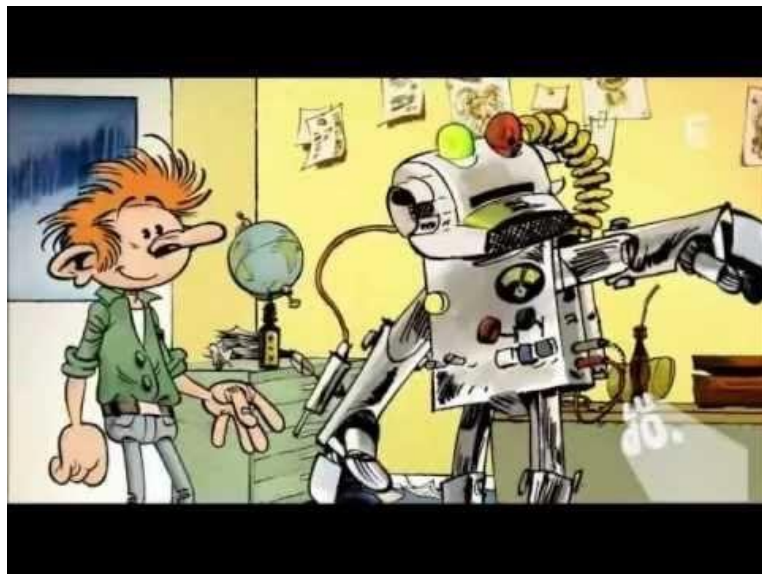
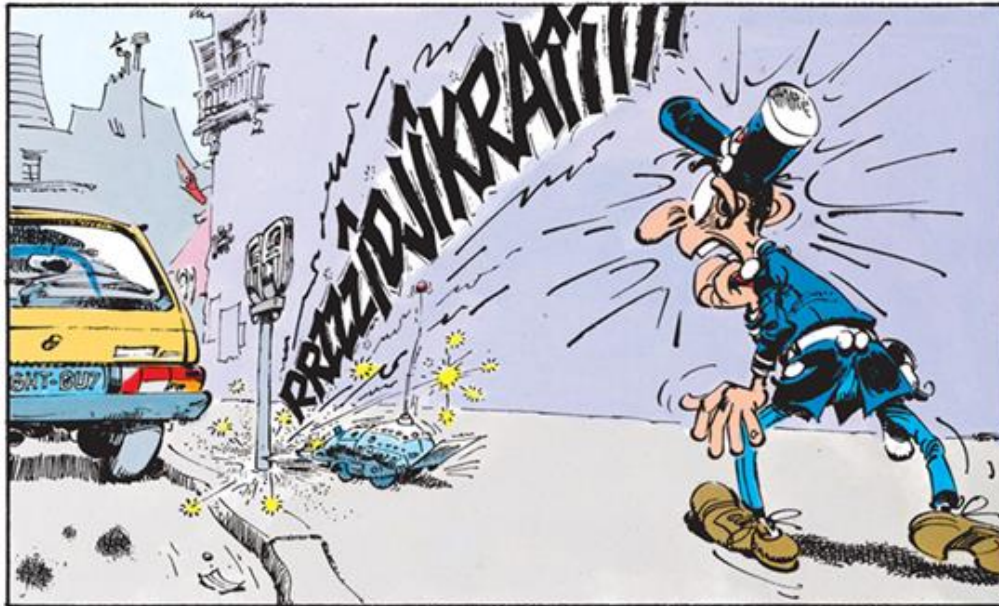


