

Approaches to sustainable black soil cultivation

可持续黑土耕作方法

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Gefördert durch:

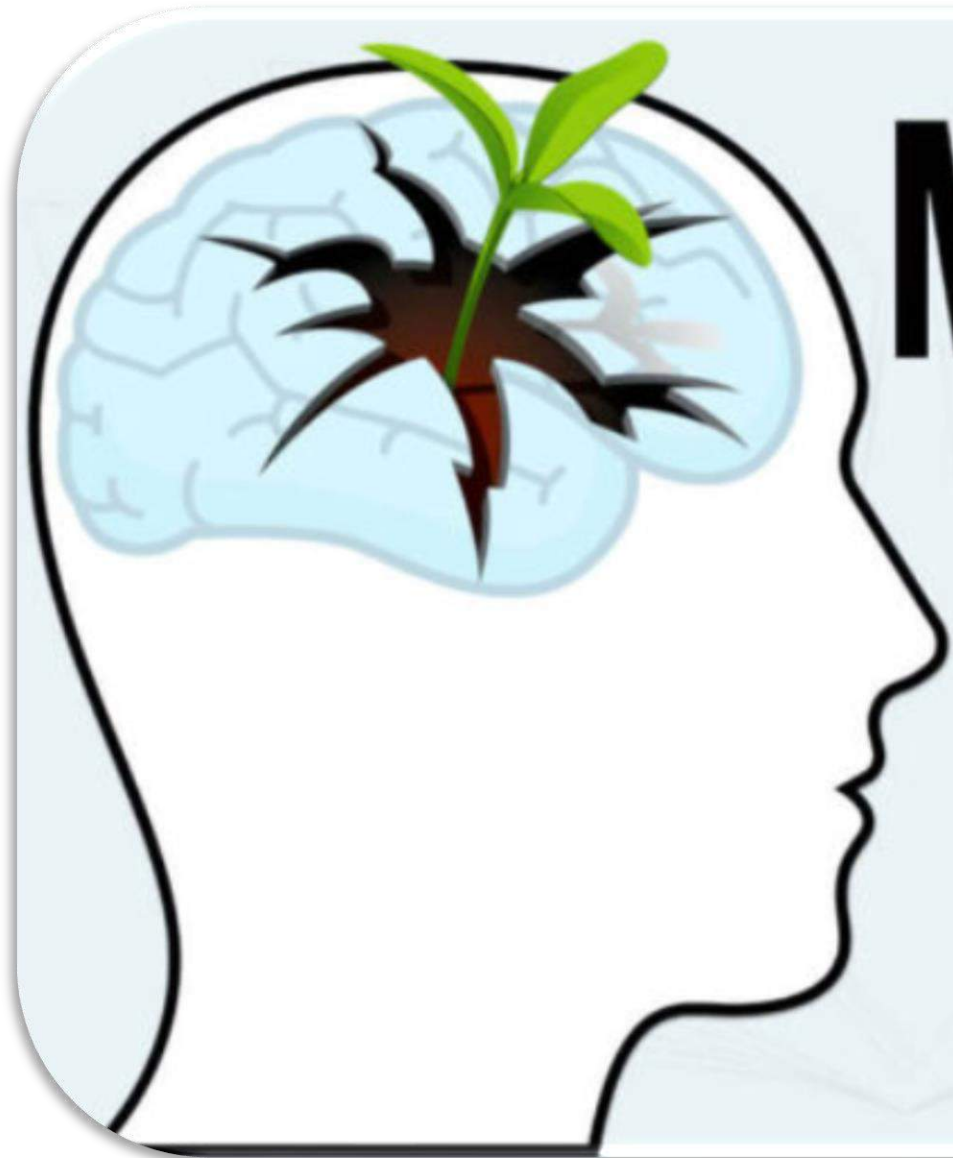


aufgrund eines Beschlusses
des Deutschen Bundestages

Highlight was the yearly field day at Huanghai Farm 在江苏农垦黄海分公司举办的一年一度中德示范园“田间日”



