

中国小农户储粮技术装备及经验

Technology, Equipment and Experience of Smallholders' grain storage in China

严晓平 (研究员)
Xiaoping Yan /Researcher

CONTENTS

农户储粮损失及原因分析

01 **Analysis of smallholders' grain storage losses and causes**

小钢仓使用注意事项

03 **Precautions for the use of small steel silos**

农户储粮装具介绍

02 **Introduction of smallholders' storage equipment**

中国农户储粮经验与成绩

04 **Experience and achievements of Chinese smallholders in grain storage**

01

Analysis of smallholders' grain storage losses and causes

农户储粮损失及原因分析

- 一是以中国储备粮管理集团有限公司（中央储备）和各级地方储备为主的**政府储备粮**；

(1) Government grain reserves, mainly China Grain Reserve Management Group Co., Ltd.(central reserve) and local reserves at all levels

- 二是以中粮集团有限公司等粮食加工贸易为代表的**企业加工贸易粮**；

(2) Grain processing trade represented by grain processing trade such as COFCO Corporation

- 三是以农业新型经营主体、大农户和小农户为主体的**农户储粮**；

(3) Farmers with new agricultural management entities, large farmers and small farmers as the main grain storage



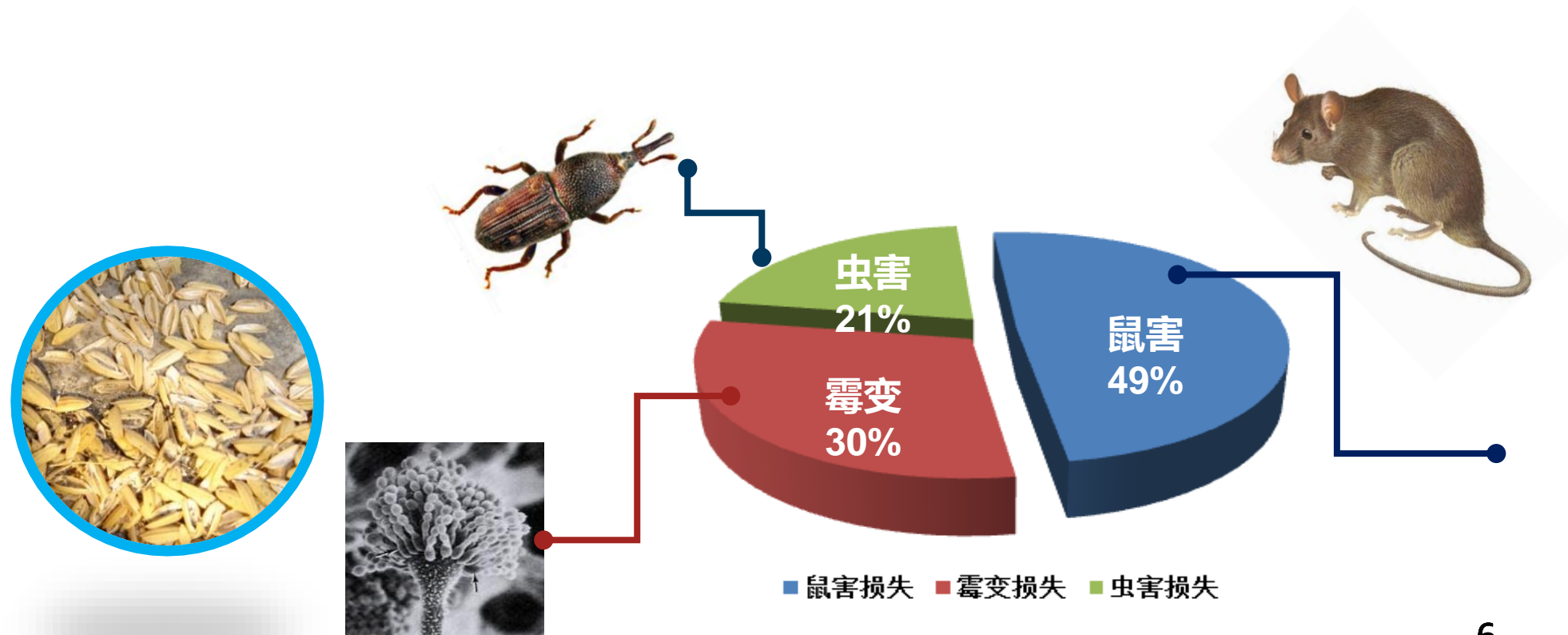
2005年前中国农户储粮情况

Grain storage by Chinese smallholders before 2005

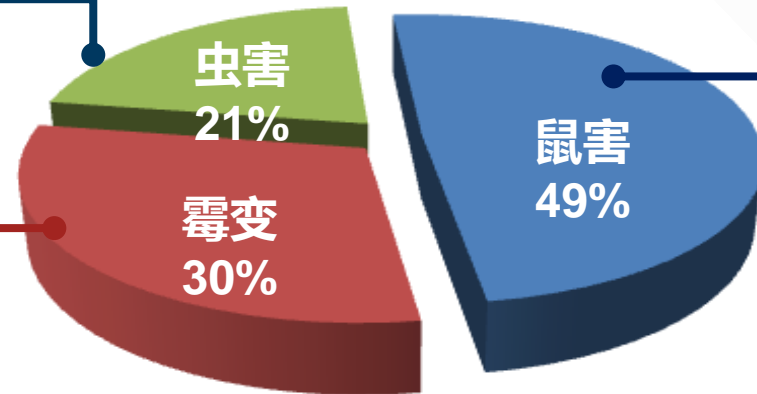
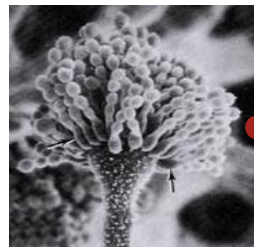


据2005年调查，储粮损耗约占农户储粮的8~10%。

According to the survey in 2005, the loss of grain storage accounted for about 8~10% of the grain stored by smallholders.