Agricultural robots in the Covid-19 crisis



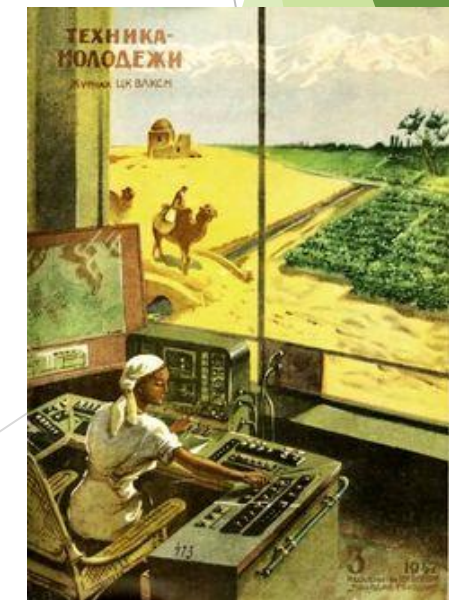
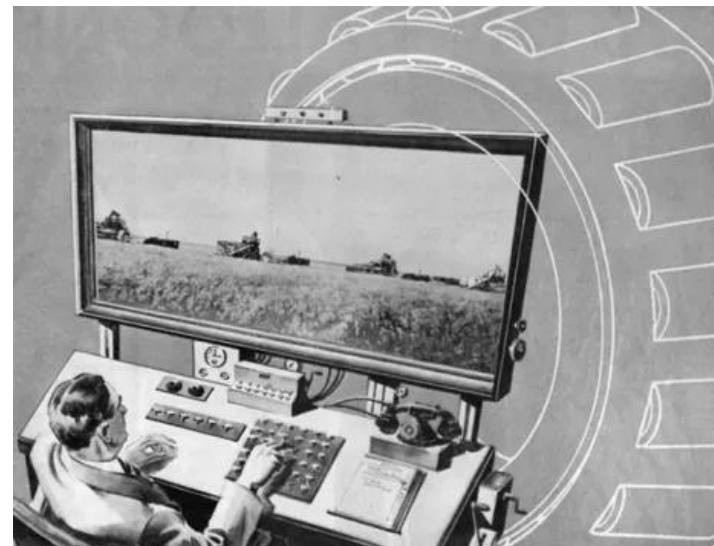
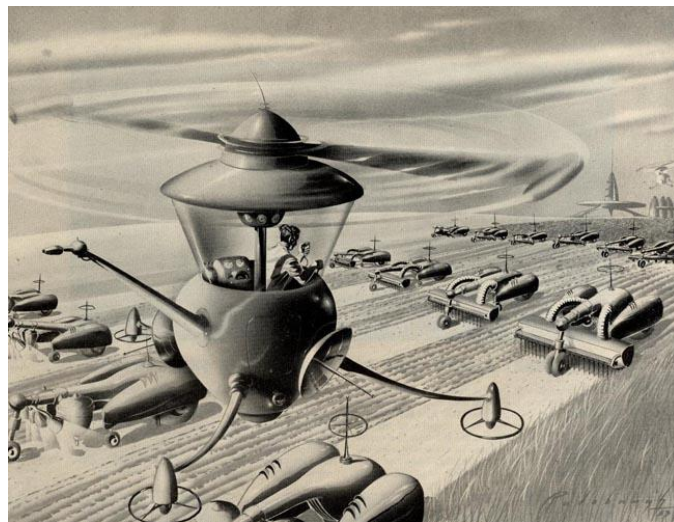
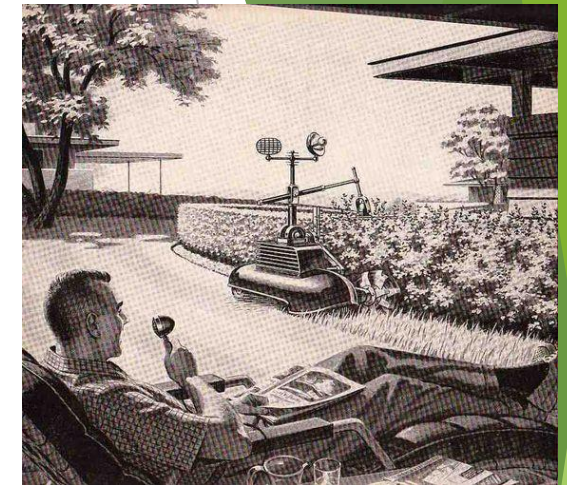
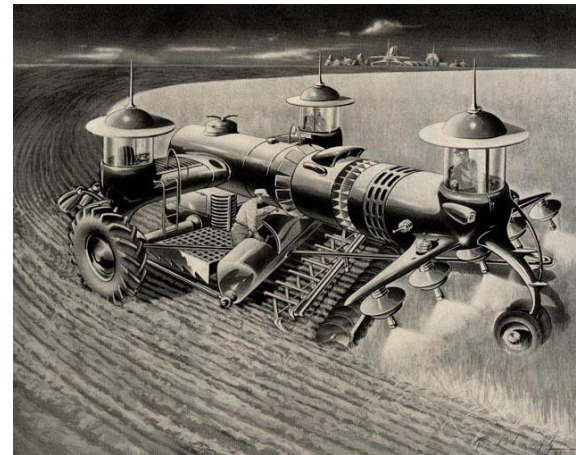
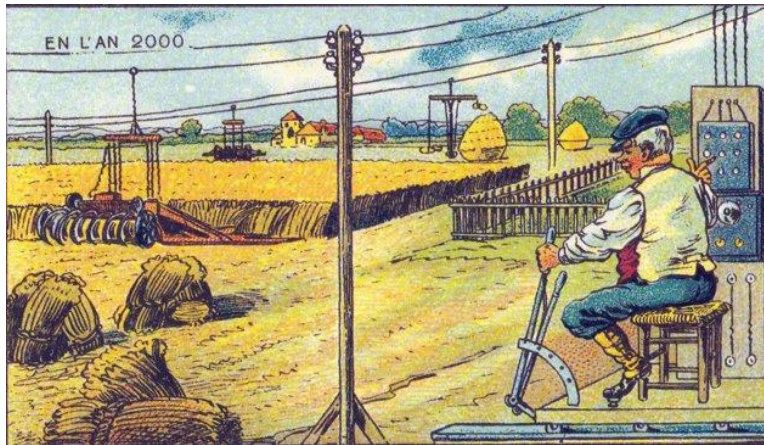
**Guy Waksman and Philippe Gate (Arvalis R&D director)
members of the French Academy of Agriculture**

