



# IP Protection - a Seed Company Perspective 知识产权保护 – 公司视角

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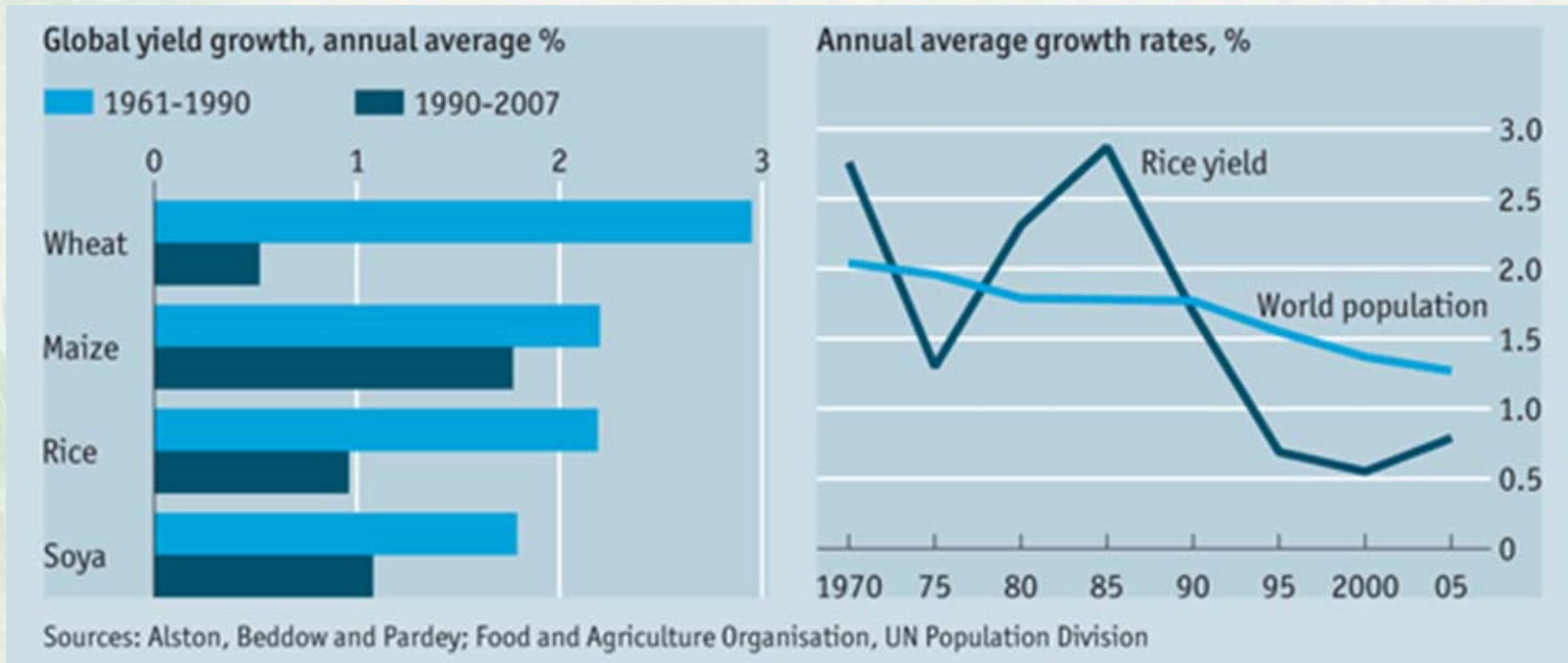
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Rights  
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# Outline 报告内容

- Intellectual Property and Genetic Gain  
知识产权和遗传增益
- IP Protection practices  
知识产权保护实践
  - Training (internal/external collaboration) 培训 ( 内/外合作 )
  - Operating procedures 运行流程
  - Physical protection 实物保护
  - Legal protection 法律保护
- Germplasm infringement detection 种质侵权检测
- Conclusions-Discussion 总结-讨论