其中鼠害损失约占总损失量的49%，霉变的损失约占总损失量的30%，虫害的损失约占总损失量的21%。**The loss of rodent infestation accounted for about 49% of the total loss, the loss of mildew accounted for about 30% of the total loss, and the loss of pest infestation accounted for about 21% of the total loss.**

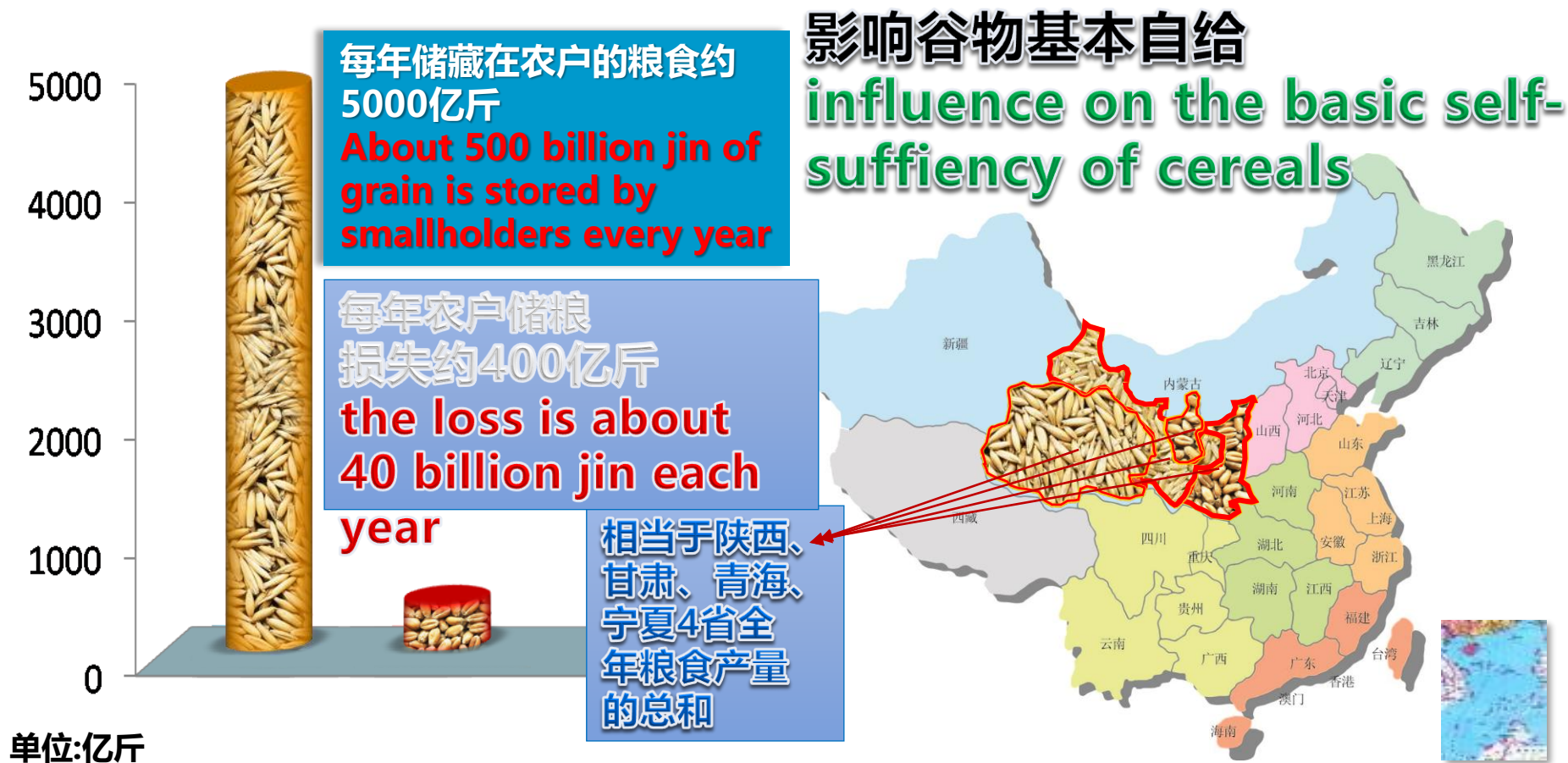


■ 鼠害损失 ■ 霉变损失 ■ 虫害损失



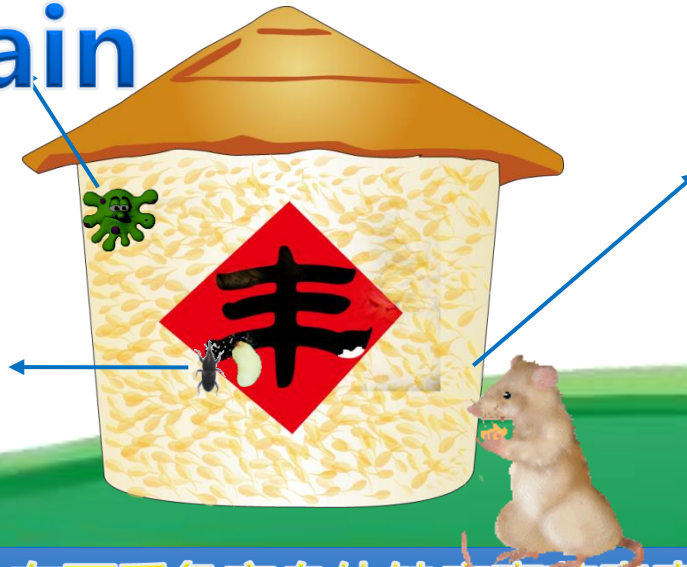
粮食增产越来越困难，减少损失是粮食“增产”的有效途径

It is becoming more and more difficult to increase grain production, and reducing losses is an effective way to increase grain production.





