UNITED NATIONS ESCAP
Economic and Social Commission for Asia and the Pacific
CSAM

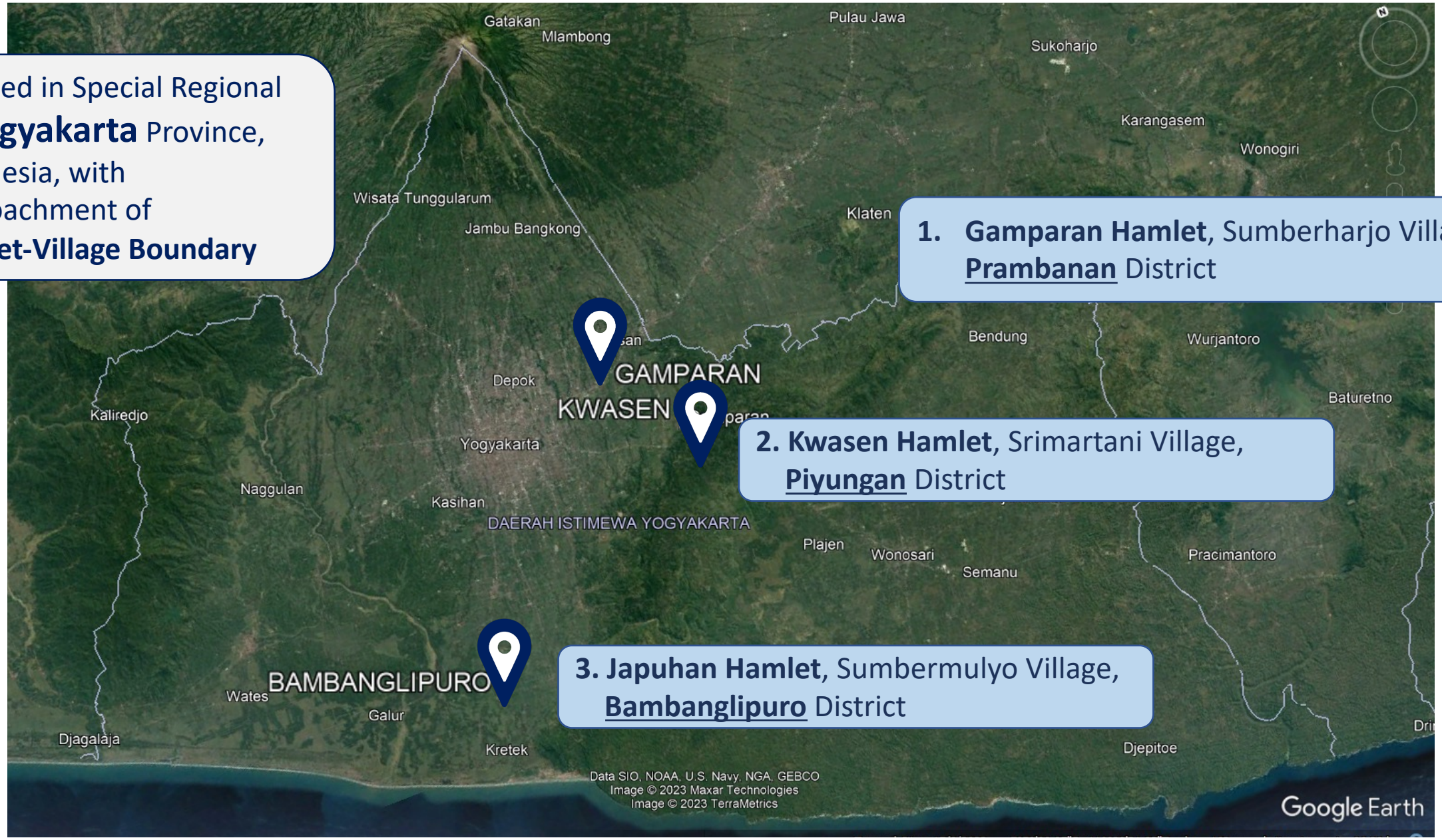
UNIVERSITAS GADJAH MADA

Regional Workshop 2023

Enabling Sustainable and Climate-smart Agriculture in ***Indonesia*** *through Mechanization Solutions for Integrated Management of Straw Residue and Air Pollution Monitoring*

