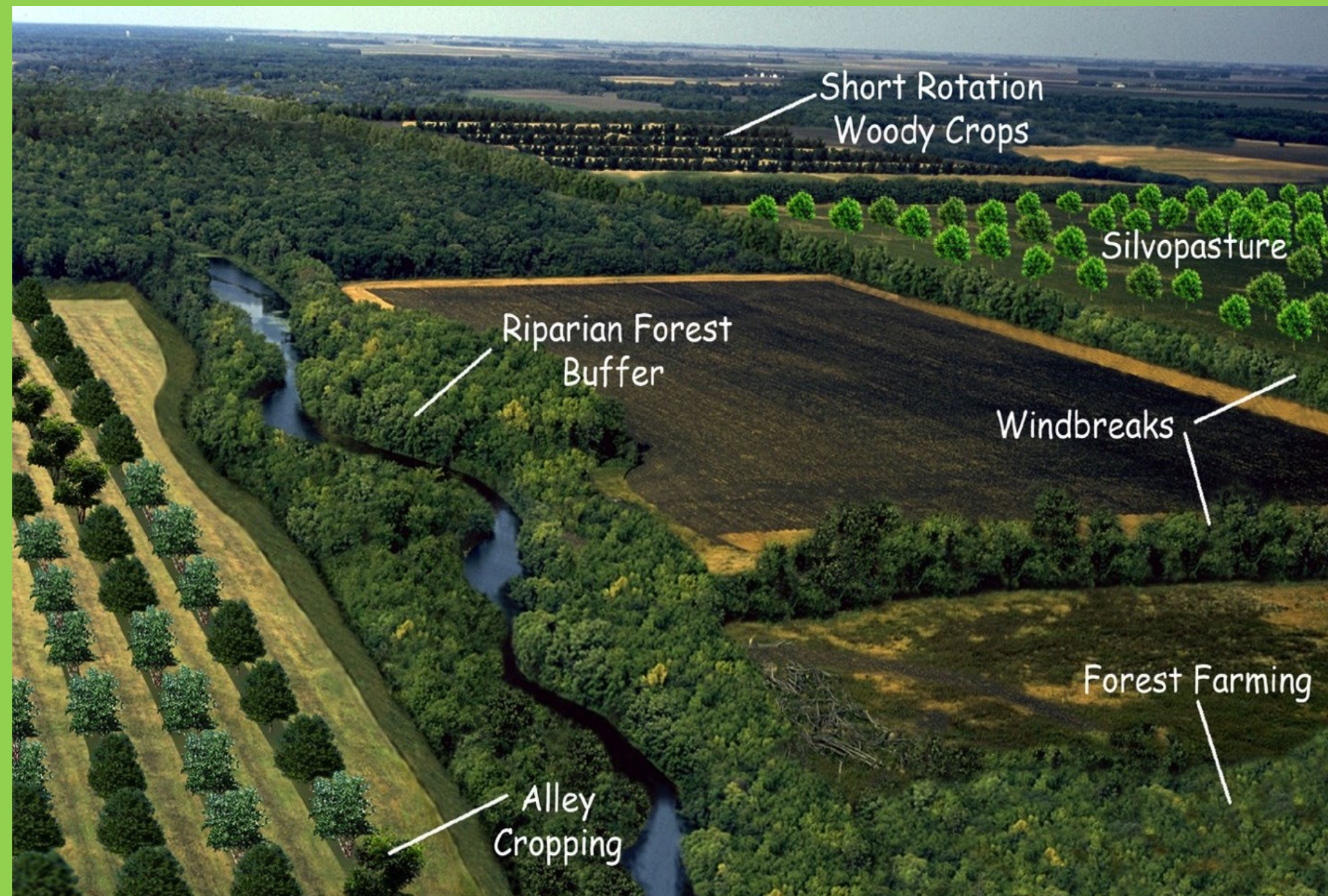




Agroforestry systems for bioenergy and ecosystem services

Experimental plantation of conventional agro-production combined with short rotation coppice and alley cropping

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Main types of agroforestry systems USDA, 2010

Agroforestry systems (AFS) means land use systems in which trees are grown in combination with agriculture on the same land (Regulation (EU) No 1305/2013)

- very innovative and flexible (for task - conditions)
- allows stable production with strong eco-services
- mitigation and adaptation measures

The aim of the experiment (and following work)

- To evaluate possibility of AFS with SRC as a measure (subsidy) of new CAP (2022+)
- to study agronomic, production, ecosystems and economic aspects of AFS.