Mindset / 心态



MINDSET

Way of thinking / 思维方式

Attitude / 态度

Assumption / 假设

Conviction / 信念

Perception / 感知

Value / 价值

What are the problems / 有哪些问题

1. Monokulture (Corn - Corn - Corn) or (Corn - Soja - Corn - Soja)
单一种植 (玉米 - 玉米 - 玉米) 或 (玉米 - 大豆 - 玉米 - 大豆)
2. Soil compaction due to intensive soil preparation (Machine - Sedimentation) 由于集约化土壤准备导致的土壤压实 (机器 - 沉积)
3. pH Low - Medium - High / pH 低 - 中 - 高
4. Straw management / 秸秆管理
5. Just N-P-K fertilization and too much / 仅仅N-P-K施肥且过量
6. Insect problems. In corn, European corn borer / 虫害问题。在玉米中, 欧洲玉米螟虫
7. Weed problems? / 杂草问题?
8. Too much pesticide? / 农药太多?
9. Millions of hectares are contaminated with pesticides / 数百万公顷的土地被农药污染 How we can solve this problem? 我们如何解决这个问题?

Challenges / 挑战

- ▶ Level of education of managers / 管理者的教育水平
- ▶ Führungs- und Entscheidungsstrukturen / 管理和决策结构
- ▶ Change of mindset / 思维方式的改变

The big mistake / 大错误



Checklist / 清单

Implementation of 7 "C"
实践“7C”

Keep up to date
与时俱进

Wider crop rotation
更广泛的轮作作物

Start with a small
area. 10%
从小片区域开始
比如10%面积

Establish track
建立机耕道

Rent a no till machine
租用免耕农机具

Symbol picture / 符号图片

Learn from others
从他人那里吸取经验

Test your soil. Do soil profil-
检测土壤。进行土壤剖面分析

Improve poorly drained
改善排水系统

Remove soil compact
改善土壤压实，松土

Cover the soil with cover crops
覆盖，给土壤供给营养

Wheel pressure
胎压



The background features abstract, overlapping geometric shapes in various shades of green, ranging from light lime to dark forest green. These shapes are primarily located on the right side of the frame, creating a modern, layered effect. The text is centered on a white background.

Know your soil
了解你的土壤

A range of values for infiltration rates is given below:

以下是下渗速率的数值范围

低渗透率

Low infiltration rate

less than 15 mm/hour

小于15毫米/小时

中等渗透率

medium infiltration rate

15 to 50 mm/hour

15 - 50毫米/小时

高渗透率

high infiltration rate

more than 50 mm/hour

超过50毫米/小时



- Soil profil / 土壤剖面
- Water infiltration test / 水分渗透测试
- Soil analysis / 土壤分析
- Soil strength or structure / 土壤强度或结构



IDEÍ

Know your soil with proper soilanalysis / 了解土壤，进行适当的土壤分析

BASIC VALUES					
pH (H2O) / pH值:	6,6	CEC _{pot} /TEC (Total Exchange Capacity; mmol/100g) / 交换容量 ; mmol/100g):		28,4	
pH (KCl) / pH值:	5,9	SATURATION: 饱和度	TARGET: 目标	ACTUAL: 实际	Desired Ca:Mg-Ratio / 理想的钙:镁比率. 69 : 11
Soil organic matter (%) / 土壤有机质 (%):	7,7	Calcium (%): 钙 (%)	60-70	61,7	TARGET ACTUAL / 目标 实际
Total-N (%) / 总氮 (%):	0,38	Magnesium (%): 镁 (%)	10-20	23,6	TARGET ACTUAL / 目标 实际
C/N-Ratio / 碳氮比:	11,6	Potassium (%): 钾 (%)	2-7,5	2,6	TARGET ACTUAL / 目标 实际
N-Delivery (kg/ha) / 氮供应 (公斤/公顷):	124	Sodium (%): 钠 (%)	0,5-3	0,5	TARGET ACTUAL / 目标 实际
CaCO ₃ (%):	0,1	Hydrogen (%): 氢 (%)	10-15	6,8	TARGET ACTUAL / 目标 实际
Texture / 质地:	Lu	Variable (%): 变量 (%)		4,9	

