Big Data in Agriculture (BDA)

DOI: http://doi.org/10.26480/bda.02.2025.106.111

ISSN: 2682-7786 (Online)
CODEN: BDAIDR

RESEARCH ARTICLE

SUSTAINABLE MECHANIZATION: AGRO-ECONOMIC ASSESSMENT OF SUPER SEEDER FOR WHEAT ESTABLISHMENT IN NEPAL'S RICE–WHEAT CROPPING SYSTEM

Manoj Kumar Joshi[a]*, Shamshad Ansari[b], Govinda Timsina[b] , Shreemat Shrestha[a], Mukti Nath Jha[a], Naramaya Shrestha[b], Santosh Shrestha[b]

[a] National Agricultural Research Center(NAERC), Khumaltar, Lalitpur, Nepal Agricultural Research Council
[b] Directorate of Agricultural Research(DoAR), Koshi Province, Tarahara
**Corresponding Author Email: ma.kumarjoshi@gmail.com*

ARTICLE DETAILS

Article History:

Received 19 May 2025
Revised 25 June 2025
Accepted 28 June 2025
Available online 14 July 2025

ABSTRACT

This study assesses the efficacy of Super Seeder technology, a tractor-operated machine that allows for simultaneous residue integration and seed sowing, under various paddy straw height circumstances in Nepal's Terai region. Crop residue management is critical for sustained intensification of rice-wheat systems. Despite its negative environmental consequences, residue burning before wheat sowing continues to be common in Nepal. We conducted a field experiment at the on-station of the Directorate of Agricultural Research, Koshi Province. The study applied four straw height treatments 0-5 cm, 10-15 cm, 25-30 cm, and 35-40 cm with five replications per treatment. The results demonstrated that, in comparison to both greater residue levels and residue-free plots, moderate straw heights (10–15 cm) produced better wheat emergence and a significantly better grain yield (4.03 t/ha). While early emergence rates were not significantly impacted by straw height ($p>0.05$), there were significant differences in biological and grain yields between treatments. According to economic analysis, under subsidized conditions(if farmer gets 75% subsidy on initial purchase of super seeder), the Super Seeder achieved a payback period of 0.64 years and cut input costs by 25%. Due to its cost-effectiveness and operational efficiency, farmers at the NARC Technology Village in Sunsari district expressed a high preference for the Super Seeder in a large plot demonstration that contrasted it with zero tillage and traditional methods. This study focuses on the potential of Super Seeder technology to improve residue management, minimize labor and fuel consumption, and promote climate-smart wheat production in Nepal.

KEYWORDS

Super Seeder, residue management, conservation agriculture, economic analysis, farmer perception.

1. INTRODUCTION

Wheat (Triticum aestivum L.) is a staple cereal crop in South Asia, playing a crucial role in food security and rural livelihoods. In Nepal, wheat is the third most important cereal crop after rice and maize, occupying about 697762 hectares with an average yield of 3 t/ha (MoALD, 2023). The prevalent rice -wheat cropping system, practiced by millions of smallholder farmers, often faces significant agronomic and environmental challenges, chief among them is the management of rice residues prior to wheat sowing.

Traditional practices of residue burning are still widespread across the Indo-Gangetic Plains, including parts of Nepal, due to the short turnaround time between rice harvest and wheat planting. This practice, however, contributes to severe air pollution, greenhouse gas (GHG) emissions, nutrient loss, and soil degradation (Bijay-Singh et al. 2008; Jain, Bhatia, and Pathak 2014). In response to these concerns, conservation agriculture (CA) technologies, particularly zero-till and residue management tools have gained traction for promoting sustainable intensification.

The Super Seeder, a tractor-operated machine, represents a significant advancement in CA technology. It enables direct drilling of wheat into paddy fields with standing stubble by simultaneously cutting, lifting, and incorporating the straw into the soil while sowing seeds. This reduces the need for multiple tillage passes, thereby saving fuel, labor, and time (Dewangan, et al., 2020). Studies from northern India and Pakistan have shown that the Super Seeder not only reduces residue burning but also improves wheat germination, yield, and soil health (Jat et al., 2019).

