

Agricultural robots and autonomous vehicles – the next level of smart farming?



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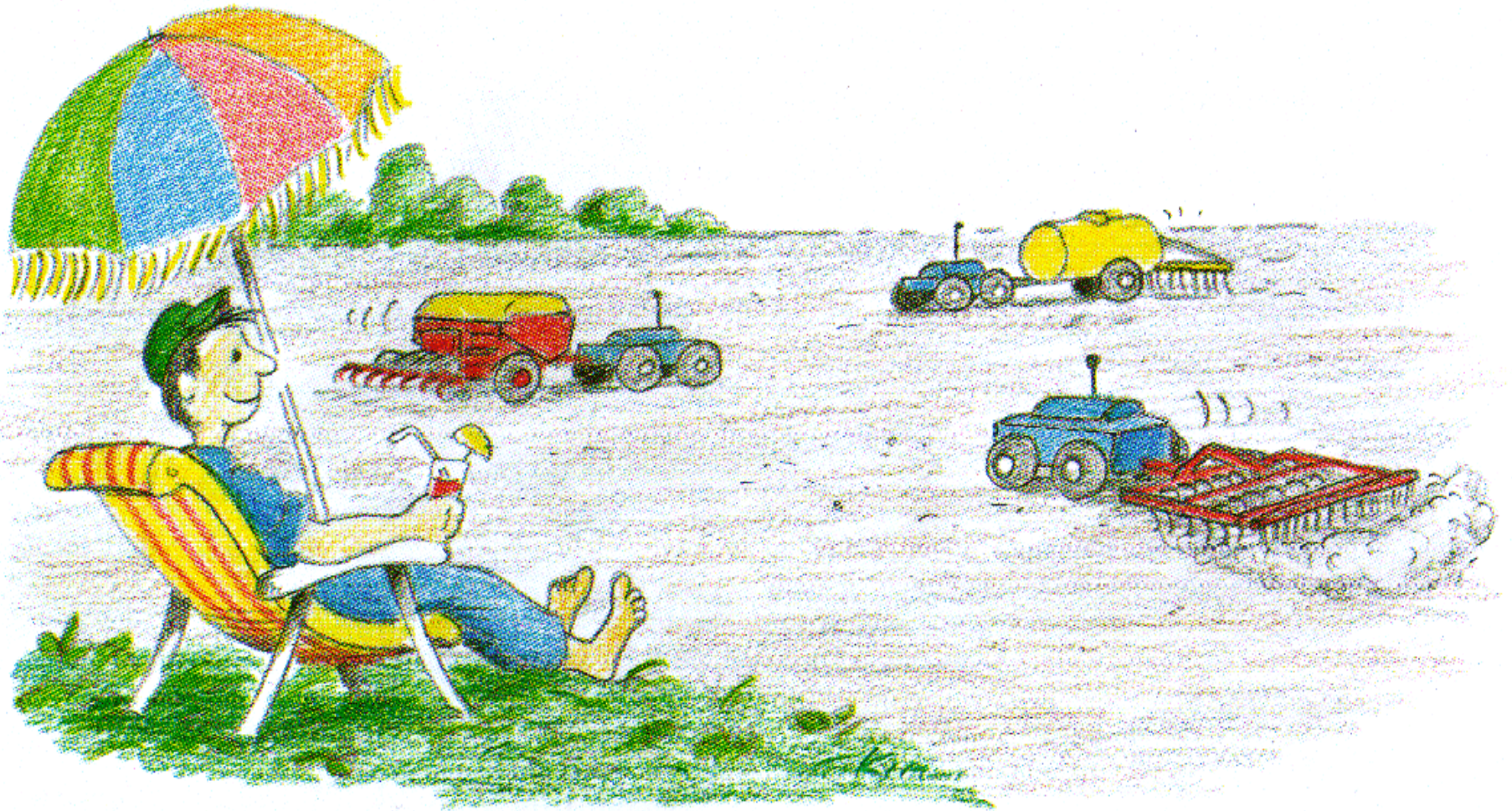


GNSS-based Automatic Steering Solutions

- Highly adopted by customers
- Integration of Headland Management
- Trend towards higher accuracy (RTK)



Is this the future?



Field Robots



Source: Deepfield Robotics



Source: Robotics Business review



Source: University of Helsinki



Source: Hochschule Osnabrück

Trend towards fully autonomous (driverless) tractors?



Source: CNHI



Source: AGCO/Fendt



Source: Kubota

Autonomous Tractors in Test



Drivers for autonomous vehicles



- Shortage and cost of educated labor
 - Large arable farming vs. specialty crops
- Cost reduction of unmanned machine
 - No cab needed
- Soil compaction reduction
 - Controlled traffic farming vs. light weight robots
- Reduction of input cost through precise placement/single plant treatment
- Autonomous cars & trucks
 - Strong cost reduction of safeguarding sensors
 - Facilitates legal approval discussion
- Educational focus on robotics
- Strong focus of venture capital and startup companies on agricultural robotics

Challenges for autonomous vehicles



- Product liability
- Legal situation
 - Driving on public roads
- Safeguarding sensors
 - Challenging environment (dust, dirt, fog, vibrations)
- Monitoring of other machine functionality
- Logistics
 - Handling of harvested material or inputs (seed, fertilizer)
 - Transport to/from field
- Complete re-design of machines
 - Optimal machine size depends on application
- Development of totally new cropping systems
- Availability of robotics/AI engineers

Applications - Weeding



Source: FarmWise



Source: Naio Technologies



Source: EcoRobotix



Source: Carré

Applications - Spraying

Source: Jacto



Source: SwarmFarm Robotics



Source: GUSS

Applications - Harvesting



Source: FFRobotics



Source: Harvest CROO Robotics



Source: HandsFree Hectare

Summary & Outlook

- GNSS-based steering solutions are mainstream.
- Growing interest and research in fully autonomous (unmanned) vehicles.
- A lot of drivers towards autonomous vehicles, but a lot of challenges still ahead of us.
- Field robots will be introduced first in specialty crops due to labor cost and labor shortage.
- Swarm technologies and alternative energy concepts seem to be necessary for introduction in large arable farming.



JOHN DEERE



Thank You!