CATIONS / 阳离子			RECOMMENDATION	Priority	kg/ha	kg/h
Calcium (kg/ha) / 钙 (公斤/公顷)	Value found / 检测值 Target value / 目标值 Balance / 平衡值	7867 8792 -925	Gypsum / 石膏	1)	2240	149.33
Magnesium (kg/ha) / 镁 (公斤/公顷)	Value found / 检测值 Target value / 目标值 Balance / 平衡值	1822 850 +972	None / 无			
Potassium (kg/ha) / 钾 (公斤/公顷)	Value found / 检测值 Target value / 目标值 Balance / 平衡值	652 1243 -592	Potassium Sulfate 0-0-50 / 硫酸钾 0-0-50	4)	448	29.87
Sodium (kg/ha) / 钠 (公斤/公顷)	Value found / 检测值 Target value / 目标值 Balance / 平衡值	67 146 -79	Rock Salt / 岩盐		52	3.47

ANIONS / 阴离子						
Sulfur / 硫	ppm	12	Sulfur / 硫 90%	2)	95	6.33
Phosphates P2O5 / 磷酸盐 P2O5 (kg/ha-公斤/公顷)	Available / 可用 Stock / 存量	21,6 433	MAP 11-52-0	3)	224	14.93

TRACE ELEMENTS / 微量元素						
Boron / 硼	ppm	1,0	Boron 17%	7)	13	0.87
Iron / 铁	ppm	325,5				

