

TECHNICAL PROCEDURE FOR HIGH-QUALITY, LOW-EMISSION RICE PRODUCTION IN THE MEKONG DELTA

(Issued together with Decision No. 4043/QĐ-TT-CLT dated 10 November 2025 of Director General of the Department of Plant Production and Protection)

I. GENERAL INTRODUCTION

On 27 November 2023, the Prime Minister issued Decision No. 1490/QĐ-TTg approving “*The Project on sustainable development of 01 million hectares for specialized farming of rice with high quality and low emission associated with green growth of the Mekong Delta by 2030.*” (hereafter referred to as the *1 Million Hectares Rice Program*). In implementation of the Program, on 27 March 2024, the Department of Crop Production and Plant Protection (formerly the Department of Crop Production) issued Decision No. 145/QĐ-TT-CLT promulgating the Technical Procedures and Guidance Handbook for “High-Quality and Low-Emission Rice Production in the Mekong Delta.” This technical procedure was developed with the support of the International Rice Research Institute (IRRI) and domestic experts. It is based on a synthesis of research outcomes, field demonstration models, expert knowledge, and practical experience from local authorities.

After more than one year of pilot implementation, several components of the technical procedure revealed challenges in practical application and therefore required revision and supplementation to ensure feasibility. Based on consolidated feedback from provincial authorities, research institutes, universities, scientific organizations, and professional associations, together with consultations with experts, the Department of Crop Production and Plant Protection reviewed, revised, and supplemented the procedure. The revision focuses on strengthening the integrated system of agronomic practices to improve production efficiency while reducing greenhouse gas emissions, as summarized below:

1. Scope of the Technical Procedure

The procedure covers the entire rice production cycle, including three major components: (i) Crop cultivation techniques; (ii) Harvest management and post-harvest handling; & (iii) Rice straw management. These components are designed as a coherent and integrated technical package, ensuring consistency and synchronization throughout the production chain and forming a comprehensive guideline applicable to rice production within the scope of the Project.

- Crop cultivation techniques: include practices related to Land preparation; Seed preparation; Seeding operations; Water management for greenhouse gas mitigation; Fertilizer application; Rice pest management
 - Harvest and post-harvest management: Include technical measures related to Harvesting operations; Grain drying; Storage management. These measures aim to enhance rice quality, minimize post-harvest losses, and improve energy efficiency.
 - Rice straw management: Includes technical measures for the management of straw and rice stubble following circular agriculture principles and emission reduction objectives.
2. **Applicable entities:** The procedure applies to organizations (farmer clubs, cooperative groups, agricultural cooperatives, and enterprises) and Individuals (farming households and agricultural farms) participating in the Program “Sustainable Development of One Million Hectares of High-Quality and Low-Emission Specialized Rice Production Associated with Green Growth in the Mekong Delta by 2030.”
3. **Scope of application:** The procedure applies to high-quality and low-emission rice production zones within the above-mentioned Project in the Mekong Delta.

II. TECHNICAL CONTENT OF THE PROCEDURE

1. Crop cultivation techniques

The cultivation practices include the following main stages: Land preparation; Seed preparation; Seeding; Water management; Fertilizer application; Rice pest management

1.1. Land preparation

- Annual ploughing and soil aeration should be conducted after the Winter–Spring Season harvest. For subsequent seasons, shallow tillage and harrowing practices should be applied.

- Field requirements: The field surface must be well-leveled, with a maximum elevation difference of no more than 5 cm between the highest and lowest points. Field leveling may be conducted using water-level grading or laser-guided leveling technologies.
- Additional requirements: Clean the field and reinforce bunds to ensure effective water management. Soil should be tilled to a loose structure at a depth of 7–15 cm. Harrowing and drainage channels should be established (especially during the Summer–Autumn Season) to improve drainage, reduce soil acidity, and control golden apple snails.
- Before seeding: Drain water from the field 6–12 hours before operating row or hill seeding machines. It is recommended to drain water in the evening and perform seeding the following morning to ensure appropriate soil moisture for machinery operation and optimal seed-soil contact.
- For acid sulfate soils or saline soils: Deep ploughing beyond 15 cm should be avoided to prevent the release of acid sulfate layers or salinity intrusion from deeper soil horizons.

