IFPRI MYANMAR

STRATEGY SUPPORT PROGRAM RESEARCH NOTE 131 JUNE 2026

Rice Establishment Methods in Myanmar

Trends, Perceptions, and Constraints

Joseph Goeb, Bart Minten, Nang Lun Kham Synt, and Zin Wai Aung

Key Findings

- Direct-seeded rice (DSR) is widely adopted in Myanmar rice production, used by around 50 percent of farmers during the monsoon season and about 75 percent during the dry season, accounting for the majority of cultivated rice area.
- Rice establishment methods remained relatively stable from 2023–2025 despite political instability, market disruptions, labor shortages, and price volatility.
- DSR adoption is higher among larger farms and non-irrigated farms, indicating that labor and water constraints strongly influence establishment choices.
- Broadcasting is the dominant DSR method, particularly dry broadcasting, while row planting remains uncommon.
- Most farmers believe puddled-transplanted rice (PTR) produces higher yields than DSR, with an average perceived yield advantage of about 11 baskets per acre.
- Farmers overwhelmingly perceive PTR as more labor-intensive, while differences in fertilizer and pesticide use are viewed as relatively small or mixed.
- Labor shortages and water constraints are the primary reasons for adopting DSR, not perceptions of lower profitability or lower yields under PTR.

Recommended Actions

- Strengthen investments in irrigation and water management systems to reduce water-related constraints and enable farmers to choose establishment methods based on productivity rather than necessity.
- Address rural labor shortages through mechanization support, labor-saving technologies, and improved access to agricultural services.
- Develop and disseminate best management practices for DSR, particularly for weed control, seed establishment, and water management to improve productivity and profitability.
- Conduct rigorous research on the economic returns of DSR and PTR across different agro-ecological zones, farm sizes, and irrigation conditions.

Australian Centre for International Agricultural Research | Australian Aid

Introduction

Rice establishment methods are central to rice productivity. Broadly, there are two main categories of establishment approaches: puddled-transplanted rice (PTR), in which seedlings are raised in a nursery and transferred to the fields, and direct seeding (DSR[1]), in which rice seeds are sown directly in the fields. In Asia, where rice is the dominant staple food and production crop, DSR was historically the dominant establishment method, but was gradually supplanted by PTR, which saw accelerating adoption as part of Green Revolution production systems during the 1960s and 1970s that drove dramatic increases in production and yields (Kumar & Ladha, 2011; Farooq et al., 2010). Since the 1990s and increasing in the 2000s, researchers have documented partial reversals of this trend, with farmers in South and Southeast Asia increasingly transitioning away from PTR toward direct-seeded rice (DSR) establishment methods.

A growing body of agronomic research documents the tradeoffs between the two systems. DSR often reduces labor use, production costs, water demands, and greenhouse gas emissions, but faces higher weed pressure and greater knowledge requirements. Yield comparisons are central to this debate, and while PTR establishment can increase production under ideal environments, the farm-level evidence is increasingly mixed and context-specific, with DSR outperforming PTR on yields in some environments. Yet, in policy circles, PTR often remains the benchmark for international organizations and extension and research systems and is widely promoted.

This emphasis reflects an analytical lens largely focused on yield potential within relatively favorable systems – reliable water supply, complementary input availability, and supporting services. Many farmers, however, operate outside of these conditions and choose establishment methods under constraints in labor, water, and input availability that vary across regions and households. The documented shift towards DSR across much of South and Southeast Asia suggests that DSR is often preferred in on-the-ground contexts where labor is scarce and water control is limited (Baird et al., 2022; Farooq et al., 2010).

This research note analyzes rice establishment practices in Myanmar. As early as 2013, researchers documented use of both PTR and DSR methods in Myanmar (Denning et al., 2013). Our study period is 2023-25, covering a period of conflict-induced rural labor scarcity and rising farm wages. Using nationally representative data, we first document changes in rice establishment methods over time, with comparisons across key factors including farm size, labor scarcity, irrigation access, agro-ecological zones, and rice variety group. We then complement the trends with (i) direct assessments of perceived tradeoffs between DSR and PTR establishment methods, (ii) reasons for not using or stopping use of PTR among farmers who use DSR methods, and (iii) timing when farmers first began using their current establishment method, providing household-level evidence on the timing of the transition toward DSR. These direct questions on establishment perceptions and reasons are a key contribution of this note, and they allow us to examine why farmers adopt DSR or PTR, specifically across parameters of output (yields) and input use.

Our results highlight four main findings. First, DSR is a dominant establishment method in Myanmar – used by about half the rice farmers during the monsoon season, and three-quarters of farmers in the dry season – and DSR establishment was stable between 2023 and 2025 despite significant labor and market disruptions related to conflict. Second, DSR is most prominent in the monsoon season among larger farmers and those without irrigation, showing labor constraints and water control as key drivers of adoption. Third, DSR is a relatively recent practice – most farmers that used DSR in the 2025 monsoon season adopted the practice within the past decade, whereas PTR users overwhelmingly report having always transplanted. Fourth, most farmers expect that PTR would

[1] Direct-seeded rice includes several establishment methods including broadcasting – which can be done on either dry or puddled fields, and with either dry or pre-germinated seed – and row planting where seeds are drilled in rows. Like transplanting, DSR can be done mechanically or by hand.

produce higher yields than DSR broadcasting on the same plot, and that PTR requires similar or lower quantities of agrochemicals. Yet DSR persists as a major establishment method, and the main reasons cited are labor and water constraints rather than productivity or profitability.

This note proceeds with a more detailed review of the literature in Section 2, followed in Section 3 by a description of our data and key questions asked to farmers. Section 4 presents our descriptive results, and we conclude with a summary and discussion of implications in Section 5.

Literature review

There is a wide body of evidence centered on rice establishment methods covering agronomic performance, farm returns, and the drivers of adoption. This section briefly reviews the literature across these dimensions.

