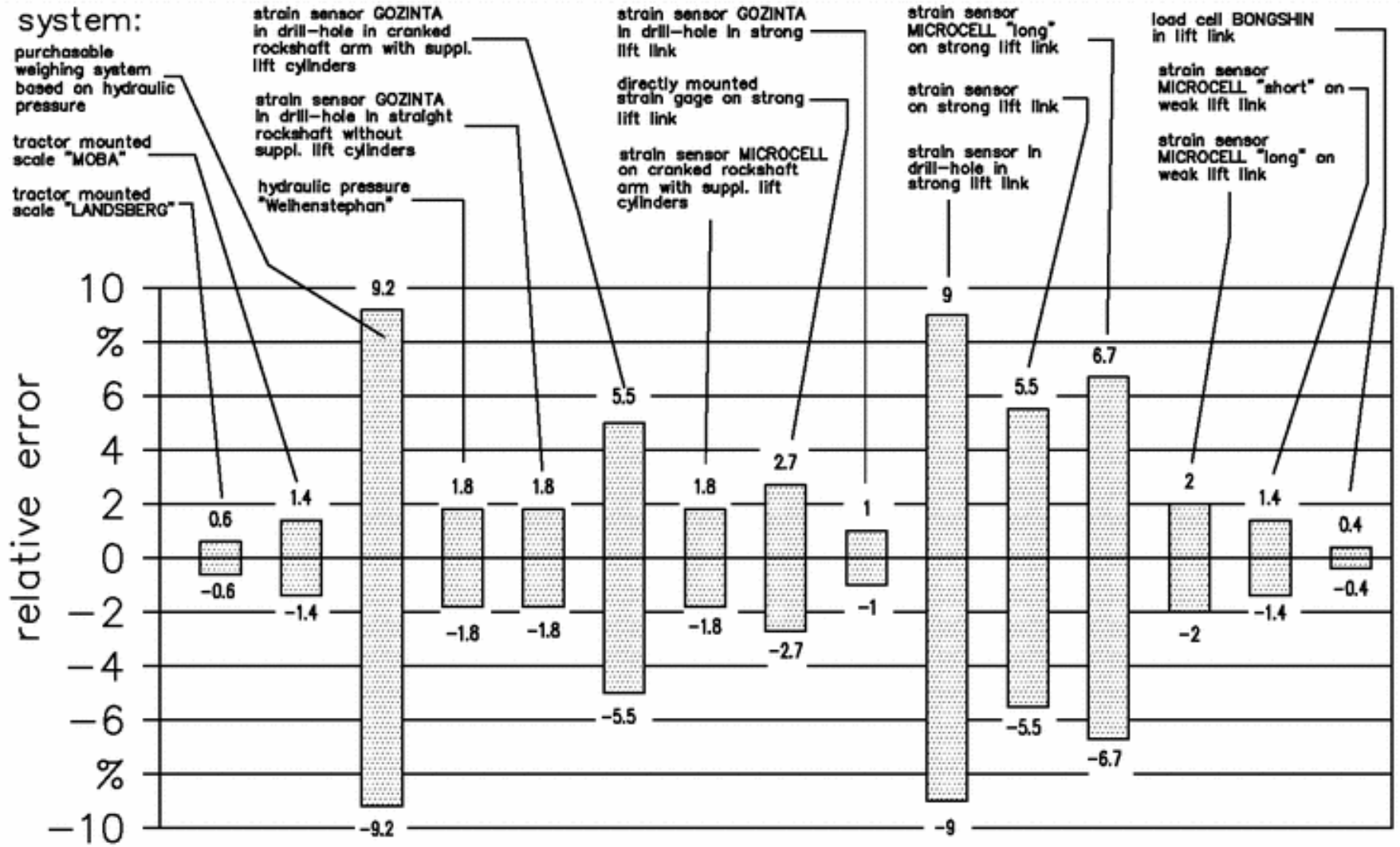
Absolute mean errors with 95 % confidence intervals for the weight detection in the three-point-linkage {GOZINTA} in lift link



Confidence interval of the absolute errors for the weight detection in the three-point-linkage