Despite its growing adoption in India, empirical field evaluations of Super Seeder performance in Nepalese agro-ecological conditions remain limited. One key agronomic question is how varying paddy straw heights, often left after mechanical harvesting, affect wheat seedling emergence, early growth, and yield. Prior studies have indicated that excessive surface residue may hinder germination by impeding seed-soil contact and modifying microclimate conditions (Jessop and Stewart, 1983; Wuest, et al., 2000). Therefore, understanding the interaction between straw height and wheat emergence is critical for optimizing Super Seeder performance.

This study aims to evaluate the field performance of Super Seeder technology in wheat production in plain region of Nepal under different paddy straw height conditions. Specifically, it investigates wheat emergence, yield potential, and operational efficiency to provide recommendations for wider adoption of sustainable residue management practices in Nepal's rice-wheat systems and its economic comparison with traditional wheat sowing method.

2. MATERIALS AND METHODS

2.1 Study Area

Quick Response Code	Access this article online	
	Website: www.bigdatainagriculture.com.my	**DOI:** 10.26480/bda.02.2025.106.111

Cite The Article: Manoj Kumar Joshi, Shamshad Ansari, Govinda Timsina , Shreemat Shrestha, Mukti Nath Jha, Naramaya Shrestha, Santosh Shrestha (2025). Sustainable Mechanization: Agro-Economic Assessment of Super Seeder for Wheat Establishment in Nepal's Rice–Wheat Cropping System. *Big Data in Agriculture, 7(2): 106-111.*

