

Implementation of the Pilot Project on Integrated Straw Management in China

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Outline

- **Straw burning problems in China**
- **Policy arrangement**
- **Mechanization solutions**
- **Main challenges**

Section I :

**Straw burning problems
in China**

Status of straw burning in China

High straw yield in China

Total quantity of crop straw in China: **>800 million tons/year**. (Source: *Ministry of Agriculture and Rural Affairs, P.R.China, 2018*)



Straw burning causes many environmental problems:

A large amount of straw was burned because of inefficient management, poor awareness of farmer and scarce policy.



- Air pollution
- Water pollution
- Fire hazard
- Biomass energy waste...

Section II: Policy arrangement

The State Council, P. R. China issued the policies related to **“Straw Management”** to accelerate integrated crop straw management in China.

| Document | Department |
|--|-------------------------------------|
| 2007 Central NO.1 Document | <i>The State Council, P.R.China</i> |
| 2008 Central NO.1 Document | <i>The State Council, P.R.China</i> |
| Opinions on accelerating the comprehensive utilization of crop straw | <i>The State Council, P.R.China</i> |
| 2017 Central NO.1 Document | <i>The State Council, P.R.China</i> |
| 2018 Central NO.1 Document | <i>The State Council, P.R.China</i> |



中华人民共和国中央人民政府
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国务院办公厅关于加快推进农作物秸秆综合利用的意见

国办发〔2018〕25号

各省、自治区、直辖市人民政府，国务院各部委，各直属机构：

近年来，我国在一些地区出现农作物秸秆（以下简称秸秆）乱堆乱放的普遍现象，不仅污染环境，严重影响交通运输安全，还浪费资源。为加快推进秸秆综合利用，实现秸秆资源化、减量化、无害化处理，对环境保护和乡村振兴、脱贫攻坚、农村生态文明建设具有重要意义。

（一）指导思想、基本原则和主要目标

（二）基本原则

（三）主要任务

（四）保障措施

（五）有关要求



中华人民共和国中央人民政府
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中共中央 国务院关于实施乡村振兴战略的意见

（2018年1月2日）

实施乡村振兴战略，是党的十九大作出的重大决策部署，是决胜全面建成小康社会、全面建设社会主义现代化国家的重大历史任务，是新时代“三农”工作的总抓手。现就实施乡村振兴战略提出如下意见。

一、新时代实施乡村振兴战略的重大意义

党的十八大以来，在以习近平同志为核心的党中央坚强领导下，我们坚持把解决好“三农”问题作为全党工作重中之重，持续加大强农惠农富农政策力度，扎实推进农业农村现代化和新农村建设和农村改革，农业农村发展取得了历史性成就，为党和国家事业全面开创崭新局面提供了重要支撑。8年来，粮食生产能力再上新台阶，农业供给侧结构性改革迈出步伐，农民收入持续增长，农村民生全面改善，脱贫攻坚取得决定性进展，农村生态文明建设显著加强，农村获得感显著提升，农村社会稳定和谐，农业农村发展取得的重大成就和“三农”工作积累的丰富经验，为实施乡村振兴战略奠定了良好基础。

农业农村农民问题是关系国计民生的根本性问题，没有农业农村的现代化，就没有国家的现代化。当前，我国发展不平衡不充分问题在乡村最为突出，主要表现在：农产品阶段性供过于求和供给不足并存，农业供给质量亟待提高；农民适应生产力和市场竞争的能力不足，新型职业农民队伍建设急需加强；农村基础设施和民生领域欠账较多，农村环境和生态问题比较突出，乡村发展整体水平有待提升；国家支农体系和体制机制需要调整，农村金融改革任务繁重，城乡之间要素合理流动机制亟待健全；农村基础薄弱存在薄弱环节，乡村治理体系和治理能力亟待强化。实施乡村振兴战略，是解决人民日益增长的美好生活需要和不平衡不充分的发展之间的矛盾、实现“两个一百年”奋斗目标、实现中华民族伟大复兴的必然要求，是实现全体人民共同富裕的必然要求。

National Ministries and local government also issued a lot of policies to prohibit “*straw burning*” and improve environment quality and sustainable development.

| Document | Department |
|---|--|
| Focused 50 technologies on “10 th Five-year plan” (2001) | <i>Ministry of Agriculture and Rural Affairs, P.R.China</i> |
| Notice on strengthening prohibition of straw burning and comprehensive utilization of straw (2003) | <i>Ministry of Ecology and Environment , P.R.China</i> |
| Notice on “12th Five-year plan” for integrated straw (2011) | <i>National Development and Reform Commission, P.R.China</i> |
| Notice on Adjusting and Improving the Tax Reduction Policies for Comprehensive Utilization of Straw Products (2011) | <i>Ministry of Finance, P.R.China</i> |
| Notice on extension of the Comprehensive Utilization and Prohibition of Crop Straw (2013) | <i>National Development and Reform Commission,, P.R.China</i> |
| Notice on Accelerating the Comprehensive Utilization and Prohibition of Crop Straw (2015) | <i>National Development and Reform Commission,, P.R.China</i> |
| Notice on extension of the Prohibition of Crop Straw (2018) | <i>Ministry of Agriculture and Rural Affairs, P.R.China; Ministry of Ecology and Environment , P.R.China</i> |