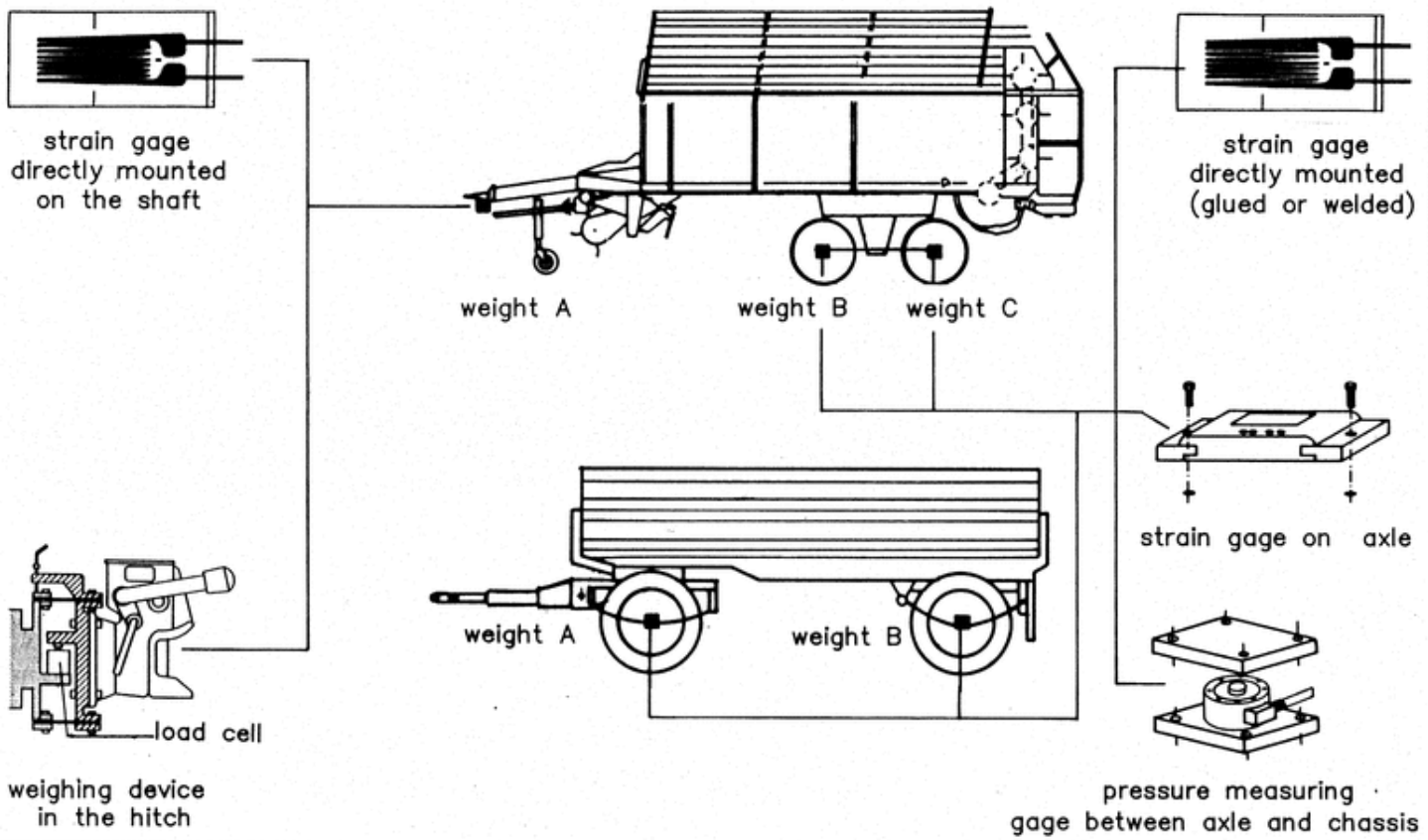
Confidence intervals of the relative errors for the weight detection in the three-point-linkage