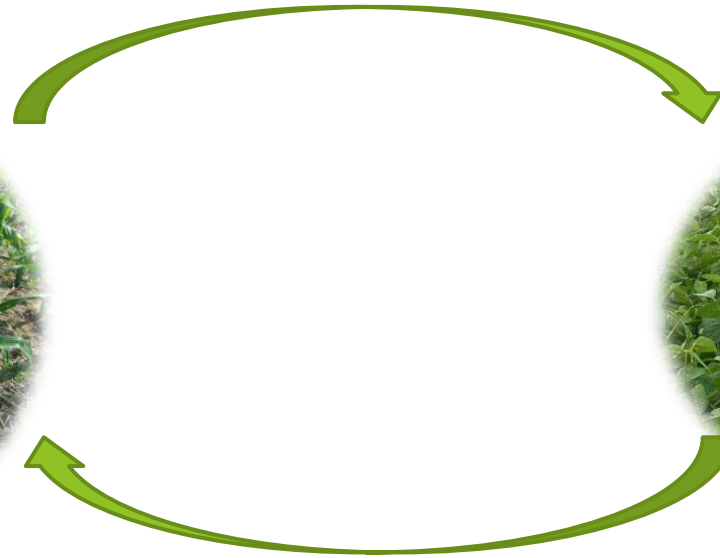
Crop rotation / 轮作

Classic crop rotation / 经典轮作：

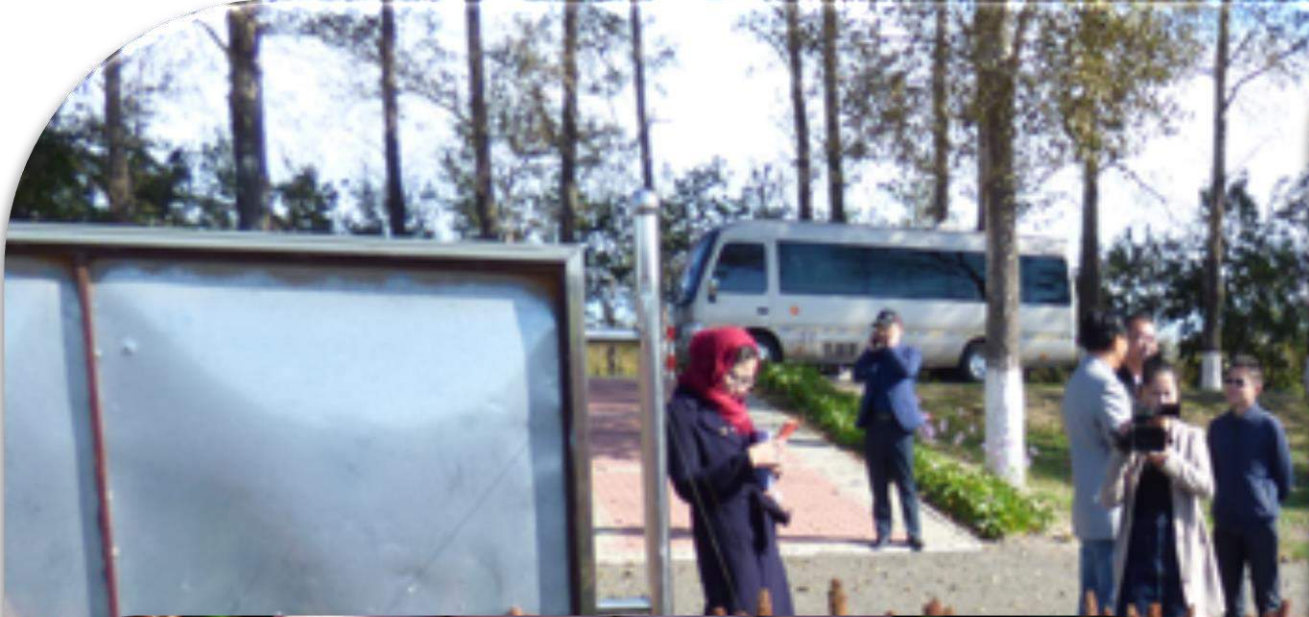
Corn



Soja



What are the problems / 有哪些问题



Possible wider crop rotation / 可能的更广泛的轮作 Soja / 大豆

Corn / 玉米



Wheat / 小麦

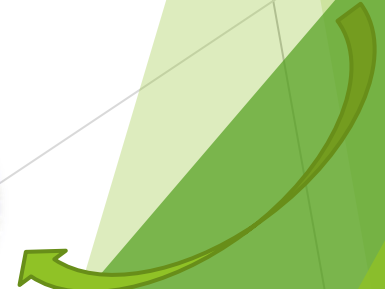


What with Cover crops?
覆盖作物怎么办?

Sunflower / 向日葵



Buckwheat / 荞麦





Dams for soy and/or corn / 大豆和/或玉米的水坝

Bare soil - evaporation / 裸土 - 蒸发

Channels between the dams - erosion / 水坝之间的沟渠 - 侵蚀

Plough equals clods and biological holocaust / 犁耕等于土块和生物大灾难



Cover crops / 覆盖作物

Catch crop in the undersowing method / 在套种法中使用捕获作物



Interrow cultivation + Fertilizer incorporation
+ cover crops seeding / 行间耕作 + 施肥 + 覆
盖作物播种



Strawmanagement

秸秆管理

Straw management, an important key in SA

秸秆管理是可持续农业的重要关键



Chop the straw where it has grown → Optimal straw distribution

在原地进行秸秆粉碎 → 最佳的秸秆分配法



Mulching after grain corn makes soil cultivation and sowing possible !
收完玉米后用穆庭粉碎，更有利于后续的整地和播种！



Due to the suction effect, the crop is completely sucked in and processed

由于吸力作用，作物被完全吸入机具并粉碎

Perfect food for soil life
"完美的土壤生物饲料"



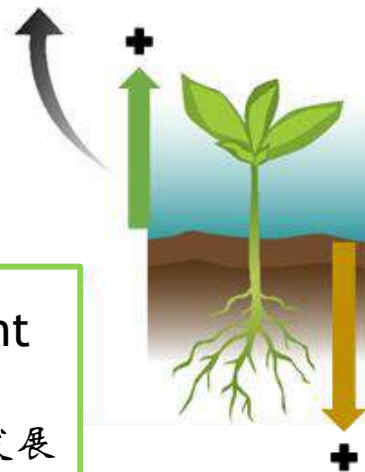
Mulch 粉碎



Nutrient-rich
Worm excrement
富含养分的蚯蚓粪便



Better root and plant
development
促进植株生长和根系的发展

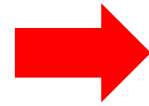


Shortened
Decomposition time
缩短秸秆分解腐化时间

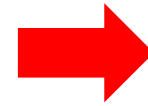


Cultivation methods / 栽培方法

Conventional soil cultivation (plough) 传统的耕作 (犁)