OVERVIEW OF THREE PILOT LOCATIONS IN INDONESIA

Focused in Special Regional of **Yogyakarta** Province, Indonesia, with approachment of **Hamlet-Village Boundary**



1. **Gamparan Hamlet**, Sumberharjo Village, **Prambanan** District
2. **Kwasen Hamlet**, Srimartani Village, **Piyungan** District
3. **Japuhan Hamlet**, Sumbermulyo Village, **Bambanglipuro** District

GENERAL OVERVIEW OF THE THREE PILOT LOCATIONS


Gamparan Hamlet


Kwasen Hamlet


Japuhan Hamlet

Point of Consideration	Gamparan Hamlet	Kwasen Hamlet	Japuhan Hamlet
Agricultural land area (ha)	15.38	17	10
Agricultural productivity (rice ton/ha)	6.8	7.7	7.8
Member of farmers group (in the baseline survey)	12	18	25
Member of women farmers group (in the baseline survey)	11	11	10
Land topography	Highland	Lowland	Lowland
Crop cycle per year	3	3	3
Agricultural product per cycle	Paddy-paddy-second crop	Paddy – paddy – second crop	Paddy – corn – second crop
Existing agriculture machinery ownership in the group	A few	A few	None (borrow or rent)
Agricultural Mechanization	Semi manual	Semi manual	Semi manual

All of three pilot locations has implemented **Integrated Crop and Livestock farming system**

Results from Baseline Surveys in the Pilot Locations

Baseline Survey Results in The Three Pilot Locations

Gamparan Hamlet - Prambanan

- **Total respondent of 23 person in the survey:**
  12 members of Tani Makmur Farmer Group and
  11 members of Rukun Women Farmer Group
- **Crop cyle and agricultural production:**
  Crop cycle 1 (November – Januari) : paddy
  Crop cycle 2 (February – April) : paddy
  Crop cycle 3 (May – July) : second crop (peanuts, etc)
- The harvesting procedure is still conducted **manually**
- **The straw residue is** mostly **directly utilized** as animal feed **without appropriate supported treatment.**
- **The** feedstock (straw residue) are **directly given** to the livestock after undergoing only **drying process**.
- **Existing agricultural machinery ownership:**
  1 three-wheel motorcycle, 1 rickshaw, 1 shovel, 1 hand tractor, 1 water pump machine, and 1 hoe.
  The most prevalent agriculture machinery is **a thresher** from the Association of Farmer Groups **with rented system.**

Kwasen Hamlet - Piyungan

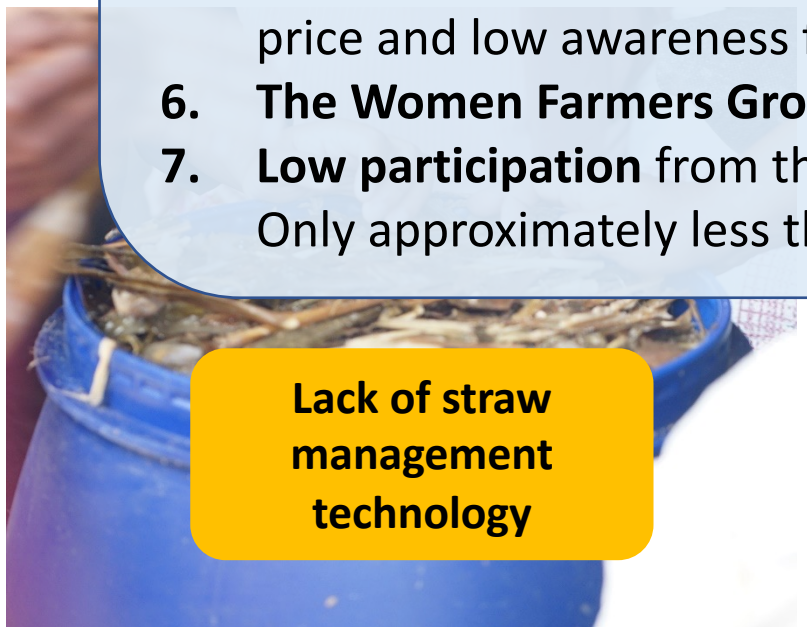
- **Total respondent of 29 person in the survey:**
  9 members of Tani Mandiri Farmer Group
  6 members of Sentul Rejo,Langgeng Raharjo Livestock Farming Group
  11 members of Puspitasari Women Farmer Group
  3 members of Taruna Tani Bangkit - Young Farmer Cadet
- **Crop cyle and agricultural production:**
  Crop cycle 1 (August - November) : paddy
  Crop cycle 2 (December – February) : paddy
  Crop cycle 3 (May – July) : second crop (corn, soybean, peanuts, etc)
- The harvesting process still use **manual method**
- Threshing process is still carried out by hitting the paddy stalks **manually**
- The straw is used for animal feed with **barely minimum treatment**
- Most of the straw and the forage is **directly fed** to the livestock with **only manual drying process** and **without any pre-treatment.**

