

On the ecological sustainability of organic farming



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A design problem

- ❖ Agriculture is not sustainable, because it wasn't designed to be sustainable
- ❖ Organic ag models conventional ag more closely than it models Nature
- ❖ Apart from disallowed inputs, both organic and conventional suffer from the same fundamental design flaws

What design flaws?

- ◆ Annual growth habit
- ◆ Monocrop
- ◆ Large scale
- ◆ Bare soil/cultivation
- ◆ Linearized nutrient flow
[for export; no return]
- ◆ All contravene the principles that sustain Nature, esp. here



Design is the first sign of intention

- ❖ Agriculture wasn't designed to *be* sustainable (ecologically, socially, economically); sustainability wasn't a design driver
- ❖ Agriculture was *designed* to export to the Mother Country
- ❖ For sustainability, need another design



Does organic emulate Nature?

- ◆ 9 Ecological Sustainability Indices (ESI)

- ◆ Tested over 12 organic farms

 - * 3 pasture farms

 - * 5 mixed crop/livestock

 - * 4 horticultural farms

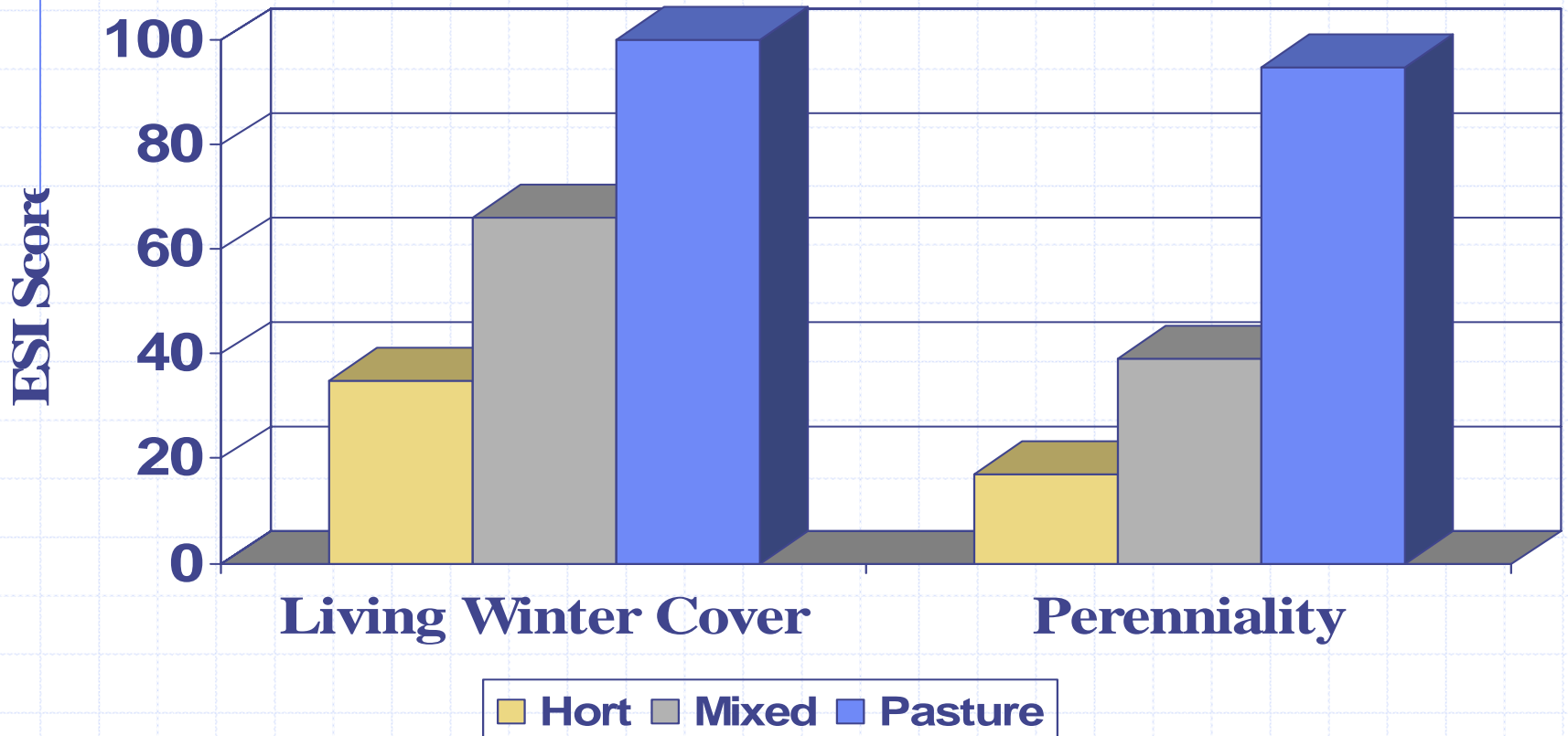


- ◆ Surveyed by Clark and Maitland (2004)

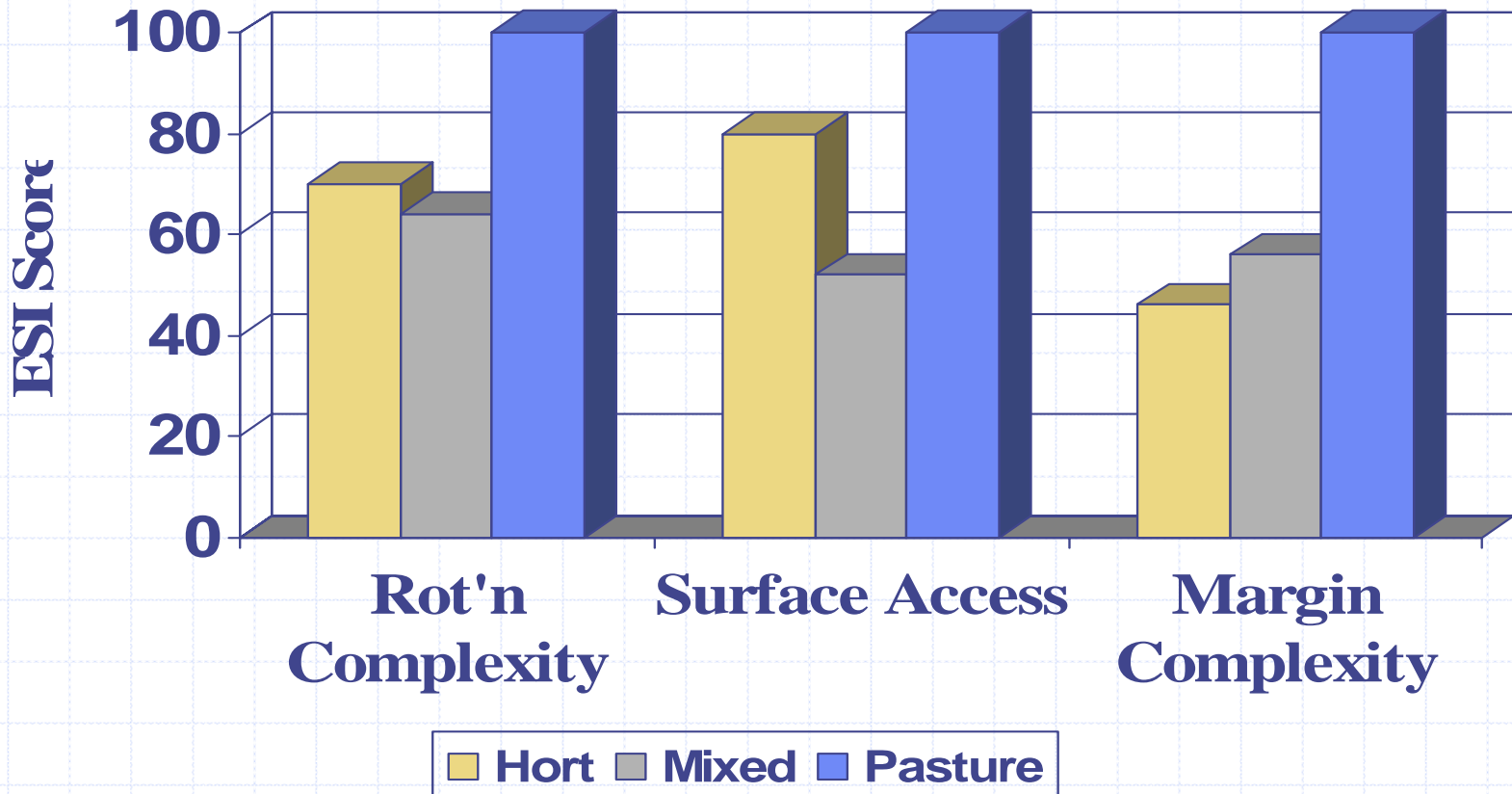
ESI (Ecological Sustainability Indicators)