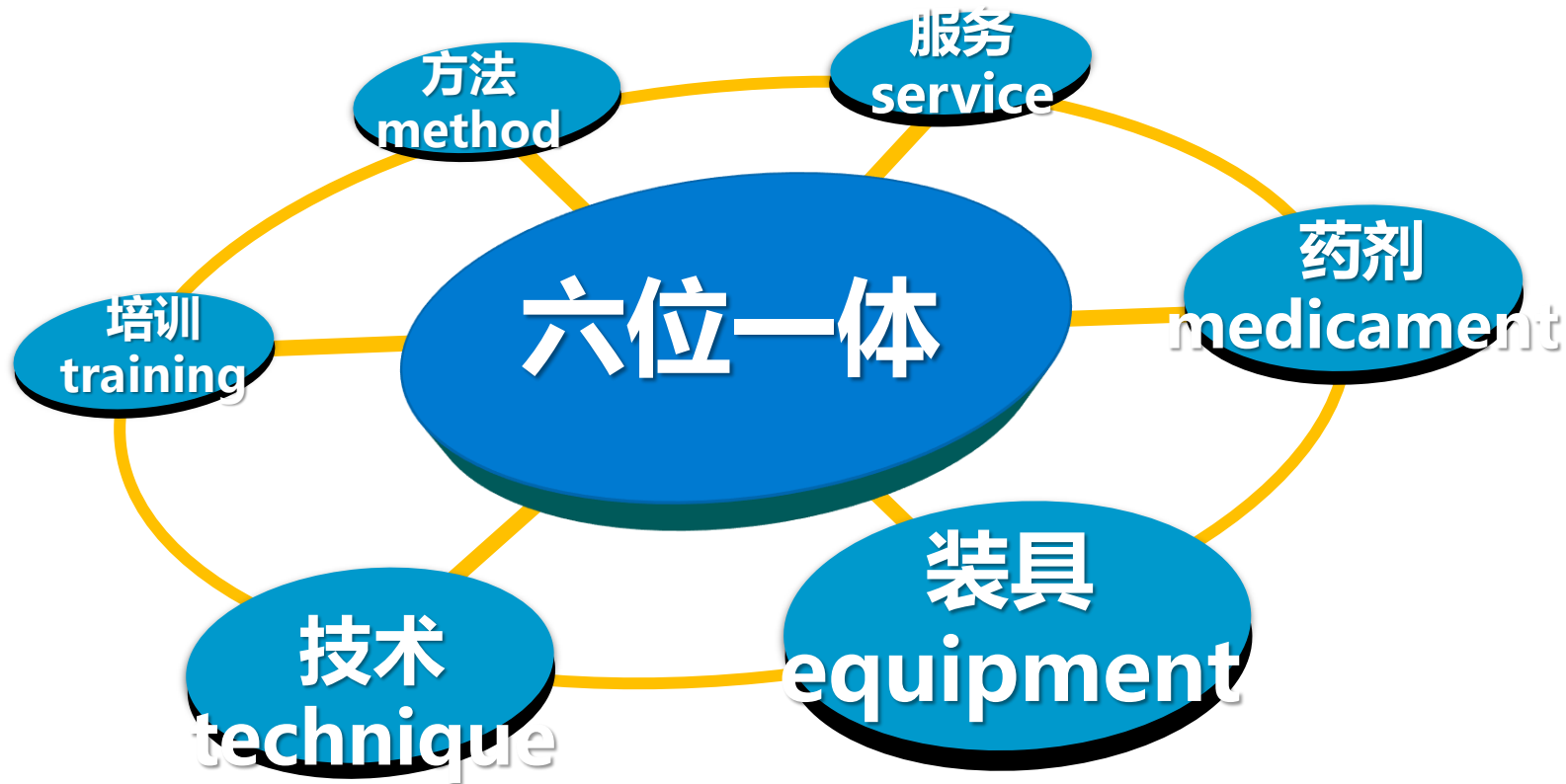
影响口粮安全 decrease the safety of food grain



还可能含有严重危害身体健康真菌毒素和致病菌
It may also contain mycotoxins and pathogenic bacteria that seriously endanger people's health.

从2001年开始，我国政府通过“六位一体”的技术路线，进行农户储粮专项实施。

Since 2001, the Chinese government has carried out the special implementation of grain storage for smallholders through the technical of "six in one" .



小农户（粮食产量小的农户）采用的主要储粮装具有：

The main grain storage equipment used by smallholder (farmers with small grain production) are:



大规模农户储粮技术与装备 Large-scale farmers' grain storage technology and equipment



农户小型钢板仓
Small steel silos for farmers

基本情况

- 材质为钢板
- 价格约20万元/套(含基础), 每立方米造价为2200元
- 容积90m³, 装粮数量约50-65吨

Basic information

- The material is steel plate.
- The price is about 200,000 yuan / set, and the cost per cubic meter is 2200 yuan.
- The volume is 90m³ and the amount of grain is about 50-65 tons.

大规模农户储粮技术与装备 Large-scale farmers' grain storage technology and equipment



农户小型钢板仓
Small steel silos for farmers

特点

- 适合储藏安全水分稻谷和小麦。
- 配备通风和测温装置。

Features

- Suitable for storing safe-moisture rice and wheat.
- Equipped with ventilation and temperature measurement devices.

大规模农户储粮技术与装备

Large-scale farmers' grain storage technology and equipment



钢骨架六角环形仓

Hexagonal ring silo with steel skeleton

基本情况

- 材质为角钢、钢丝网、彩钢板
- 价格约43000元/套，每立方米造价为358元
- 容积120m³，装粮数量约60吨

Basic information

- The materials are angle steel, steel wire mesh and pre-painted steel plate.
- The price is about 43,000 yuan / set, and the cost per cubic meter is 358 yuan.
- The volume is 120m³ and the grain loading capacity is about 60 tons.

大规模农户储粮技术与装备 Large-scale farmers' grain storage technology and equipment



钢骨架六角环形仓
Hexagonal ring silo with steel skeleton

特点

- 适合中国东北地区使用，储藏高水分（小于30%）玉米棒。
- 通过自然通风或机械通风可降至安全储藏水分，不需要烘干。

Features

- Suitable for use in the northeast areas of China, storing high-moisture (less than 30%) corn on the cob.
- Natural or mechanical ventilation reduces to safe moisture storage without the need for drying.

高水分玉米棒短期应急储存技术与装备 Short-term emergency storage technology and equipment for high-moisture corn on the cob



组合式高水分玉米穗短期储存仓
Combined short-term storage silo for high-
moisture corn ear

基本情况

- 材质为角钢、钢丝网
- 每单元价格约450元/套，每立方米造价为130元
- 容积约35m³，装粮数量约20吨

Basic information

- The materials are angle steel and steel wire mesh.
- The price of each unit is about 450 yuan / set, and the cost per cubic meter is 130 yuan.
- The volume is about 35m³, and the grain loading capacity is about 20 tons.

高水分玉米棒短期应急储存技术与装备 Short-term emergency storage technology and equipment for high-moisture corn on the cob



组合式高水分玉米穗短期储存仓
Combined short-term storage silo for high-
moisture corn ear

特点

- 中国东北地区使用，短期储藏高水分（小于30%）玉米棒。
- 需要烘干，为烘干争取时间。

Features

- Used in the northeast areas of China, short-term storage of high-moisture (less than 30%) corn on the cob.
- Need to dry moisture.



采用新装具后，示范农户储粮损失率由8%~10%降低至**2%以下**。

After using the new granary, the grain storage loss rate of the demonstration smallholders decreased from 8% ~10% **to less than 2 %**.

02

Smallholders' storage equipment- small steel silo

小农户储粮装具-小钢仓

彩钢板组合仓

Introduction of Pre-painted Steel Silo

- 材质为0.4毫米厚彩钢板

0.4 mm thick pre-painted steel sheet

- 价格约400-500元/套,每立方米造价为260-350元

Paddy about 400-500 CNY/set, cost 260-350 CNY/m³

- 容积1~1.5m³, 装粮数量约560公斤~850公斤

Volume 1~ 1.5 m³ to store about 600kg~1 ton grains

- 适合储藏安全水分的稻谷

Suitable for storage of paddy within safe water content



彩钢板组合仓 Pre-painted Steel Silo

该仓一般为3层，高度约1.35米

The silo is generally 3 layers, height of about 1.35 meters.



