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CLUB OF BOLOGNA
strategies for the development of agricultural mechanisation

FEDER UNACOMA
Italian Agricultural Machinery Manufacturers Federation

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Farm Machinery to Feed the World

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Agricultural mechanization - a key for future mankind welfare

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Agricultural mechanization, its importance for mankind:

1. The ***classical role***
2. The ***environmental role***
3. The ***strategic role***

Source: Renius 2008 - Key note celebrating 50 years of agricultural engineering within VDI

1. The ***classical role*****:** mechanization of plant and animal production, storage and processing in order to feed the planet sustainably – even in 2050

2. The recently added ***environmental role*****:** mechanization of raw material and clean energy production & landscape maintenance in order to safeguard the planet and its resources

3. The ***strategic role*****:** mechanization of agriculture to free working people for developing other areas of national economy achieving welfare and prosperity

Source: Renius 2008 - Key note celebrating 50 years of agricultural engineering within VDI

Experts forecast at least (50)* 60% plant production increase needed for food, raw material and energy 2014- 2050.

Agricultural mechanization can improve:

a) land productivity

b) labour productivity

*** in case of considerably reduced losses & wasted food**

a) Land productivity (aqua farming not included):

Main factors

- Breeding
- Fertilizing
- Irrigation
- Plant protection
- Post harvesting methods
- Mechanization

Conclusion: Mechanization is one of several factors, improves plant growing process and product quality at very low yield losses

b) Labour productivity: Estimated increase factors by machinery

- Milking machine ..... *factor* 15
- Two horses ploughing 25
- Small tractor ploughing 50
- Multi purpose tractor mowing 500
- Large tractor ploughing 1000
- Large combine 4000

Conclusion: … by far the dominating factor

Source: Renius 2008

Brasil

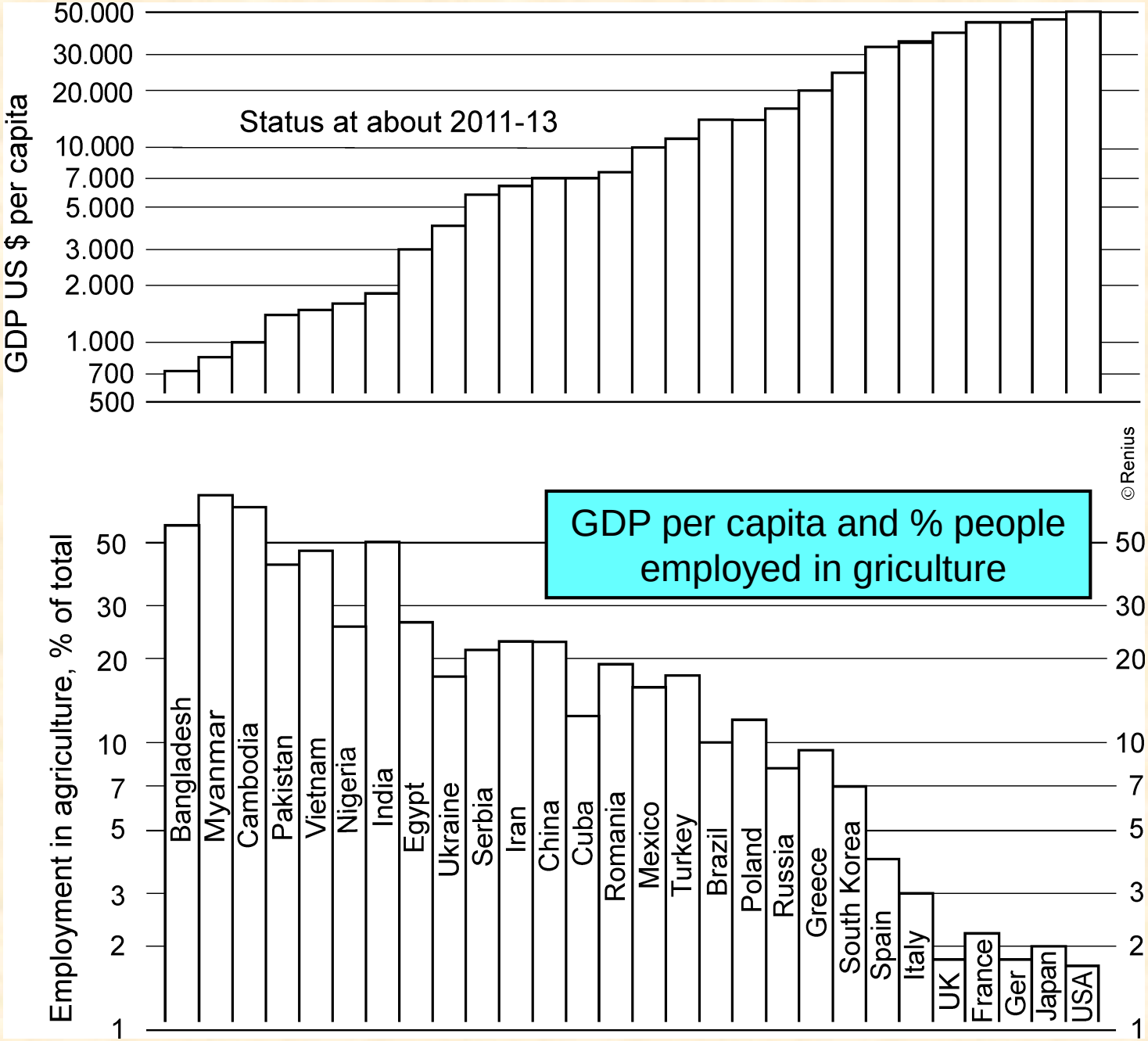
31 Combines, followed by 12 direct-seeders