Agronomic performance and input-use tradeoffs

Rice production and yield comparisons between PTR and DSR methods are a central point of debate and studies of farm performance show substantial heterogeneity in their estimated differences. A recent meta-analysis of studies across India finds that fields planted using DSR produce 9 percent less rice per unit of land area than those planted with PTR methods, though there is substantial heterogeneity across locations and management conditions (Kumara et al., 2026). The broader research highlights this heterogeneity. Several field experiments show yields under DSR that are comparable or higher than those under PTR (Mubarak et al., 2025; Ishfaq et al., 2020; Jat et al., 2009). In Eastern India, Devkota et al., (2020) find that machine transplanting outperforms DSR on yields by a wide margin.

While the yield effects are mixed, the evidence consistently shows that DSR reduces requirements of key inputs relative to PTR. DSR is fundamentally a labor- and water-saving technology. A review by Kumar and Ladha (2011) shows that labor requirements are on average 27 percent lower with DSR (though estimates range from 11 to 66 percent across regions and complementary management practices) and use of irrigation water is 10 to 50 percent less. In India, Kumara et al., (2026) estimate reductions in water-use and 18 percent lower production costs of DSR relative to PTR. Studies also document substantial environmental and ecosystem services benefits of DSR, including more sequestered carbon, less methane emitted, and improved soil properties (Kumara et al., 2026; Chaudhary et al., 2023). There is wide support for these resource-use advantages across the literature.

Where yields under DSR fall short of those under PTR, a leading driver is weed pressure. With PTR, flooding suppresses weeds early in the growth cycle, while with dry field DSR establishment methods, germinating rice seeds compete with early weeds on unflooded fields. Without proper weed management – which often requires herbicides and knowledge of effective and timely applications – DSR can have much lower yields (Singh et al., 2009; Kumar and Ladha, 2011). DSR establishment is also more sensitive to weather around sowing times, especially heavy rains which can wash out seeds. The literature also documents varietal challenges with DSR as most rice varieties are bred for more ideal PTR conditions and funding for development of DSR-adapted varieties is low (Farooq et al., 2010; Negi et al., 2024).

Farm returns and drivers of adoption

DSR is widely shown to have lower costs than PTR that drive higher net farm incomes, implying that the mixed implications on yields are outweighed by resource and expenditure savings during production. Studies from India and China use econometric methods to mitigate selection bias in farmers' choices of establishment methods and compare farm incomes under DSR and PTR. Dey et

al., (2025) use propensity score matching and endogenous switching regression methods with data from four Indian states and show that even where DSR has small or negative implications for yields, net rice income increases meaningfully. Likewise, Sha et al., (2019) use endogenous switching regression methods with data from southern China and find a 66 percent increase in net rice income for DSR adoption relative to PTR. Comparisons from the Philippines, although econometrically less rigorous, also show income gains from adopting DSR (Bautista et al., 2023).

While there are several tradeoffs in input use across PTR and DSR production systems, the cost reductions of DSR are largest in labor use as PTR is much more labor-intensive. As a result, DSR adoption increases substantially when labor is scarce. In a study of South Asian countries during the COVID-19 pandemic, Pakistan and Bangladesh – which did not have large farm labor market disruptions – experienced no meaningful shifts in DSR adoption, but India – which did experience labor shortages – had a large increase in DSR, though the shift was temporary and linked to the immediate period of labor disruptions in 2021 (Kaur et al., 2024).

A similar cross-country relationship between labor costs and DSR adoption is observed by Baird et al., (2022). Comparing southern Laos and northern Thailand – two areas with similar agro-ecologies – the authors show that just 14 percent of farmers in their Laos sample practiced DSR in 2019, compared to 87 percent of farmers in their Thailand sample. The difference is largely driven by labor market differences as Thailand had sustained outmigration from rural areas that increased labor costs and led to an increase in DSR adoption of 66 percentage points between 2000 and 2019. The study also highlights herbicide availability as an enabling technology for the transition to DSR as a substitute for hand-weeding and to control early weeds.

Mechanization and technology

Both transplanting and direct seeding can be done manually or with specialized equipment, and the literature documents developments across both methods. For PTR, mechanical transplanters have spread in parts of East and South Asia, where they can achieve higher yields than manual transplanting under suitable conditions, though they require higher complementary investments (e.g., laser leveling) or higher cash expenditures on hired services making them inaccessible to some smallholders (Devkota et al., 2020). For DSR, mechanization developments include tractor-mounted seed drills, drum seeders, and row seeders, which can have advantages over broadcasting in seed placement and lower seed rates (van Hung et al., 2024; Sansen et al., 2019). Agricultural drones are an emerging, though understudied, technology for broadcasting rice seed that have the potential to reduce labor and seed use (Belton et al., 2025). However, these technological advances in mechanized establishment have not yet become widespread in Myanmar where most farmers establish rice by hand.

Data & Methods

Our data come from multiple rounds of the Myanmar Agricultural Performance Survey (MAPS), a nationally and sub-nationally representative phone survey of farming households in Myanmar. MAPS is conducted in both the main monsoon growing season (May-October) and secondary dry season (December-April, sometimes referred to as summer and winter or as pre- or post-monsoon)[2]. During the dry season, there is near-zero rainfall, and paddy production relies on irrigation.

We use data from five recent MAPS rounds that consistently assessed rice establishment methods: monsoon seasons in 2023 (N=2,598) and 2025 (N=2,734), and dry seasons in 2023 (N=653), 2024 (N=814), and 2025 (N=872). No data are available for the 2024 monsoon season. In each round,