Funny robots (1): the most famous robot in French comics, aimed at sawing and destroying the parking meters in front of the cops...



Click on the image to see “the future as we saw it in the past”
Splendid drawings gathered by my friend Alain Fraval
E-mail: [alain.fraval\(a\)orange.fr](mailto:alain.fraval@orange.fr)

The future robots as we saw them in the past



Funny robots (2): Robot wolves prevent Japanese bear attacks, and are also very creepy



Click on the image to access the article in The Guardian

Guy Waksman,

- Member of the French Academy of Agriculture
- Agronomist (Montpellier 1970-1973)
- Editor of two weekly newsletters Afia (in French) and Efita (in English) since 1997

- Canada / Remote sensing / Head of ACTA Informatique, a small Ag IT company

- Participant in a number of national and EU R&D projects devoted to ICT in Agriculture

See informatique-agricole.org

Others information sources

- [Future Farming \(NL\)](#)
- [Farm Industry News \(USA\)](#)
- [AgFunderNews \(USA\)](#)
- USDA



Overview

- Main characteristics of agricultural robots available today
- Agricultural robots in the face of a recurring lack of manpower
- Agricultural robots in test / demonstration (in Digifermes in particular) in their essential "digital" environment
- Robotization: continuity or break?



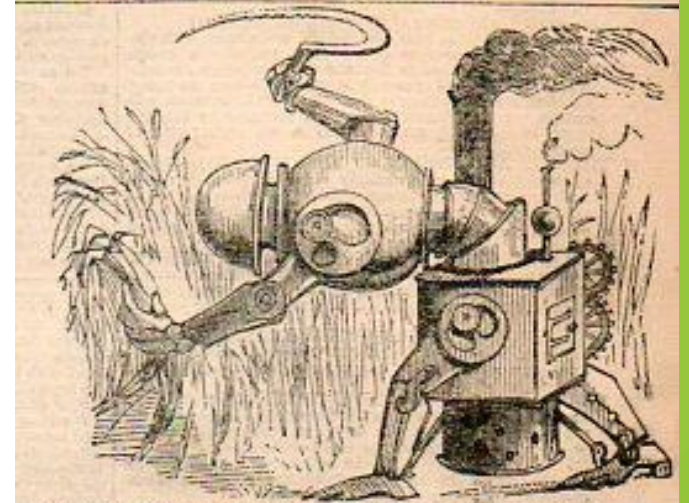
Bilboquet: there is a brain inside, you see this arm, its strength ...