# IP protection and Genetic Gain:

Global Yield Increase for several Key Crops  
知识产权和遗传增益：全球几种主要作物的产量增长

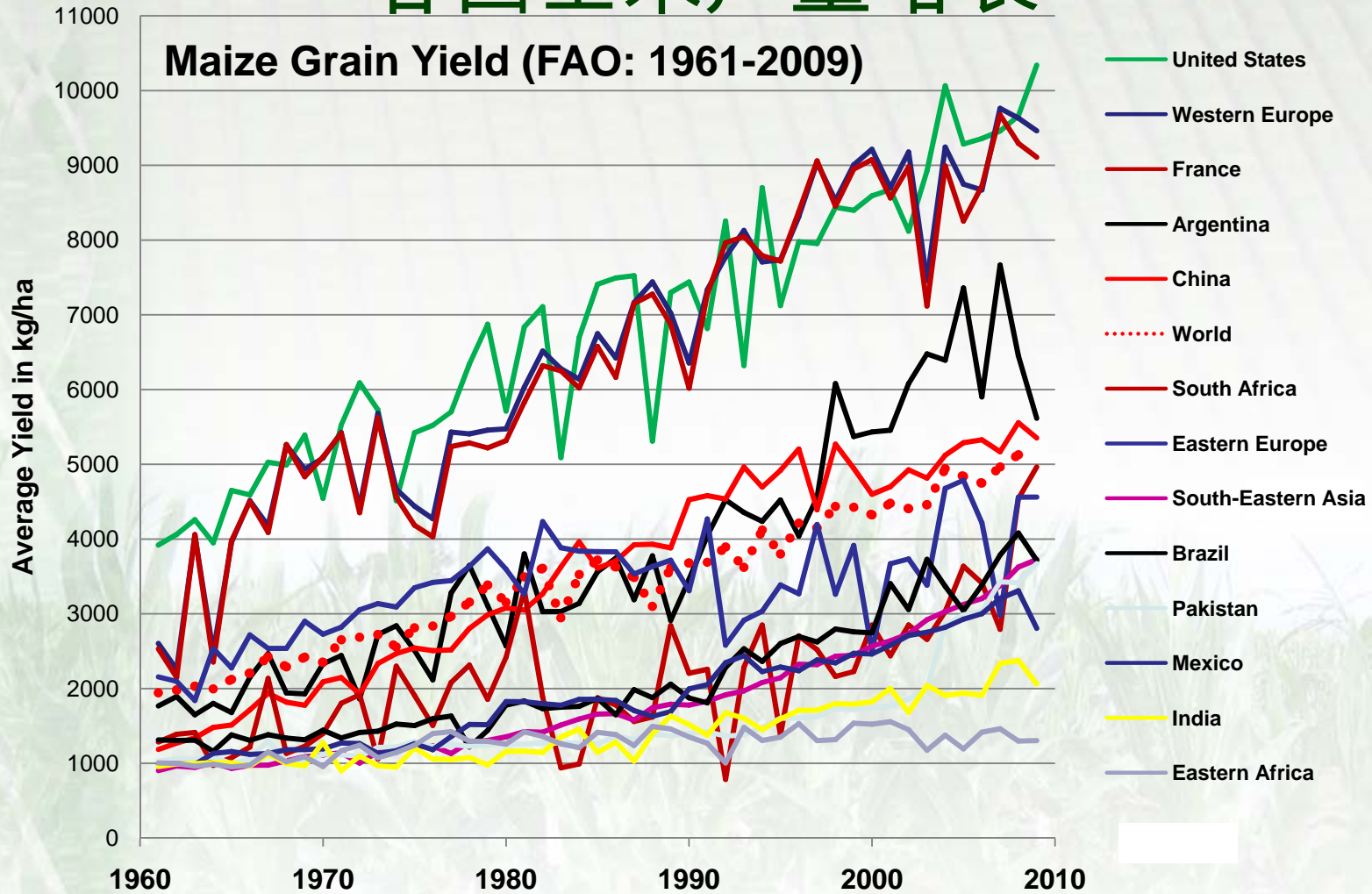


Significant decrease in Wheat gains during last 20 years.

过去20年小麦收益的显著下降

# Corn Yield Increase by Country

## 各国玉米产量增长



Yield increase impacted by multiple factors, but strong IP protection enhances investment in Genetic Gain. 多个方面影响产量增长，但IP保护促进遗传增益投资