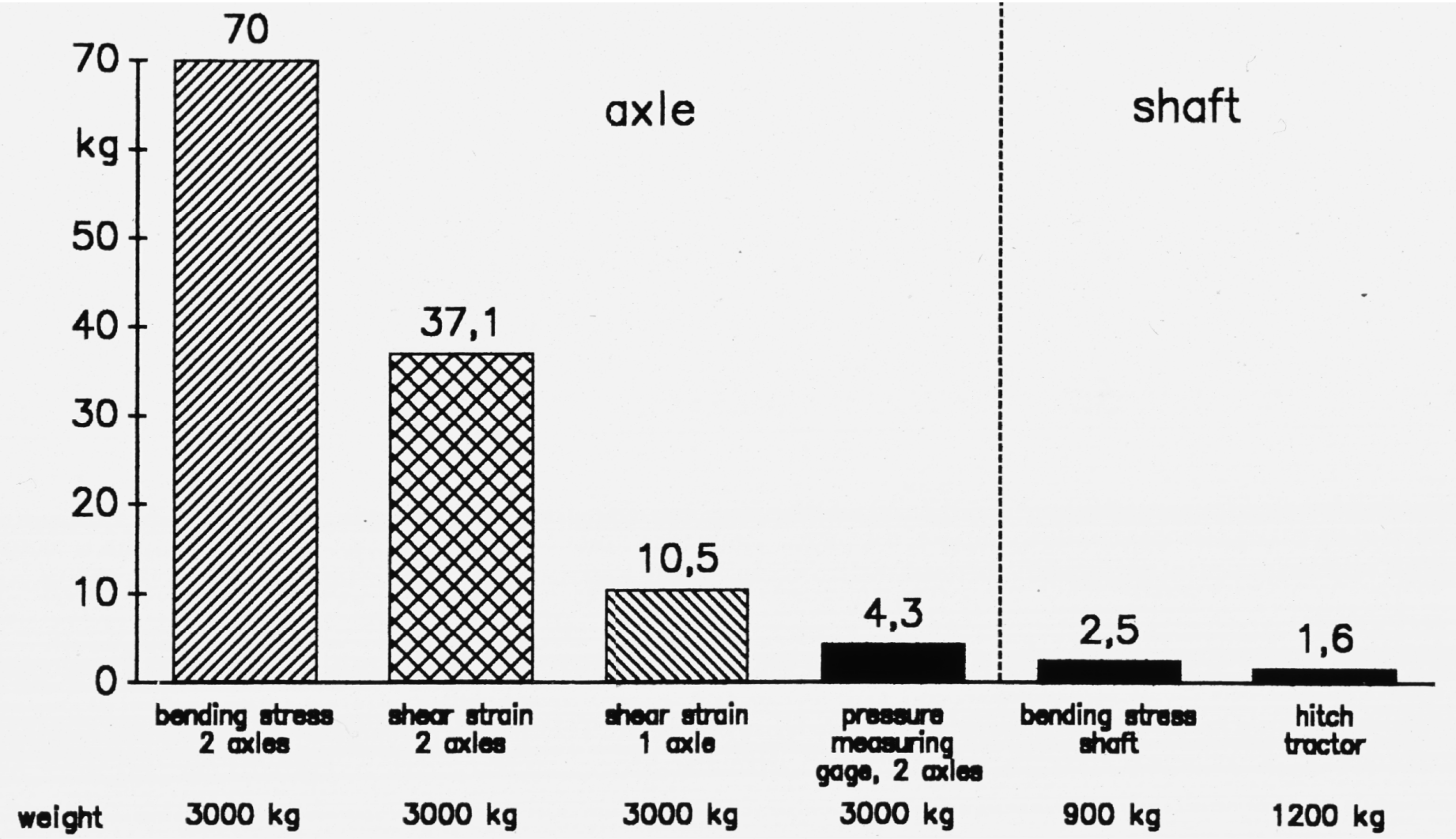
Weight detection in trailers

Two principle ways of detecting the load are possible:

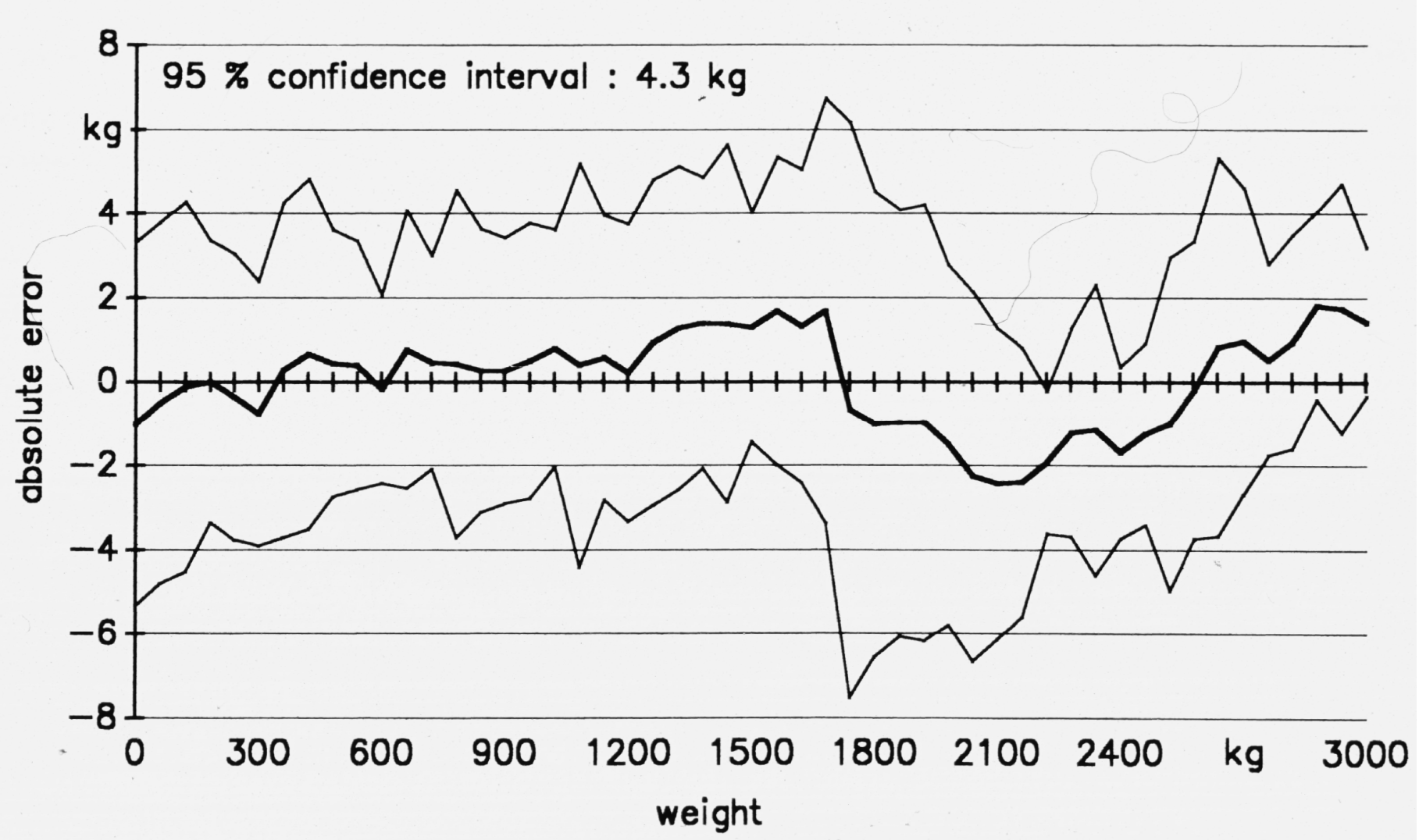
- Directly applied sensors detect the stress at the structure (e.g. axle and shaft)
- Load cells between axle and chassis detect the load force