Robots: opportunity or scapegoat for job cuts

- Beet harvesters
- Grape harvesting machines
- Milking machines in dairy farming

- Taking care of delicate, repetitive, demanding, and low-paid work

- Machines maintain, in our immediate environment, a huge diversity of productions under acceptable economic conditions
- The emergence of new, more attractive professions



The Steam Reaper, who will never be likely to bring any burdens upon its parish.



Agricultural robots may meet different needs

- Replacing manpower either expensive or unavailable
- Allowing the improvement of workforce productivity
- Replacing an existing tool



Robots must be adapted to the regulatory context

- None of the possibilities of Tesla or Google vehicles...

To comply with the regulations, the robot must be transported to the field or to the orchard

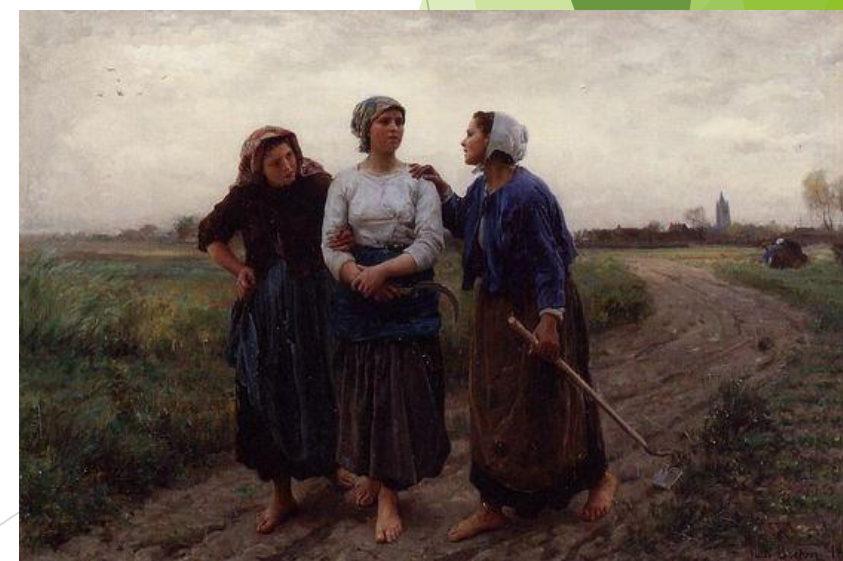
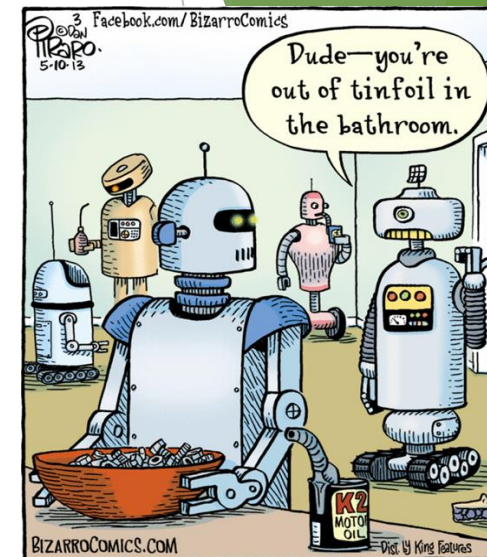
- Regulations (and caution) also dictate that you do not throw an agricultural robot into an unattended field

- If you watch one, you watch several robots.