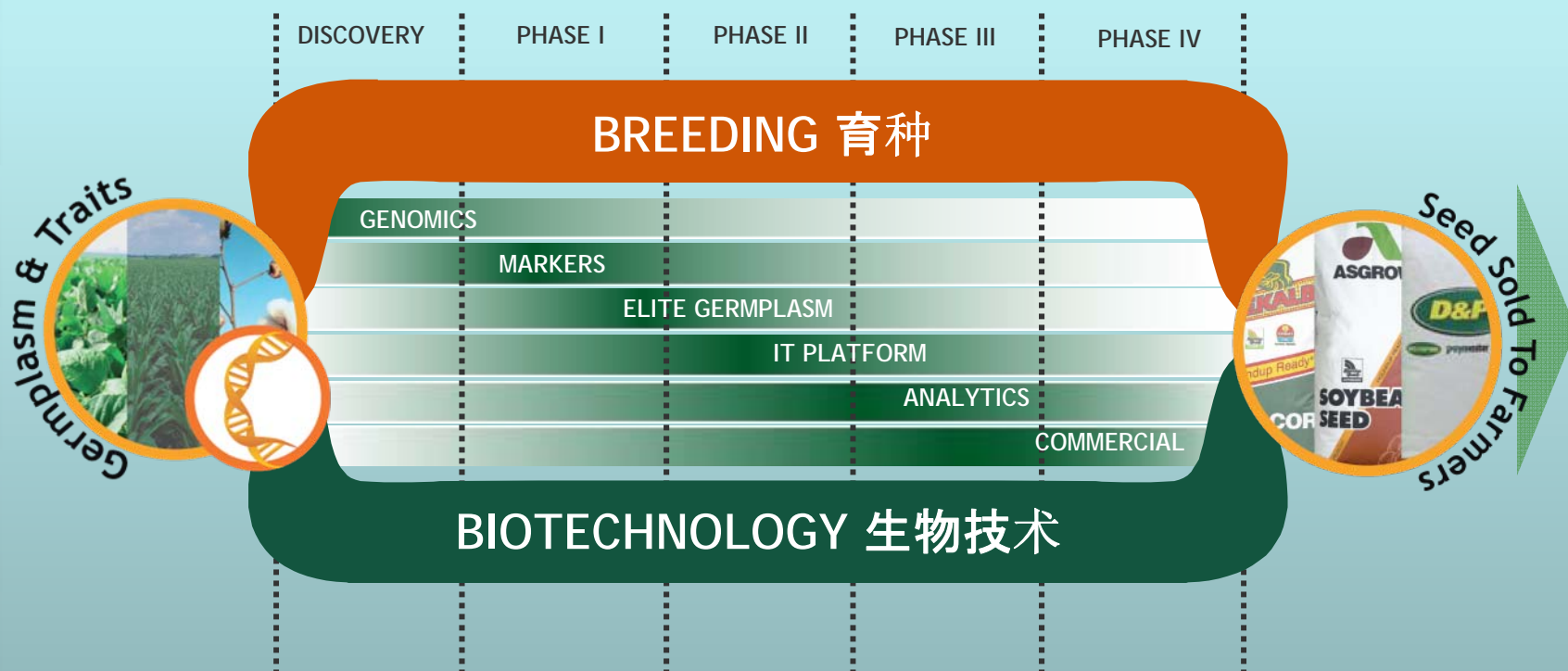
# Strong Intellectual Property Protection is linked to Investment in Crop Improvement

## 强大的知识产权保护与作物改良投资密切相关

- Plant breeding and innovation is expensive  
植物育种和创新投入昂贵
- Return on investment is relatively long-term: 6-12 years for unique breakthroughs  
投资回报时间长：独特的技术突破需6-12年
- Technically Advanced breeding investment needs to be sustained by: 技术创新型育种投资需要两方面支持：
  - Improved Intellectual Property Protection 改善知识产权保护
  - Appreciation by the seed industry of the value created by new varieties and technology 种业对新品种和技术创造价值的认可

# Protection is needed for the Variety and other R&D innovations 品种和研发创新需要获得保护

## DEVELOPMENT PATHWAYS 研发途径



# IP Protection practices - Training

## 知识产权保护实践 – 培训

### Internal Training for Employees 内部员工培训

- Confidentiality of IP and Trade Secrets  
知识产权和商业机密保密工作
- Rules of engagement/communication – Internal and external  
制定内/外沟通的规定

### External collaboration 对外合作

- Communicate the value of IP for a growing seed industry and for stronger private-public collaboration (clearly defined ownership is critical for collaboration)  
强调知识产权对于成长的种业和强有力的公-私机构合作的价值  
( 明确定义的所有权是合作中关键所在 )
- Support best practice development in the industry.  
支持行业中良好规范的建立和发展

# IP Protection practices – Operating Procedures ( examples ) 知识产权保护实践 – 运行流程 ( 实例 )

- Global Germplasm movement restrictions

## 全球种质资源流动限制

Company restrictions linked to 公司限制与下列情况有关 :

- IP protection systems and common practices in each country.