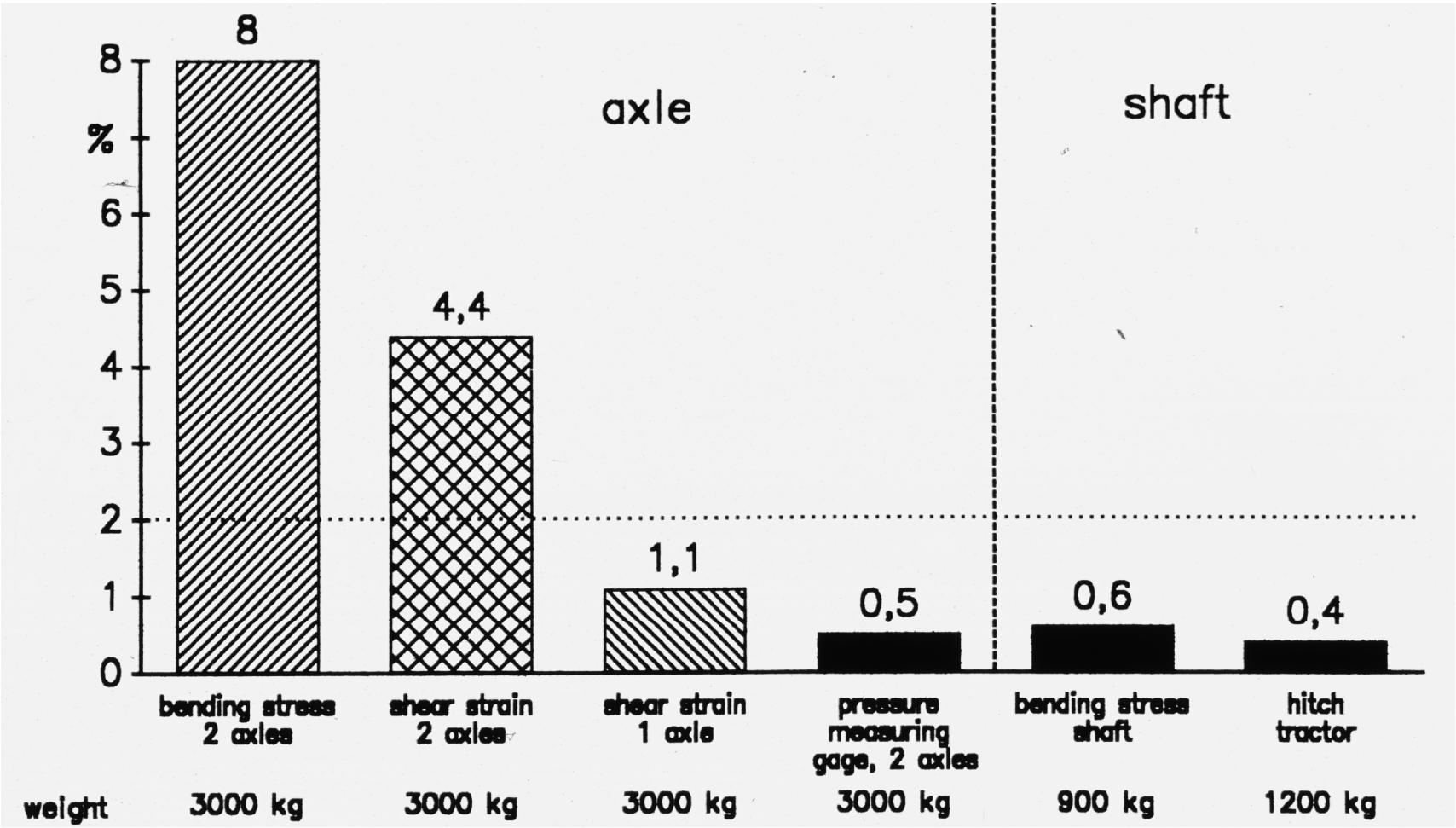
Confidence intervals of the absolute errors for the weight detection in trailers



Absolute mean deviations with 95 % confidence intervals for the weight detection in trailers



Confidence intervals of the relative errors for the weight detection in trailers



Conclusions

During the last three years at the Institut für Landtechnik at the Technical University of Munich extensive trials have been done on the weight detection in the three-point-linkage and in trailers.

Many of the tested sensor applications have enough accuracy for use in agriculture.

In most cases they are technical satisfying and easy to fit solutions which can be produced for low costs.

Trials have started this year to detect the correct weight on moving tractors and trailers. This "dynamic weighing" needs new algorithms, new filters and additional information like the acceleration.

Early results show that there is a way to reach this further aim within the next year.

Acknowledgements

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