Conservation tillage (mulching-strip tillage) "保护性耕作 (粉碎-条耕)"



Direkt drilling/ NoTill 直播/免耕

Erosion risk 侵蚀风险

Machine efficiency 机器效率

Intensity 强度

Trafficability 通行能力

Evaporation 蒸发

Water efficiency 用水效率

Cost intensivity 成本强度

soil organisms 土壤生物

Carbon losses 碳损失

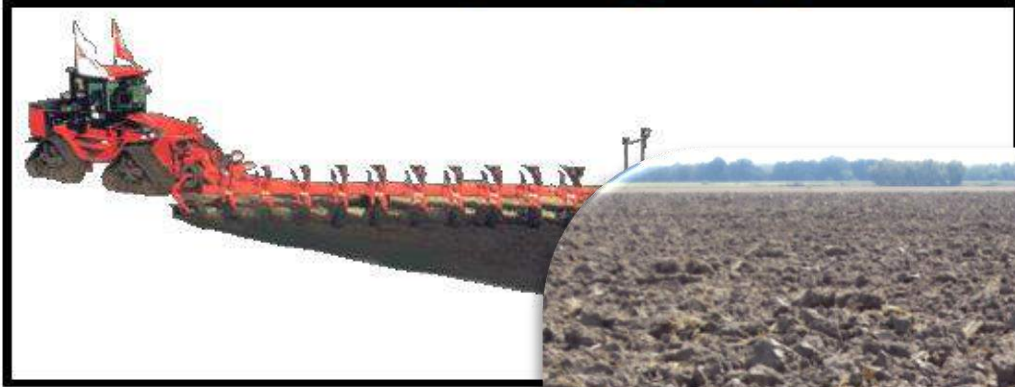
The plough a soil killer 犁——土壤

French

法国

World 24 hr ploughing record

世界24小时犁地记录



- 1.25 square miles or 80
- 4 million tonnes of soil!
- 650 tnes CO₂ (175 tnes
- 17.5 tnes Nitrogen