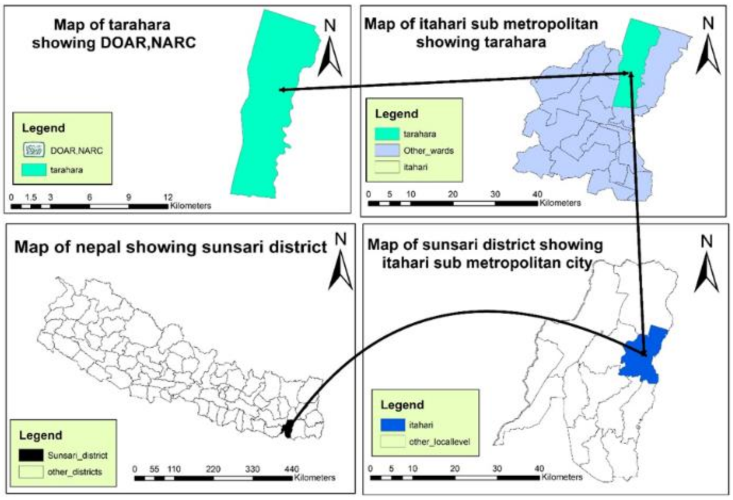

Figure 1: Study Location Map

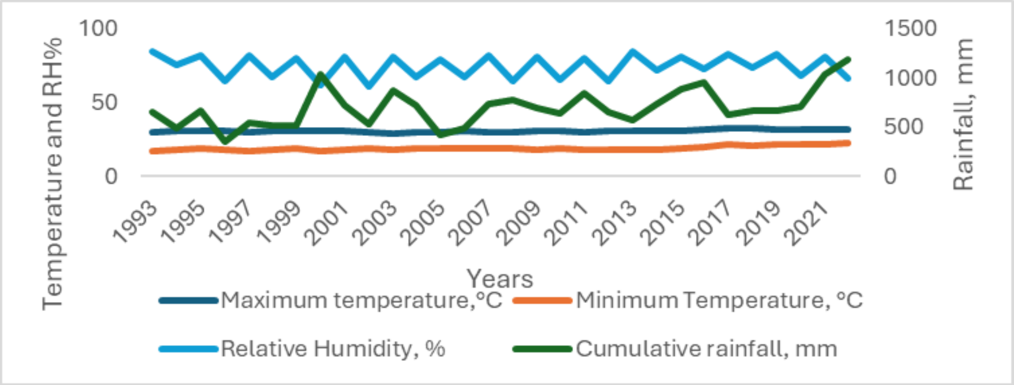

Figure 2: Climatic details of Wheat season in DoAR, Tarahara

The field experiment was conducted during the wheat season (December-May) of 2023/2024 at Directorate of Agricultural Research, Koshi Province, Tarahara, Sunsari district, Nepal, situated at an altitude of approximately 120 meters above sea level shown in above figure 1. The site falls within the Terai agro-ecological zone and experiences a subtropical monsoon climate, with average annual rainfall of approximately 1945 mm with its 36% rainfall in the wheat growing season and mean temperature ranging from (19-31) °C during the cropping season and the detail is shown in figure 2. The soil at the experimental site as clay loam, with a pH of (6.5-7), and moderate fertility levels.

2.2 Experimental Design and Treatments

The experiment was laid out in a Randomized Complete Block Design (RCBD) with five replications. The main treatment factor was the height of standing paddy straw left in the field after rice harvest, divided into the following levels:

T1 – No straw left (0-5 cm)

T2 – Paddy straw height = 10-15 cm

T3 – Paddy straw height = 25-30 cm

T4 – Paddy straw height = 35-40 cm

Each plot measured approximately 150 square meter (5 passes of seeding in 10 m length strips), with a buffer zone of 0.5 m between plots to separate treatments. And the economic saving of super seeder technology was briefly compared with traditional method of wheat sowing.

2.3 Machinery Description/Specifications

Table 1: Specification of Super Seeder Used in the research.

Specification	7-FEET Model
Model	7-FEET
Working Width	81"
Hitch Type	CAT-II
HP Required	50-55 HP
Gearbox	Multi Speed
Working Depth	4 to 6"
No. of Blades	54 Nos
Blade Type	L/JF Type
Seed Capacity	98 Kg
Fertilizer Capacity	105 Kg
Number of Disc Opener	10 Assy (20 Disc)
Disc Diameter	12"
Disc Thickness	3 mm
Roller Diameter	8-1/2"

Cite The Article: Manoj Kumar Joshi, Shamshad Ansari, Govinda Timsina , Shreemat Shrestha, Mukti Nath Jha, Naramaya Shrestha, Santosh Shrestha (2025). Sustainable Mechanization: Agro-Economic Assessment of Super Seeder for Wheat Establishment in Nepal's Rice–Wheat Cropping System. *Big Data in Agriculture, 7(2): 106-111.*

Table 1 (cont): Specification of Super Seeder Used in the research.

Seed Covering Device	10 Nos
No. of Rows	10 Nos
Disc Spacing	8-1/2"
Weight	940 Kg

A tractor-mounted Super Seeder from Landforce Company, India having specifications as in Table 1 was used for all direct seeding operations under T1, T2, T3, and T4 treatments. The machine integrates a rotary tiller, straw chopper, disc-openers, and enabling residue incorporation and seed sowing in a single pass. The Super Seeder was operated with a 55 HP tractor at a forward speed of approximately 2.5–3 km/h, and the working depth was maintained at 5–7 cm.

2.4 Crop and Cultural Practices

Wheat variety BL4341 was sown at a seed rate of 120 kg/ha with row spacing of 20 cm. A uniform fertilizer dose of 100:40:40 N: P_2O_5:K_2O kg/ha was applied across all plots. Nitrogen was applied in three splits; basal, tillering, and booting stages. Standard irrigation, pest, and weed management practices were followed as per local requirement.

2.5 Data Collection and Observations

2.5.1 Wheat Emergence

Wheat emergence was recorded 10 and 15 days after sowing (DAS) using a 1 m^2 quadrat randomly placed at one location within each replication. Same locations were used in both recordings. Emergence was expressed as the number of plants per square meter.

2.5.2 Crop Yield and Yield Attributes

At physiological maturity, plants were harvested from a net plot area of 10 m^2 (5m x 2m), and sun-dried. Observations included: Number of plants/m^2, Spike length (cm), Number of grains/spike, Thousand grain weight (g), Grain yield (kg/ha) and straw yield (kg/ha), adjusted to 12% moisture content.