原因 Reason

- **节省材料，因地制宜**

Save materials, Adaption to local conditions

- **考虑到装粮方便和安全**

Consider for convenience and safety of grain loading

特点 Characters

- **防潮、防鼠、耐用 (>15年)**

Moisture-proof, Rodent Control and Durable.

- **便于规模化、流水线加工生产**

Facilitate large-scale and assembly line processing

小钢仓的安装与收拢:



Pack up



Install

加视频

小钢仓装粮的主要流程:

The main process of grain loading in small steel silos:



加视频

小钢仓的生产工艺： Production technology of small steel silo:



仓底生产
production of
silo bottom



仓体生产
production of the silo's
main body

小钢仓的生产工艺:

Production technology of small steel silo:



模具装备
mold equipment



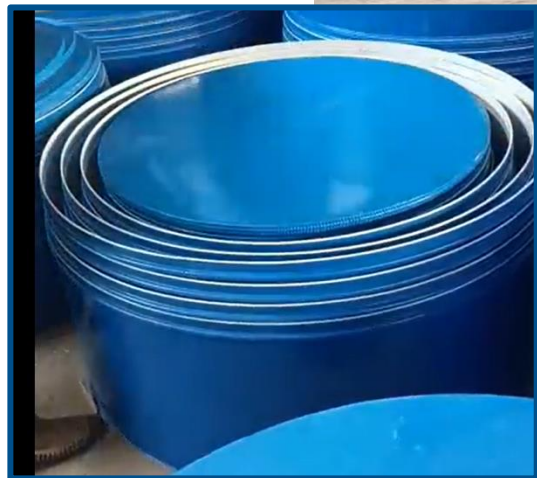
液压成型
hydroforming



仓盖成型
silo lid forming

仓盖生产 production of silo cover

小钢仓的仓库： warehouse of small steel silos:



03

Precautions for the use of small steel silos

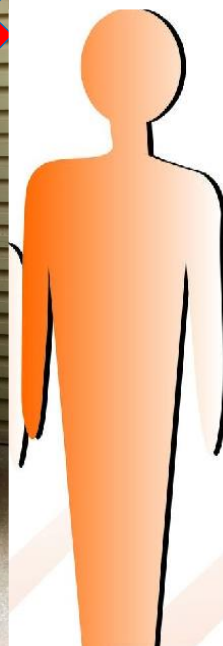
小钢仓使用注意事项

彩钢板组合仓 Pre-painted Steel Silo

该仓不宜超过三层，
并且竖直。

Not more than 3 layers.

装粮不够方便，不易进行粮情检测
It is not easy to load grain and carry out grain detection.



容易侧倒
Easy to fall sideways

彩钢板组合仓 Pre-painted Steel Silo



“ 该仓只能在室内使用。 Only use indoor.

“ 选择干燥、平整、通风良好的地点，不宜放在卧室、厨房、畜舍、禽舍等处。

The space must be dry, tidy and ventilated and should not be put in bedroom, kitchen, live-stock shed.

“ 主要是因为稻谷不耐高温。过夏的稻谷容易陈化，烈日下曝晒的稻谷，或曝晒后骤然遇冷的稻谷，容易出现“爆腰”现象。

- paddy isn't heat resistant, easy aging, easy crack after exposed to strong sunlight.

彩钢板组合仓 Pre-painted Steel Silo



“ 仓底应配备防潮垫。

Moisture-proof pad must be in bottom.



“ 不能将其中装有粮食的重物压在彩钢仓的筒壁上。

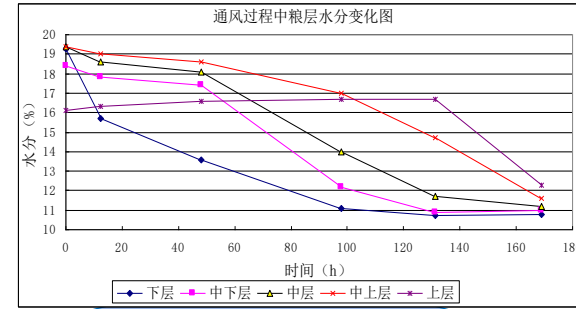
No heavy bag on the silo.

“ 不用时不能装有毒东西，以免再次装粮时污染粮食。

No toxicant in the bin.

偏高水分稻谷通风降水后进行储存
High-moisture paddy can be stored after ventilation

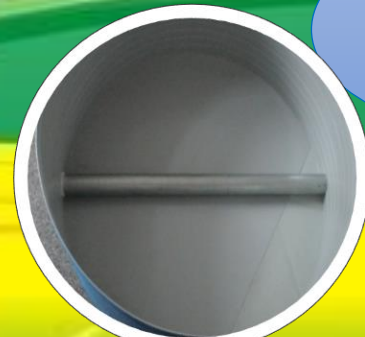
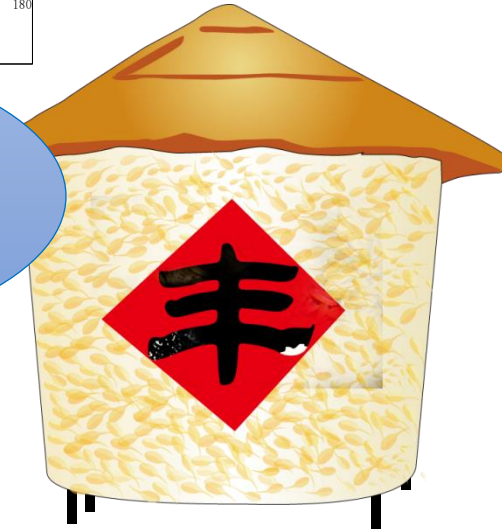
连续阴雨天
Continuous rainy days



通风降水
reduce moisture by ventilation

降至安全水分
reach the safe level

发生霉变
mildew



高水分稻谷通过袋式干燥降水后进行储存 High-moisture paddy can be stored by bag drying.

对于高水分稻谷，可通过袋式干燥，将水分降至安全储藏水分。

For high-moisture paddy, moisture can be reduced to safe storage moisture by bag drying.