Diverse engines

- Electric drives often preferred
(But : cost and weight of the batteries = an issue)
- Robots = less powerful than current big machines (especially with an electric motor)
- Working in herd (no stop) they will achieve an interesting output

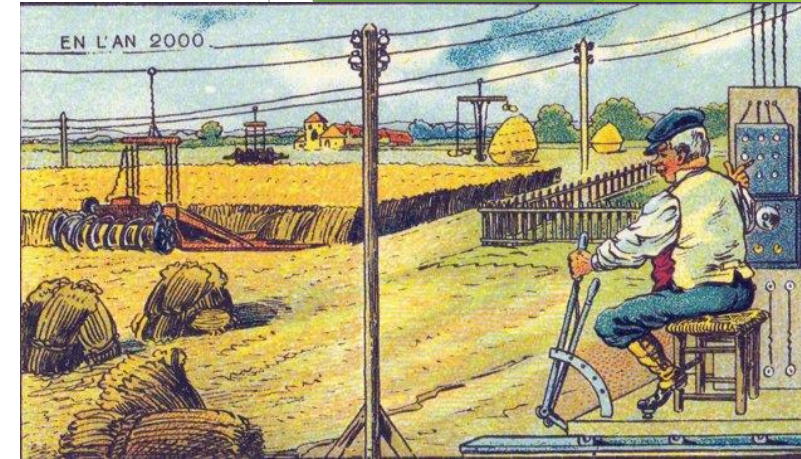


Sophisticated software

- Robots will use artificial Intelligence techniques: processing data from cameras, sensors and connected objects
- Very highspeed image analysis

Positioning to the centimeter

- Robot positioning precision on the plots is a prerequisite
- RTK system to correct the GPS signal using a fixed reference station
- Galileo is far more precise than GPS but not sufficiently precise for field works

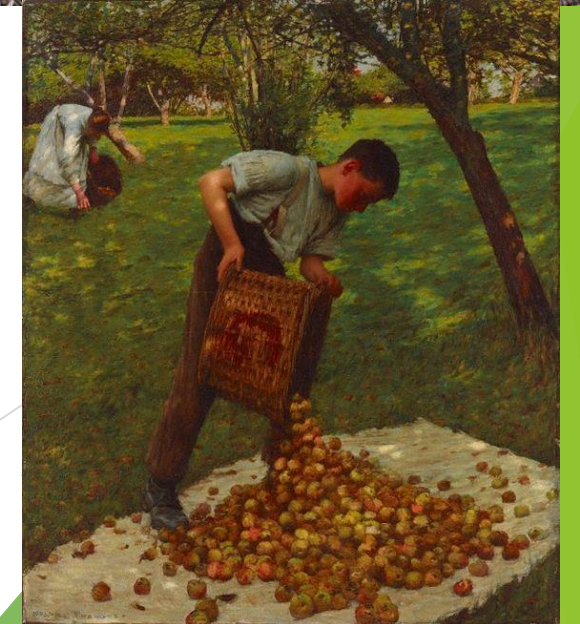
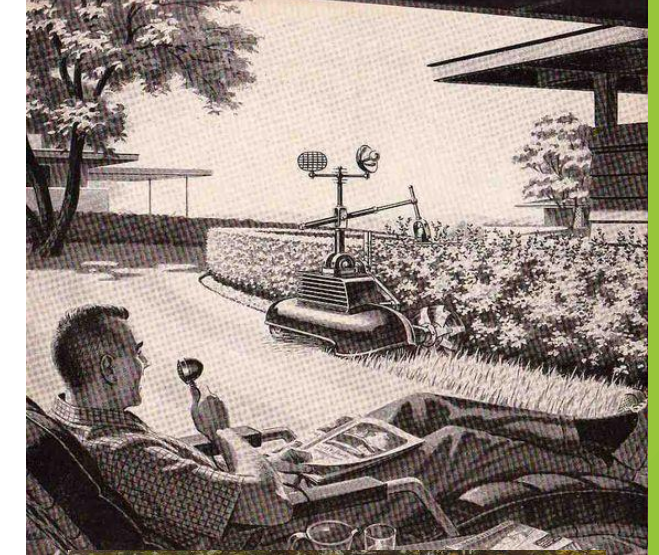