2.5.3 Economic viability and Machine Performance Parameters

To establish the economic viability of a super seeder, we calculated the payback period by deducting the initial investment from the net return until the initial investment was completely returned. Investing in a super seeder becomes more feasible as the payback period shortens. Following that, we look at the machinery's break-even point, which is the annual utilization level at which the machine must be run to make the investment sustainable. The formulas used to calculate the economic viability of super seeders are as follows:

$$\text{Payback period} = \frac{\text{Inotial investment}}{\text{Average annual net benefit}} \qquad (1)$$

B(x) = Fixed cost + Variable cost

Where, x = Break-even point (per hectare); B = Benefits (or the custom fee)

The above formula was used for calculating the net return from the machinery after that we calculate the payback period.

$$\text{Break} - \text{even point (ha)} = \frac{\text{Annual payback,NRs.}}{\text{Annual monetary save against vonventional sowing,NRs./ha}} \qquad (2)$$

$$Gross\ return = (Total\ area\ cultivated\ by\ machine * Custom\ hiring\ charges\ ) \qquad (3)$$

$$Annual\ payback, NRs. = Total\ reveneu - Total\ cost \qquad (4)$$

For the operational parameters, the super seeder was used to sow seed production of about 25 ha in on-station of Directorate of Agricultural Research, Koshi Province, Tarahara and the following operational parameters were measured:

$$\text{Field capacity (ha/h)} = \frac{\text{Area covered,ha}}{\text{Time taken,h}} \qquad (5)$$

$$\text{Fuel consumption (L/ha)} = \frac{\text{Total Fuel Uesd,L}}{\text{Area Covered,ha}} \qquad (6)$$

and Full tank refill method was used.

$$\text{Machine Efficiency (\%)} = \frac{\text{Actual Field Capacity}}{\text{Theoretical Field Capacity}} * 100 \qquad (7)$$

2.6 Statistical Analysis

The collected data were analyzed using ANOVA (Analysis of Variance) with the help of R Software (version 4.1.1). Treatment means were compared using Least Significant Difference (LSD) at a 5% significance level ($p < 0.05$). Graphical representations were prepared using Microsoft Excel.

3. RESULT AND DISCUSSION

3.1 Effect of Straw height on crop emergence

Effect of straw height on emergence of wheat after 10 and 15 days of sowing using a super seeder

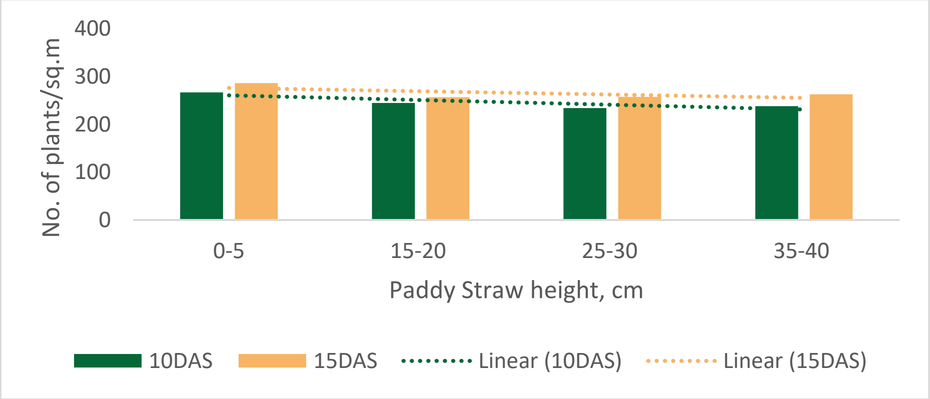

Figure 3: Comparison of Wheat emergence

The bar graph in Figure 3 illustrates that the straw height of previous crop (i.e., Paddy in this study) left in the field affects the emergence negatively. The highest emergence was found when the straw height was maintained at 0-5 cm. To check whether the effect of straw height is significant or not, One-Way ANOVA is performed.