Type	ESI (9, each equally weighted at 100 points)
Soil	1. Living winter cover (% years) in rotation 2. Perenniality (% years) in rotation
Biodiversity	3. Rot'n complexity (more better) 4. Surface access (edge/area ratio; plotted) 5. Margin complexity (wild edges)
Nutrients	6. N-fixation (% years) in rotation 7. Livestock integration (on-farm, compost, forage)
Energy	8. Tractor intensity (passes/field) 9. Travel distance (local, provincial, export)
Aggregate	% of maximum 900 points

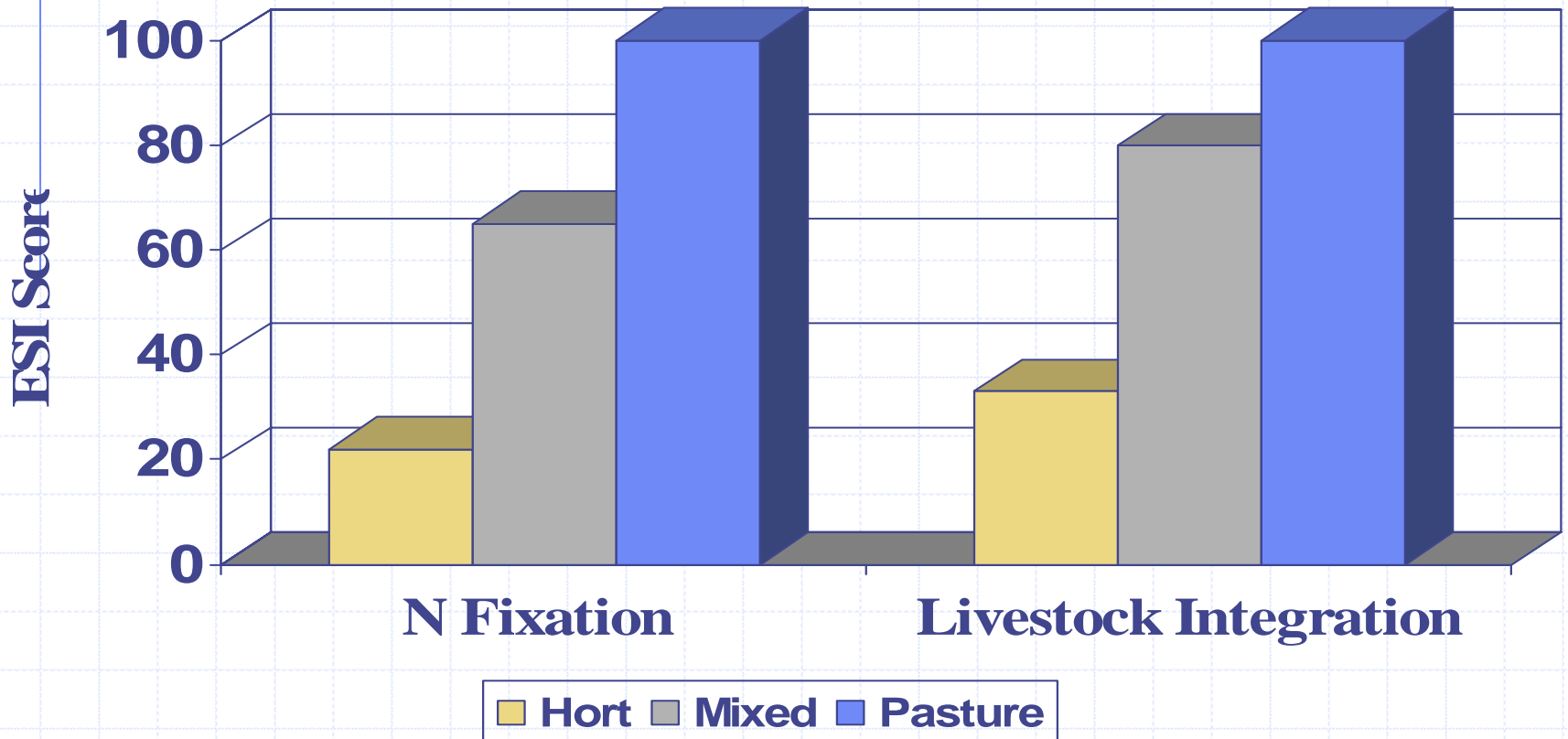
Scoring of ESI components: soil



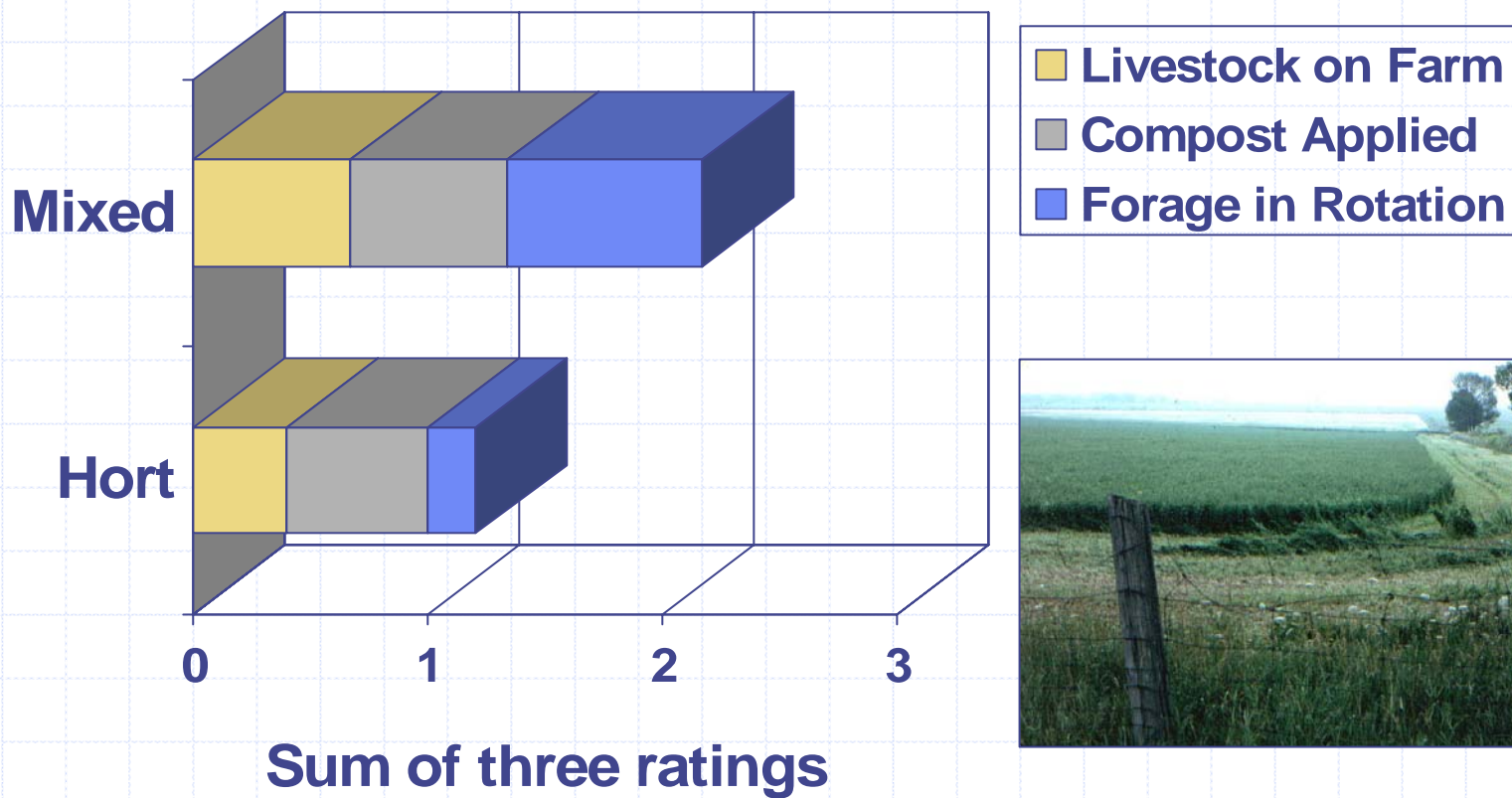