Remote / automatic piloting

- Agricultural robots are controlled remotely, or work in automatic mode.
- It requires an interface with the farm's geographic information system, itself part of the FMIS (Farm Management Information System)

Need to restructure the farm fields

- Alignment of the rows of vines to enable the harvesting machine to move from one plot to another
- Restructuration of the orchards into fruit hedges facilitating access to fruits



Robot rather turtle than hare

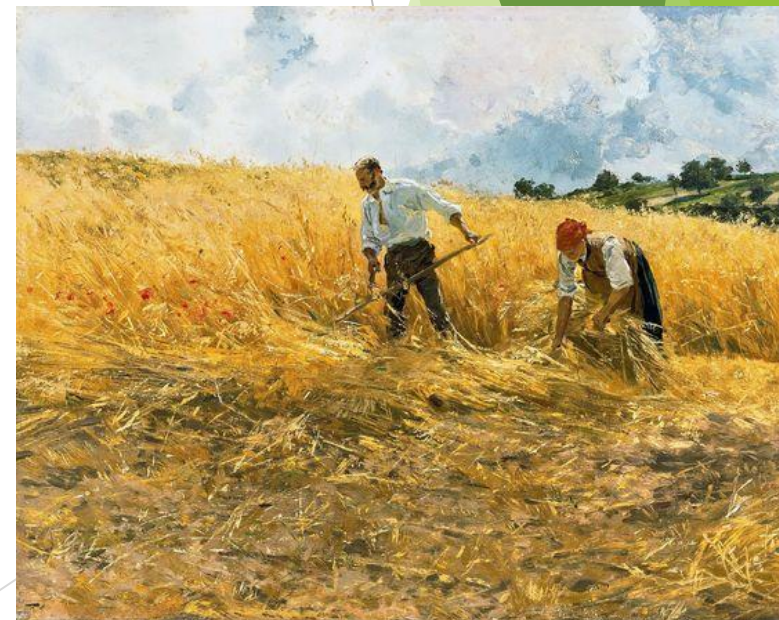
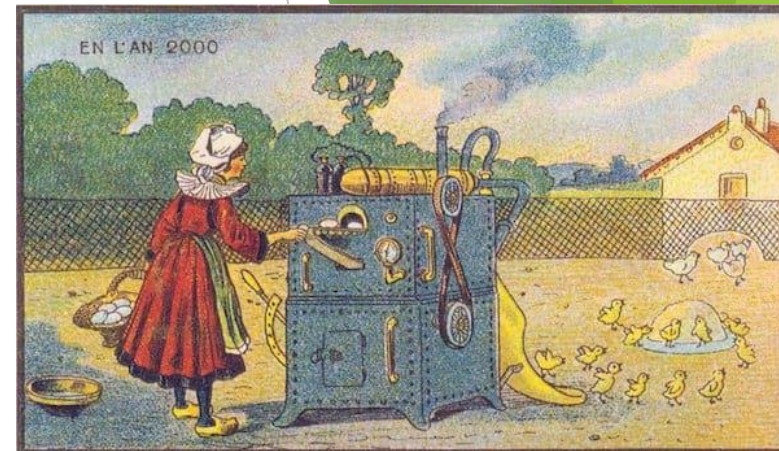
- Robots not necessarily fast
- Can do long working days (collecting strawberries produced in greenhouses)
- Can work during the night

Giant robots ?

Very astonishing projects are under development, such as the Russian project aiming to build 10,000 driverless robots combined.