2 Throughout this note, we define the year as the year in which the dry season concluded.

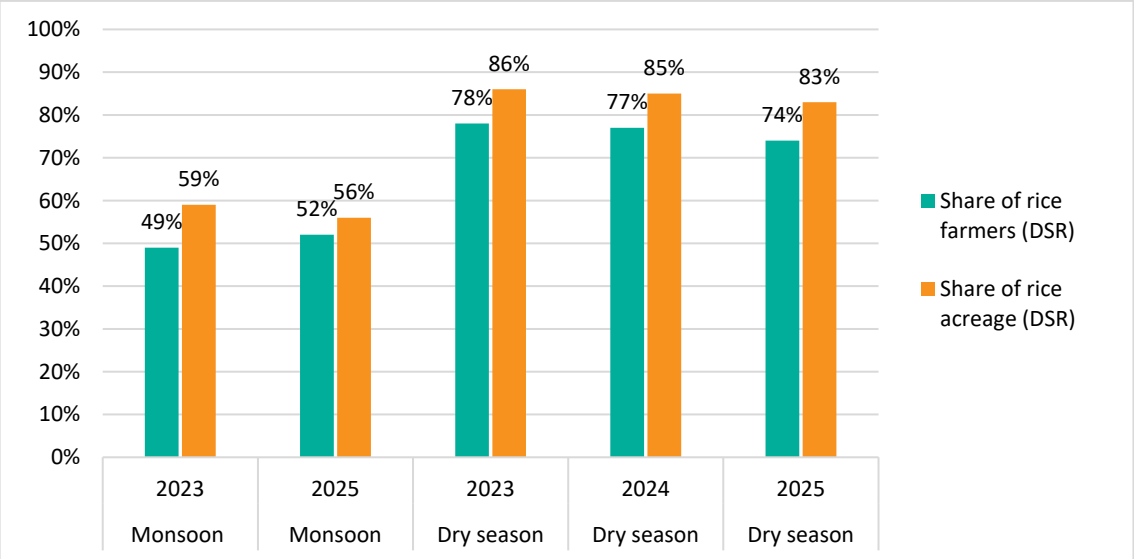
MAPS collects detailed production information for the household's main paddy plot, including the rice establishment method used. The 2025 dry season questionnaire included an additional module on rice establishment methods administered to the 3,094 farmers who grew monsoon paddy in 2023 or 2024. This module captured farmers' perceived differences in yields and input use – labor, fertilizer, herbicide, and other pesticides – between PTR and DSR broadcast systems. The 2025 monsoon round captured additional detail on the specific DSR method used, distinguishing between wet broadcasting (scattering pre-germinated seed onto saturated soils), dry broadcasting (scattering dry seed), and row planting.

Our analysis is entirely descriptive. We compare rice establishment methods over time and explore heterogeneity across several variables that the literature identifies as key determinants of establishment method choice: paddy farm acreage categories (small, less than or equal to 2.5 acres; medium, more than 2.5 and less than or equal to 5 acres; large, more than 5 acres); whether irrigation is used; whether the farmer reported at least one type of labor disruption. Our more detailed analyses focus on the monsoon season data where we have more observations and greater heterogeneity across farming systems.

Results

Figure 1 shows the percentages of rice farmers using DSR establishment methods and of total paddy acreage under DSR for 2023 through 2025, split by monsoon and dry seasons. The data establishes DSR as a widely used establishment method in the monsoon season, used by about half of paddy farmers and accounting for more than half of all paddy acreage. It is even more prominent in the dry season when about 3 out of 4 farmers use it and it accounts for about 85 percent of acreage. The monsoon is the most important growing season for rice, accounting for about 80 percent of all rice acreage planted per year, with the dry season accounting for the remaining 20 percent. The difference across seasons highlights differences in the production systems across the seasons including nearly all dry season farmers using irrigation.

Figure 1. DSR adoption – percentage of rice farmers and percentage of rice area – by year, monsoon and dry season



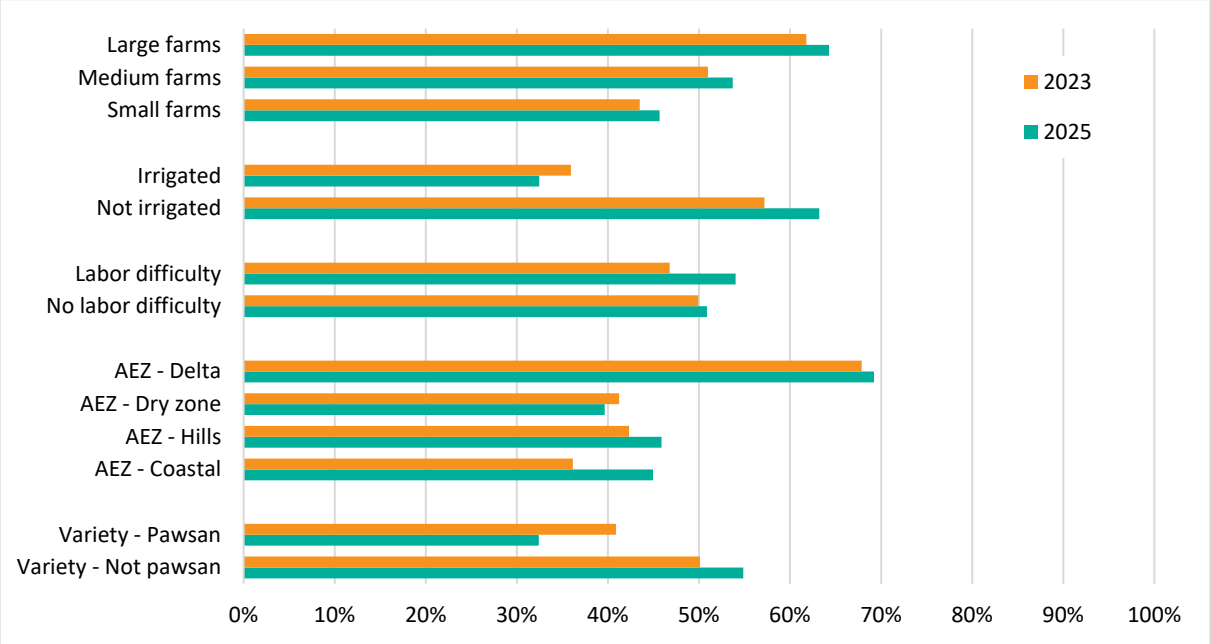
Source: Myanmar Agricultural Performance Survey Rounds Data
Notes: No monsoon season data available for 2024. PTR establishment percentages equal 100 – DSR percentages. Monsoon number of observations: 2023 – 2,598; 2025 – 2,734. Dry season number of observations: 2023 – 653; 2024 – 814; 2025 – 872. Years for dry season indicate when the season ended, e.g., 2024-25 dry season is 2025.

The data also establishes relative stability in establishment methods over time despite widespread disruptions from conflict and military policies that altered labor, input, and output markets, as well as

large changes in local rice prices stemming from global market changes. The share of farmers using DSR shows relatively minor changes over time, increasing by 3 percentage points (pp) between monsoon seasons in 2023 and 2025, and decreasing by 4 pp between dry seasons in 2023 and 2025.

