

RICE MECHANIZATION LEVEL IN THE PHILIPPINES

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ABSTRACT

With the significant contribution of mechanization in modernizing the agriculture sector, an appropriate mechanization strategy is imperative. This paper assessed the status of rice mechanization across major rice-producing areas in the Philippines to support evidence-based decision-making. The study employed complete enumeration, analysis of secondary data, and key informant interviews to estimate the level of rice mechanization using different indices. Conducted in 2021-2022, the study covered 58 rice-producing provinces nationwide. Results revealed notable regional disparities in the concentration of rice machinery. Four-wheel tractors are increasingly used for land preparation in several regions, particularly Region I, although two-wheel tractors are still widely utilized as primary and secondary tillage machines in all areas. Meanwhile, there was high machine intensity for rice combine harvesters recorded in Regions III, II, and XI. The level of rice mechanization based on power available was estimated at 2.68 hp/ha in 2022 and improved to 2.81 hp/ha in 2025. Six provinces recorded high levels of mechanization, exceeding 4.0 hp/ha, while most provinces exhibited mechanization indices ranging from 2.0 to 3.0 hp/ha. In terms of power ratio, the level of rice mechanization was 84.25%, with four regions surpassing 90%. In terms of mechanization degree per operation, 77.59% of the total area was already mechanized using either two-wheel or four-wheel tractors, while harvesting-threshing was 53.66% mechanized using rice combine harvesters. The findings provide a comprehensive benchmark of rice mechanization levels in the Philippines and serve as an important reference for setting mechanization directions, identifying targeted interventions, and strengthening the monitoring and evaluation of various mechanization programs in the country.

Key words: level of mechanization, power available

INTRODUCTION

While rice remains as the most important crop in the Philippines, the local rice value chain has been constrained by low productivity, huge postproduction losses and high costs of production that contribute to low competitiveness. Postproduction losses still persist at 16.5 percent of potential output, with milling, drying and harvesting-threshing accounting for 95 percent of total losses (Salvador et al. 2012). Meanwhile, the unit cost of production is 49% and 104% percent higher than Thailand and Vietnam, respectively (Bordey et al. 2016). Among the costs of production, labor costs have been 6 to 7 times higher than the two countries. This was explained by the predominant use of mechanization technologies such as combine harvesters, four-wheel tractors, and labor-saving direct-seeding techniques as exhibited by the higher mechanization level of major rice-exporting countries. This

highlights the significance of labor-saving technologies in improving competitiveness. This is consistent with empirical studies indicating the strong relationship between the level of agricultural mechanization and the productivity/yield of certain crops, and also the country's level of economic development.

With its strategic importance in improving productivity, efficiency, income, and attaining agricultural modernization (Kishida 2006; Clarke 2000; Lu 2009; Emami et al. 2018; Vortia et al. 2019; Shi et al. 2021; Liu and Li 2023; Takeshima and Mano 2023), mechanization was given an increasing role in the government's development agenda with the enactment of AFMA, AfMech Law, and the Rice Tariffication Law. As the country is steadfast in its efforts to accelerate mechanization, formulation of an appropriate mechanization program is imperative, and this requires a benchmark study on the level of mechanization to know the current status, set mechanization directions, and guide monitoring and evaluation. This is especially called for since the most recent studies conducted in 2011 and 2012 are no longer relevant. With the implementation of major government mechanization programs such as the Rice Competitiveness Enhancement Fund and DA-National Rice Program, there is an urgent need to formulate mechanization plans and establish the bases in monitoring the progress of government and private initiatives in advancing rice modernization through agricultural mechanization.

