Central Agricultural
Broadcasting and Television School
中央农业广播电视学校

FULLY MECHANIZED RICE AND WHEAT PRODUCTION WITH A FOCUS ON LOSS REDUCTION

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PART.02

Mechanization Technology of Land Preparation

1.Mechanized Land Preparation Technology

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Mechanized operations:

- Use of **mechanical power** to operate equipment such as **mouldboard ploughs, rotary tillers, and subsoilers.**
- Efficiently perform **ploughing, soil fragmentation, and farmland levelling.**

Objectives:

- Improve **soil structure.**
- Enhance **soil fertility.**
- Create favourable conditions for **sowing** and **crop growth.**

Outcomes:

- Increases **production efficiency.**
- Reduces **labor intensity.**
- Promotes **agricultural standardization** and **large-scale farming.**

2.Laser Land Preparation Technology

How it works

- Uses **laser transmitters** and **receivers** for **real-time monitoring** and **control.**
- Automatically **adjusts blade height** via the hydraulic system.
- Achieves **high-precision levelling** (accuracy within **±2 cm**).

Applicable scenarios

- **Paddy fields.**
- **Dryland.**
- **Irrigated farmland.**

Key benefits

- Improves **irrigation uniformity.**
- **Reduces water waste.**
- Improves **efficiency** of **agricultural mechanization operations**.

3.Land Preparation and Returning Straw to the Field

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1. Ploughing with straw deep-burying

How it works

- Uses **mouldboard** or **disc plow**.
- Tillage depth: **18–35 cm**.
- Buries **straw** in **lower soil layer** → full **contact with soil** → faster **decomposition.**

Advantages

- Creates **deep cultivated layer**, improves soil structure.
- Increases **soil permeability** & **water-holding capacity.**
- Promotes thorough **straw decomposition,** reduces pests/diseases risks.
- Suitable for **plots** with a **large amount of straw** and **fertile soils**.

Disadvantages

- **High power consumption**.
- Requires **large machinery** and **higher costs.**
- Disrupts **original soil structure** → **loose surface soil.**
- Needs **refinement** with **rotary tillage.**

2. Rotary tillage with straw returning

How it works

- Uses **rotary tiller** to **mix & smash straw** with **surface soil (0–15 cm).**
- Ensures **straw** is **evenly distributed** in soil.
- **Shallow tillage depth**: typically, **10–15 cm**.

Advantages

- **Low power consumption**.
- Suitable for **small & medium machinery**.
- **Even mixing** → faster straw decomposition.
- **Highly adaptable** → applicable to **various crop residues**.

Disadvantages

- **Shallow cultivated layer.**
- Large amounts of **straw** may not be fully buried → some left on **surface**.
- Long-term **rotary tillage** → risk of **soil compaction.**
- Requires regular **deep ploughing** to mitigate **soil compaction**.

3. No-tillage with straw returning

How it works

- Cover **soil surface** with **straw** without tillage.
- **Direct seeding into furrows** created in the straw mulch layer.

Advantages

- Minimizes **soil disturbance**, preserves **soil structure**.
- Reduces **soil erosion**.
- **Straw mulching** keeps soil warm & moist, inhibit **weed growth**.
- Saves **fuel** & **machinery costs.**
- Suitable for **conservation tillage.**

Disadvantages

- May affect **sowing quality** → **uneven seedling emergence**.
- Higher risk of **pests & diseases** → requires **stronger control.**
- Slow **straw decomposition** → may affect **crop growth** in next season.

Straw Treatment – Key Focus

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- **Select appropriate method according to local conditions.**
- **Follow key principles:**
  - Shorter cuts.
  - Even distribution.
  - Deeper burial.
  - Cleaner overall handling.

4. Ploughing combined with rotary tillage

How it works

- **Combines two tillage methods:**
  - **> Ploughing → deeply bury straw (18–35 cm).**
  - **> Rotary tillage → finely crush & level topsoil layer (0–15 cm).**

Benefits

- Ensures full straw return to the field.
- Create well-prepared seedbeds for crop cultivation.

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Recommendations for Straw Returning & Land Preparation

Promote advanced technologies

- Promote **laser leveling technology** to reduce **fertilizer, water**, and **pesticide usage.**
- Develop and improve **high-quality straw/stubble returning technology.**
- Promote **large-scale combined tillage machinery** for efficient, precise operations.

Adapt to local conditions

- Select the most appropriate **land preparation** and **straw returning method** according to:
  - **Regional characteristics.**
  - **Farm operator conditions.**