



Session 7:
Software supported
Voluntary Exchange of Land Parcels

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Overview

1. Land Consolidation is hard in Theory
2. Land Consolidation is even harder in Practice
3. Taylor-made Software
4. Some Results
5. Final Remarks

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1. Land Consolidation is hard in Theory



9 farmers, 342 lots

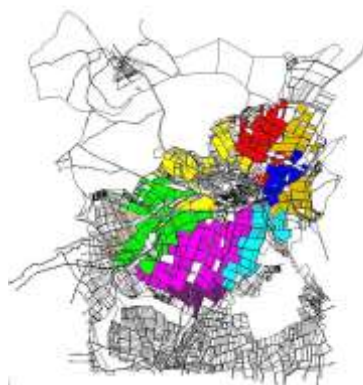
- 9^{342} combinations
- evaluation of all combinations takes approx. 10^{289} years (size, quality of soil)
- Big Bang approx. 10^{10} years ago



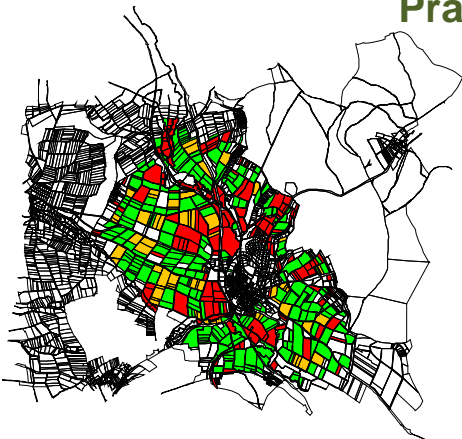
Derive Optimization model



Solution by Combinatorial & Convex Optimization



2. Land Consolidation is even harder in Practice



voluntary exchange allows for

- **fixed lots**
- **desired center lots**
- **free lots**

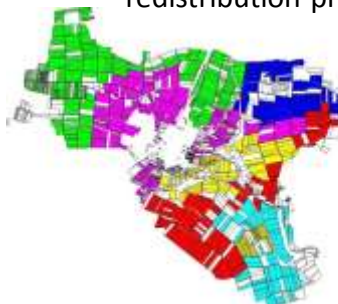
and even more complex, e.g.,



fixed lots can become **free lots**

3. Taylor-made Software


Participating farmers decide on

- which lots participate
- who is allowed to get lots
- how they start their redistribution process



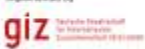



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It has to be

- simple
- transparent
- flexible (just try!)





and has to consider

- farm sizes
- quality of soil
- EU subsidies
- etc.