Scoring of ESI components: biodiversity



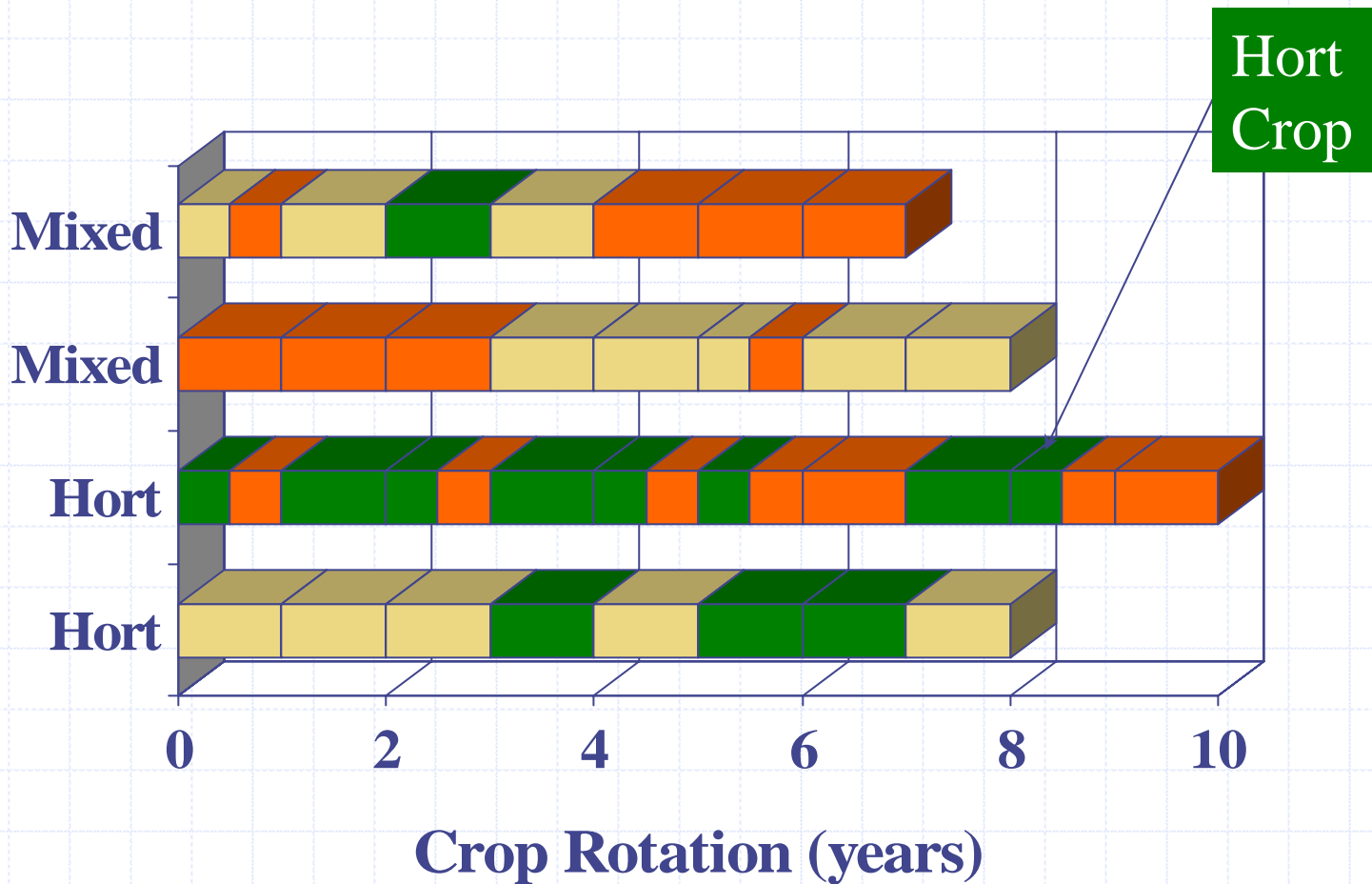
Scoring of ESI components: nutrients



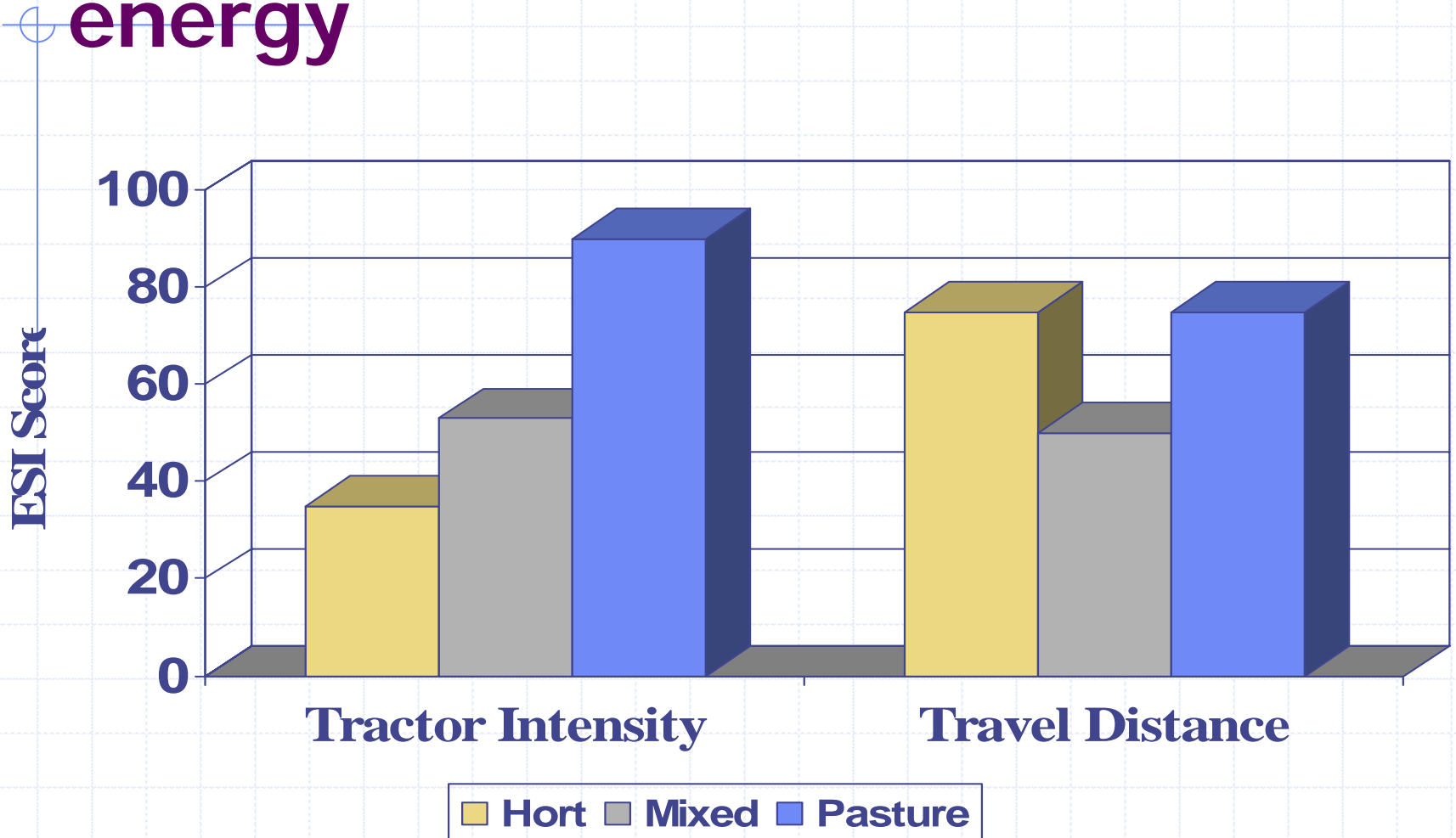
Integration of livestock on hort vs. mixed farms