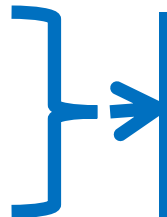
Bag Drying

稻谷干燥降水后的储存-加工模式图 (1)

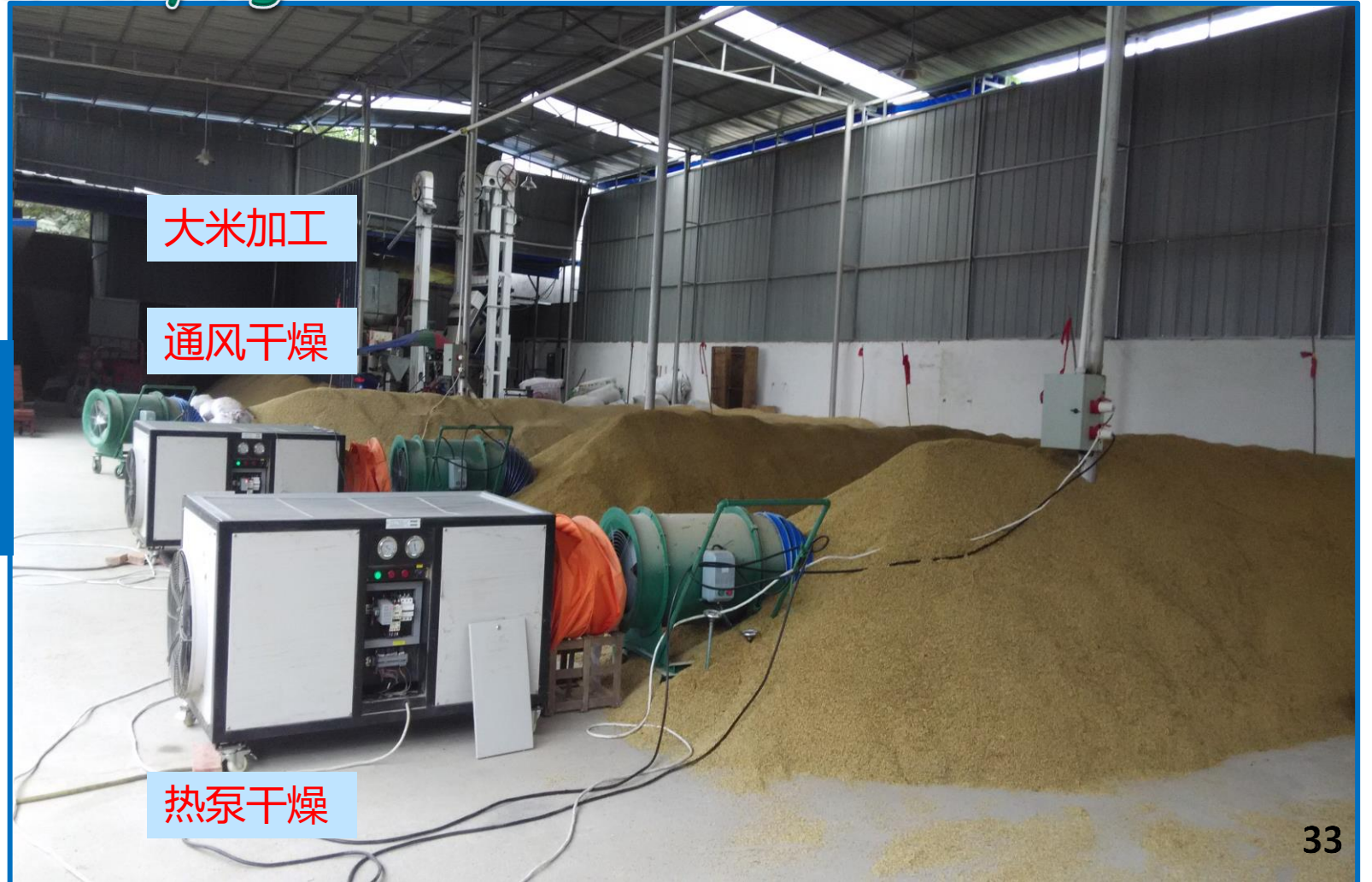
storage of paddy after drying- processing mode(1)

热泵干燥
heat pump
drying

通风干燥
ventilation



大米加工
paddy
processing



大米加工

通风干燥

热泵干燥

稻谷干燥降水后的储存-加工模式图 (2)

storage of paddy after drying- processing mode(2)

日晒干燥
solarization

小粮仓
通风干燥
ventilation

袋式干燥
bag drying



大农户
储存
large farmers'
storage method





对稻谷的要求

Requirment for paddy

干燥
Dry



安全水分以内

Within safe water content

饱满
Well-filled



充分成熟后收割

Harvested after Well-filled

籽粒饱满

Well-filled

干净
Clean



杂质清理干净

Clean off impurity





对储藏的要求

Requirment for storage

做好隔离 Separation

有虫粮和无虫粮分开

Grains with pests separated from none-pests grains.

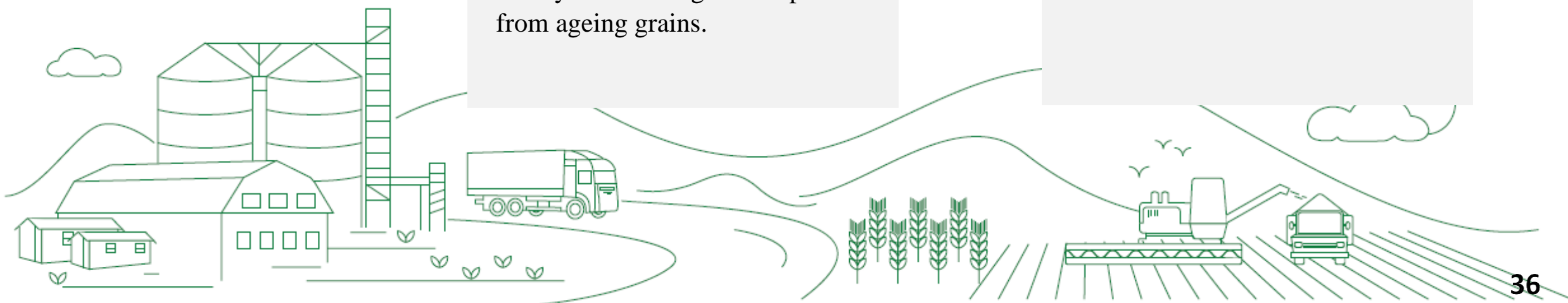
陈粮与新粮分开

Newly harvested grains separated from ageing grains.

定期检查 Periodic Check

发现问题及时处理

Problems are found and tackled timely .