While there are several indicators being adapted in assessing the status of agricultural mechanization (Bermudez et al. 2004; Dela Cruz and Bobier 2013; Malanon et al. 2014; Firouzi 2015 (rice cultivation machinery); Nath et al. 2017 (harvesting); Amongo et al. 2018; Hassan et al. 2021 (percent area mechanized)), a more comprehensive and practical approach to data collection and analysis is needed to support evidence-based decision making. This requires a combination of nationwide coverage, international comparability, real-time updating, and granular data visualization that create a novel data ecosystem that integrates local, national and international dimensions. This is to ensure representative coverage across different geographic and socio-demographic environments and cultural contexts for more location and technology-specific and tailored policy recommendations. Moreover, the application of a simplified index also facilitates direct comparison with data from other countries. This adds global relevance, enabling cross-country analysis, performance evaluation, monitoring and identification of best practices in the area of mechanization. Furthermore, the system developed through this research is also designed to follow near real-time updating, a significant advancement over traditional periodic or partial static reporting approaches. This allows policymakers, program implementers, and researchers to respond quickly to emerging trends and monitor the immediate impact of mechanization-related interventions. Thus, the study sought to assess the rice mechanization level in the Philippines using relevant indicators to serve as policy inputs in the formulation and implementation of rice mechanization programs in the country.

METHODOLOGY

Conceptual/analytical framework. The conceptual framework depicts the pathway in attaining the goal of mechanization in improving rice competitiveness. Through an appropriate and effective mechanization program, problems on low productivity, high production cost, and high postharvest losses will be addressed. This can be realized by promoting both public and private investments in mechanization and enhancing the adoption and sustained utilization of the technologies.

Updating the current state of mechanization will provide insight on the magnitude of intervention needed to fill the mechanization gap to achieve the desired state of agricultural development. In addition, there is a pressing need to have an accurate assessment of the mechanization requirements of rice farmers based on the available number of rice mechanization facilities and equipment and the practices of farmers particularly on the use of farm power. This will ensure resource allocation efficiency and realize the goal of mechanization program (Fig.1).

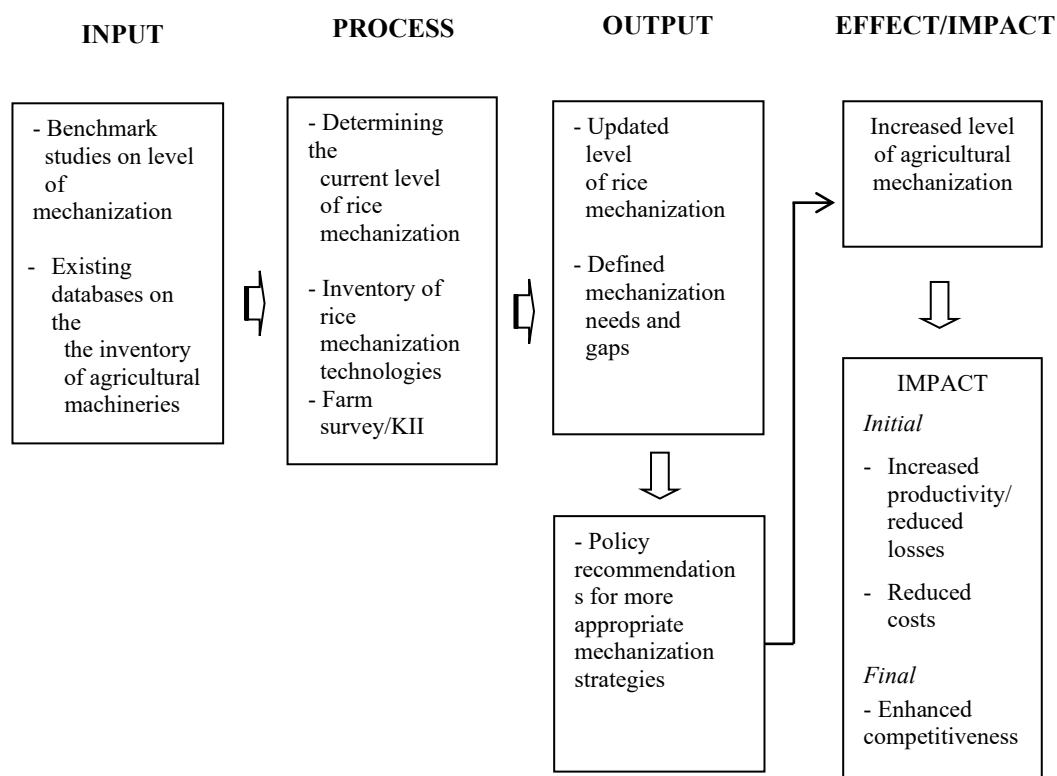


Figure 1. Conceptual framework of the study

Data needs and sources. In updating the level of rice mechanization, the study used countrywide data. Primary and secondary data were gathered from the following:

Table 1. Data needs and sources

Data Needs	Source
1. Inventory of rice mechanization technologies	Complete enumeration of rice mechanization technology owners/operators
2. Total area planted to rice	PSA; MLGU
3. Census of farm laborers employed in rice farming	PSA; MLGU
4. Census of draft animals engaged in rice farming	PCC, PSA; Office of the Provincial Veterinarian
5. Efficiency factors of different power sources	AMTEC, PCC

An inventory of available mechanization technologies was conducted in 58 rice-producing provinces identified by the Department of Agriculture as the focus of interventions based on their potential to enhance competitiveness. The criteria in selecting these provinces include area harvested, yield, percent irrigated area and unit cost of production.

Table 2. Areas of the study

Region	Province
CAR	Apayao; Ifugao; Kalinga
Region I-Ilocos Region	Ilocos Sur; Ilocos Norte; La Union; Pangasinan
Region II-Cagayan Valley	Cagayan; Isabela; Nueva Vizcaya; Quirino
Region III-Central Luzon	Aurora; Bataan; Bulacan; Nueva Ecija; Pampanga; Tarlac; Zambales
Region IV-A-CALABARZON	Cavite; Laguna; Quezon
Region IV-B-MIMAROPA	Occidental Mindoro; Oriental Mindoro; Palawan
Region V-Bicol Region	Albay; Camarines Sur; Masbate; Sorsogon
Region VI-Western Visayas	Aklan; Antique; Capiz; Iloilo; Negros Occidental
Region VII-Central Visayas	Bohol; Negros Oriental
Region VIII-Eastern Visayas	Biliran; Leyte; Samar; Southern Leyte
Region IX-Zamboanga Peninsula	Zamboanga del Sur; Zamboanga Sibugay
Region X-Northern Mindanao	Bukidnon; Lanao del Norte; Misamis Occidental; Misamis Oriental
Region XI-Davao Region	Davao de Oro; Davao del Norte; Davao del Sur; Davao Oriental
Region XII-SOCCSKSARGEN	North Cotabato; Sarangani; South Cotabato; Sultan Kudarat
CARAGA	Agusan del Norte; Agusan del Sur; Surigao del Sur
BARMM	Lanao del Sur; Maguindanao

Complete enumeration of rice mechanization technologies covering land preparation to milling equipment and facilities was gathered from barangay, municipal and provincial levels. All operational or functional facilities as of 2020 were included although old equipment (beyond economic life) still utilized were noted. Validations were done through complete enumeration of farmers or machinery operators in selected barangays and municipalities.

Municipal data from the PHilMech database or municipal data were used as a guide in validating/updating the list of machinery owners by filtering out the non-functional/non-operational units and adding up new facility acquisitions or appending other technology owners not included during the last inventory. To determine the rice cropping/farming systems and use of farm power, information was abstracted from the baseline study of SEPRD in support to RCEF-Mechanization Component program. These were supplemented by key informant interviews from the Provincial Agriculture Offices, Municipal Agriculture Offices, and other entities involved in rice mechanization.

Data encoding, processing, and analysis. Data were encoded using Microsoft Excel to facilitate consolidation, processing, and tabulation. Inventory data were exported to the PHilMech database for data storage, security, updating, access, and data processing for other applications.