Section III:

Mechanization solutions

Mechanization plays an important role in straw utilization management



1. Fertilizer



2. Fodder



3. New energy resources

Integrated Straw Management



4. Base stock



5. Industry material

1. Fertilizer

◆ Direct straw returning

Crop harvest → straw chopping and mulching → no-till seeding



Harvester



Straw returning machine



No-till seeder

- **Mechanization promotes harvesting and sowing efficiency**

◆ Cow manure returning

Composting → fertilizer spreading → no-tillage seeding



Composting machine

Fertilizer spreader

No-till seeder

- **Mechanization increased composting efficiency and planting performance**

2. Fodder

Maize harvesting → straw storage and fermentation → feeding cow



Ensilage harvester



Fermentation machine

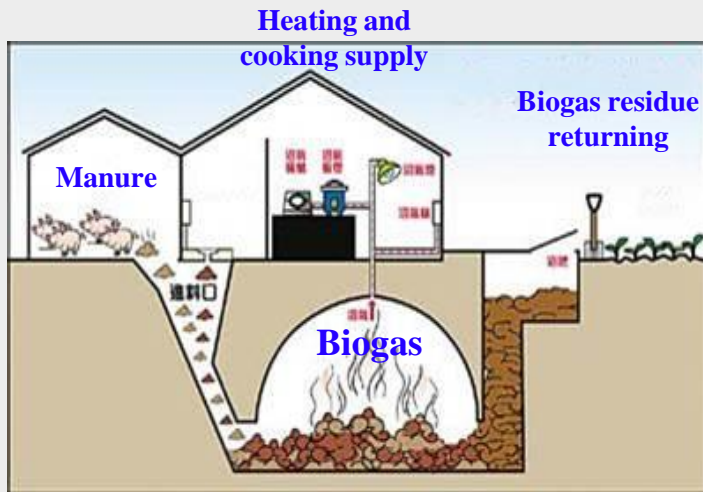


Feeding machine

- **Mechanization improves quality and palatability of fodder.**

3. New energy resource

Manure → composting and fermentation → produce biogas → heating supply and cooking



Biogas digester



Biogas tank

- Mechanization improves biogas production efficiency and new energy utilization.

4. Base stock

Material reserving → fermentation → planting → fungi management → harvest



Related machines are widely used in straw management as base stock and industry material

5. Industry material

Smash → infiltration → calcify → continuous cook → straw pulp → decoloration → homogenate → compression → coating → molding → incision → package → products



Project “Pilots of Integrated Straw Management in China”

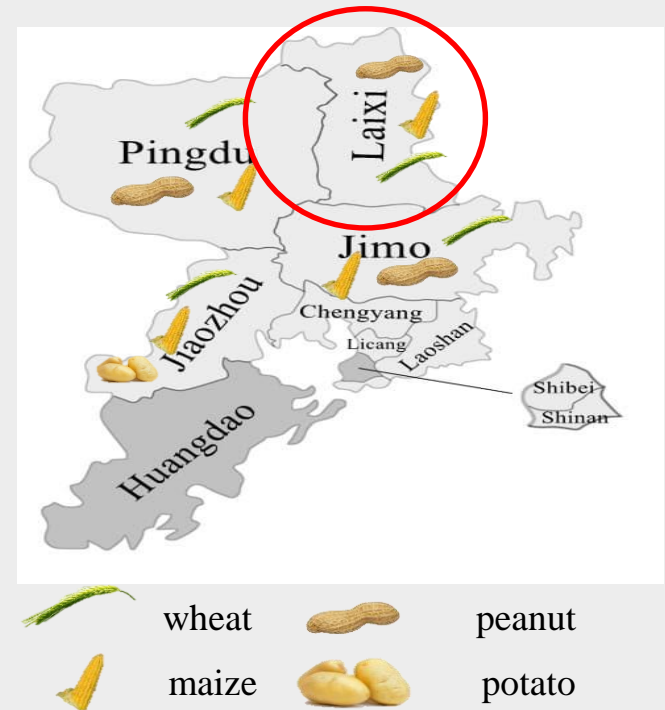


Establish the pilot site in Laixi (2019-2022)

Project objective

- Objective 1: **Develop** an integrated straw management
- Objective 2: Establish demonstration site in Laixi
- Objective 3: **Technical trainings** on integrated straw management technology
- Objective 4: **Extension** of straw management technologies

Target area



Straw distribution in Qingdao

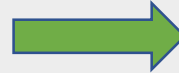
The three main crops (Wheat, Maize and Peanut) annually produce >800 thousand tons of straws. It's a **great challenge for Laixi!**