各国的IP保护体系和常见做法

- Import sampling and safeguard systems.

进口样品和维护系统

- Country claims on plant genetic resources imported

国家对进口植物遗传资源的权属声明

- Government -imposed restrictions across countries.

- 政府: 施加国家之间的限制



# IP Protection practices –

## Operating Procedures ( examples )

### 知识产权保护实践 – 运行流程 ( 实例 )

- Tracking of seed movement: A large global organization moves millions of seed packets every year.  
监测种子流动：大型全球组织每年有几百万袋种子在各地流动
- Data protection: Database and IT tool management.  
数据保护：数据库和IT工具管理
- Marker-based Quality Control systems in breeding:  
育种中以分子标记为基础的质量控制体系
  - for development of internal genetic library 利于内部遗传库的扩充
  - Infringement-tracking capabilities. 建立对侵权行为进行监测的能力

# IP Protection practices

## The case of Germplasm Movement 知识产权保护实践 – 以种质流动为例

Movement can be restricted in two ways:

种质移动在下面两个方面受限：

- *Self-imposed* by the company, due to weak IP protection systems and risk  
公司 *自己施加* 的限制：源自IP保护薄弱和风险考虑
- *Regulatory framework*, due to restrictive import-export regulations.

*法规框架*，源自苛刻的进出口法规

Both mechanisms are strongly detrimental to the rate of crop genetic gain within a given country.

这两种机制都非常不利于一个国家的作物遗传增益

# IP Protection practice - Physical protection

## 知识产权保护实践 – 实物保护

- Physical protection of germplasm assets – nurseries and germplasm banks

种质财产的实物保护 – 苗圃和种质资源库



- Stronger IP respect significantly reduces the need for physical protection 加强对知识产权的尊重显著降低实物保护的必要性

Brazil  
巴西



Mexico  
墨西哥





# IP Protection Practice - Legal Protection

## 知识产权保护实践 – 法律保护

An Effective Legal system 高效的法律体系：

- Predictability and Certainty of obtaining and protecting IP rights. IP权利获得和保护具有可预见性和确定性
- Elements which prevent or discourage infringement are indispensable (PVP, principle of ED, safeguards of seed deposits for IP) 防止或阻止侵权行为的要素不可或缺
- Legal infrastructure is needed for enforcement in cases where IP rights are not respected  
在IP权利不受尊重的情况下，需要建立法律基础体系，推进执法
- Collaboration is encouraged by clearly defined ownership of IP rights among public and private sectors. 公-私组织的合作需要明确定义IP所有权



# IP Protection for Plant-Based Innovation

## 源自创新的植物知识产权保护

- Plant Variety Protection 植物品种保护
- Utility Patents 发明专利
- Plant Patents 植物专利
- Trade Secrets 商业机密
- Contract Provisions 合同条款