Japuhan Hamlet - Bambanglipuro

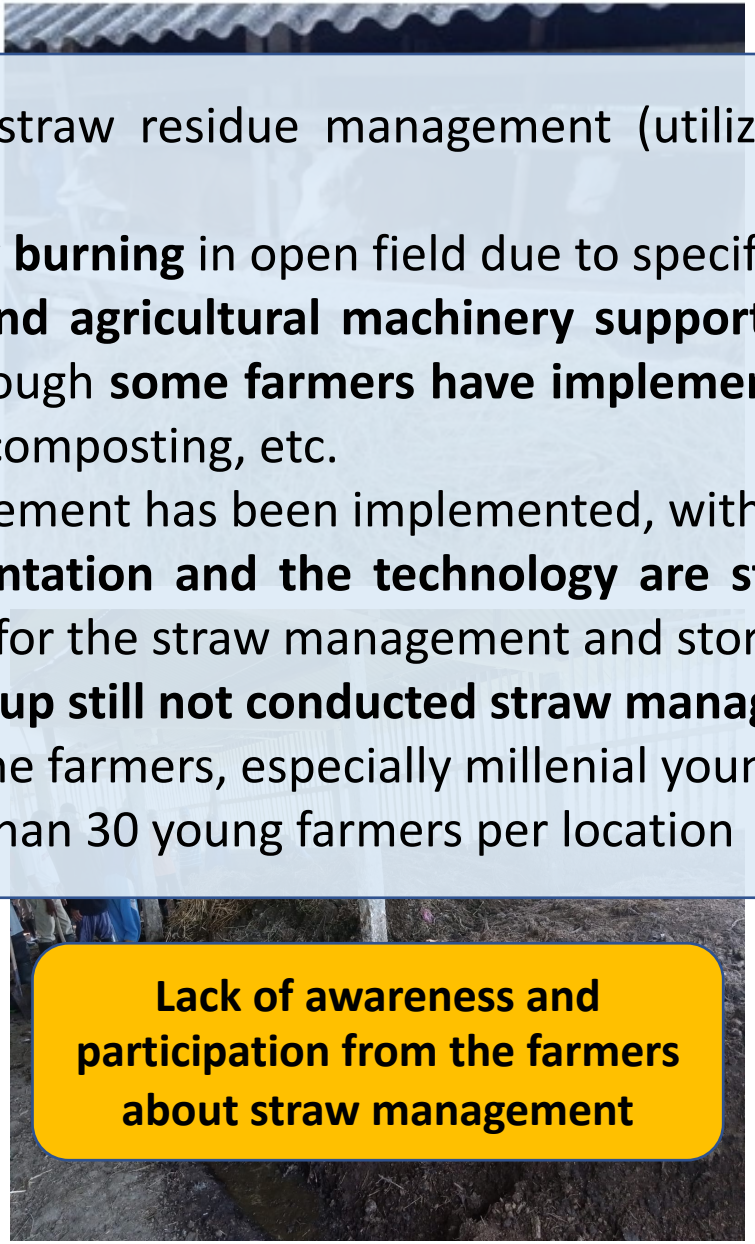
- **Total respondent of 35 person in the survey:**
  15 members of Tani Waris Farmer Group
  10 members of Lembu Suro Livestock Farming Group
  10 members of Puspitasari Women Farmer Group
- **Crop cyle and agricultural production:**
  Crop cycle 1 (August - November) : paddy
  Crop cycle 2 (December – February) : corn
  Crop cycle 3 (May – July) : second crop (soybean, peanuts, etc)
- The Tani Waris Farmers and Women Farmers Group in this area **did not own or have any modern agricultural machineries and equipment**.
- They just **borrow or rent tractors** and thresher as they only have **manual tools.**
- All harvesting techniques also employ just **semi-manual technique**