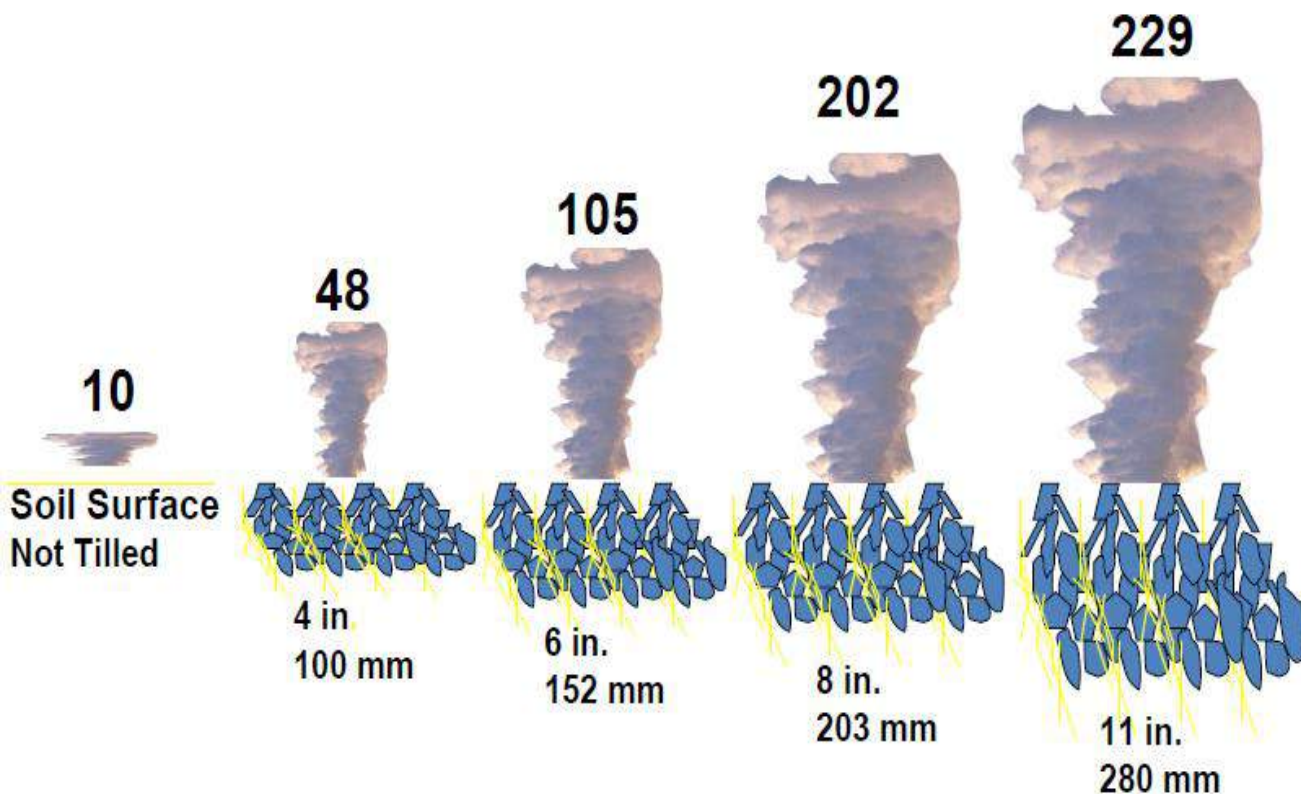
Calculations based on work by Prof Reicosky,

英亩，也即324公顷（4860亩）

(£12,000?)