Working power equal to about 100.000 hand workers

… with reduced losses and rather better working quality

Source: Club of Bologna 2009 - E. Ch. Mantovani / Brasil

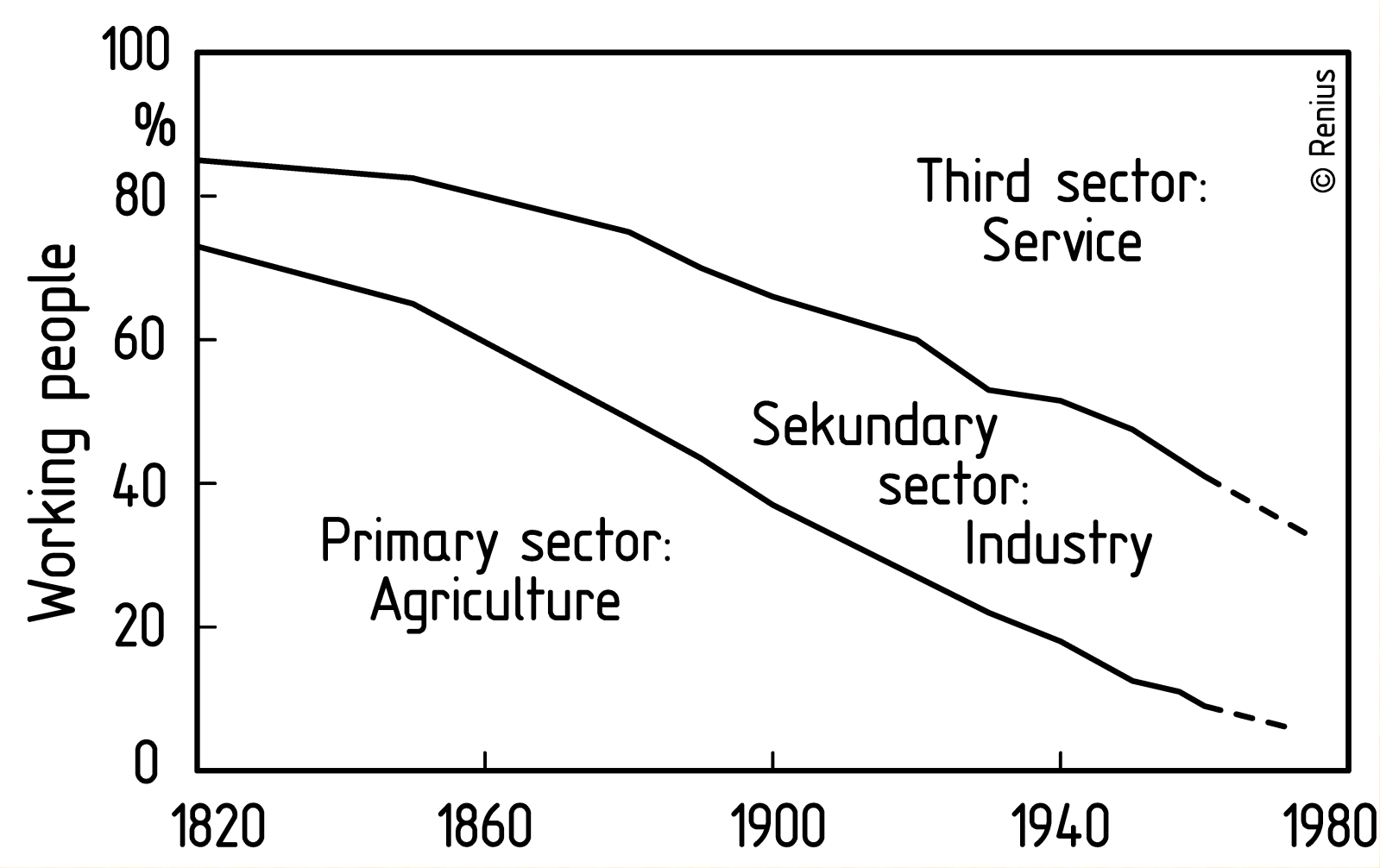
The strategic role of agricultural mechanization for whole national economies



Source:

World Bank, FAO, personal estimations and others

Three sector model: the case of USA



Source: Fourastié 1963, Renius 2008

A low level in agricultural mechanization usually means

- high level of poverty
- low food quality, high prices
- low fresh water availability/quality
- low level of infrastructure
- high illiteracy, low education level
- low expectation of life
- high infant mortality
- **low interest of investors**
- **high risks of emigration**

The majority of the nations of this globe still needs a considerably higher level in agricultural mechanization.

How to realize?

An important general condition is
Political stability and internal peace.