Table 2: Descriptive statistics and one-way ANOVA for wheat emergence under different treatments

SUMMARY					
Groups	*Count*	*Sum*	*Average*	*Variance*	*CV(%)*
10DAS	16	3934	245.875	1493.317	15
15DAS	16	4259	266.1875	1800.429	15.2

Cite The Article: Manoj Kumar Joshi, Shamshad Ansari, Govinda Timsina , Shreemat Shrestha, Mukti Nath Jha, Naramaya Shrestha, Santosh Shrestha (2025). Sustainable Mechanization: Agro-Economic Assessment of Super Seeder for Wheat Establishment in Nepal's Rice–Wheat Cropping System. *Big Data in Agriculture, 7(2): 106-111.*

Table 2 (cont): Descriptive statistics and one-way ANOVA for wheat emergence under different treatments

ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	3300.781	1	3300.781	2.004272	0.167155	4.170877
Within Groups	49406.19	30	1646.873			
Total	52706.97	31				

From above Table 2, F (2.004272) is a relatively low value, suggesting that the differences between the treatment group means are not very large compared to the variation within the groups. P-Value (0.167), this is much higher than the typical alpha level of 0.05, indicating that the observed differences between the groups are not statistically significant. This means we fail to reject the null hypothesis, implying there is no strong evidence that the treatments have different effects. Since, calculated F (2.004) is less than the critical F (4.171) at significance level 0.05; it confirms the lack of significant difference between the treatment means. Based on this analysis, the treatment effects are not statistically significant, suggesting that the observed differences could be due to random variation rather than actual treatment effects. This means, using Super Seeder to sow wheat, straw height of previous crop does not affect emergence.

3.2 Yield and Yield attributes

Table 3: Variation of Means for yield and yield attributes for different treatments

Treatments	**Grains per spike**	**Spike length, cm**	**Plants/m2**	**Biological yield(t/ha)**	**Grain Yield(t/ha)**	**Harvest Index**
T1	36.4 ± 4.72	8.82 ± 0.71	365.4 ± 69.14	10.34 ± 1.06	3.98 ± 0.44	0.37 ± 0.02
T2	39.8 ± 1.92	8.61 ± 0.87	394.6 ± 67.00	10.52 ± 1.16	4.03 ± 0.62	0.37 ± 0.02
T3	36.0 ± 3.81	8.16 ± 0.54	357.6 ± 47.97	9.10 ± 0.82	3.27 ± 0.26	0.36 ± 0.02
T4	38.0 ± 2.92	8.70 ± 0.66	362.8 ± 49.89	9.82 ± 0.92	3.47 ± 0.51	0.37 ± 0.02

From Table 3, it is evident that the four treatments revealed significant variance in yield attributes. Grains per spike varied from 36.0 ± 3.81 (T3) to 39.8 ± 1.92 (T2), with spike lengths ranging from 8.16 ± 0.54 cm (T3) to 8.82 ± 0.71 cm (T1). T3 had the lowest plant density (357.6 ± 47.97 plants/m^2), whereas T2(10-15cm straw height of paddy) had the greatest (394.6 ± 67.00 plants/m^2), had the highest Biological Yield (10.52 ± 1.16 t/ha) and Grain Yield (4.03 ± 0.62 t/ha), indicating higher productivity. The Harvest Index was consistent throughout treatments at around 0.37 ± 0.02.

Table 4: One-Way ANOVA

Variable	**Df for Treatments**	**Df for Residuals**	**Sum Square**	**Mean Square**	**F value**	**Pr(>F)**	**Significance**
Grains per spike	3	16	0.25	0.25	0.0187	0.8928	NS
Spike length, cm	3	16	0.1724	0.17239	0.3442	0.5647	NS
Plants/m2	3	16	502	501.8	0.1512	0.7019	NS
Biological yield(t/ha)	3	16	6.0025	6.0025	5.3789	0.03234	*
Grain Yieldy(t/ha)	3	16	1.3248	1.3248	5.3763	0.03238	*
Harvest Index	3	16	0.0004	0.0004	1.2587	0.2766	NS

(At 95% Confidence interval, NS = Not Significant, * = Significant)

The analysis of variance (ANOVA) results in Table 4 show that among the yield components evaluated, the applied treatments had a significant influence on Biological Yield (t/ha) and Grain Yield (t/ha), with p-values of 0.03234 and 0.03238, respectively, both falling below 0.05 significance threshold for T2(10-15cm paddy straw height). This shows that the treatments had a significant impact on total biomass production and final grain yield. With p-values significantly over 0.05, other yield-related characteristics, such as Harvest Index, Plants per m2, Spike Length (cm), and Grains per Spike, on the other hand, showed non-significant responses, suggesting that they were less susceptible to treatment modifications.