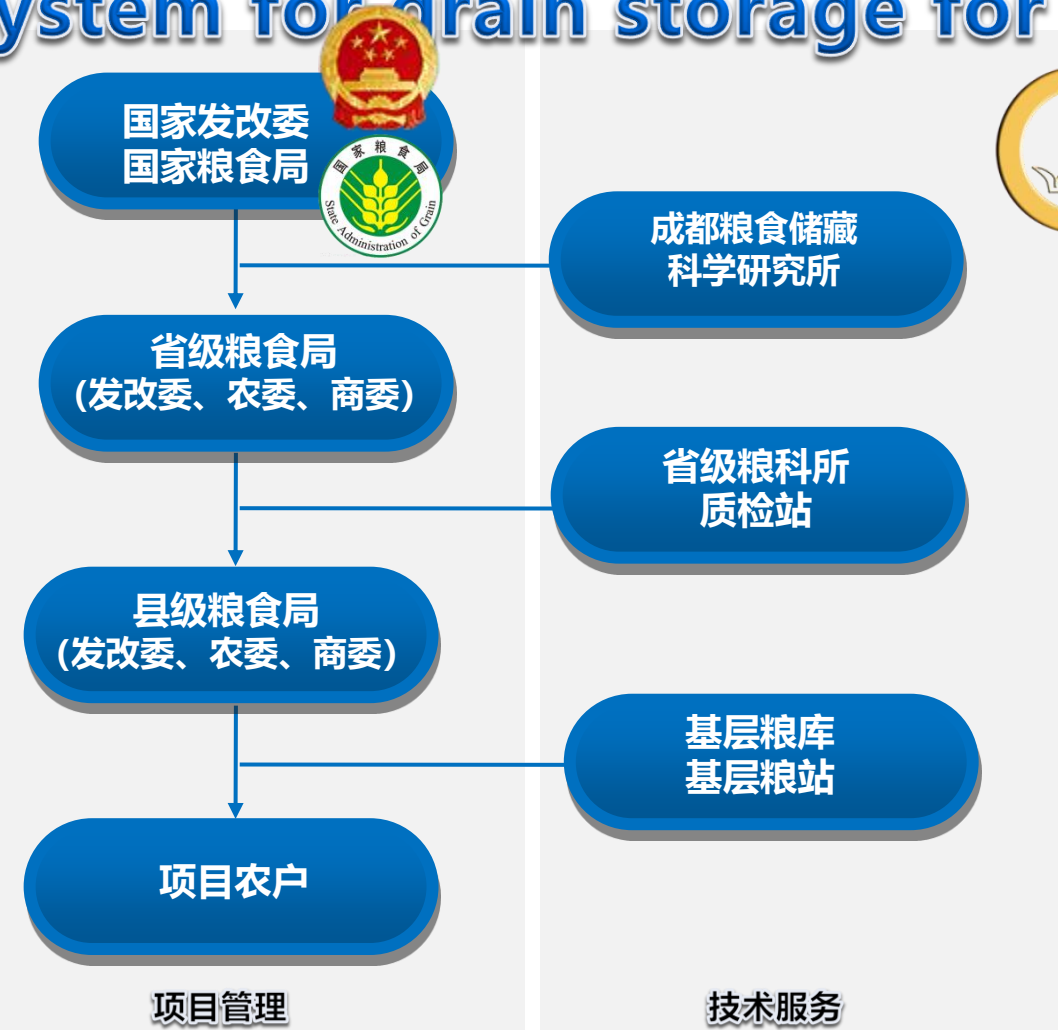


04

Experience and achievements of Chinese smallholders in grain storage

中国农户储粮经验与成绩

1. 初步建立起了中国农户储粮技术服务体系 **technical service system for grain storage for Chinese farmers**



三级农户储粮技术服务体系

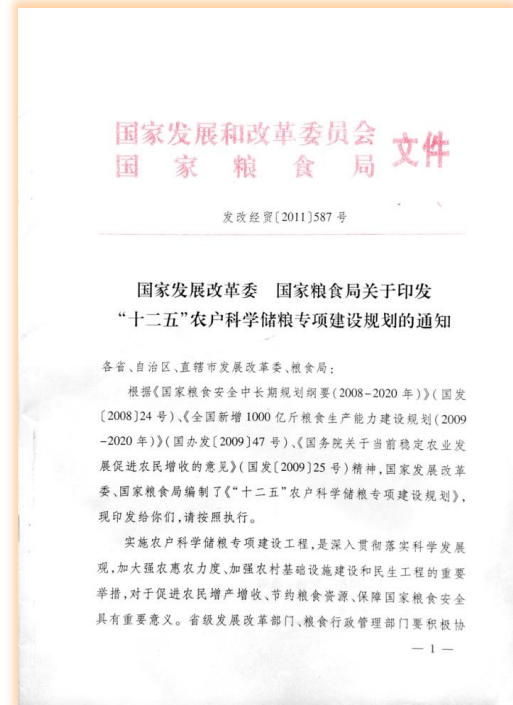
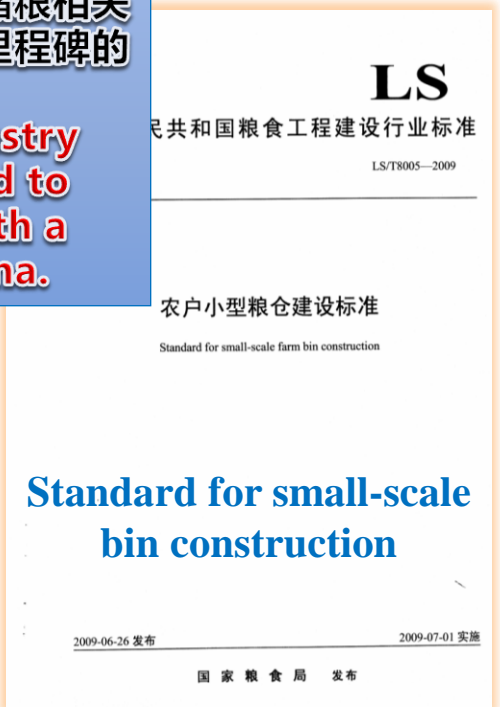
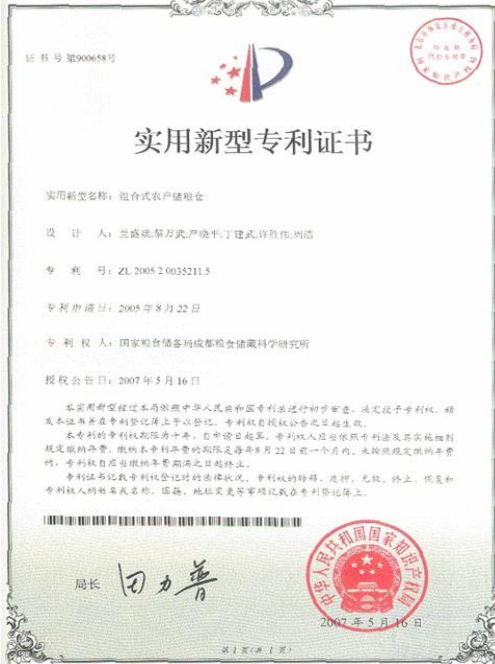
- 推广适宜规模化生产农户的储粮设施
针对粮食主产区和粮食主产县种粮大户的需求，开发储粮规模超过100吨的农户储粮粮仓，研究与之相适应的粮食干燥、清理设备，试点建设适合规模化生产的农户和农场的小型钢板仓。重点在吉林、湖北等地的农场和种粮大户建设1000套。
- 逐步建立农户科学储粮技术服务体系
各级粮食行政管理部门要认真做好农户科学储粮的宣传推广工作，结合为800万农户配置储粮装具，引导企业加大为农服务力度，加强对农户储粮装具使用技术指导，加强农户科学储粮知识的培训，加大绿色环保储粮新技术、新装具的研发推广，推广干燥、

专栏 3: 农户科学储粮技术服务体系建设

该技术服务体系为农户科学储粮技术的应用推广和全国农户科学储粮专项的实施发挥了重要作用
The technical service system has played an important role in the application and promotion of farmers' scientific grain storage technology and the implementation of the national farmers' scientific grain storage special project

2. 制定了行业标准《农户小型粮仓建设标准》及通用图纸 Standards for the Construciton of Small Grain Silos for Farmers

我国第一个与农户储粮相关的行业标准，具有里程碑的意义
It's the first industry standards related to grain storage, with a milestone in China.