Figure 2 introduces heterogeneity across several dimensions – farm size categories, irrigation use, reported labor difficulties, agro-ecological zones, and rice variety group[3] – and shows the shares of farmers using DSR across these groups for the 2023 and 2025 monsoon seasons. DSR is more common on larger farms: more than 60 percent of farmers in the large farm category use DSR, compared to less than half of farmers in the small farm category. DSR in the monsoon season is also much more common among farmers with no irrigation, and therefore less water control. Similar shares of farmers use DSR methods across reported labor difficulties. DSR is more common in the Delta (nearly 70 percent using) – the main rice producing area of the country – than in other agro-ecological zones (around 40 percent). Finally, DSR is much less common for farmers growing pawsan varieties of rice.

Figure 2. Share of farmers using DSR establishment in the monsoon season by groups, 2023 and 2025



Source: Myanmar Agricultural Performance Survey Rounds Data
Notes: AEZ is agro-ecological zone. Percentage of observations in each group in 2025: Large farms (>5 acres of paddy) – 29%; Medium farms (<=5 acres, >2.5 acres of paddy) – 24%; Small farms (<=2.5 acres of paddy)– 47%; Irrigated – 38%; Not irrigated – 62%; Labor difficulty – 35%; No labor difficulty – 65%; Delta – 39%; Dry zone – 35%; Hills – 19%; Coastal – 7%; Pawsan – 13%; Not pawsan – 87%.

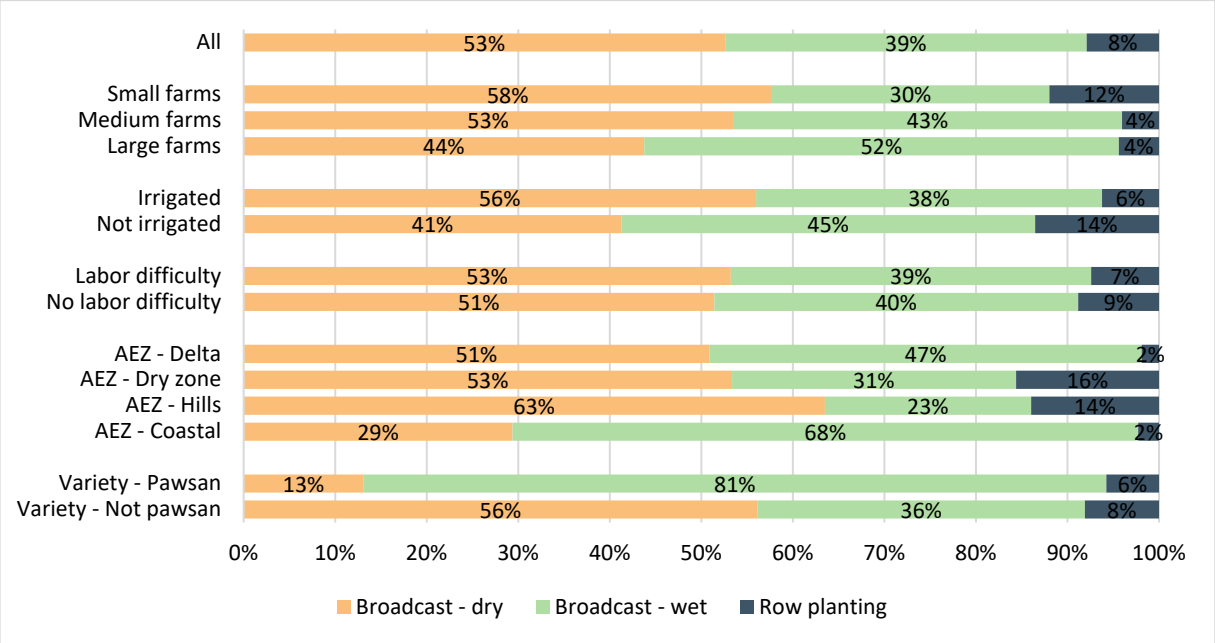
The changes between 2023 and 2025 reveal interesting patterns. DSR increased across all three farm-size categories, but the directional changes are different across irrigation use. Farmers using irrigation decreased their use of DSR in 2025 relative to 2023, while those without irrigation increased their use. This pattern aligns with the observed decline in DSR during the dry season over the same period. DSR increased among farmers who reported labor difficulties and those that did not, though the increase is much larger among the disrupted group (7 pp). Rising labor costs were a main labor market disruption reported by farmers, consistent with a contraction in rural labor supply. We also note that the period from 2023 to 2025 has seen significant rice price volatility – largely due to international market changes – and concurrent inflationary pressures in Myanmar, which affect the relative prices of inputs (including labor, fertilizer, and other services) to output and also likely

[3] We compare pawsan to all other rice varieties in our analysis. Pawsan is a group of specialized rice varieties that have long maturity periods, are almost exclusively cultivated in the monsoon season, and are geographically adapted to certain areas – specifically parts of the Ayeyarwady (Delta) and Sagaing (Dry Zone). It is often preferred among Myanmar consumers and has higher prices in local markets, but it is not widely exported.

contributed to farmer adoption of establishment methods. DSR adoption increased noticeably in the Coastal and Hills agro-ecological zones, increased moderately in the Delta, and declined slightly in the Dry Zone. Across variety types, there was a large drop in DSR adoption among pawsan growers (-9pp) while for non-pawsan groups, DSR adoption increased (+5 pp).

Our data for the 2025 monsoon capture more detail on types of DSR establishment methods and identify whether farmers doing DSR use wet broadcasting (scattering soaked seeds into saturated soils), broadcasting dry seed (scattering dry seed), or row planting. Figure 3 shows the shares of these methods among farmers using DSR for the national sample and by groups.

Figure 3. Methods of DSR establishment by groups, monsoon season 2025



Source: Myanmar Agricultural Performance Survey Rounds Data
Notes: Percentages are conditional on doing DSR establishment. Small farms = <=2.5 acres of paddy; Medium farms = >2.5, <=5 acres of paddy; Large farms = >5 acres.