3.3 Evaluation of Super Seeder for Wheat seeding

3.3.1 Economic viability Assessment

Table 5 shows the super seeder machine's payback period, net present value, and break-even point value. The period during which the initial expenditure is recouped is known as the payback period. The point at which both fixed, variable costs are recouped, and there is no loss or profit is known as the break-even point. The break-even threshold determines the machine's useful working lifespan. We can determine how many hectares of land must be planted before the machine turns a profit by figuring out the break-even point. Also, The use of Super Seeder technology in wheat production has significantly reduced greenhouse gas (GHG) emissions, principally by removing the requirement for residue burning and reducing fuel usage (Singh et al., 2021).

During the large plot demonstration in NARC Technology village in Sunsari district, it was found that farmers preferred the super seeder technique due to its multiple functions in a single operation, and it was also found to be more economical(25% cost saving) than conventional sowing methods, similar result was found in case of ZT (Pandey et al., 2020).

Table 5: Payback period, net present value and break-even point for the super seeder machine

1	**Costs**	**Value (NRs.)**	**If provided 75% Subsidy on initial purchase**
A	Fixed costs		
i	Initial cost	600000	150000
ii	Depreciation @ 10% per annum	60000	15000
	Total of initial cost and depreciation	660000	165000
iii	Interest on fixed cost @ 12% per annum	72000	19800
	Total of initial cost, depreciation and interest on fixed cost	732000	184800
	Total fixed costs without initial cost	132000	34800
B	Variable costs		

Table 5 (cont): Payback period, net present value and break-even point for the super seeder machine

i	Diesel consumption (liter/ ha) @ NRs. 173/liter 18.5 L/ha	3200.5	3200.5
ii	Labor cost (Rs/ha)	600	600
iii	Maintenance cost (NRs. ha-1)	350	350
	Total of diesel consumption, labor cost and maintenance cost (NRs./ha)	4150.5	4150.5
iv	Interest on operational cost @ 12% per month/ha	41.51	41.51
	Total of diesel consumption, labor cost, maintenance cost and interest on operational cost (NRs./ha)	4192.01	4192.01
C	Total costs*	136192.01	38992.01
2	Returns		
i	Average sown area by one super seeder in wheat season in one year (ha)	50	50
ii	Sowing charges (NRs./ha)	5500	5500
iii	Average operational cost of sowing (NRs.) earned in year	275000	275000
iv	Interest on average operational cost @ 12%	33000	33000
v	Total operational cost	254525	254525
vi	Total cost (NRs.)*	184925	38992.01
vii	Gross return	275000	275000
viii	Net return	90075	236008.00
3	Payback period	6.66	0.64
4	Net present value	553510.9	1450269.1
5	Break-even point, ha	364	91
6	Break-even point, hr	582.4	145.6

*= In fixed costs, only depreciation charges and interest on fixed capital are included.

(Assuming life span of Super seeder to be 10 years)

3.3.2 Mechanical Performance of the Super Seeder

At the Directorate of Agricultural Research, Tarahara, the Super Seeder's operational effectiveness was assessed during the sowing of wheat over a total area of 25 hectares. Field capacity, field efficiency, fuel consumption, and working depth were among the important performance metrics that were measured.