PRIOR CONDITION OF STRAW MANAGEMENT IN THE PILOT LOCATIONS

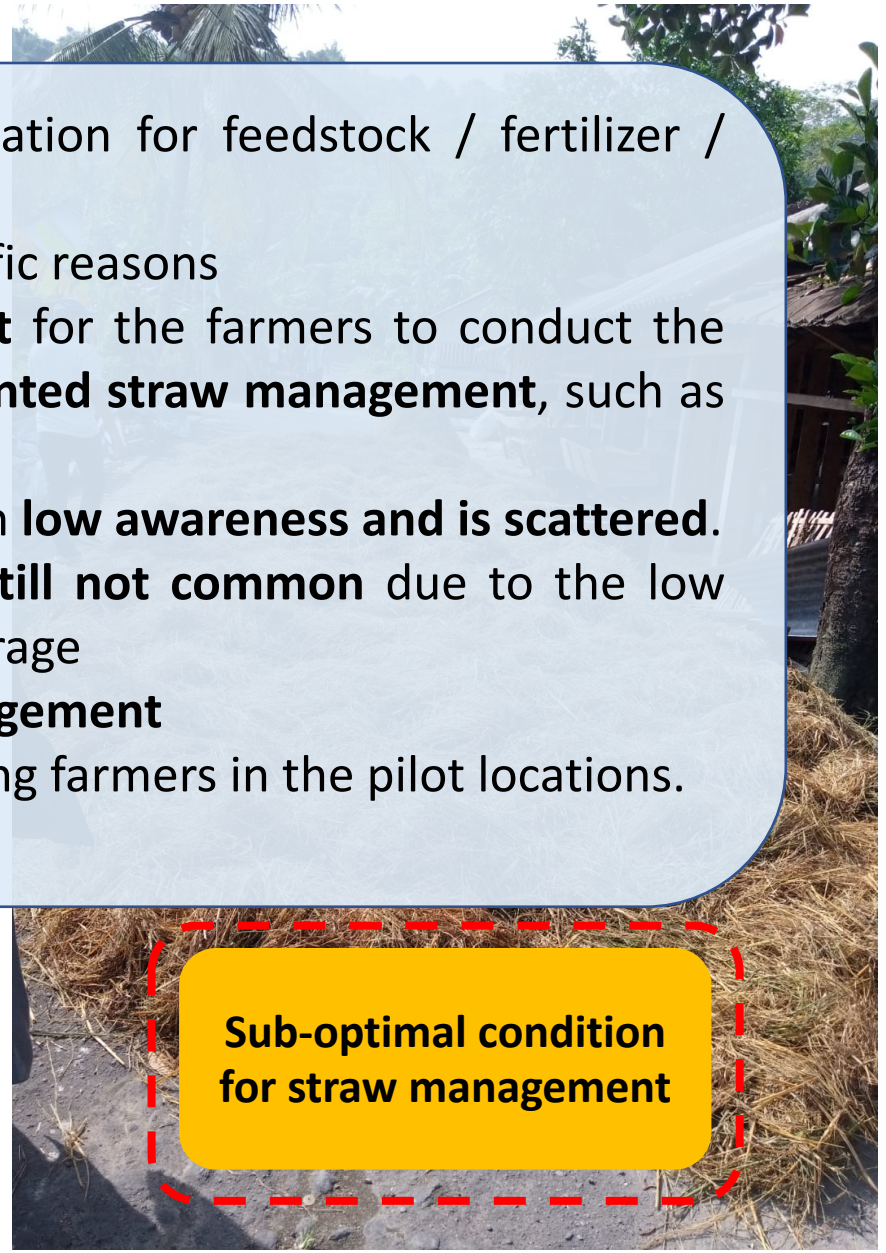
1. **Minimum processes** of straw residue management (utilization for feedstock / fertilizer / compost)
2. **Some uncontrolled straw burning** in open field due to specific reasons
3. **Sub-optimal condition and agricultural machinery support** for the farmers to conduct the straw management. Although **some farmers have implemented straw management**, such as fermented feed, organic composting, etc.
4. The straw residue management has been implemented, with **low awareness and is scattered**.
5. **Straw pressing implementation and the technology are still not common** due to the low price and low awareness for the straw management and storage
6. **The Women Farmers Group still not conducted straw management**
7. **Low participation** from the farmers, especially millenial young farmers in the pilot locations. Only approximately less than 30 young farmers per location