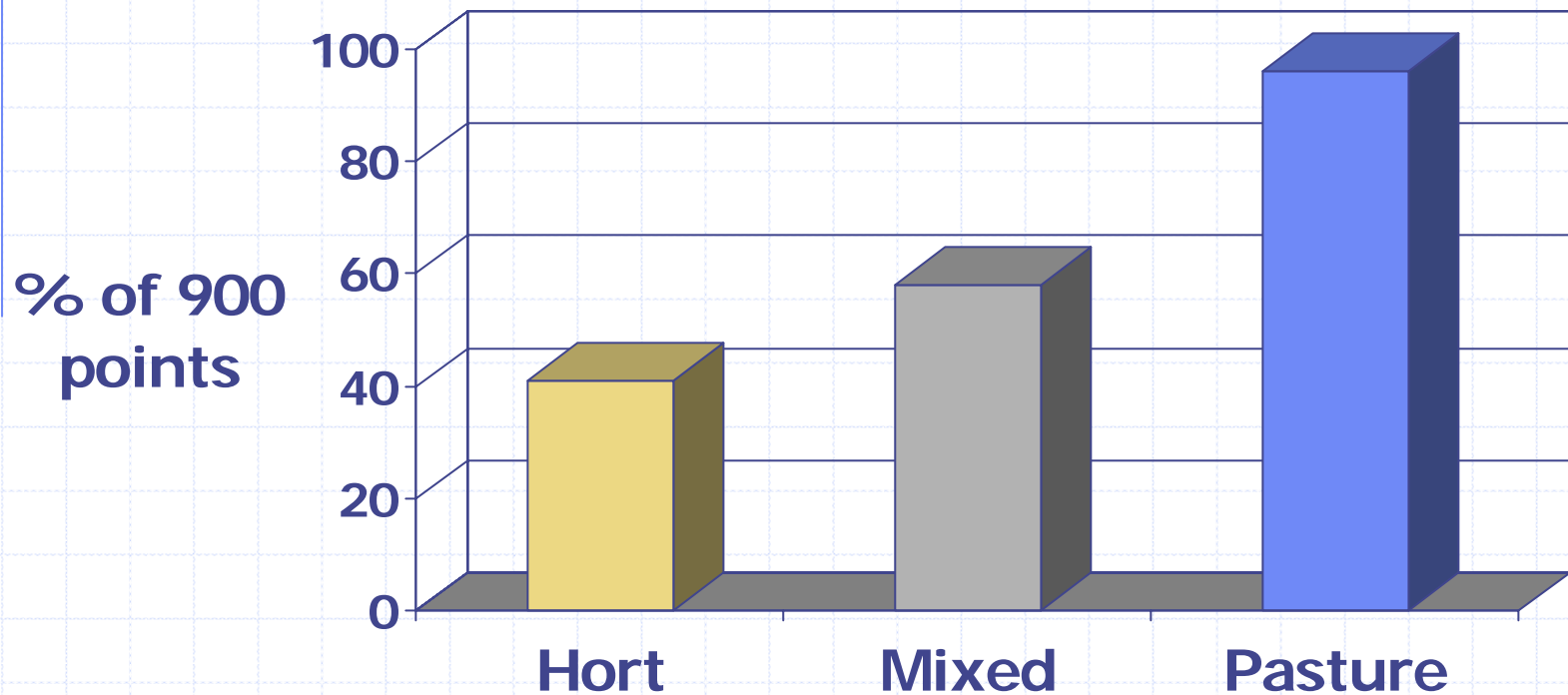
Use of grain (■) and forage/cover crops (■) in hort v. mixed crop rotations