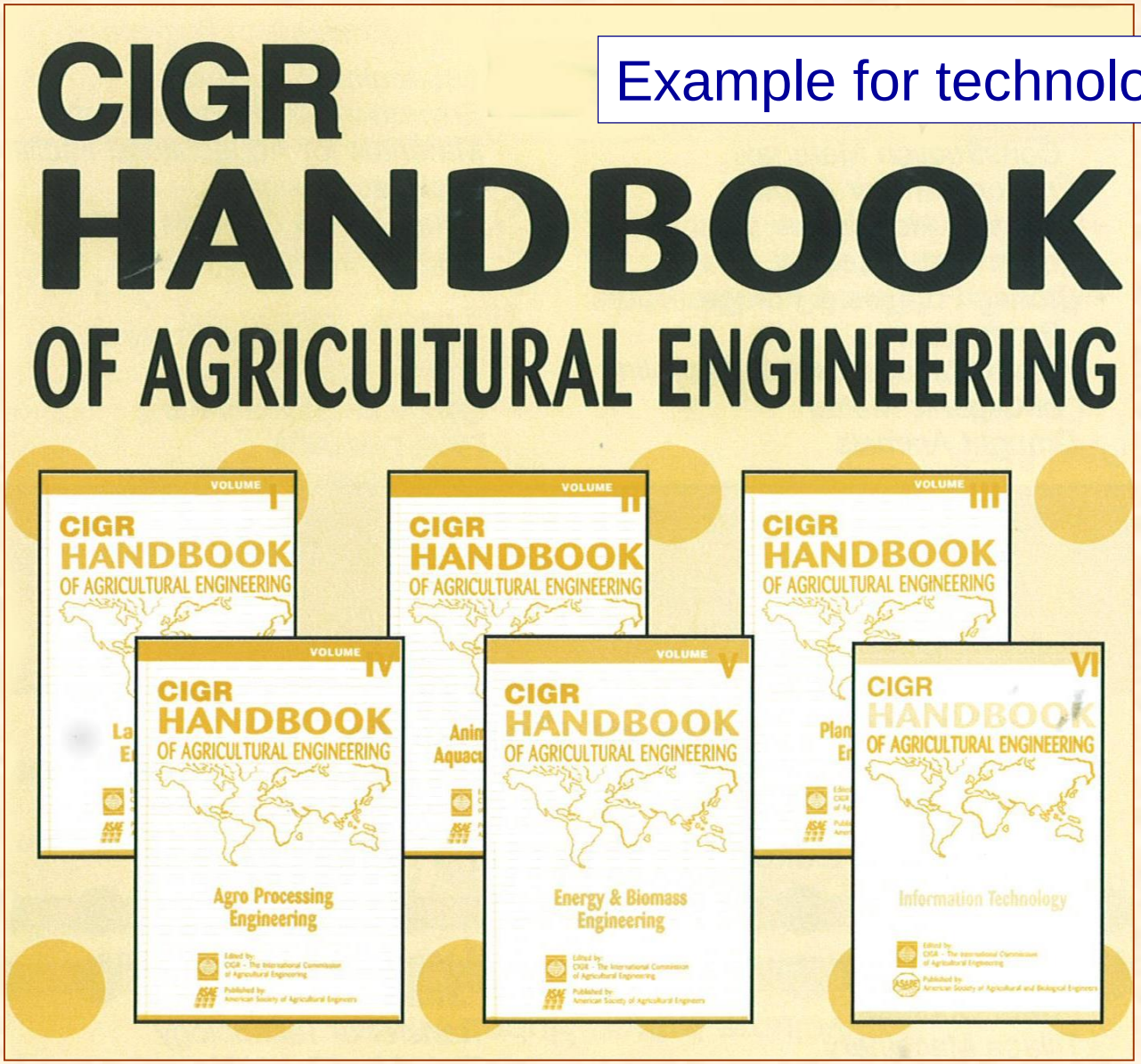
Only if a certain level of safety is achieved, ag mechanization is getting a chance …

Lower technology levels: Seven key points for supporting agricultural mechanization

- Improving national ag engineering **education**
- Building up national ag engineering **societies**
- Technology transfer by intern. **networking**
- Technology transfer by internat. **co-operation**
- Technology transfer by internat. **publications**
- Technology transfer by low cost **licences**
- Technology transfer by standards & **regulations**

Key points of the Club of Bologna

Example for technology transfer



Upper technology levels within the idustrialised countries: IT penetration benefits all aspects of agriculture:

- Productivity
- Product quality
- Traceability
- Sustainability
- Environment
- Energy efficiency
- Safety and comfort
- Farm management

Key points of the Club of Bologna

Population benefits of ag mechanization within the idustrialised countries:

- Food has never been that cheap in terms of income: costs only about 12%
- Product quality has never been that high

Problem of ag machinery industry:

How to meet the extremely wide span of globally demanded machinery specifications from „very simple“ to „high sophisticated?“

Approach:

Globally planned and produced tractors & ag machinery (save costs and enables adequate prices and maintenance costs for the farmer).