Methodology

As a model we have used silvoarable **agroforestry system with coppiced tree belts (AFS-CTB)**

- 25 ha field with 17% covered by CTB and 83% by conventional food crops
- 5.5 m-wide belts with 3 rows of coppiced trees (poplars Max-4, 'Kaktu'; willow 'Rokyta').
- Distance between CTBs is approximately 26 m.
- Electric fence for protection against animal damage (browsing roe-buck, hare)

Evaluation of production: we have collected yields of coppices trees from existing SRC plantations as well as newly established CTBs. For rotating annual crops in AFS we have used yields form statistical yearbooks.

For economic evaluation of AFS-CTB we have used the minimum price method, which enables simultaneous assessment of annual and perennial crops (tree) over time. We have collected data for economic analysis including establishment cost.

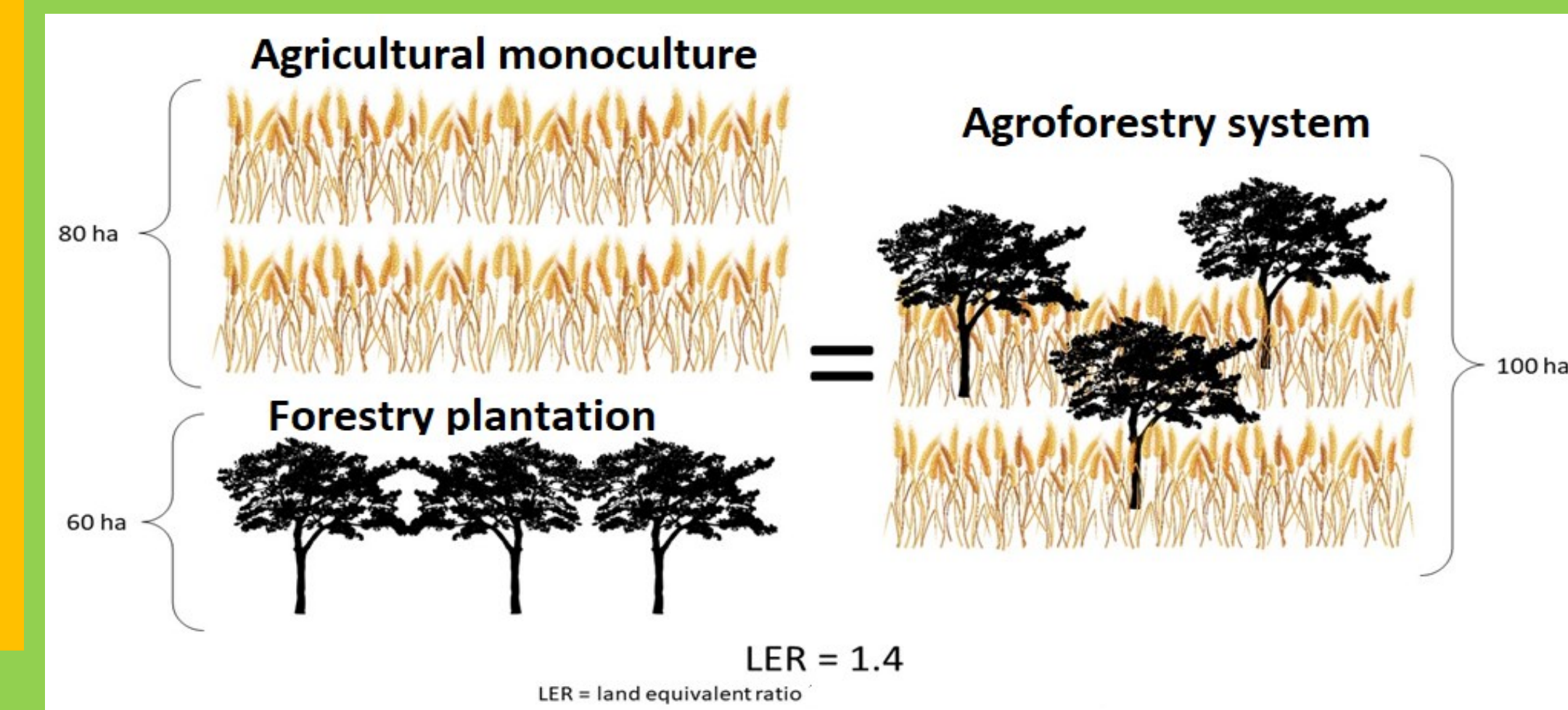
For environmental evaluation of AFS-CTB we have been using data from (narrow) short rotation coppices and have established monitoring parameters in new field experiments.