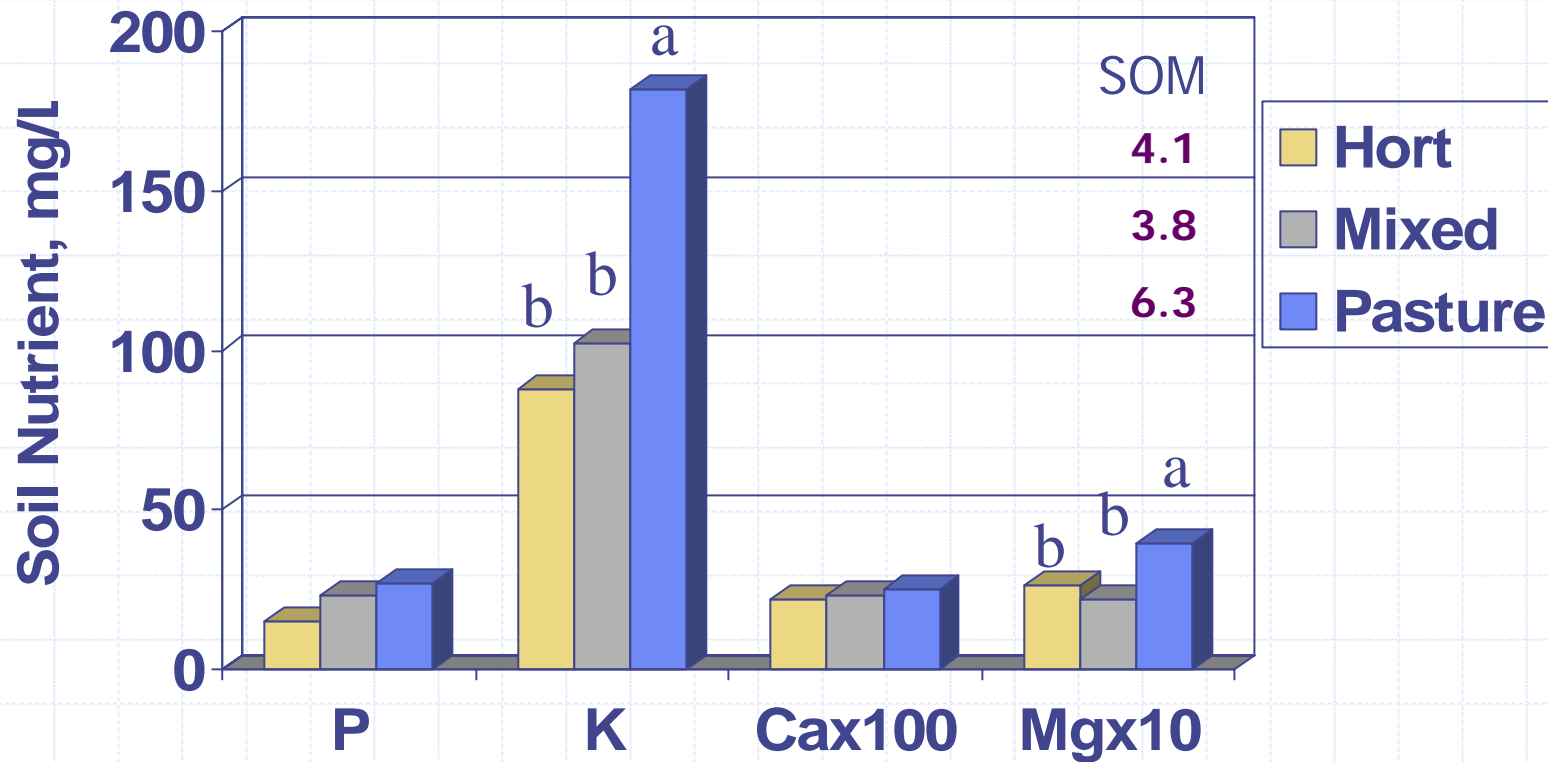
Scoring of ESI components: energy



Aggregate ESI by farm type



Farm type and soil nutrients



Pasture closest approximation to Nature

- ◆ Predominantly if not wholly perennial
- ◆ Year-around soil cover (no bare soil)
- ◆ N-fixing as well as other species
- ◆ Livestock in place
- ◆ Most nutrients cycle in place
- ◆ Little tractor (fossil fuel) dependence
- ◆ BUT typically travels provincially or more

Conclusions



- ◆ It's a design problem
- ◆ Agriculture was not designed to be sustainable; organics follows in same mold
- ◆ Grass-based farming is the closest approximation to Nature in humid temperate zone
- ◆ Livestock are essential to sustainability