Broadcasting seed is overwhelmingly used over row planting. For the full sample of farmers using DSR, 53 percent broadcast dry seed, 39 percent broadcast wet (pre-germinated) seed, and only 8 percent did row planting. There are noticeable differences in DSR methods across farm size categories. Small farms have the highest shares doing dry broadcasting and row planting, and subsequently the lowest share doing wet broadcasting. Only 4 percent of DSR farmers use row planting in the medium and large farm categories. The share using wet broadcasting increases sharply with farm size to 52 percent in the largest category from 30 percent in the smallest.

DSR farmers with irrigation are much more likely to use dry broadcasting (56 percent), while those without irrigation more often use wet broadcasting (45 percent) and are more likely to row plant (14 percent). There are only minor differences in the different DSR methods across reported labor difficulties, suggesting that labor problems in any single season may not be strongly associated with selection of DSR methods and that more persistent labor challenges and broader agronomic contexts, market environments, and household constraints may be more important drivers of the different DSR practices.

DSR establishment types vary across agro-ecological zones. Row planting is minimal (2 percent) and broadcasting is dominant in both the Delta and Coastal areas, while in the Dry Zone and Hills areas row planting is more prevalent. Within broadcasting, wet and dry establishment methods are relatively balanced in the Delta, while dry broadcasting is relatively more prevalent in the Dry Zone and Hills.

Coastal areas have by far the largest adoption of wet broadcasting, though we note that our sample is relatively limited within this agro-ecological zone.

There are large differences in DSR establishment methods across pawsan and other variety types. DSR among pawsan growers is dominated by wet broadcasting (81 percent) while other varieties are more commonly dry broadcast (56 percent).

The 2025 monsoon season survey captured information on when farmers first began implementing the establishment method they used in the 2025 monsoon season. Table 1 reveals the clear and recent evolution of DSR establishment methods. The vast majority of farmers using PTR say they have always used that method, compared to just 37 percent of farmers broadcasting and 46 percent of farmers row planting. Strikingly, 54 percent of farmers using DSR broadcasting began using that practice in the last 10 years; the same share for row planting is 47 percent, and for PTR that share is just 13 percent. The biggest transition to DSR broadcasting appears to have happened before the recent political crisis as 36 percent of broadcasting farmers began the practice between 2015 and 2020. While only a minor share of all farmers used row planting, adoption happened recently as nearly one third began the practice after 2020.

Table 1. Year started using establishment method, conditional on use in the 2025 monsoon season

	PTR	DSR - broadcast	DSR - row plant
N observations	1,487	1,502	104
Always	81%	37%	46%
Before 2015	6%	9%	7%
2015-2020	8%	36%	18%
After 2020	5%	18%	29%

Source: Myanmar Agricultural Performance Survey, Dry Season 2025
Notes: Conditional on using the practice in 2025 monsoon season. Question was "In which year did you start implementing this practice?"

Having assessed adoption of different seed establishment methods, we now turn to our more detailed data on farmer perceptions captured during the 2025 dry season survey. First, we examine differences in perceived yields between PTR and DSR broadcasting establishment methods. Critically, we asked farmers to consider the same lowland plot in their assessments to try to isolate yield impacts from plot differences that might create selection problems in choice of methods (Table 2). Unsurprisingly, most farmers expect higher yields under PTR (70 percent), and smaller shares expect higher yields under DSR broadcasting (11 percent) or the same yields across the methods (13 percent). Six percent of all farmers said they do not know which method would have higher expected yields, suggesting uncertainty about the relative differences perhaps due to not having enough experience or context with one or both methods.

Table 2 also explores heterogeneity in expected yield comparisons across farm size categories and the farmer's actual establishment method used during the most recent monsoon season. Farmers in the small farm group were least likely to expect higher yields under PTR (67 percent) and most likely to report that they do not know (9 percent), while the medium and large farm groups were slightly more likely to expect higher yields under PTR and less likely to say they do not know. These differences are reflected in the expected yield differences with the small farmer category mean being 9.9 baskets more per acre under PTR, and the medium and large farmer categories showing 11.2 baskets per acre. Shares expecting similar yields or higher yields under DSR broadcasting are stable across farm sizes.

Table 2. Expected lowland yield comparisons between PTR and DSR broadcasting, by group

Response	N of Obs.	Establishment method that gives higher yields				Average Expected Yield Difference (PTR – DSR; basket/acre)
		DSR-Broadcast	PTR	The Same	Do Not Know	
All Respondents	3,094	11%	70%	13%	6%	10.7
Land Size Categories						
Small	950	11%	67%	13%	9%	9.9
Medium	822	11%	74%	13%	3%	11.2
Large	1,322	11%	72%	13%	5%	11.2
Establishment method used (most recent monsoon season)						
PTR	1,488	8%	75%	10%	7%	12.0
DSR	1,606	14%	65%	16%	5%	9.4
Agro-ecological zone						
Hills	489	20%	63%	16%	1%	10.8
Dry Zone	1,165	6%	80%	10%	4%	13.5
Delta	1,275	8%	64%	14%	14%	7.3
Coastal	165	3%	83%	7%	7%	13.8

Source: Myanmar Agricultural Performance Survey, Dry Season 2025
Notes: Percentages reflect responses to the question “which practice gives higher yields on the same lowland field?” Average expected yield difference is PTR – DSR-broadcasting in baskets/acre with ‘do not know’ responses excluded. Small farms = <=2.5 acres of land owned; Medium farms = >2.5, <=5 acres of land owned; Large farms = >5 acres land owned.