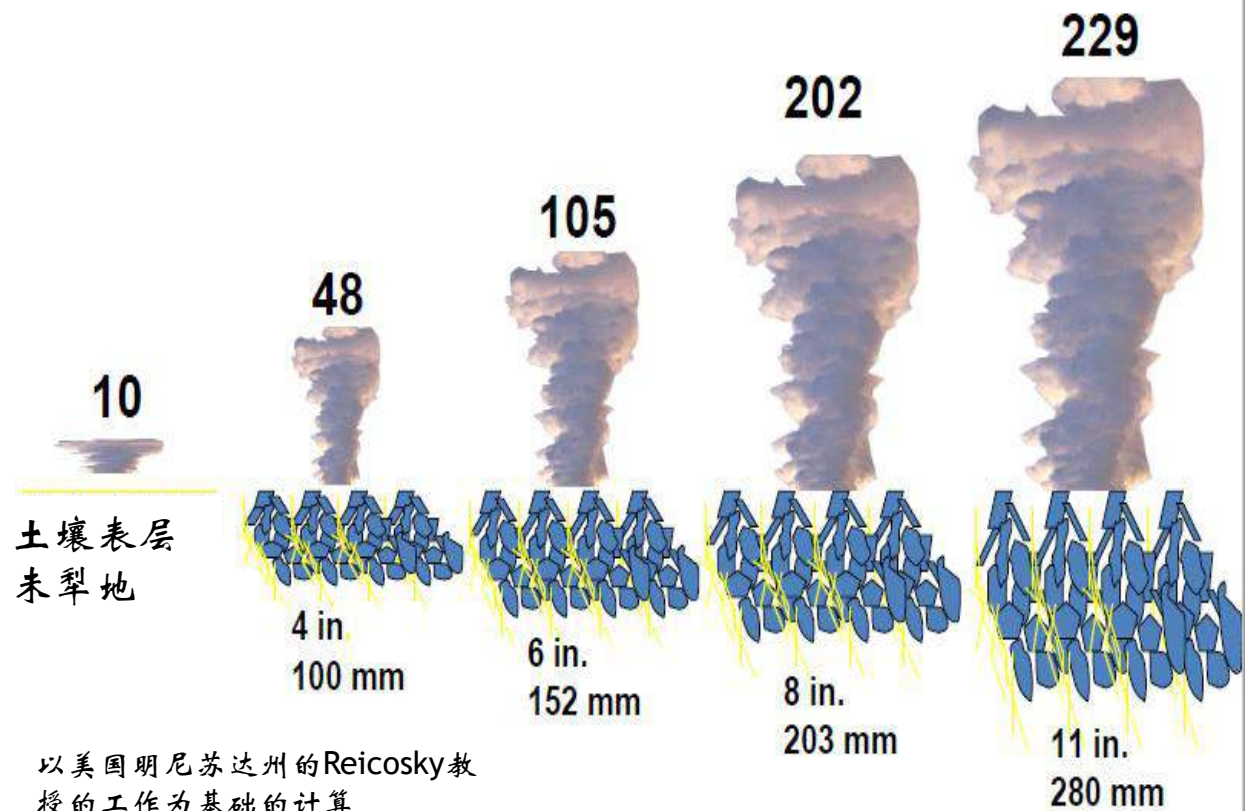
nesota, USA

12 Aug., 1998 Plow Depth Study Swan Lake Farm
24 hour cumulative CO₂ losses (g CO₂ m⁻²)



Calculations based on work by Prof Reicosky, Minnesota, USA

1998年8月12号，犁地作业深度研究 天鹅湖农
24小时累计二氧化碳的挥发量

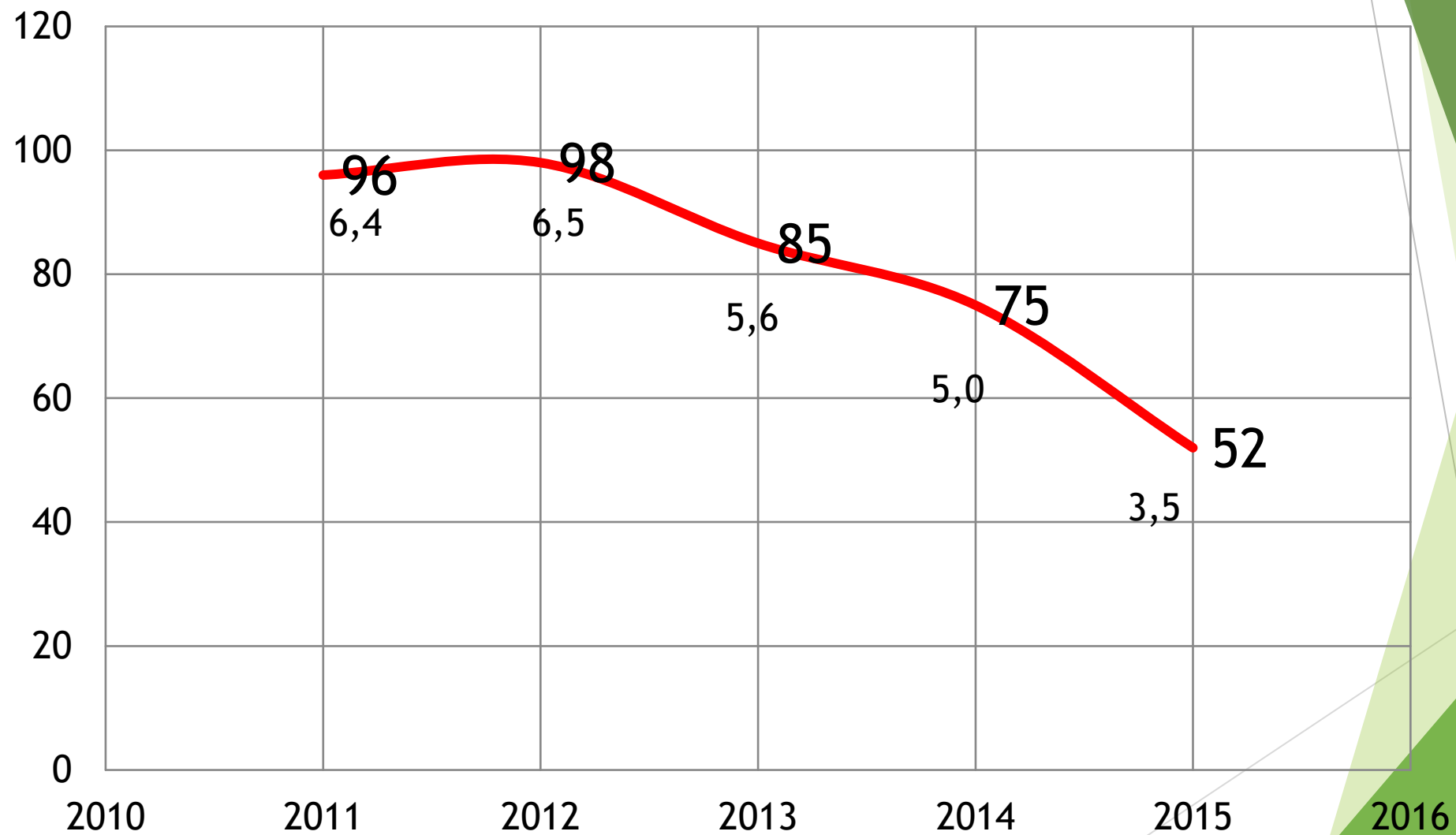


以美国明尼苏达州的Reicosky教授的工作为基础的计算

Calculations based on work by Prof Reicosky, Minnesota, USA



Fuel consumption (l/ha-Mu) 燃料消耗 (升/公顷-亩)



Drill and Plant Methods

"钻孔和种植方法"

Conventional sowing for all crops / 所有作物的常规播种



Strip tillage for corn - soy - sunflower - rapeseed - sugar beet. All crops with a row spacing of 45 to 75 cm / 玉米、大豆、向日葵、油菜籽和甜菜的条带耕作。所有作物行距为45至75厘米



Direct sowing possible for all crops / 所有作物都可以直接播种



Strip tillage a compromise between conventional and no tillage / 条带耕作是传统耕作和免耕之间的一种妥协





Intensive praxis of „7 C“

对“7C”进行大量实践应用

1. „C“ = **Culture**, means wider crop rotation and diversification / 农业措施习惯。意味着更多品种的作物轮作，多样化
2. „C“ = **Cover crops** for soil structure and carbon in the soil / 覆盖作物。提升土壤结构和土壤中的碳