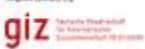



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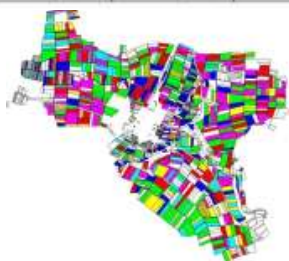
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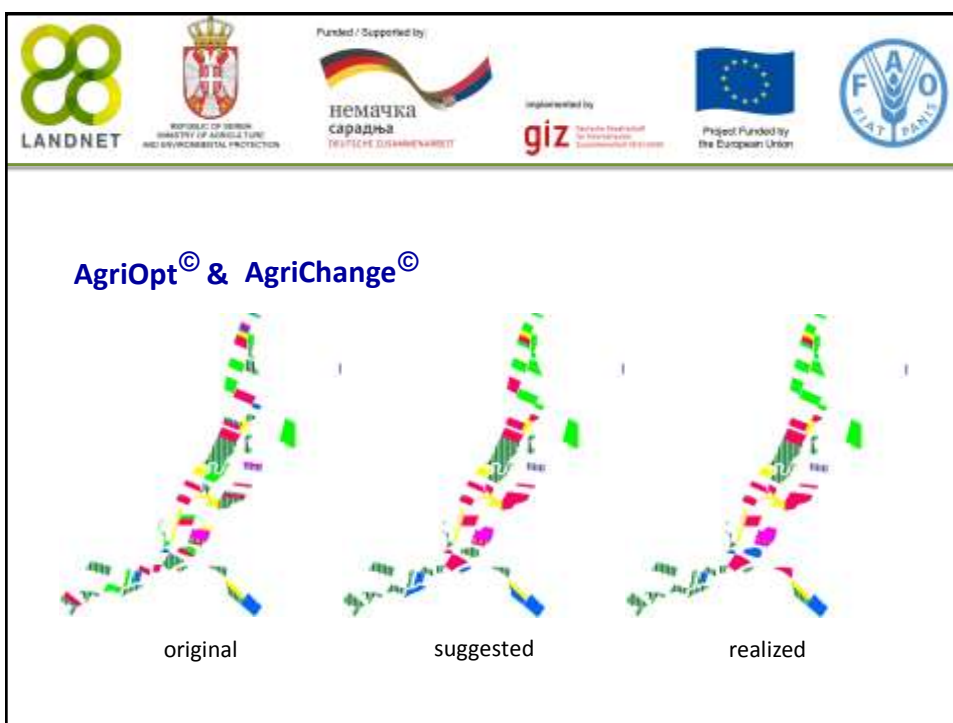
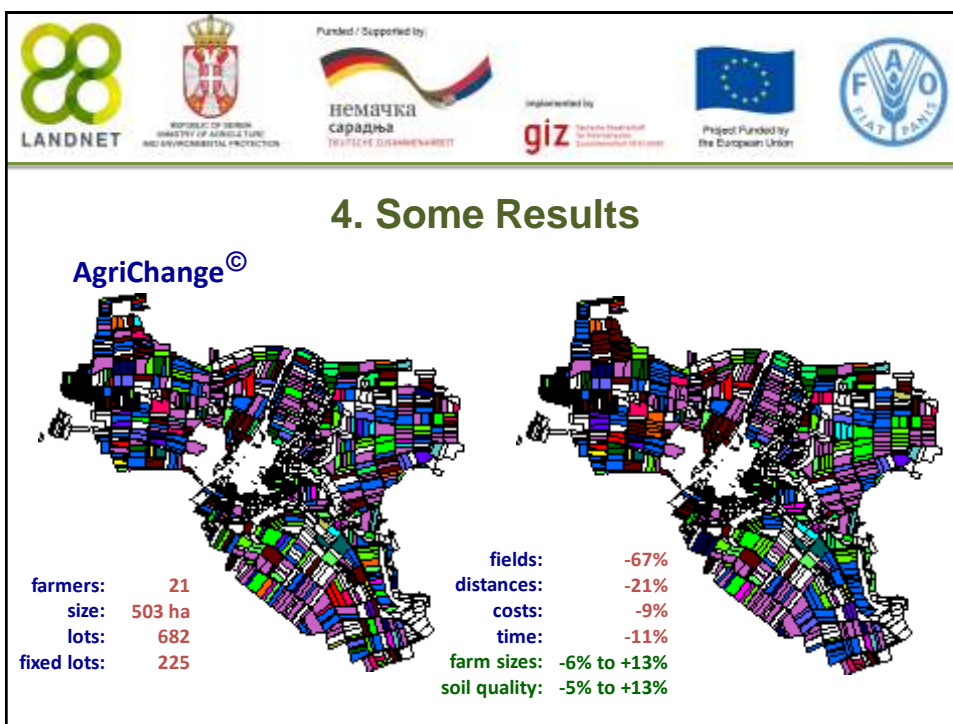


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... because you have to convince the farmers!

fixed lots	total cost	cultivation cost	driving cost	number of lot components	possible reduction in lot components
32%	-8,76%	-8,06%	-27,07%	-32,08%	86,31%
24%	-9,73%	-8,95%	-30,25%	-35,40%	92,49%
16%	-10,84%	-9,83%	-37,15%	-38,50%	95,08%
8%	-11,53%	-10,26%	-44,50%	-40,27%	96,30%
4%	-11,65%	-10,27%	-47,81%	-40,27%	96,30%
1 per farmer	-12,26%	-10,77%	-50,91%	-42,04%	100%





4. Final Remarks

- Research Project

EURO Excellence in Practice Award 2013

Sponsored by **IBM** distinguished accomplishments

- in the **practice** of Operational Research
- of outstanding **scientific quality**, and
- **high impact to practice**.

- Software

- applied by farmers for exchanging their lots
- used in school for teaching young farmers
- employed by the Bavarian forest administration (different optimization tasks)