Results and Conclusion

1. Biomass production of AFS-CTB can be higher per growing area than in large SRC plantation due to positive edge effect (+100-250 %; $K_{ef}=1,13$ for whole CTB in our model).
2. Tested successfully electric fence for protection of trees in CTB against animal browsing (only 7-23% browsed trees).

Futher plans

Establishment of three more rows in above mentioned agroforestry system consisting of fruit and hardwood trees. For example *Sorbus torminalis*, *Prunus avium*, *Quercus cerris*, *Juglans regia*, *Pyrus pyraeaster*, *Castanea sativa*, *Crataegus sp.*, *Acer campestre*, *Quercus robur* should be planted in.



LER (land equivalent ratio) of value 1,4 means that 100 ha of AFS produces the same yields as 140 ha of trees and agricultural crops when grown separately. (Mead, Willey, 1990)



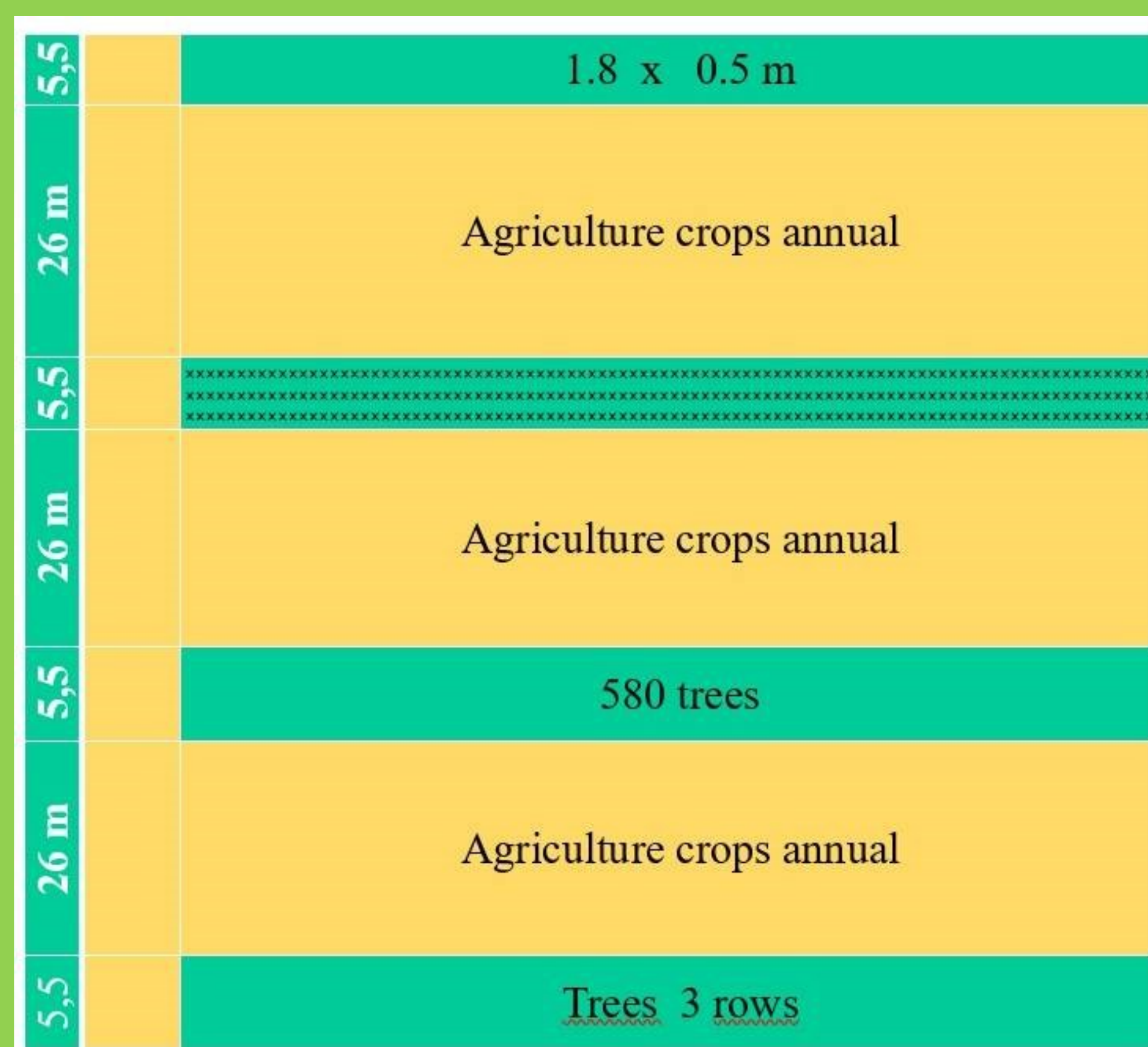
A newly established AFS-CTB in Průhonice protected with an electric fence was very efficient in protection against animal damage (browsing roe-buck, hare)