1.2. Seed preparation

- Certified rice seeds must be used.
- Recommended seeding rates:
 - + Before 2028: 70-80 kg/ha
 - + From 2028 onward: ≤ 70 kg/ha
- Seed treatment and soaking/germination procedures should follow manufacturer recommendations and appropriate practices for the selected seeding method.

1.3. Seeding

- a) Seeding schedule: Seeding should be conducted synchronously in accordance with the seasonal crop calendar recommended by local crop production and plant protection authorities.
 - b) Seeding methods
 - The use of mechanized seeding technologies is encouraged:
- + Row seeding machines - Row spacing: 25 × 25 cm (uniform row spacing); 10 × 40 cm (border-row effect configuration)
- + Hill seeding machines - Hill spacing: 20 cm
- Seeds after seeding should be lightly covered with soil (0.1–0.3 cm) to ensure adequate contact with moist soil and prevent seed loss or displacement.
 - Alternative technologies, such as Unmanned Aerial Vehicle (UAV / drone) seeding; Seed broadcasting machines, may be applied, provided that seeding rates comply with the recommended levels.
 - It is recommended to combine seeding with fertilizer deep placement at 3–4 cm depth in order to: reduce nutrient losses; improve fertilizer use efficiency & mitigate greenhouse gas emissions.

1.4. Water management for greenhouse gas mitigation

- a) Pre-tillage water management: Depending on the cropping season, fields should be fully drained 10–15 days before land preparation.
- b) Post-seeding water management:
 - 1–7 days after seeding: Maintain sufficient soil moisture to support early seedling growth.
 - From tillering to before heading:
 - + Apply Alternate Wetting and Drying (AWD) irrigation: At least two drainage cycles should be conducted. Each drainage cycle should ideally occur 5–7 days after fertilizer topdressing.
 - + Requirements for each drainage cycle: Fields must remain dry for at least three consecutive days (defined as the period from when surface water disappears until: light soil cracking occurs, or water level reaches –10 to –15 cm below the soil surface). Water should then be reintroduced (with a maximum depth of 5 cm).
 - + For low-lying fields or high rainfall conditions: At least one drainage cycle should be implemented during 28–50 days after seeding and ensure the field remains dry for at least 3 consecutive days.

Note: Water management must be adjusted according to seasonal conditions, soil characteristics (acid sulfate soils, saline soils), flood regimes, and salinity intrusion risks.

- c) Pre-harvest water management: Drain irrigation water 7–15 days before harvest.

1.5. Fertilizer management

- a) Principles: Fertilizer application must be: balanced, crop-demand-based & adapted to specific soil conditions and cropping seasons.
- b) Fertilizer rates per hectare for direct-seeded rice
 - Organic fertilizer recommended: 1.5 – 3.0 tons/ha
 - Lime (CaO)
 - + Moderately acidic soils (pHKCl 4.0–5.0): 200–300 kg/ha
 - + Strongly acidic or acid sulfate soils (pHKCl < 4.0): 400–500 kg/ha
 - Macronutrient fertilizer rates – Winter–Spring Season
 - + Alluvial soils: 90–100 kg N; 30–40 kg P₂O₅; & 30–40 kg K₂O
 - + Light acid sulfate soils: 80–100 kg N; 40–50 kg P₂O₅ & 25–30 kg K₂O
 - + Moderate acid sulfate soils: 60–80 kg N; 50–60 kg P₂O₅; & 25–30 kg K₂O
 - For Summer–Autumn and Autumn–Winter crops: Nitrogen application should be reduced by 15–20% compared with the Winter–Spring crop.
 - If fertilizer deep placement is combined with seeding, nitrogen rates should be reduced by 10–15%.
 - The use of a Leaf Color Chart (LCC) is encouraged to optimize nitrogen management.
- c) Fertilizer application schedule
 - Apply 100% organic fertilizer, lime, and phosphorus before seeding. For strongly acidic soils, 30% of phosphorus should be reserved for the first topdressing.
 - Topdressing schedule:
 - + 1st application (7–10 DAS): 40% N
 - + 2nd application (18–22 DAS): 40% N + 40% K₂O
 - + 3rd application (38–42 DAS): 20% N + 60% K₂O
 - For row or hill seeding combined with fertilizer deep placement: Use granular fertilizers 2–4 mm in diameter with controlled dissolution. Application schedule:
 - + 1st application: 70–80% of total fertilizer during seeding (deep placement)
 - + 2nd application (38–42 DAS): panicle initiation stage
 - The use of high-efficiency and controlled-release fertilizers is encouraged to reduce nutrient losses and greenhouse gas emissions.