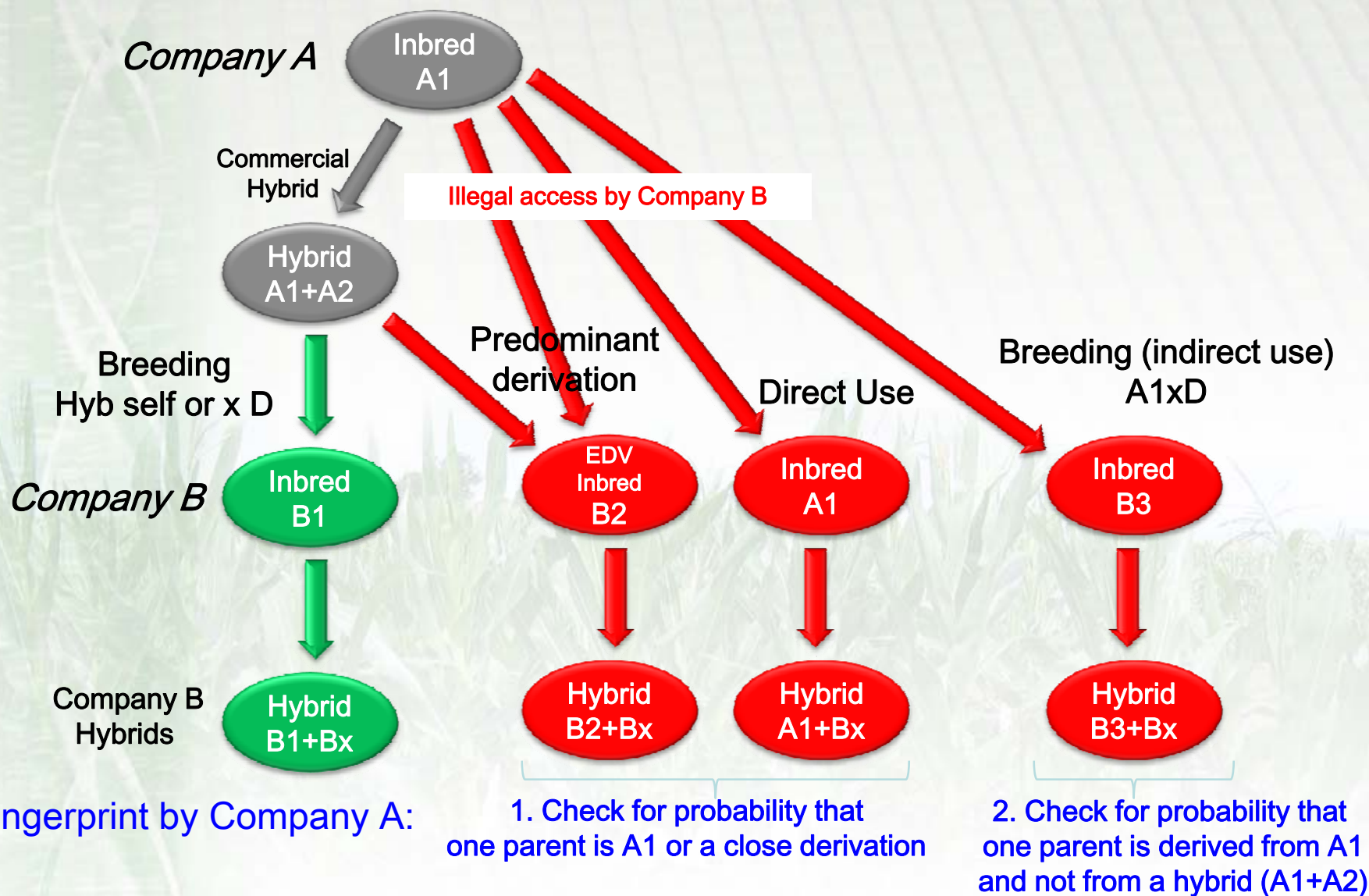
# Germplasm Infringement Detection

## 种质侵权检测

- Hybrid crops 杂交作物，
  - Common misconception: *Misuse detection options are limited when considering hybrids.*  
常见的误解：对于杂交品种，检测手段的误用是有限的
- Most common types of germplasm misuse:  
最常见的几种种质误用：
  - Direct use: misappropriated inbred parent is used to produce a hybrid,  
直接使用：使用不恰当的自交系亲本生产杂交品种
  - Predominant derivation: slightly different ‘copy’ of parental line is developed and used in hybrid combination,  
主要派生（衍生）品系：杂交中使用了近似的亲本
  - Derivation from illegally accessed source; parental line is illegally accessed to start new breeding population, resulting in a new inbred progeny.  
派生（衍生）品系来自非法获取的资源：使用非法获得的亲本培育新品种，从而获得一个新的自交系后代

# Examples of misuse of germplasm in hybrid crops

## 杂交作物中误用种质的例子



# 1. Detection of Direct use or Predominant derivation:

Hybrid fingerprint is tested for parentage relationship with proprietary inbreds.

直接使用或主要派生(衍生)品系的检测: 测定杂交指纹确定专有自交系亲子关系

## Hybrid Fingerprint

### Marker set

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10
Hybrid X	AA	AT	GG	CG	AT	CG	CC	AA	CC	CG

Estimate probability of a particular inbred being present in the hybrid combination

## Fingerprint database of proprietary inbreds

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10
Inbred A	AA	AA	GG	GG	TT	CC	CC	AA	CC	GG
Inbred B	TT	TT	CC	CC	AA	GG	CC	TT	CC	CC
Inbred C	AA	AA	CC	CC	AA	CC	GG	TT	GG	GG
Inbred D	AA	TT	CC	GG	TT	CC	GG	AA	GG	GG
Inbred E	TT	AA	GG	GG	TT	GG	GG	TT	CC	GG