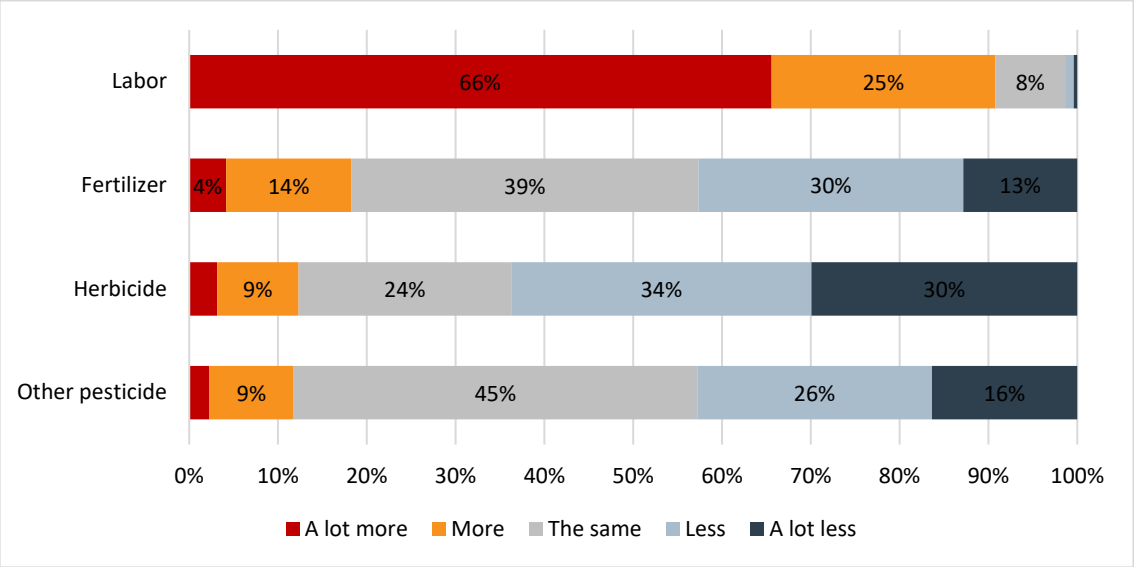
Turning to comparisons across establishment methods employed by the farmers, those using PTR are much more likely to expect higher yields under PTR (75 percent, compared to 65 percent for farmers using DSR). Conversely, farmers using DSR are much more likely to expect higher yields under DSR broadcasting (14 percent, compared to 8 percent for farmers using PTR) and more likely to expect the same yields across the two methods. Farmers using DSR have smaller average expected yield differences across the two methods.

There are noticeable differences in yield expectations across agro-ecological zones. Farmers in the Hills have, by a wide margin, the highest share expecting higher yields under DSR-broadcasting (20 percent, relative to less than 10 percent for other areas), while the Dry Zone and Coastal areas have the strongest perception that PTR produces higher yields. Interestingly, the Delta – which has the highest concentration of rice farmers – has the highest share reporting uncertainty (i.e., ‘do not know’) about which method has the highest yields. The Delta zone has the smallest overall average expected yield difference at 7.3 baskets per acre higher under PTR, while the Dry Zone and Coastal areas have the highest averages of more than 13 baskets per acre.

While expected yields are of central importance in farm management decisions, they are only one part of farm profit functions, with input costs also being of nearly equal importance. Therefore, we also examine differences in perceived input use quantities between PTR and DSR broadcasting. Farmers overwhelmingly perceive PTR to be the more labor-intensive establishment method: two-thirds of the sample say that PTR uses a lot more labor, 25 percent say it uses more, while just 8 percent say the

two methods use similar labor and the shares saying that PTR uses less are negligible (Figure 4). For agro-chemical inputs (fertilizer, herbicide, and other pesticides) the relative differences are mixed, but generally more farmers perceive lower use rates under PTR establishment. For fertilizer, 18 percent of farmers say PTR uses more, 39 percent say there are similar use rates, and 43 percent perceive less use under PTR than DSR broadcasting. Most farmers perceive less herbicide use under PTR: 34 percent say PTR requires less, and 30 percent say it requires a lot less. This reflects weed suppression in flooded fields when establishing PTR rice.

Figure 4. Perceived differences in input use requirements for transplanting relative to DSR broadcasting



Source: Myanmar Agricultural Performance Survey, Dry Season 2025
Notes: Number of observations is 3,094.

Table 3 explores heterogeneity in perceptions across land size categories and the actual establishment method used by farmers, showing the shares of farmers perceiving higher use of each input under PTR establishment. The percentage of farmers saying that PTR uses more labor than DSR broadcasting increases with farm size, from 86 percent of small farms to 93 percent of large farms. Interestingly, large farms are less likely to perceive higher fertilizer use requirements on PTR (14 percent), compared to small and medium farms (20 percent). Perceived herbicide use is stable across farm size categories, while other pesticide use shows declining shares across categories.

Similar shares of farmers perceive greater use requirements under PTR for each input across the actual establishment method used. This suggests that perceptions are not strongly associated with practices, and that the broader agronomic and household constraint contexts are more important for selecting an establishment method than perceptions on input use.

Across agro-ecological zones, there are two meaningful differences in these perceptions. First, the Hills area shows a relatively smaller share perceiving greater labor use under PTR (83 percent, compared to at least 90 percent for other regions), but it shows the highest shares perceiving more use of each agro-chemical under PTR. Second, the Delta and Dry Zone have comparable patterns across inputs, with the exception of fertilizer, where the Dry Zone has more farmers perceiving greater use under PTR.

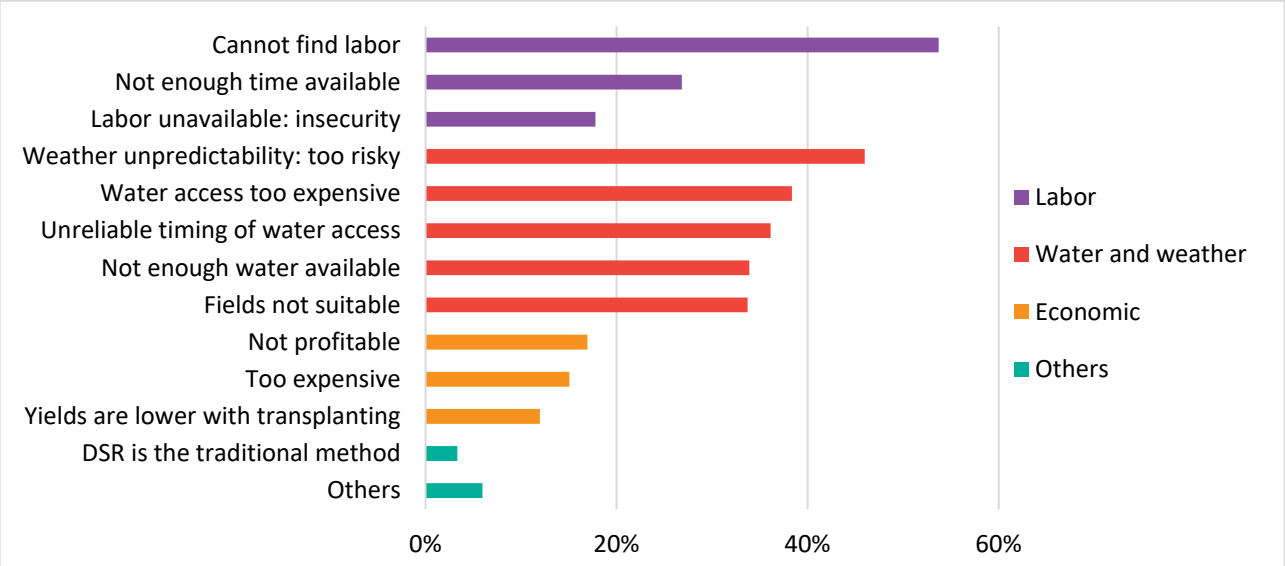
Table 3. Percentage of farmers saying transplanting requires more input than DSR broadcasting, by subgroup