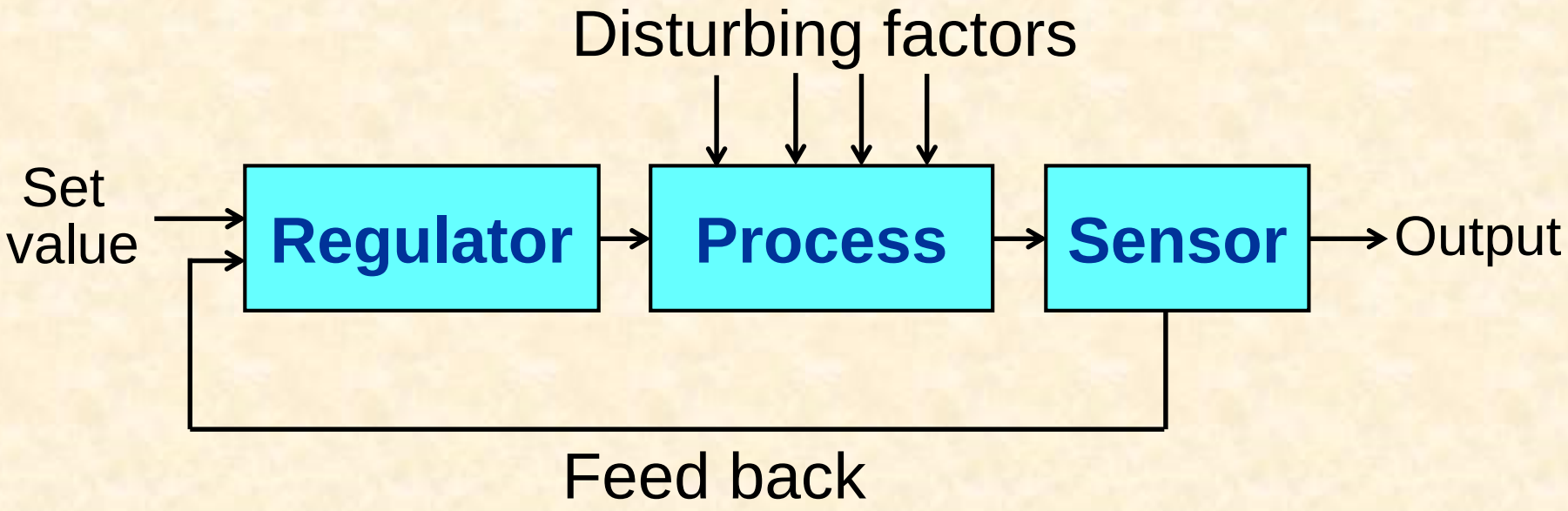
Break down by technology levels – example tractor