The following indices were estimated:

$$\text{Machinery intensity} = \text{Total no. of machines} / \text{Total production area} \times 50 \text{ has} \dots\dots\dots (1)$$

The rice mechanization level followed the methodology adopted by Dela Cruz and Bobier (2013), Panagsagan (2011), and other countries (Almasi et al. 2000; Ereno, 2008; Magalhaes et al. 2013; Paman, 2020; Islam, 2018; Maheshwari and Tripathi, 2019; Singh, 2006; Singh and Kumar, 2017; Singh and Singh, 2021). This indicator draws on the assumption that the power being utilized by farmers is based on the existing or available power. This approach is the most practical to use considering the following: a) The index primarily uses inventory of machines which also needed updating; b) A baseline was already established in 2011 so the change in the level of mechanization over time can be estimated by applying the same formula; c) Ease of updating with the institutionalization of machinery registration by LGUs; and d) Estimation of index could be even at provincial and municipal levels. This is essential for the preparation of local master plans with the full devolution of functions to LGUs with the implementation of the Mandanas-Garcia Ruling. With simple calculations and readily available data, LGUs can do their own updating.

The study determined the contribution of the three main sources of power: human, draft animals and engine to the total available power per unit area of rice crop, in hp/ha.

$$\text{Available Power (hp/ha)} = \frac{\text{Human Power} + \text{Animal Power} + \text{Mech'l Power}}{\text{Total Physical Area}} \dots\dots\dots(2)$$

Where:

$$\text{Human Power} = \text{Total no. of rice farm laborers} \times \text{Power factor (0.10 hp)}$$

$$\text{Animal Power} = \text{Total no. of draft animals} \times \text{Power factor} \\ \text{(0.67 hp for carabao, 0.45 for cattle and 1.0 hp for horse)}$$

$$\text{Mech'l Power} = \text{Total no. of machines} \times \text{Power rating of machine} \times \\ \text{Efficiency factor (80\% for motors and engines, 85\% for} \\ \text{tractors and 80\% for other machines, AMTEC)}$$

While this index has limitations as it does not account how power is being utilized, it has been widely used by other countries; hence, it is relevant for benchmarking, setting mechanization target and for monitoring and evaluation purposes. For more specific policy prescriptions, other indicators were estimated such as Power Ratio and Degree of Mechanization or Percent Area Mechanized.

Using the same data in determining the Mechanization Index, the power ratio was computed using the formula

:

$$\text{Power Ratio (\%)} = \frac{\text{Mechanical Power}}{\text{Total Power}} \times 100 \dots\dots\dots(3)$$

Where:

Total Power is the sum of human power, animal power and mechanical power

Mechanization Degree expressed as percent area mechanized, as adopted from Malanon and Dela Cruz. 2018:

$$\text{Mechanization Degree (\%)} = \frac{\text{Area Mechanized (ha)}}{\text{Total Area (ha)}} \times 100 \dots\dots\dots(4)$$

RESULTS AND DISCUSSION

Intensity of rice mechanization technologies. The distribution of rice mechanization technologies is presented in terms of machine intensity per unit of land. Since the Rice Competitiveness Enhancement Fund - Mechanization Component requires FCA/LGU applicants to have at least 50 hectares aggregate area as one of the technical requirements, this was used in determining the number of existing machineries in a certain area.

Land preparation technologies. The regional data on intensity of four-wheel tractors indicates that larger tractors were widely used in Region I, with 1.59 units per 50 hectares (Fig. 2). This was followed by Region III, Region IV-B, and Region II with 0.78, 0.48, and 0.45 unit/50 ha, respectively. On the other hand, low tractor intensities were recorded in Region IV-A, Region V, Region VI, Region VII, Region VIII, Region IX, CARAGA, and BARMM. The concentration of four-wheel tractors in these regions ranges from 0.08 to 0.32 unit per 50 hectares. The average four-wheel tractor intensity in the 16 regions was 0.51 units per 50 hectares. In the Visayas and Mindanao islands, the distribution of four-wheel tractors was more sparse compared to Luzon. The majority (57%) of the provinces reported machine intensity of less than or equal to 0.20 units per 50 hectares, nine provinces recorded 0.21 to 0.30 units per 50 hectares, while only four provinces recorded higher than 0.30 unit per 50 hectares