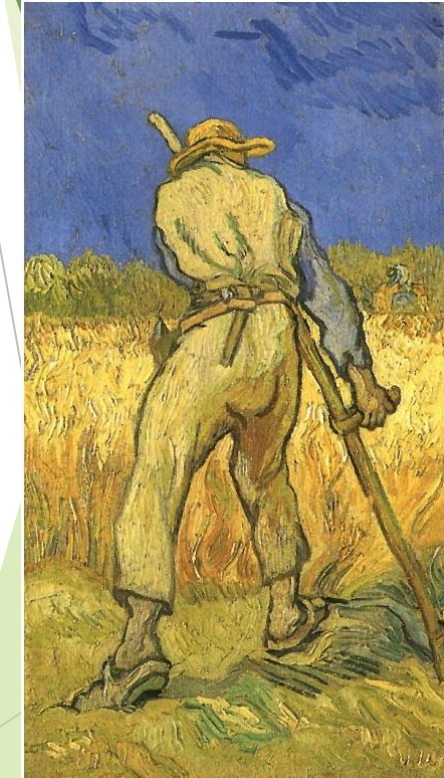
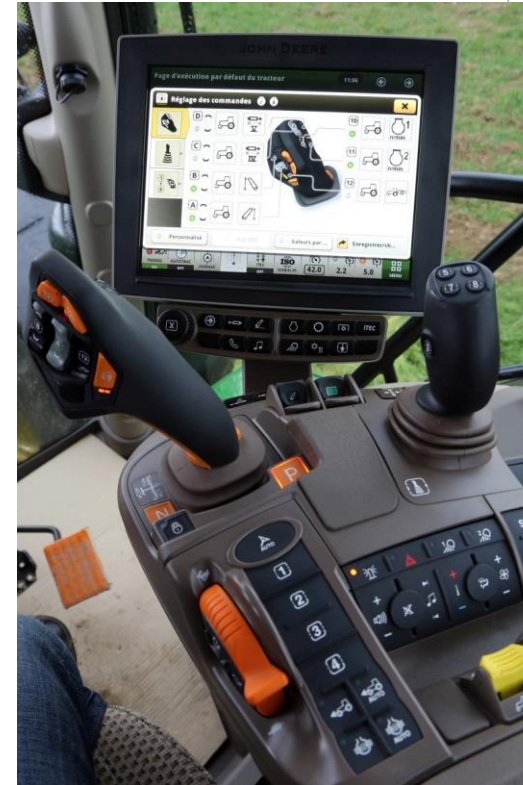
Flying robots ?

Still for phytosanitary treatments, solutions with drones (flying robots) applying treatments selectively, already exist



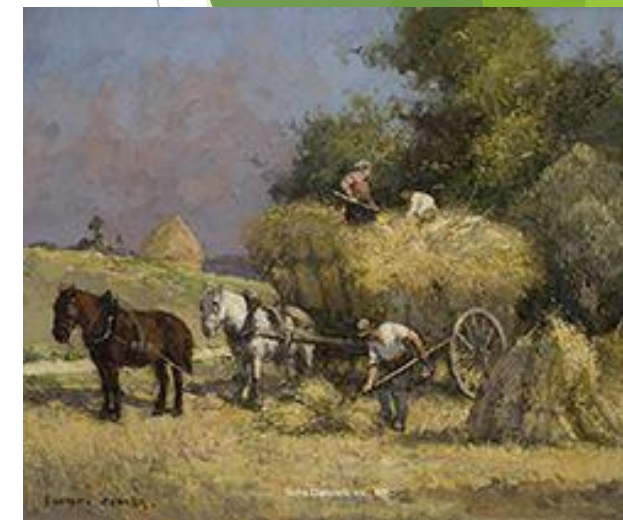
Labour vs machines / robots in the Covid crisis

- In France, 200,000 immigrant workers, needed every year
- Like Italy, which planned to regularize the situation of 600,000 immigrants
- Like the United Kingdom where nobody knew who will pick the strawberries (English people love to eat!)
- Like California, which does not see how to replace Mexican migrants



Labour vs machines / robots in the Covid crisis

- Lack of manpower due to the closure of borders
- Development of many web sites during lockdown to bring together job seekers and job providers
- 15,500 employers and 300,000 workers registered, but little successes at the end... (Around 15000 people hired)
- Many practical difficulties met
- A lack of attractiveness of agricultural jobs?
- A global failure but a few great experiences and a great communication campaign!
- There remains the solution of mechanization, or rather robotization...