1.6. Rice pest management

Rice pest management should follow Integrated Pest Management (IPM) principles under the framework of Integrated Plant Health Management (IPHM). Key practices include:

- Regular field monitoring
- Implementation of pest management measures according to guidelines issued by plant protection authorities
- Proper use of pesticides according to the “Four Rights” principle (right product; right timing; right dosage & right application method).
- Rotation of pesticide active ingredients should be applied to prevent resistance development. Priority should be given to biological and botanical pesticides.

2. Harvest management and post-harvest handling

Rice must be harvested at the appropriate maturity stage, and modern drying and storage technologies should be applied to minimize post-harvest losses in both quantity and quality.

a) Harvesting

- Harvest when grain maturity reaches 85–90% or according to varietal growth duration:
- + Short-duration varieties: 90–105 days
- + Medium-duration varieties: 106–120 days
- + Long-duration varieties: >120 days

- Harvesting should be performed using combine harvesters.

b) Grain drying

Paddy rice should be dried within 24 hours after harvest.

c) Grain storage

- Rice for storage must: have moisture content below 14% (for commercial paddy) and be cleaned prior to storage.
- Appropriate storage technologies for the Mekong Delta include:
 - + Forced-aeration warehouses to regulate temperature and humidity
 - + Hermetic bag storage, placed on wooden racks or pallets
 - + Silo storage systems with controlled temperature and humidity for large-scale operations

- + Cold storage, recommended for high-quality export rice
- + Fumigation should be minimized and must comply with pesticide residue regulations.
- + Digital technologies are encouraged for storage management, including: automated temperature and humidity sensors; insect monitoring traps; digital storage logs & post-harvest traceability systems.

These solutions contribute to reducing post-harvest losses, improving grain quality, and lowering greenhouse gas emissions across the rice value chain.