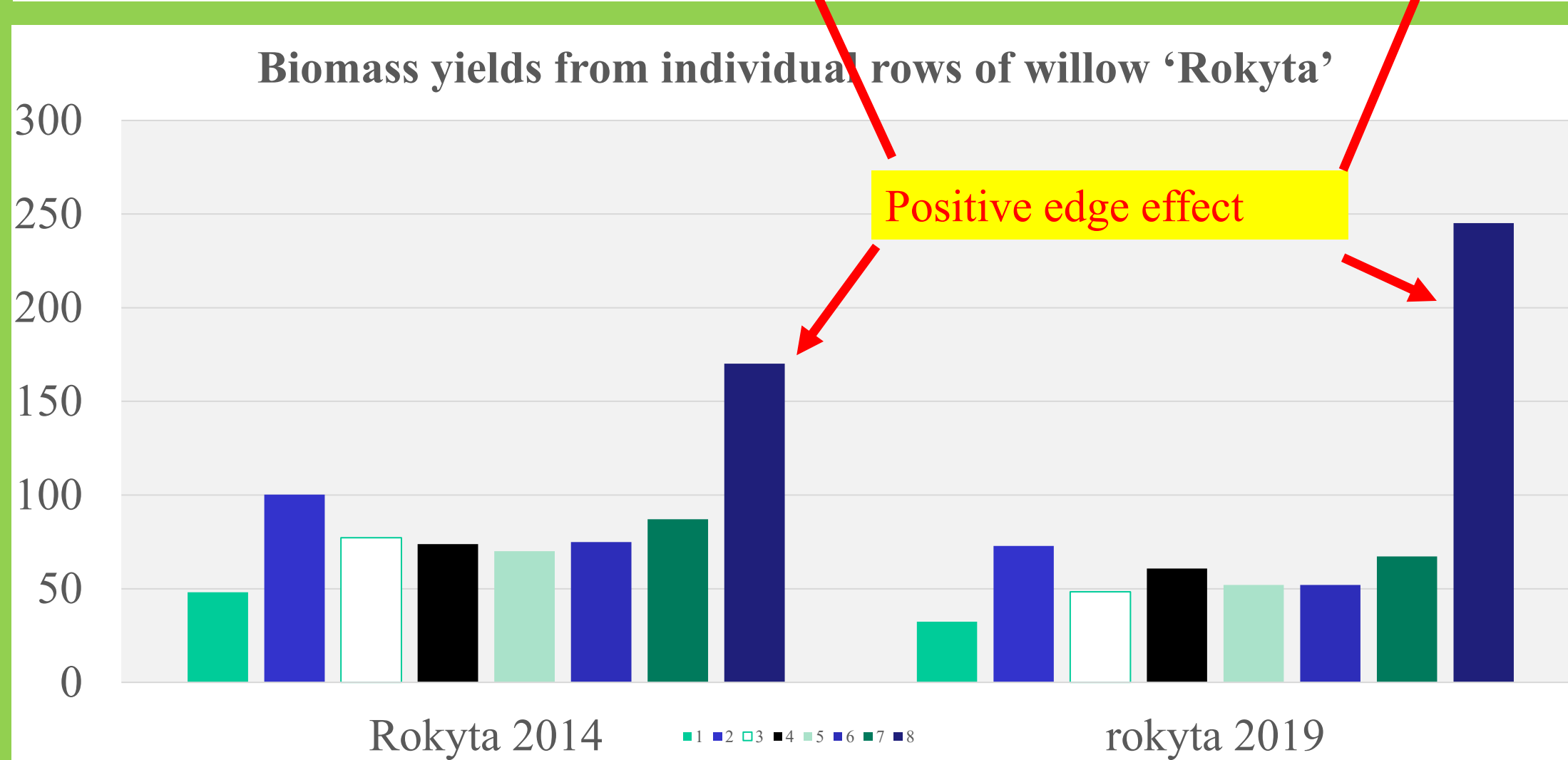
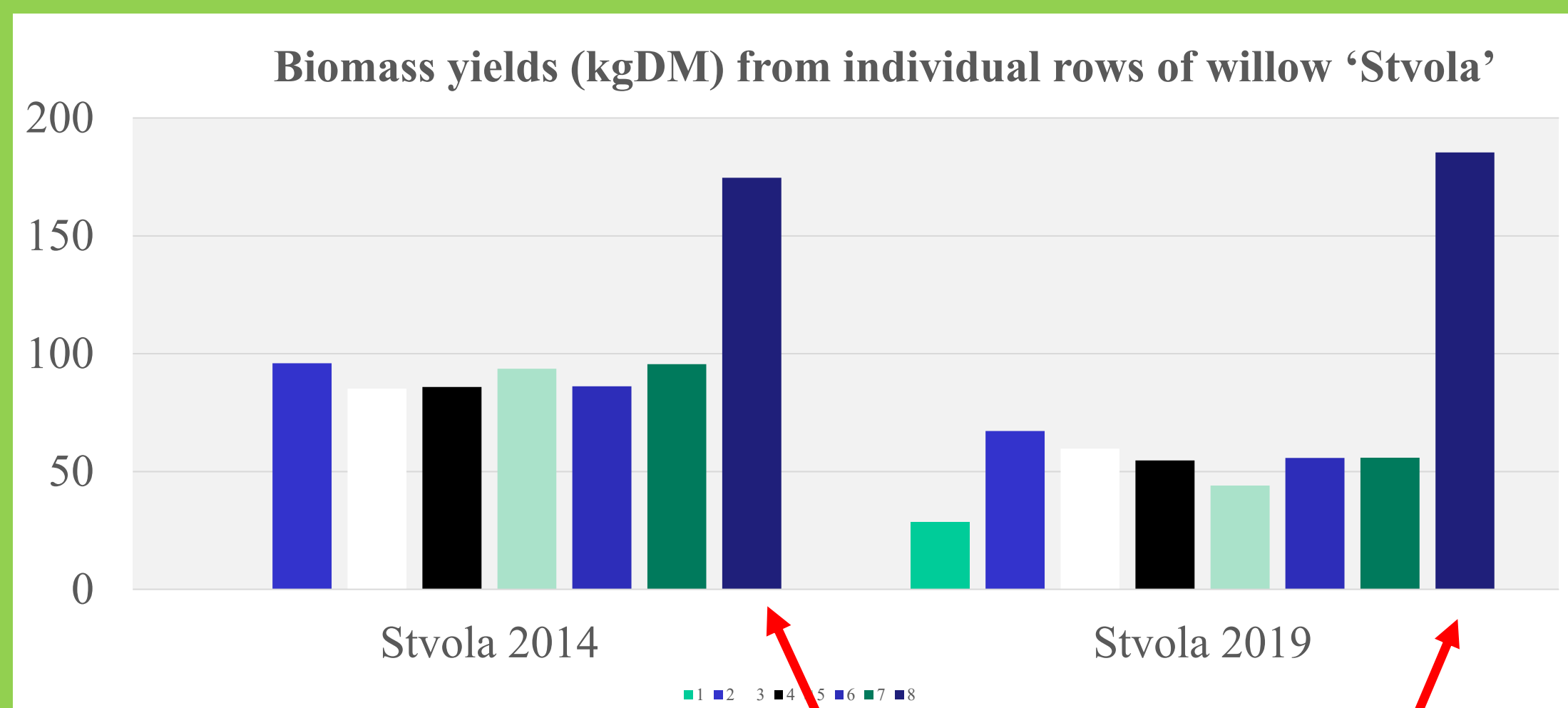
Contour plowing and seeding (here marrowfat pea March 2021) in AFS-CTB Průhonice is not difficult for experienced tractor operator (field strips are 26 m wide)



Three rows short rotation coppice part AFS about one month after pea sowing, Průhonice, May 2021.



Scheme of a model of AFS with coppiced tree belts (AFS-CTB) used in our experiment



Sowing of pea crops in 26 meters wide agriculture annual crops rows part of AFS, April 2021, Průhonice.