Table 6: Performance Indicators of Super Seeder

Parameter	Value	Method/Comment
Theoretical field capacity (ha/h)	0.54	Calculated as (Working width × Speed) / 10
Effective field capacity (ha/h)	0.43	Measured during actual operation
Field efficiency (%)	73.6	Effective / Theoretical × 100
Fuel consumption (L/ha)	18.5	Measured using full-tank method
Working depth (cm)	5–7	Manually verified with depth gauge
Average sowing depth (cm)	4.5	Evaluated from random sampling

From the Table 6, the field efficiency of 73.6% can be considered satisfactory under Nepalese field conditions. Fuel consumption of 18.5 L/ha, labor used during sowing, and fewer seed rate (20% less) as compared to Conventional method resulted in cost reduction of about (25–30) percentage lower than conventional wheat sowing method, where 3 tillage operations are used by farmers. The Super Seeder's ability to operate at optimal working depths (5–7 cm) without clogging indicates its suitability for residue-heavy rice fields. The results confirm that the machine is mechanically robust and well suited for conservation agriculture (reduced tillage as compared to conventional method), offering efficient seed placement and residue incorporation in a single pass.

4. CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

In Nepal's rice-wheat cropping systems, this study demonstrates that Super Seeder technology is a feasible option for sustained wheat cultivation, especially when paddy straw is handled at ideal heights. The results show that whereas considerable residue (>30 cm) prevents seed-soil contact and impairs crop performance, intermediate straw height (10–15 cm) promotes wheat emergence and significantly improves grain production.

Additionally, the Super Seeder offers operational and environmental benefits, such as a approximately 25% reduction in input costs, a reduction in fuel usage, the elimination of residue burning, and the ability to assist timely sowing. With a field efficiency of 73.6% and satisfactory seed placement even in fields with a lot of residue, mechanical evaluations validated the machine's dependability and effectiveness.

Economic analysis demonstrated the machine's financial feasibility under Nepal's current subsidy scenario (75% in initial purchase), revealing a quick payback period (0.64 years with subsidies) and positive break-even metrics. Feedback from farmers during large plot demonstration trials confirmed that the technology's cost-effectiveness and versatility can contribute to its popularity.

In conclusion, Super Seeder technology is a viable route to conservation agriculture, improving climate resilience, productivity, and profitability in Nepalese farming systems when combined with proper straw management. In the face of declining interest in agriculture from youths, multifunctional machines like super seeder can be game changer for sustainable agricultural transformation.

RECOMMENDATIONS

- Promote Super Seeder Adoption: Development organizations and the government should provide incentives for adoption by supporting custom-hiring centers/farmers group targeted subsidies.
- Control Straw Height During Harvest: To optimize Super Seeder effectiveness and reduce problems with seedling establishment,

Cite The Article: Manoj Kumar Joshi, Shamshad Ansari, Govinda Timsina , Shreemat Shrestha, Mukti Nath Jha, Naramaya Shrestha, Santosh Shrestha (2025). Sustainable Mechanization: Agro-Economic Assessment of Super Seeder for Wheat Establishment in Nepal's Rice–Wheat Cropping System. *Big Data in Agriculture, 7(2): 106-111.*

encourage combine harvester operators to leave straw around 15 cm.

- Develop Farmer Capacity: To guarantee appropriate use and long-term effects, conduct hands-on practical training and demonstration programs on machine operation, maintenance, and the advantages of conservation agriculture.
- Promote Additional Research: Encourage long-term research on the effects of Super Seeder use on greenhouse gas emissions, nitrogen cycling, water retention, and soil health.

REFERENCES

Arnier, P., De Gryze, S., Merckx, R., and Recous, S., 2006. Soil moisture, carbon and nitrogen dynamics following incorporation and surface application of labelled crop residues in soil columns. European Journal of Soil Science, 57(6), Pp. 894–905. https://doi.org/10.1111/j.1365-2389.2005.00785.x

Bijay-Singh, Shan, Y. H., Johnson-Beebout, S. E., Yadvinder-Singh, and Buresh, R. J., 2008. Crop residue management for lowland rice-based cropping systems in Asia. In D. L. Sparks (Ed.), Advances in Agronomy (Vol. 98, pp. 117–199). Academic Press.

Coppens, F., Singh, B., Shan, Y. H., Johnson-Beebout, S. E., Yadvinder-Singh, and Buresh, R. J., 2008. Crop residue management for lowland rice-based cropping systems in Asia. In D. L. Sparks (Ed.), Advances in Agronomy (Vol. 98, pp. 117–199). Academic Press.