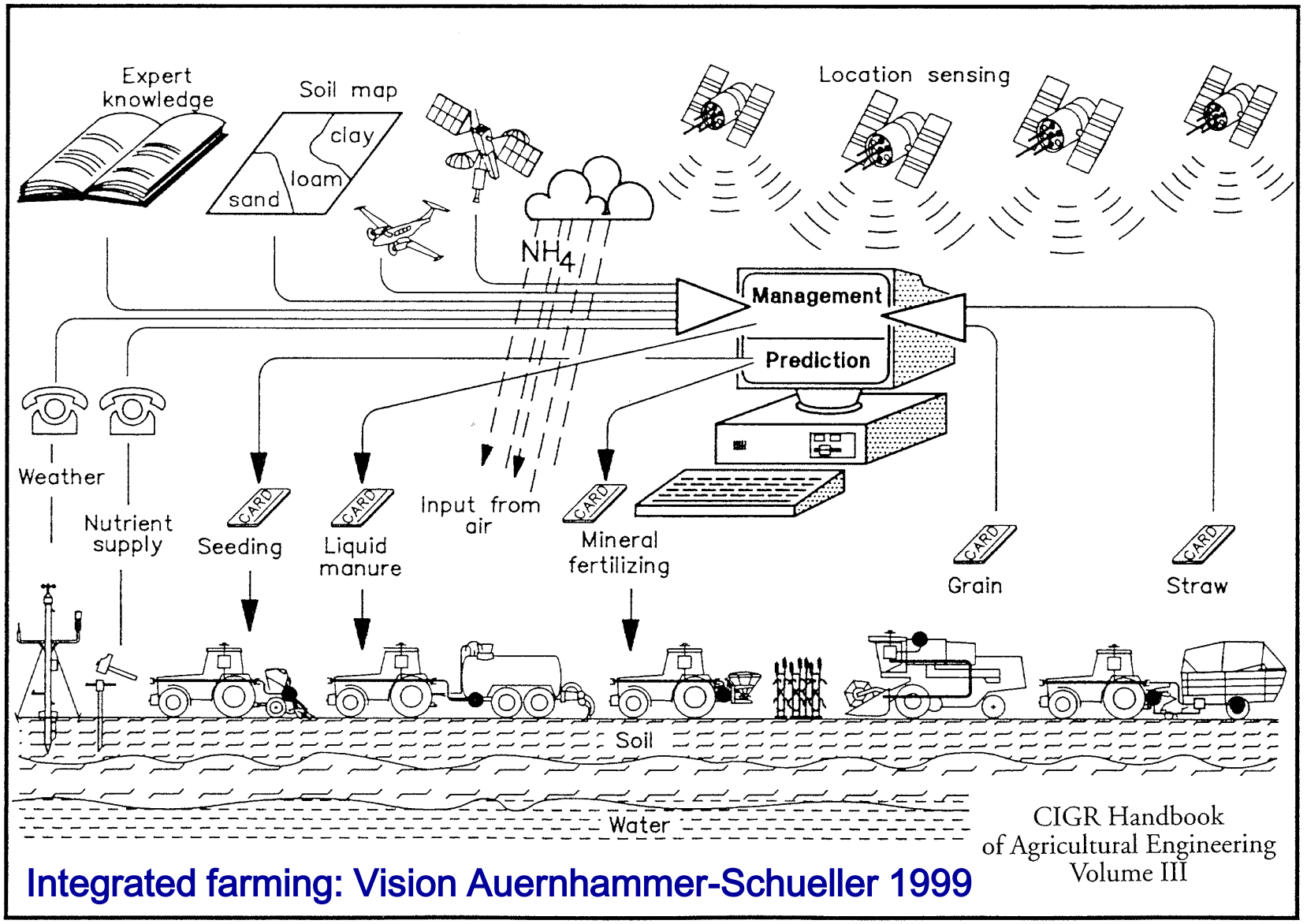
Technology level	Nominal engine power			Wheel drive			Diesel engine					Drive transmission					PTO			Hydraulics				Cab			Elec-tronics		
	Low	Medium (40–80 kW)	High	Only rear-wheel drive	Four-wheel drive opt.	Four-wheel drive stand.	1 Cylinder	2 Cylinder	3 Cylinder	4 Cylinder	6 Cylinder	Very simple	Simple	Partial power shift	Full power shift	Infinitely variable	540/min	540 and 1000/min	3 or 4 speeds	Rear 3-point hitch	Remote Control	Rear & front 3-p. hitch	Load Sensing circuit	No cab	ROPS / low cost cab	Comfort cab	Not existing	Low cost concepts	High tech concepts
I	X			X			X	X		X		X					X			X				X			X		
II	X	X			X			X	X	X	X		X					X		X	X			X	(X)		X	(X)	
III		X	(X)		(X)	X			X	X	X			X				(X)	X	X	X	X			X	(X)		X	(X)
IV		X	X			X			(X)	X	X			X	X				X	X	X	X	X			X			X
V		X	X			X				X	X					X			X	X	X	X	X			X			X

Source: Renius, K.Th.: Global tractor development: Product families and technology levels . 30. Symposium Actual Tasks on Agricultural Engineering, Opatiya 12.-15.03.2002

New age of automation in agriculture is based on the cybernetic principle of **"closed loop control"**

Maxwell 1867 - Isidori *Club of Bologna* 2012





Integrated farming: Vision Auernhammer-Schueller 1999