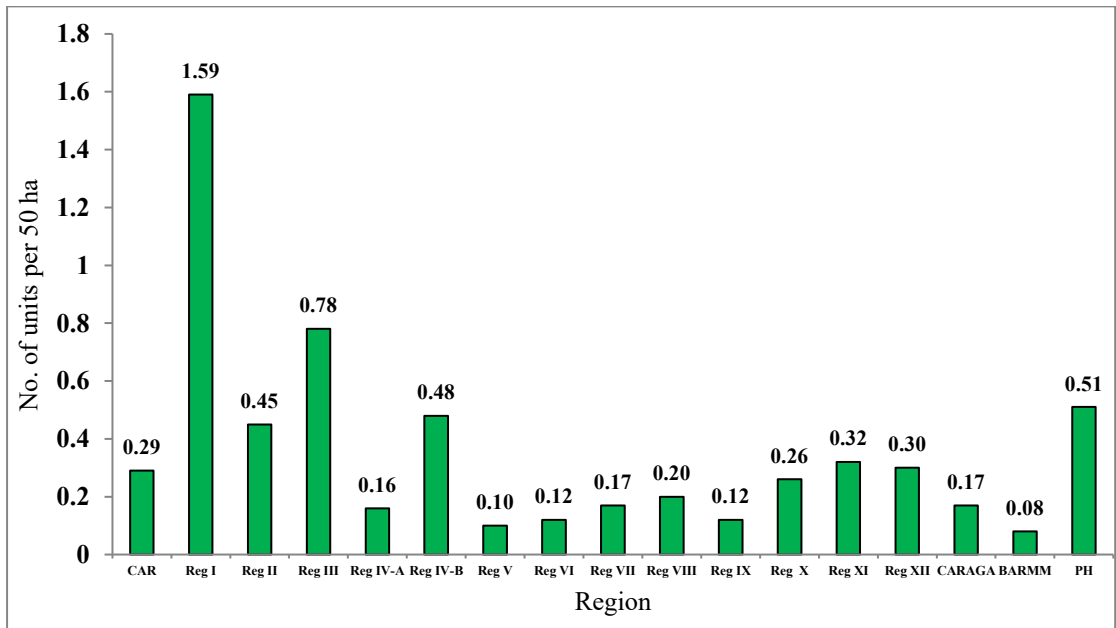


Figure 2. Number of four-wheel tractors per 50 hectares, Philippines, 2021-2022

While four-wheel tractors were already used as primary land preparation machinery in some areas, two-wheel tractors were still used in most areas for land preparation activities that include plowing, harrowing, and leveling. The regional average on intensity of two-wheel tractors shows that hand tractors were predominantly used in Region II and Region IV-A, with tractor intensities higher than 8.0 units per 50 hectares (Fig. 3). This was followed by Region I, Region VI, and Region VII, recording at least 7.0 to 8.0 units per 50 hectares. These indicate that high percentages of rice farmers own hand tractors and do not depend on custom service providers. Meanwhile, Region IX, Region XII, Region XI and BARMM recorded less than 3.0 units per 50 hectares. It should be noted that standard hand

tractors were predominantly used in Luzon provinces, with minimal numbers of floating tillers recorded in CAR, Region I, Region III, and Region II. Small numbers of floating tillers were noted in Region V, Region IV-A and Region IV-B, registering 0.26, 0.33 and 0.46 unit per 50 hectare, respectively. All the regions in Mindanao (Regions IX, X, XI, XII, CARAGA and BARMM) and Central Visayas (Region VII) have higher proportion of floating tillers compared to standard hand tractors popularly utilized in Luzon.