标准规定了：粮仓分类、技术要求、安装和维护、检验规则、运输和装卸、合适证等

The standard stipulates: grain silo classification, technical requirements, installation and maintenance, inspection rules, transportation, loading and unloading, suitable certificates, etc.

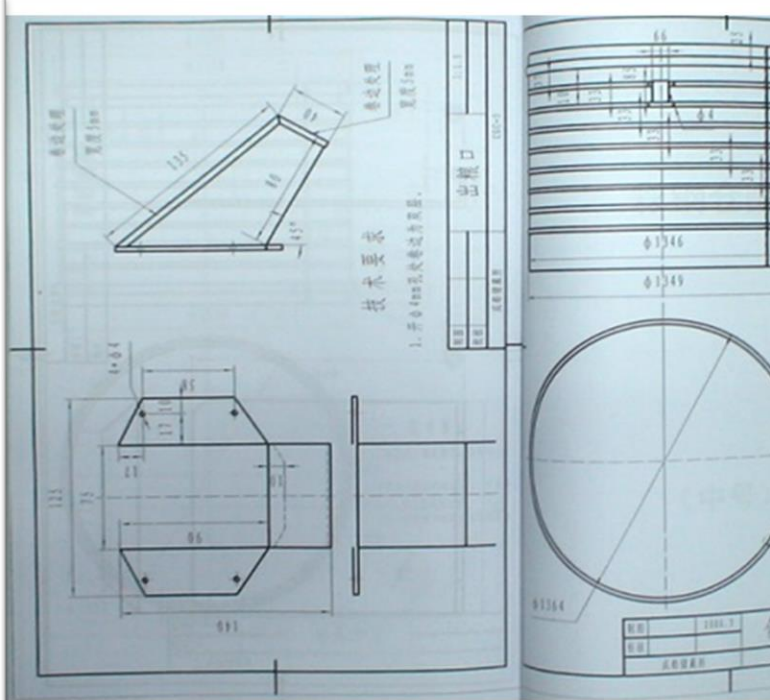
《农户科学储粮专项管理办法》规定 National Special Management System for Farmers' Scientific Storage

所有配置的农户粮仓必须符合《农户小型粮仓建设标准》 All farmers' bin must comply with this standard

农户科学储粮专项

农户小型粮仓通用图集

国家粮食局
二〇〇九年五月



《农户粮仓标准化通用图集》成为全国农户科学储粮专项的重要依据

General Atlas of Farmers' Granary Standardization becomes an important basis for the national farmer' households' scientific grain storage project

仓体结构合理、储粮安全可靠、进出粮方便、操作简便、美观耐用、技术成熟、价格适宜，宜推广使用

The structure of silo is reasonable, the grain storage is safe and reliable, the grain entry and exit are convenient, the operation is simple, the appearance is durable, the technology is mature, the price is suitable, and it is suitable for use