3. „C“ = **Carbon** for soil structure, storing water and nutrients, feeds soil organisms / 碳。用于土壤结构的组成、储存水和养分、为土壤生物提供养分
4. „C“ = **Calcium** is more than just a pH regulator / 钙。而钙不仅仅是pH调节剂
5. „C“ = **Cultivation**, reduce it to keep soil structure / 耕种。减少整地或耕作，用以保持土壤的原始结构
6. „C“ = **Chemical**, reduce them, even a fungicide is killing worms or other insects / 化学药剂。减少使用化学药剂，即使是杀菌剂也能杀死虫卵
7. „C“ = **Constancy**. Don't give up if it does not work as you expect

坚持。如果没有达到你的期望值，坚持下去，不要放弃

Sustainable Agriculture (SA) / 可持续农业 (SA)

- It needs years for SA to show its benefits / 可持续农业需要多年时间才能显示其好处
- It needs years for government to accept and support SA / 政府需要多年时间才能接受和支持可持续农业
- It needs years for farmers to understand, accept and try SA / 农民需要多年时间来理解、接受和尝试可持续农业
- It needs years to find whether SA will bring negative effects / 需要多年时间才能确定可持续农业是否会带来负面影响
- It needs constancy / 它需要持续性

Time will prove everything! / 时间会证明一切!

Thank you

Xiè xiè