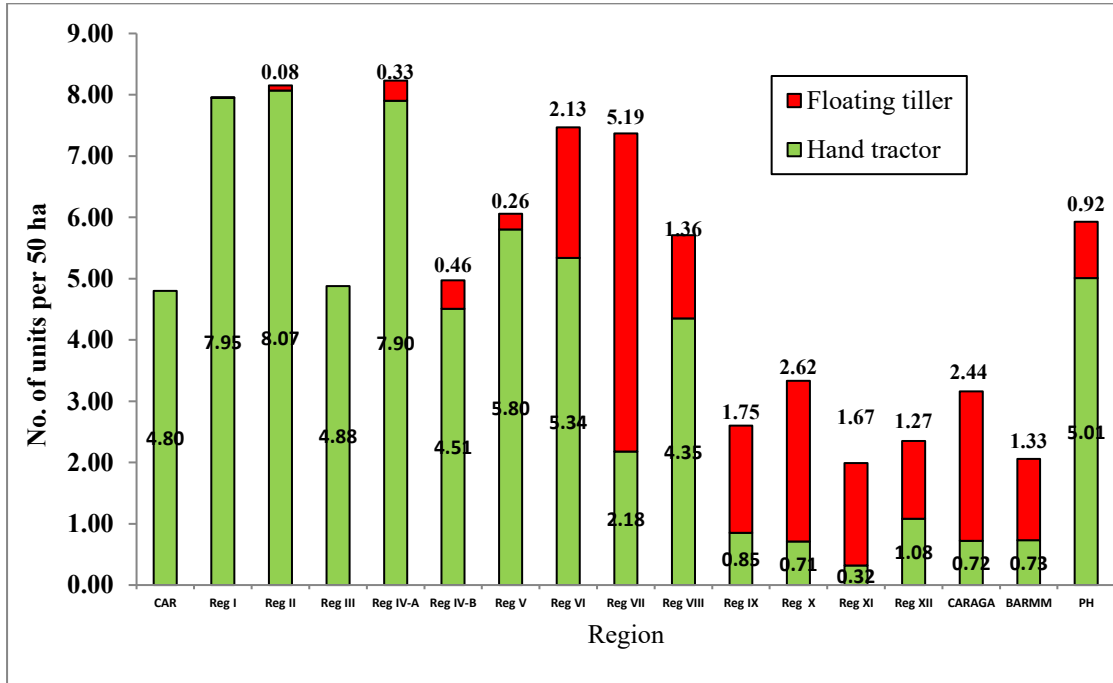


Figure 3. Number of power tillers per 50 hectares, Philippines, 2021-2022

Harvesting and threshing technologies. While threshing operation had long been mechanized with the development of rice threshers, harvesting was only mechanized in the early part of the 2010s with the introduction of rice combine harvesters. The increasing cost of labor driven by dwindling labor supply and the design of machines suitable to the agro-physical condition of rice farms in the country influenced the wide adoption of the technology. As of 2022, the regional distribution of RCH exhibited that there were high concentrations of the technology in Region III, Region II, and Region XI while RCH intensities were still very low in Region V, the entire Visayas, Region IX, and BARMM (Fig. 4).