3. 制作了一系列农户储粮技术科普资料

A series of popular science materials on grain storage technology for farmers





触摸屏式的多媒体查询一体机

Touchscreen-type multimedia inquiry all-in-one machine



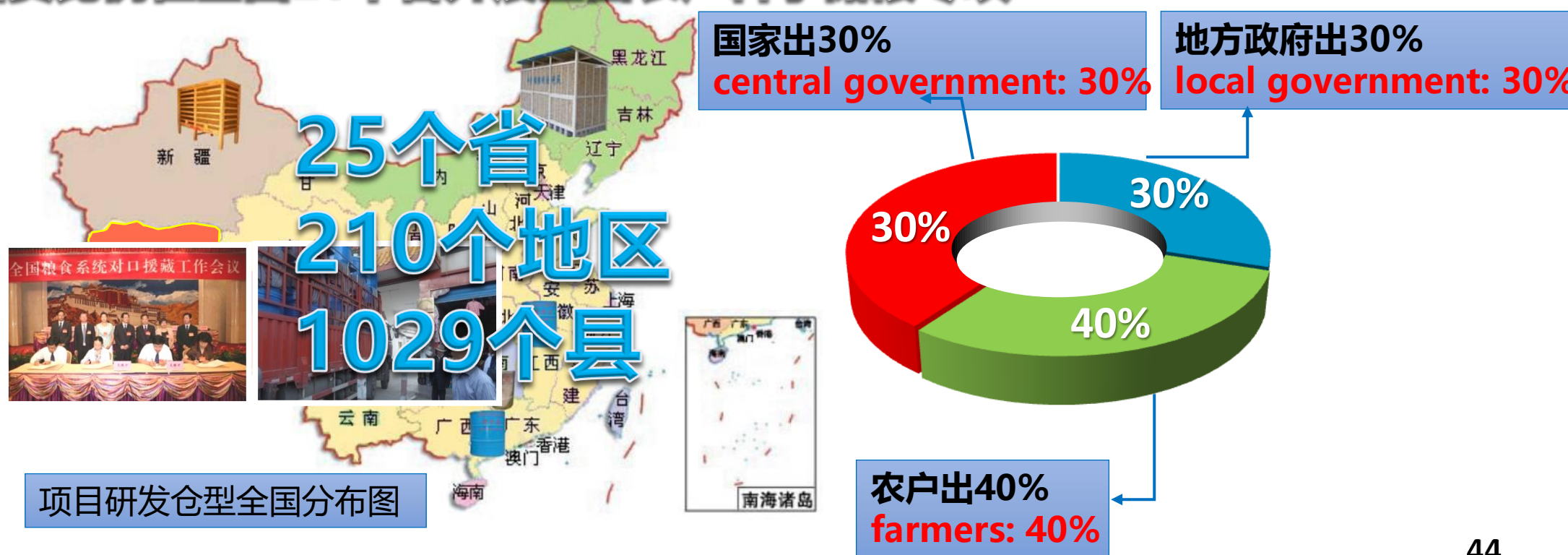


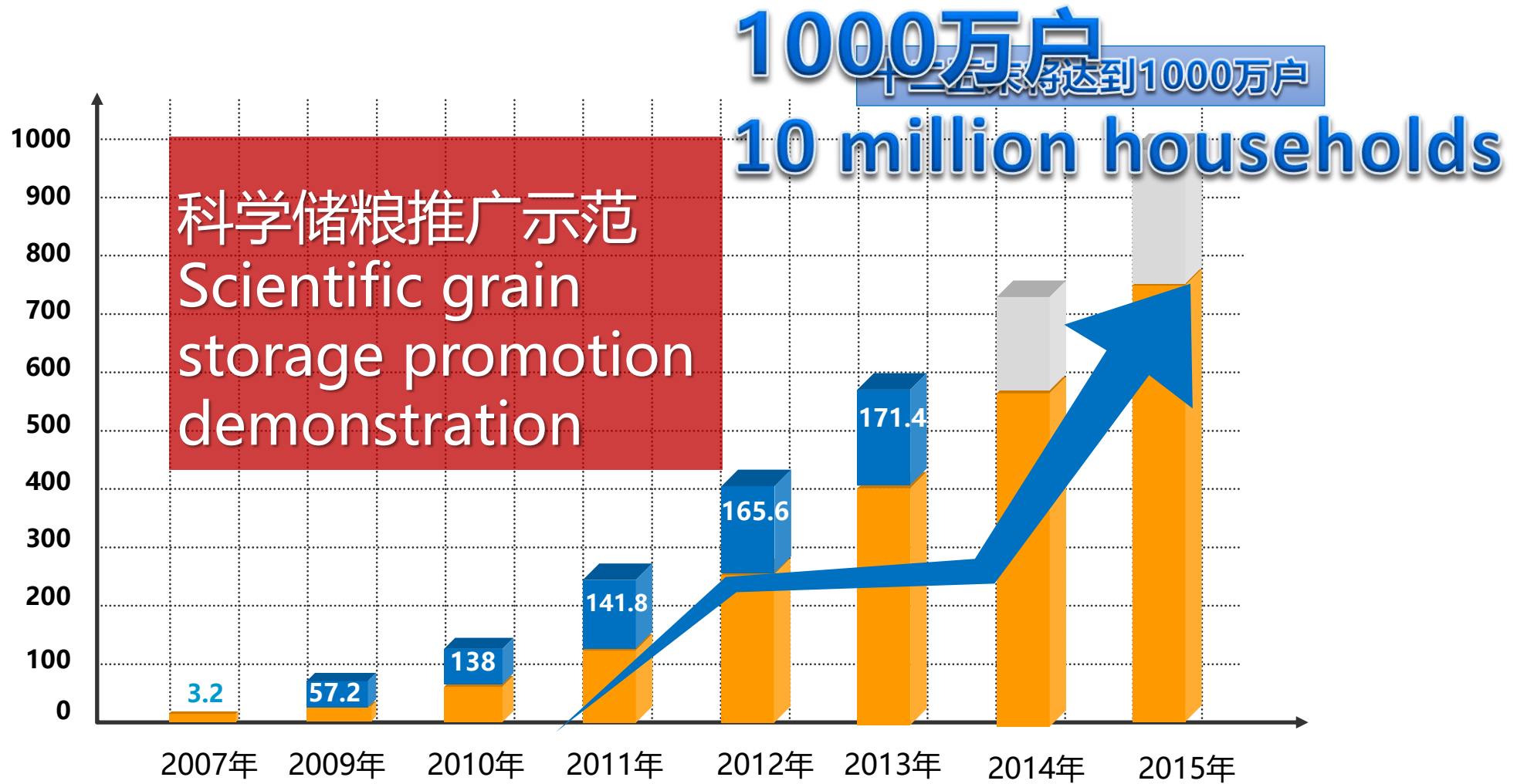
《农户粮食储存实用技术》该影片获得国家电影局优秀影片并被新闻电影制片厂推荐参评2013年电影最高奖华表奖
Practical Technology for Grain Storage for Farmers won the excellent film of the National Film Administration and was recommended by the news film studio to participate in the 2013 Huabiao Award, the highest film award

4. 在全国广泛开展农户储粮专项实施行动

Carry out a wide range of special implementation actions for grain storage by farmers throughout the country

从2007年开始，国家发改委、财政部、国家粮食和物资储备局联合发文，按照3:3:4的出资比例在全国26个省开展全国农户科学储粮专项





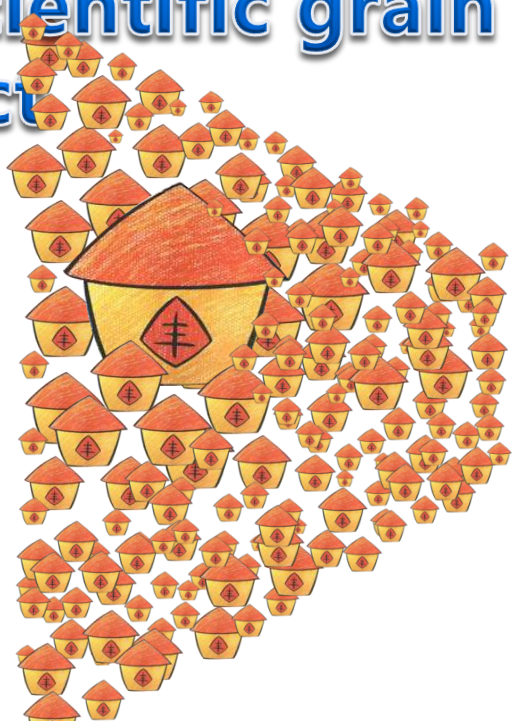
单位: 万户
unit: 10000 households

农户科学储粮专项示范带动作用明显

of scientific grain storage by farmers has obvious driving effect

The special demonstration

of scientific grain storage by farmers has obvious driving effect



956万户

带动drive

减损19亿斤 reduce the loss of 1.9 billion jin

周边农户减损90亿斤

surrounding farmers reduce the loss of 9 billion jin

通过项目示范，明显带动了农民自主投入

Through project demonstration, obviously, it has led to farmers' independent input

农户科学储粮专项示范带动作用明显 The special demonstration of scientific grain storage by farmers has obvious driving effect



减损 19亿斤



相当于增加“无形良田”：中国农户储粮专项实施每年可减少储粮损失约19亿斤，相当于增加了277万亩 The implementation of the special grain storage project for Chinese farmers can reduce the loss of grain storage by about 1.9 billion jin per year, which is equivalent to an increase of 2.77 million mu



Thank You



The project is funded by Bill and
Melinda Gates Foundation.