Lack of straw management technology



Lack of awareness and participation from the farmers about straw management



Sub-optimal condition for straw management

GAP ANALYSIS

Prior Condition of Straw Management in the Three Pilot Locations in Indonesia

- **Sub-optimal training and knowledge of the farmers and women farmers** in their participation for straw management
- **Lack of awareness and training** for implementing straw management (fermented feedstock, composting, organic fertilizer, etc)
- **Low participation** from the farmers in the implementation of straw management, especially targeting to millenial young farmers's participation
- **Lack of agricultural machineries and technology** to support implementation of straw management
- **Sub-optimal condition and agricultural machinery supports** for the implementation of straw management

OPTIMAL CONDITION:

Integrated Management of Straw Residue through Agricultural Mechanization Solutions

Mechanization-based Interventions Implemented at The Pilot Locations

Straw Management Implementation

ON FARM → **HARVEST** → **POST HARVEST** → **STORAGE/ UTILIZATION**

- ***Composting***
- ***Fermented feed making***
- ***Pressed straw storage***

Implemented agriculture machineries per stage based on specific needs:

ON FARM	HARVEST	POST HARVEST	STORAGE/ UTILIZATION
• Handy straw cutter • Hand tractor of straw cutter – Mower • Trailer / straw transportation	• Mobile rice power tresher • Mobile corn power tresher • Trailer / straw transportation	• Chopper • Grinder • Customized straw pressing machine • Trailer / straw transportation	• Chopper • Grinder • Sprayer • Rotating Compost Sieve • Trailer/straw transportation

7 and 8 (Japuhan only*) agriculture machineries have been implemented and equipped per pilot location**

Mechanization-based Interventions Implemented at The Pilot Locations

ON FARM



HARVEST



Mechanization-based Interventions Implemented at The Pilot Locations

POST HARVEST



STORAGE/ UTILIZATION




- ***Composting***
- ***Fermented feed making***
- ***Pressed straw storage***

Results from Field Trials : All machineries have undergone field trials

1. **Demonstration and Field Testing** of the machinery in the pilot locations

2. **Field trials of straw management practices** (composting, fermented feed making) with **the expert practicioners**











Machinery Modification: 3 machineries have been modified

Modification of Customized Straw Pressing Machine:

- Straw pressing practice in Indonesia is still not common.
- We introduced the **customized** straw pressing machine and then **modified** by **adding cage wheel** for easier operation and movement.

Modification of Hand-tractor straw cutter / Mower:

- Adding cage wheel to the mower for easier operation in the wet land
- Attached the straw cutter to 4-wheel tractor .

Modification of Trailer/ Straw Transport:

- Changing type of wheel for easier operation and attachment to the hand tractor

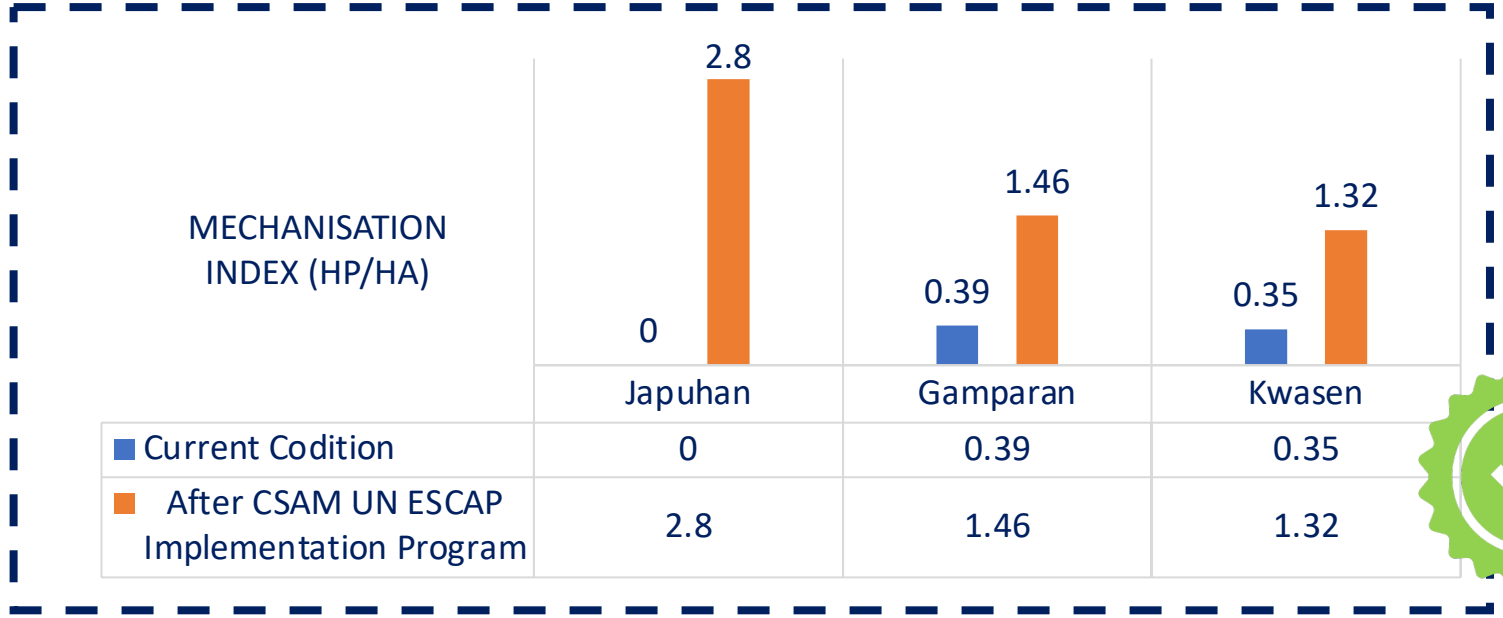
Training of Operators and Awareness Generation amongst Farmers in Three Pilot Locations

TRAINING AND AWARENESS GENERATION	INVOLVED PARTIES
1. Introduction of straw management, sustainable agriculture, policy, and regulation of straw burning prohibiton	1. **UGM**, Local Govt., Agricultural Extension Workers
2. Introduction and how to operate the agriculture machinery	2. **UGM** and Local industry
3. Training of agriculture machineries - *on farm stage + field trial*	3. **UGM**, INAARD, Local Govt.
4. Training of agriculture machineries – *harvest* and *post harvest + field trial*	4. **UGM**
5. Training of agriculture machineries – *utilization:* fermented feed making	5. **UGM**
6. Training of agriculture machineries – *utilization: composting*	6. **UGM**
7. Training of maintenance and management of agriculture machineries	7. **UGM** and INAARD

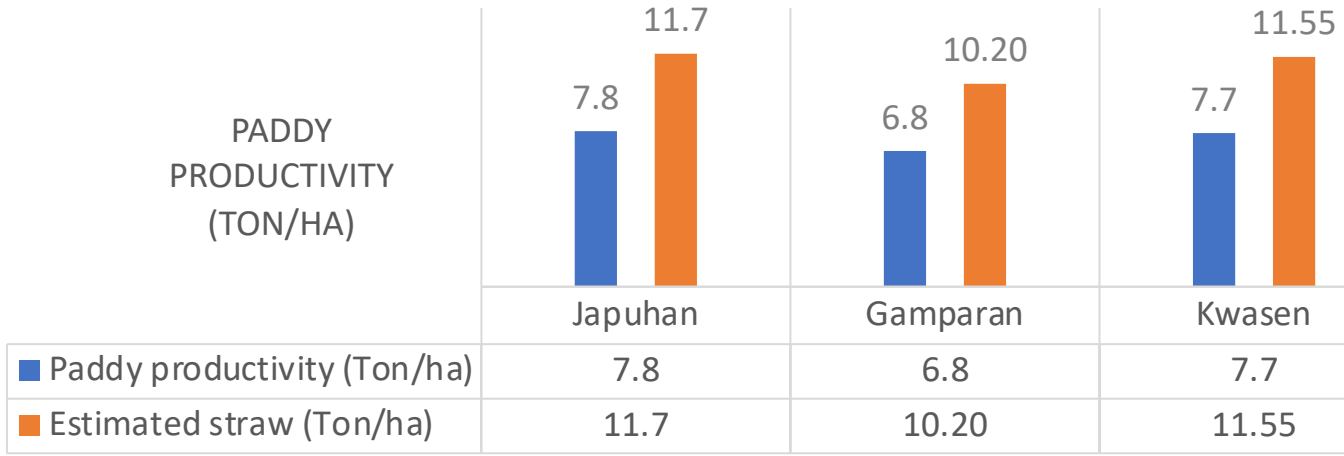
All trainings conducted in the three pilot locations equally
Total training: 21 times (7 training per location)