	N Obs	Labor	Fertilizer	Herbicide	Other Pesticide
All Respondents	3,094	90	18	12	11
Land Size Categories					
Small	950	86	20	12	14
Medium	822	91	20	12	11
Large	1,322	93	14	11	9
Establishment method used (most recent monsoon)					
PTR	1,488	90	19	12	12
DSR	1,606	89	17	12	10
Agro-ecological zone					
Hills	489	83	23	19	19
Dry Zone	1,165	90	18	9	8
Delta	1,275	93	12	8	7
Coastal	165	93	22	16	13

Sources: Myanmar Agricultural Performance Survey, Dry Season 2025
Notes: Each cell is the percentage (by subgroup) of farmers saying transplanting requires 'more' or 'a lot more' of the input relative to DSR broadcasting. Small farms = <=2.5 acres of land owned; Medium farms = >2.5, <=5 acres of land owned; Large farms = >5 acres land owned.

Finally, we asked the farmers who used DSR for their 2024 monsoon season establishment why they did not transplant (Figure 5). Farmers could report multiple reasons, and the leading categories of responses are labor and water and weather. The single most common response was an inability to find labor (54 percent), while unavailable labor due to insecurity risks (18 percent) and not having enough time available (27 percent) were also common. The five responses that we categorize as 'water and weather' constraints were each reported by between 34 and 46 percent of farmers. Unpredictable weather making transplanting too risky is the most common response in this category and likely implies that farmers do not have water control to flood their fields as needed. Thus, water availability and control, which many farmers in Myanmar do not have, is a critical driver of PTR adoption. Economic reasons are cited far less often: only 17 percent say that PTR is unprofitable, 15 percent that it is overall too expensive, and 12 percent that yields are lower. This observation, together with the fact that most farmers expect that PTR produces higher yields, suggests that farmers likely do not adopt DSR over PTR because they see PTR as agronomically or even economically inferior, but because labor and water constraints make it impractical in their contexts.

Figure 5. Reasons for not using PTR establishment



Sources: Myanmar Agricultural Performance Survey, Dry Season 2025

Conclusion

This note documents that direct-seeded rice (DSR) establishment methods are widely used in Myanmar, practiced by half of farmers in the monsoon season and three-quarters in the dry season, and accounting for nearly two-thirds of all cultivated rice area throughout the year. Despite a period of sustained disruptions to markets and prices of labor, inputs, and output, establishment methods were largely stable from 2023 to 2025. We also find that DSR is a relatively recent practice – most farmers that used DSR in the 2025 monsoon season adopted the practice within the past decade, whereas PTR users overwhelmingly report having always transplanted. This points to an ongoing transition toward DSR in Myanmar, consistent with the broader regional shift documented in the literature. The results also reveal that DSR is more common among larger farmers and farmers without irrigation, highlighting that labor and water constraints are key factors shaping establishment decisions.

Our results highlight an important contrast. Most farmers expect higher yields under PTR and generally do not view it as requiring more agrochemical inputs. Yet, farmers overwhelmingly perceive that PTR is more labor-intensive, and when we asked farmers why they do not use PTR (among DSR adopters), they point to labor and water as key limitations.

As this analysis is descriptive, an important avenue for future research is to apply more rigorous econometric methods to farmer choices of rice establishment methods, especially focusing on the impacts of labor (wages and availability) and irrigation (access and costs). It is critical for researchers and policymakers to understand the broader contexts in which farmers make their establishment decisions, rather than relying on field trials and yield potential to broadly promote PTR over DSR. Indeed, the Myanmar context shows that yield potential is not the determining factor, and that DSR adoption is a rational response to constraints – especially in labor and water – and agro-ecological conditions and rice varieties. More work providing credible, rigorous assessments of net returns under these constraints in multiple contexts is needed, as is more nuanced, context-specific advice that would better serve the large number of farmers for whom DSR is already the practical choice of establishment method.

References

Baird, I. G., Manorom, K., Piyadeth, S., Gaja-Svasti, S., & Ninchaluene, C. (2022). Labour, mechanization, market integration, and government policy: Agrarian change and lowland rice cultivation in northeastern Thailand and southern Laos. Journal of Agrarian Change, 22(2), 278–298. https://doi.org/10.1111/joac.12452

Bautista, A. P. G., Mataia, A. B., Austria, C. M., Tiongco, M. M., & Laborte, A. G. (2023). Adoption and performance of direct-seeded rice (DSR) technology in the Philippines. Philippine Journal of Science, 152(1), 459–484.

Belton, B., Baldiga, L., Justice, S., Minten, B., Narayanan, S., & Reardon, T. (2025). Can the global drone revolution make agriculture more sustainable? Science, 389(6764), 972-976.

Chaudhary, A., Venkatramanan, V., Kumar Mishra, A., & Sharma, S. (2023). Agronomic and environmental determinants of direct seeded rice in South Asia. Circular Economy and Sustainability, 3(1), 253-290.