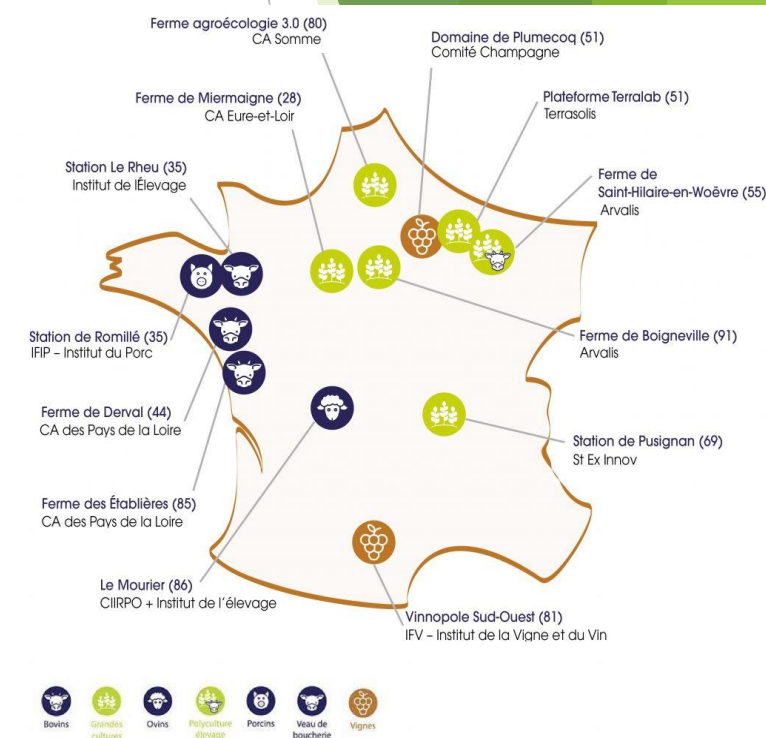
To meet the needs for tests & demos (1)

In France:

- 8,000 milking robots
 - 2,000 robots dedicated to managing livestock feed and effluents
 - 100 weeding robots for horticulture productions or vineyards
- To convince farmers, a lot of demonstration work to be done in full-scale work with robots still in the prototype stage, particularly in plant production.

There are margins for further progresses and needs for tests and demos: e.g.

- In Germany with DLG / In Netherlands with WUR
- In US with USAID
- In France with Digifermes, real playgrounds for digital innovations, including robots, in cattle breeding and field crops



To meet the needs for tests & demos (2)

- Robots and their digital farm environment
- Decision Support Systems, Farm Management Information System
- IoT, captors, image processing, satellite imagery, drone imagery, mapping



Outils d'aide à la décision utilisés sur les différents dispositifs

Septo-LIS®

Baromètre Maladies

Mélanges
des produits phytosanitaires

& autres applettes ARVALIS

SYSTERRE®, un outil d'évaluation multicritères



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expert

Vos parcelles vues du ciel

Option Drone

FERTIWeb®
La solution plan de fumure

Irré-LIS®

Taméo®
L'innovation agronétique

Robotization: continuity or break? (1)

- The effort to mechanize agriculture that began in the first half of the 19th century is continuing today with robots
- From 1851 to 1975, fifty million immigrants had followed one another on French territory
- Machines have replaced the low or unpaid (see spouses and children and other family members), painful, endless, and uninteresting work of millions farm workers
- Machines really freed these workers who rushed to the towns to find miserable life conditions together with a feeling of liberty and the hope for better life...



Milking robot



Potatoes harvest

Robotization: continuity or break? (2)

- The development of robotization in agriculture is not yet an easy and costless task
- Technical progresses together with promotion, testing, demonstration, and insertion efforts in the digital world of farms
- FIRA is and will remain extremely useful to agriculture for many years to come...





Thank you for your attention
Motto of the French Ag Academy:
One passion: to know
One ambition: to transmit