Key Achievements & Benefits: Increasing Mechanisation Index

Mechanisation Index (MI):
Comparison of existing and after implementation conditions



	Japuhan	Gamparan	Kwasen
Current Codition	0	0.39	0.35
After CSAM UN ESCAP Implementation Program	2.8	1.46	1.32



	Japuhan	Gamparan	Kwasen
Paddy productivity (Ton/ha)	7.8	6.8	7.7
Estimated straw (Ton/ha)	11.7	10.20	11.55

$$\text{MI} = \frac{Total\ horse\ power\ (HP)\ of\ agriculture\ machinery\ usage}{Agricultural\ Land\ (ha)}$$

Key Achievements & Benefits: IMPROVEMENT CONDITIONS

FEEDBACKS RESULTS

Point of view	Description	Average Score of Feedback I	Average Score of Feedback II
RELEVANCE: 1.	The event considered national/local contexts and conditions.	3.79 of 5	4.65 of 5
RELEVANCE: 2.	The event was tailored to your needs and requirements.	**3.90** of 5	**4.72 of 5**
RELEVANCE: 3.	The event considered gender dimensions (eg. how the project activities can benefit women).	**3.93** of 5	**4.33 of 5**
EFFECTIVENESS: 4.	The event achieved its objective of engaging stakeholders to promote integrated management of straw residue through agricultural machinery.	**4.10** of 5	**4.55 of 5**
EFFECTIVENESS: 5.	The scope and scale of the event met your expectations.	**3.79** of 5	**4.48 of 5**
EFFECTIVENESS: 6.	The content including presentations and discussions were of high quality, concise and clear.	**4.14** of 5	**4.57 of 5**
EFFECTIVENESS: 7.	The event enhanced your capacity to implement improved technologies and practices for integrated management of straw residue.	**4.21** of 5	**4.57 of 5**
EFFECTIVENESS: 8.	You feel motivated to learn more about or apply the solutions and practices highlighted in the event.	**4.24** of 5	**4.56 of 5**
EFFECTIVENESS: 9.	You look forward to taking part in more such events in future.	**4.40** of 5	**5 of 5**
EFFICIENCY: 10.	The logistical arrangements of the event were efficient.	**4.12** of 5	**4.61 of 5**
EFFICIENCY:11.	The event was delivered in a timely manner and according to plan.	**3.95** of 5	**4.27 of 5**

- Increasing Mechanisation Index before (**0 – 0.39 HP/ha**) and after (**1.32 – 2.48 HP/ha**)
- Number of farmers trained: **55 person of male farmers**
- Engagement and number of involved women farmers: **50 women farmers**
- Implementation of agricultural mechanization for improving the conditions in the pilot locations (**Slide 10 – 13**)
- **21 training of agricultural machineries and related straw management** have been implemented

Key Learning & Recommendations:

Continuous process and follow-up activities on program sustainability

- **Qualitative approach** (laboratory test, follow-up assistance as part of UGM's commitment) will be continued
- **Developing and promoting a role model of agricultural learning centre** regarding straw management in the pilot locations: *technology transfer, knowledge center, training and learning center*
- **Strengthening farmers's group organization and functions** in order to reach a **self-reliant implementation** of agricultural mechanization and straw management business for the farmers

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THANK YOU