Denning, G., Baroang, K., & Tun Min Sandar. (2013). Rice Productivity Improvement in Myanmar. Background Paper No. 2. Michigan State University (MSU) and Myanmar Development Resource Institute (MDRI), prepared for USAID/Burma.

Devkota, K. P., Pasuquin, E., Pame, A. R. P., Dikitanan, R., Singleton, G. R., Stuart, A. M., & others. (2020). Assessing alternative crop establishment methods with a sustainability lens in rice production systems of Eastern India. Journal of Cleaner Production, 244, 118835. https://doi.org/10.1016/j.jclepro.2019.118835

Dey, S., Abbhishek, K., Saraswathibatla, S., & Das, D. (2025). Economic suitability of direct seeded rice across different geographies in India. PLoS One 20(4): e0321472.

Farooq, M., Siddique, K. H. M., Rehman, H., Aziz, T., Lee, D. J., & Wahid, A. (2010). Rice direct seeding: Experiences, challenges and opportunities. Soil & Tillage Research, 111(2), 87–98. https://doi.org/10.1016/j.still.2010.10.008

Ishfaq, M., Akbar, N., Anjum, S. A., & Anwar-Ijl-Haq, M. (2020). Growth, yield and water productivity of dry direct seeded rice and transplanted aromatic rice under different irrigation management regimes. Journal of Integrative Agriculture, 19(11), 2656-2673.

Jat, M. L., Gupta, R., Ramasundaram, P., Gathala, M. K., Sidhu, H. S., Singh, S., Singh, R. G., Saharawat, Y. S., Kumar, V., Chandna, P., & Ladha, J. K. (2009). Laser-assisted precision land leveling: A potential technology for resource conservation in irrigated intensive production systems of the Indo-Gangetic Plains. In Integrated crop and resource management in the rice–wheat system of South Asia (pp. 223–238). International Rice Research Institute (IRRI).

Kaur, S., Ahmed, S., Awan, T. H., Ali, H. H., Singh, R., Mahajan, G., & Chauhan, B. S. (2024). Adoption pattern of direct-seeded rice systems in three south Asian countries during COVID-19 and thereafter. Crops, 4(3), 324-332.

Kumar, V., & Ladha, J. K. (2011). Direct seeding of rice: Recent developments and future research needs. Advances in Agronomy, 111, 297–413.

Kumara, K. T. M., Birthal, P. S., Meena, D. C., & Kumar, A. (2026). Unravelling trade-offs and synergies of direct-seeded rice in Indian agriculture: A meta-analysis. European Journal of Agronomy, 173, 127897. https://doi.org/10.1016/j.eja.2025.127897

Mubarak, T., Jehangir, I. A., Hussain, A., Dar, E. A., Shah, Z. A., Lone, A. H., Mir, M. S., El-Hendawy, S., Mattar, M. A., & Salem, A. (2025). Yield and water productivity of rice as influenced by crop establishment and irrigation methods under temperate environment. Scientific Reports, 15, Article 29494. https://doi.org/10.1038/s41598-025-09584-w

Negi, P., Rane, J., Wagh, R. S., Bhor, T. J., Godse, D. D., Jadhav, P., Anilkumar, C., Sreekanth, D., Reddy, K. S., Gadakh, S. R., Boraih, K. M., Harisha, C. B., & Basavaraj, P. S. (2024). Direct-seeded rice: Genetic improvement of game-changing traits for better adaptation. Rice Science, 31(4), 417–433.

Sansen, K., Wongboon, W., Jairin, J., & Kato, Y. (2019). Farmer-participatory evaluation of mechanized dry direct-seeding technology for rice in northeastern Thailand. Plant Production Science, 22(1), 46-53.

Sha, W., Chen, F., & Mishra, A. K. (2019). Adoption of direct seeded rice, land use and enterprise income: Evidence from Chinese rice producers. Land Use Policy, 83, 564-570.

Singh, R., Erenstein, O., Gathala, M. K., Alam, M. M., Regmi, A. P., Singh, U. P., Rehman, H. M. ur, & Tripathi, B. P. (2009). Socioeconomics of integrated crop and resource management technologies in the rice–wheat systems of South Asia: Site contrasts, adoption, and impacts using village survey findings. In J. K. Ladha, Yadvinder-Singh, O. Erenstein, & B. Hardy (Eds.), Integrated crop and resource management in the rice–wheat system of South Asia (pp. 355–372). International Rice Research Institute (IRRI).

Van Hung, N., Thach, T.N., Hoang, N.N. et al. (2024). Mechanized wet direct seeding for increased rice production efficiency and reduced carbon footprint. Precision Agric 25, 2226–2244. https://doi.org/10.1007/s11119-024-10163-8

ABOUT THE AUTHORS

Joseph Goeb is an Adjunct Professor at Michigan State University, based in Thailand. **Bart Minten** is a Senior Research Fellow and Myanmar Program Leader at the International Food Policy Research Institute, based in Lao PDR. **Nang Lun Kham Synt** is a Research Analyst at the International Food Policy Research Institute, based in Thailand. **Zin Wai Aung** is a Research Analyst at the International Food Policy Research Institute, based in Myanmar.

ACKNOWLEDGMENTS

This work was undertaken as part of the International Food Policy Research Institute's Myanmar Strategy Support Program. Funding support for this study was provided by the Australian Centre for International Agricultural Research (ACIAR). This publication has not gone through IFPRI's standard peer-review procedure. The opinions expressed here belong to the authors, and do not necessarily reflect those of IFPRI, CGIAR, or ACIAR.

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE
1201 Eye St, NW | Washington, DC 20005 USA
T. +1-202-862-5600 | F. +1-202-862-5606 | ifpri@cgiar.org | www.ifpri.org | www.ifpri.info

The Myanmar Strategy Support Program (Myanmar SSP) is managed by the International Food Policy Research Institute (IFPRI). The program is financially supported by the Australian Government, the Livelihoods and Food Security Fund, and the United Kingdom Government. This publication has been prepared as an output of Myanmar SSP. It has not been independently peer reviewed. Any opinions expressed here belong to the author(s) and do not necessarily reflect those of IFPRI, CGIAR, the Australian Government, LIFT, or the United Kingdom Government.