3. Rice straw management

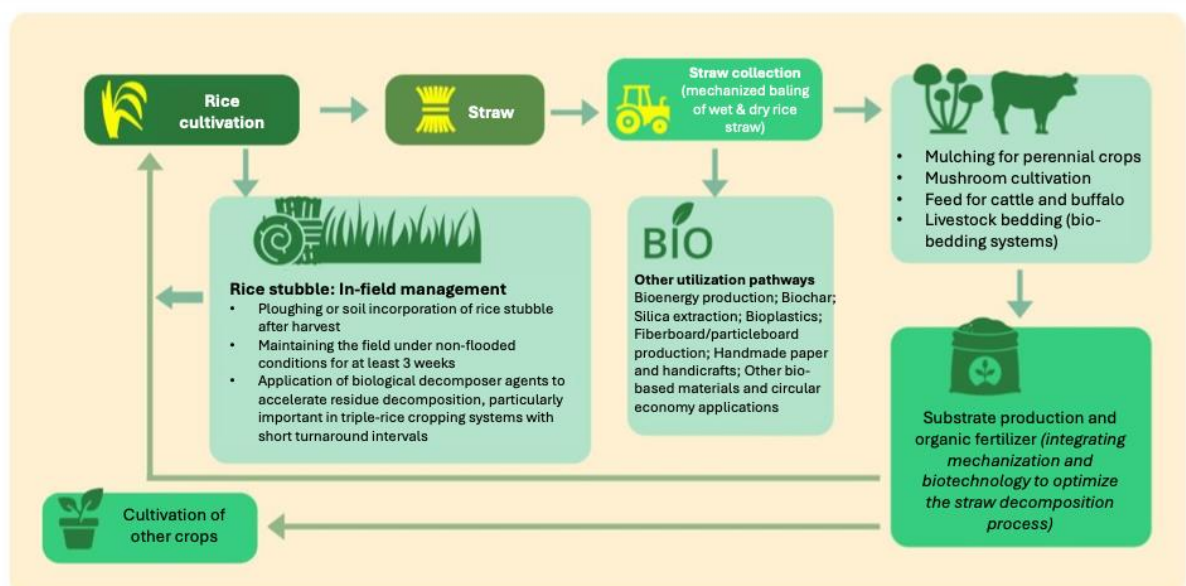
a) Straw

- Open-field burning of rice straw is strictly prohibited, and straw must not be incorporated into flooded paddy fields.
- Rice straw should be collected and removed from the field using straw balers or other appropriate equipment, with priority given to local reuse and circular utilization of straw resources.
- In cases where straw cannot be removed from the field due to rainfall, flooding, or the inability to transport machinery into the field, irrigation water should first be drained from the field before performing ploughing or tillage to incorporate the straw into the soil, combined with the application of biological decomposer agents to accelerate straw decomposition.
- Dry straw of suitable quality may be utilized for mushroom cultivation, large ruminant feed production, livestock bedding, feedstock for biomass energy generation systems (biomass power), or for manufacturing biodegradable products that substitute plastics (e.g., plant pots and similar items). Wet straw or partially decomposed straw may be used for mulching perennial crops or covering vegetable beds. Fully decomposed moldy straw should be composted and utilized as organic fertilizer.
- All types of rice straw and agricultural by-products or wastes generated from mushroom cultivation and livestock production should be recycled and reintegrated into the production system as organic fertilizers, in accordance with circular agriculture principles.

b) Rice stubble

The adoption of measures that promote the decomposition of rice stubble under non-flooded conditions is strongly encouraged. These measures include ploughing and incorporation of stubble into the soil, chopping or crushing rice stubble, and the application of biological decomposer agents for straw and stubble decomposition.

- Winter–Spring Season: Rice stubble should be ploughed or tilled and incorporated into the soil immediately after harvest (as early as possible). After incorporation, dry field conditions (without flooding) should be maintained for at least two weeks to enhance the efficiency of stubble decomposition.
- Summer–Autumn and Autumn–Winter Seasons: Fields should be ploughed or tilled immediately after harvest, combined with the application of biological decomposer products such as *Trichoderma* prior to soil incorporation.



Circular straw management diagram

References

1. **Department of Crop Production**, 2024. *Technical Handbook for High-Quality and Low-Emission Rice Production in the Mekong Delta for the One-Million-Hectare Project* (issued together with this Technical Procedure).
2. **Department of Crop Production**, 2022. *Common Land Preparation Practices in the Mekong Delta* (Decision No. 73/QĐ-TT-VPPN dated 25 April 2022).
3. **Department of Crop Production**, 2023. *Technical Procedure for Mechanized Rice Seeding to Improve Efficiency and Reduce Greenhouse Gas Emissions in Rice Production in the Mekong Delta* (Decision No. 396/QĐ-TT-VPPN dated 31 October 2023).
4. **Department of Crop Production**, 2023. *Rice Straw Management Procedure Toward Circular Agriculture and Low-Emission Production in the Mekong Delta* (Decision No. 248/QĐ-TT-VPPN dated 10 July 2023).
5. **Department of Crop Production**, 2023. *Technical Handbook for Mechanized Rice Seeding to Improve Efficiency and Reduce Greenhouse Gas Emissions in Rice Production in the Mekong Delta*.
6. **Department of Crop Production**, 2023. *Technical Handbook for Rice Straw Management Toward Circular Agriculture and Low-Emission Production in the Mekong Delta*.
7. **Department of Crop Production**, 2024. *Technical Procedure and Guidance Handbook for High-Quality and Low-Emission Rice Production in the Mekong Delta* (Decision No. 145/QĐ-TT-CLT dated 27 March 2024).