What we have done (Jul. 2019-Oct. 2020)

- **Selection and implementation of technical patterns**
- **Results and Outcomes**

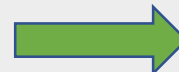
Selection and implementation of technical pattern

**Straw used as
fertilizer**



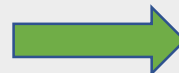
**Returning straw
to the field**
**Returning cow manure
to the field**
**Returning biogas
residue to the field
(this year)**

**Straw used as
folder**



Ensilage maize

**Straw used as
new energy
resource**



**Biogas production
(this year)**

1.Straw used as fertilizer

Returning straw to the field



**Wheat harvesting
and straw chopping**



**Maize no-till
planting**



Maize harvesting



Straw chopping



**Maize straw as
organic fertilizer**



Sprinkling irrigation



**Minimum tillage
seeding of wheat**

Returning cow manure to the field



Feeding cows



Cow manure composting



Minimum tillage seeding of wheat



Returning cow manure to the field

2.Straw used as fodder

Ensilage maize



Maize harvesting



Straw fermentation



Feeding cows



Processing fodder

3.Straw used as new energy resource

Biogas production
(this year)



Biogas production



Produce biogas
(under construction)

Returning biogas residue
to the field (this year)



Separation of biogas and
biogas residue



Returning biogas residue
to the field

Results and Outcomes

Ecological Indicators

| Item | Returning straw to the field | | Returning cow manure to the field |
|--|------------------------------|--|-----------------------------------|
| Soil organic matter (%) | 2.1 | | 2.1 |
| Straw burning reduction (tons/ha) | Winter wheat straw | 6.93 (in the growing stage of summer maize) | - |
| | Summer maize straw | 8.80 (in the growing state of winter wheat) | - |
| Cow manure returned to the field (tons/ha) | - | | 70.25 |

The demonstration achieved improvements in ecological aspects:

- 1. Soil organic matter** was **2.1%** and **2.1%** in the field with the management of straw returning and cow manure returning, respectively;
- 2. The reduction** in burning of winter wheat and summer maize straw were **48.51** and **61.60 tons** in the demonstration site (**7 ha**), respectively;
- 3. 70.25 tons/ha cow manure** (total 491.75 tons) was returned to the field in the demonstration site (7 ha).

Economic Indicators

| Indicators | Management method | Item | Wheat | | Maize | |
|------------------|-----------------------------------|---|--|-------------------|--|--------------------|
| | | | Initial value (before the project, 2018) | Value (Jun. 2020) | Initial value (before the project, 2018) | Value (Sept. 2019) |
| Yield production | Returning straw to the field | Yield (kg/ha) | 7,100 | 7,334 | 7,500 | 7,709 |
| | | Input USD/ha) | 649 | 642 | 652 | 645 |
| | | Output (USD/ha) | 2,414 | 2,493 | 2,325 | 2,389 |
| | | Net income (USD/ha) | 1,765 | 1,851 | 1,673 | 1,744 |
| | Returning cow manure to the field | Yield (kg/ha) | 7,100 | 7,425 | 7,500 | 8,250 |
| | | Input USD/ha) | 649 | 642 | 652 | 645 |
| | | Output (USD/ha) | 2,414 | 2,524 | 2,325 | 2,557 |
| | | Net income (USD/ha) | 1,765 | 1,882 | 1,673 | 1,942 |
| Milk production | Ensilage maize | Traditional fodder (before project, 2018) | | New fodder | | |
| | | Milk production (ltr/day/cow) | 20 | 21 | | |
| | | Milk value (USD/day) (only 100 cows produce milk) | 1,068 | 1,021 | | |

The demonstration achieved improvements in economic aspects:

1. The **net income** with the improved technical modes of returning straw to the field and returning cow manure to the field was **157 USD/ha** and **386 USD/ha**, respectively;
2. The **milk value** was increased by **53 USD/day** for total **100 cows** (only 100 out of 400 cows can produce milk) as compared to traditional fodder in the demonstration site.

Section IV:
Main challenges

Government support

Promulgate Policies:

- **Cooperation of National departments**
- **Subsidy policy of agricultural machinery purchase**
- **Subsidy policy of machinery operation**
- **.....**

Promotion of straw utilization :

- **Demonstration of integrated straw management**
- **Demonstration based on local conditions**
- **.....**

Improve equipment

**Returning straw to the field/
Returning cow manure to the field**



Improve no-till seeder
quality

Returning cow manure to the field



Using pollutant
discharge pipe

Suitable technical pattern

Integrated Straw
Management

Fertilizer

Fodder

New energy

- Poor working performance
- Lower utilization efficiency of straw
-



**Improve performance of integrated straw management
Optimization of technical pattern**

Enhance awareness of farmers



Class training



Field tour



Discussion

Improve the technical level of local technicians and farmers
in integrated straw utilization

*Welcome to visit Laixi
demonstration site in China!*

Thanks!