- **Test parentage hypothesis** . By using thousands of SNP markers, it is possible to establish parentage relationship with high probability (Infinium 50 K SNP markers chip is publically available)
- Algorithms are needed to screen large number of potential permutations (Multiple hybrids by multiple proprietary inbreds, at thousands of marker loci)



# Use of haplotype sequences as a proof of derivation

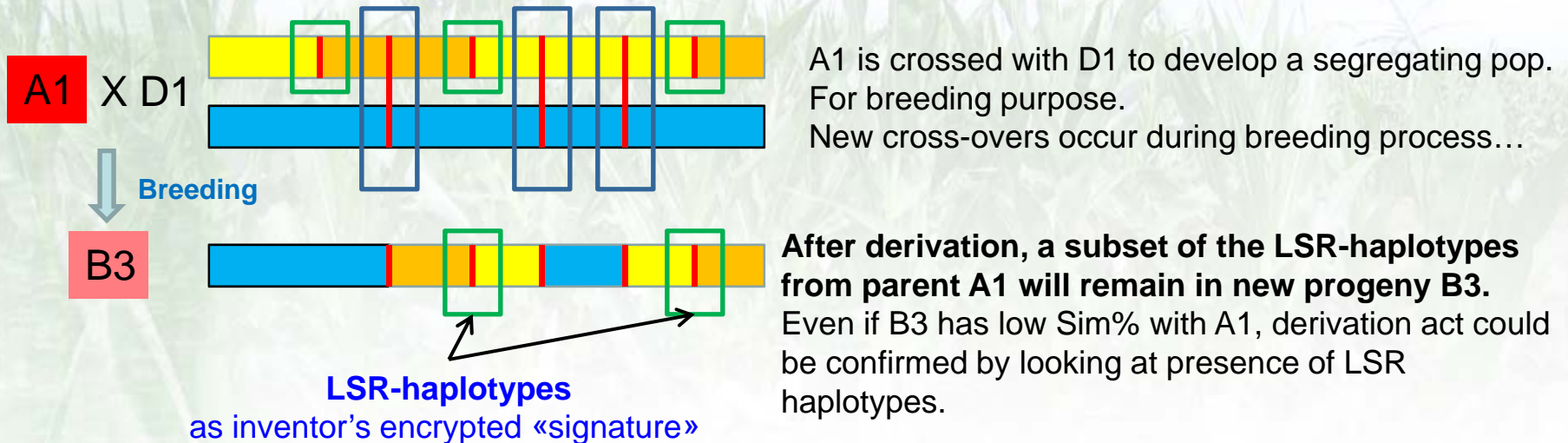
## 使用单倍体序列证明派生 ( 衍生 ) 品系

DNA recombination «Cross-overs» occur during derivation-breeding.

These « Line Specific Recombination » (LSR) events provide unique haplotypes that can be identified with confidence when comparing high-density fingerprinting profiles.



### If A1 is illegally accessed & used for breeding purpose



# Germplasm Infringement Detection Summary

## 种质侵权检测总结

- Misuse detection can be very efficient.

误用检测可以非常有效

- The added complexity in hybrid crops is now manageable through advancement in Information Technology and molecular/sequencing techniques (cost, accuracy, throughput, number of markers).

对于杂交作物，增加的复杂性是信息技术和分子/序列技术的进步（成本，精确性，处理量，分子标记数）

- High-density fingerprinting and Line-Specific-Recombination Haplotypes are powerful tools to detect suspected derivation from inbred lines.

高密度指纹和线性特异重组三倍体是检测来自自交系的可疑派生（衍生）品系的强大工具

- Fingerprinting information, coupled with algorithm-based data mining, offers solid capability to accurately detect use of hybrid parents. 指纹识别信息，结合数据挖掘算法，完全能够精确检测杂交亲本

# Conclusions 总结

- Strong Intellectual Property protection is linked to increased investment, innovation and genetic gain.

强大的IP保护促进投资、创新和遗传增益

- IP protection in Seed Companies include multiple procedures: Training; Operating Procedures, Physical protection and Legal Protection.

种子公司的IP保护包括多种方法：培训；制定运行流程；实物保护和法律保护

- Germplasm movement restrictions, whether self-imposed due to IP risks or due to restrictive legislation, reduce genetic gain.

种质流动限制减少遗传增益

- Advanced marker/IT technology is very effective in tracking misuse of germplasm.

先进的标记技术和IT技术可以有效监测种质误用



**Thank you**  
谢谢