Dewangan, S. K., Naik, R. K., and Diwan, P., 2020. Comparative performance of machine for crop residue management in rice-wheat cropping system. International Journal of Current Microbiology and Applied Sciences, 9(5), Pp. 3284–3289. https://doi.org/10.20546/ijcmas.2020.905.389

Jain, N., Bhatia, A., and Pathak, H., 2014. Emission of air pollutants from crop residue burning in India. Aerosol and Air Quality Research, 14(1), Pp. 422–430. https://doi.org/10.4209/aaqr.2013.01.0031

Jat, H. S., Datta, A., Choudhary, M., Yadav, A. K., Sharma, P. C., and Jat, M. L., 2019. Conservation agriculture-based sustainable intensification of rice–wheat system improves soil and environmental quality in Indo-Gangetic Plains of India. Journal of Cleaner Production, 208, Pp. 840–850. https://doi.org/10.1016/j.jclepro.2018.10.091

Jat, H. S., Kumar, P., Sutaliya, J. M., Kumar, S., Choudhary, M., Singh, Y., and Jat, M. L., 2019. Conservation agriculture based sustainable intensification of basmati rice-wheat system in north-west India. Archives of Agronomy and Soil Science, 65(10), Pp. 1370–1386. https://doi.org/10.1080/03650340.2019.1566708

Jessop, R. S., and Stewart, L. W., 1983. Effects of crop residues, soil type and temperature on emergence and early growth of wheat. Plant and Soil, 74(1), Pp. 101–109. https://doi.org/10.1007/BF02178745

Kamboj, B. R., Singh, Y., Kumar, A., Sidhu, H. S., Singh, M., and Jat, M. L., 2021. Energy budgeting and greenhouse gas mitigation assessment for Super Seeder: A conservation agriculture technology for sustainable crop residue management in rice-wheat cropping system of India. Energy, 228, 120549. https://doi.org/10.1016/j.energy.2021.120549

Kamboj, B. R., Yadav, A., Kumar, R., and Yadav, V. K., 2022. Comparative performance of tillage machinery for wheat under rice residue management. Agricultural Mechanization in Asia, Africa and Latin America, 53(1), Pp. 45–52.

Ministry of Agriculture and Livestock Development (MoALD)., 2023. Statistical information on Nepalese agriculture 2022/23. Government of Nepal.

Pandey, B. P., Khatri, N., Pant, K. R., Yadav, M., Marasini, M., Paudel, G. P., and Bhatta, M., 2020. Zero-till wheat (Triticum aestivum L.): A Nepalese perspective. Fundamental and Applied Agriculture, 5(4), Pp. 484–490. https://doi.org/10.5455/faa.109442

Singh, B., Shan, Y. H., Johnson-Beebout, S. E., Singh, Y., and Buresh, R. J., 2020. Crop residue management for lowland rice-based cropping systems: Challenges and opportunities. Nutrient Cycling in Agroecosystems, 87(3), Pp. 339–355. https://doi.org/10.1007/s10705-009-9349-6

Singh, P., Singh, G., Sodhi, G. P. S., and Sharma, S., 2021. Energy optimization in wheat establishment following rice residue management with Happy Seeder technology for reduced carbon footprints in north-western India. Energy, 230, 120680. https://doi.org/10.1016/j.energy.2021.120680

Unger, P. W., 1994. Residue management for dryland farming. Soil and Tillage Research, 27(1–4), Pp. 1–6. https://doi.org/10.1016/0167-1987(93)01048-L

Wuest, S. B., Albrecht, S. L., and Skirvin, K. W., 2000. Crop residue position and interference with wheat seedling development. Soil and Tillage Research, 55(3), Pp. 175–182. https://doi.org/10.1016/S0167-1987(00)00116-1

* * *

Cite The Article: Manoj Kumar Joshi, Shamshad Ansari, Govinda Timsina , Shreemat Shrestha, Mukti Nath Jha, Naramaya Shrestha, Santosh Shrestha (2025). Sustainable Mechanization: Agro-Economic Assessment of Super Seeder for Wheat Establishment in Nepal's Rice–Wheat Cropping System. *Big Data in Agriculture, 7(2): 106-111.*