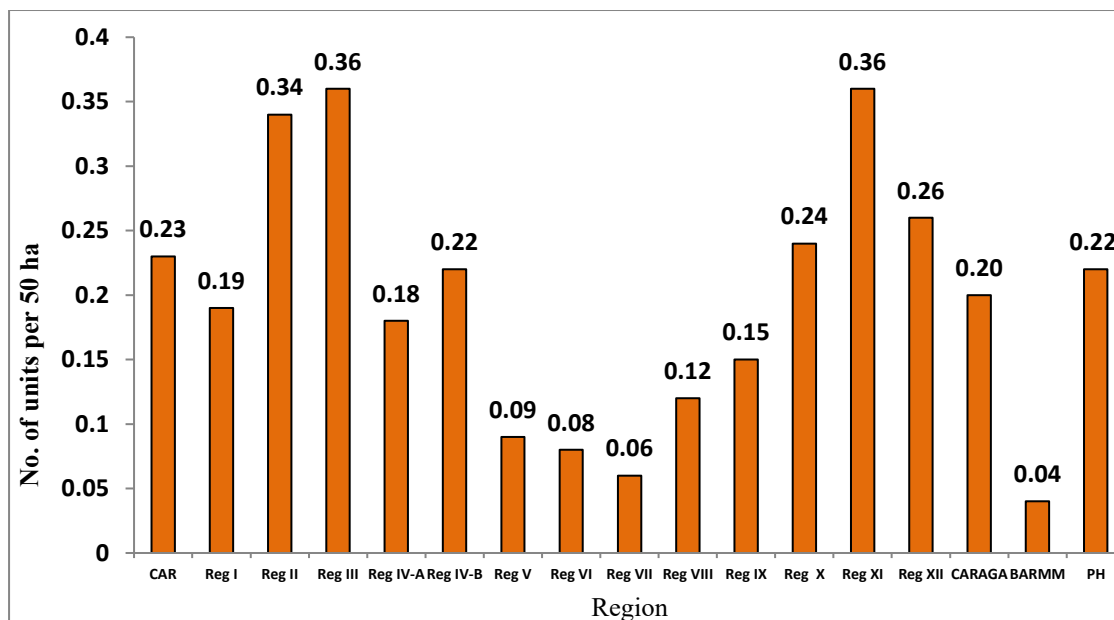


Figure 4. Number of rice combine harvesters per 50 hectares, Philippines, 2022

Rice mechanization level based on the power available. This section presents the updated level of rice mechanization in the country based on the power available. Using the inventory of rice mechanization technologies, census of available workforce and draft animals employed in rice production and postproduction activities, the provincial, regional and national levels of rice mechanization were estimated.

In terms of the regional data on mechanical power available for rice farm operations, Region II (Cagayan Valley) recorded the highest mechanization index at 3.30 hp/ha, while the Bangsamoro Autonomous Region of Muslim Mindanao (BARMM) registered the lowest mechanization level at 0.57 hp/ha (Table 3). Other regions that have relatively high levels of mechanical power available include Region I (Ilocos Region), Region IV-A (CALABARZON), Region VI (Western Visayas), Region III (Central Luzon), Region V (Bicol Region), and Region VII (Central Visayas), with a 2.00 – 3.00 hp/ha index. Meanwhile, the Cordillera Administrative Region (CAR), Region VII (Eastern Visayas), Region X (Northern Mindanao), Region IX (Zamboanga Peninsula), Region XI (Davao Region), Region XII (SOCCSKSARGEN), CARAGA, and BARMM recorded less than 2.0 hp/ha available mechanical power.

For mechanical power available, land preparation accounted for 1.41 hp/ha, comprising about 63% of the total mechanical power (Fig. 5). This was followed by harvesting-threshing at 0.59 hp/ha, irrigation at 0.16 hp/ha, and milling at 0.08 hp/ha. It should be noted that postharvest facilities such as mechanical dryers and rice mills operated by commercial millers were not included in the inventory because of the difficulty in gathering information from these sources.

Table 3. Mechanical power available per operation, per region, Philippines, 2022

Region	Land Prep	Crop Est.	Irrigation	Harvesting-Threshing	Drying	Milling	Total
CAR	1.09	<0.01	-	0.55	<0.01	0.11	1.76
Ilocos Region	2.16	<0.01	0.19	0.44	<0.01	0.06	2.86
Cagayan Valley	1.90	<0.01	0.61	0.77	<0.01	0.02	3.30
Central Luzon	1.41	<0.01	0.31	0.64	0.01	0.03	2.39
CALABARZON	1.43	0.01	-	0.91	0.02	0.24	2.61
MIMAROPA	1.26	<0.01	-	0.48	0.04	0.22	2.01
Bicol Region	1.18	<0.01	-	0.79	0.01	0.33	2.32
Western Visayas	1.60	0.01	0.02	0.70	0.01	0.09	2.43
Central Visayas	1.58	0.01	0.02	0.49	0.01	0.15	2.27
Eastern Visayas	1.17	0.01	0.05	0.54	0.03	0.10	1.90
Zamboanga Peninsula	0.56	0.01	0.04	0.41	0.03	0.06	1.10
Northern Mindanao	0.80	0.03	0.02	0.71	0.02	0.08	1.65
Davao Region	0.94	0.01	-	0.75	<0.01	<0.01	1.70
SOCCSKSARGEN	0.63	0.01	0.03	0.47	<0.01	<0.01	1.14
CARAGA	0.75	0.01	0.04	0.46	0.04	0.03	1.33
BARMM	0.38	<0.01	-	0.12	0.01	0.06	0.57

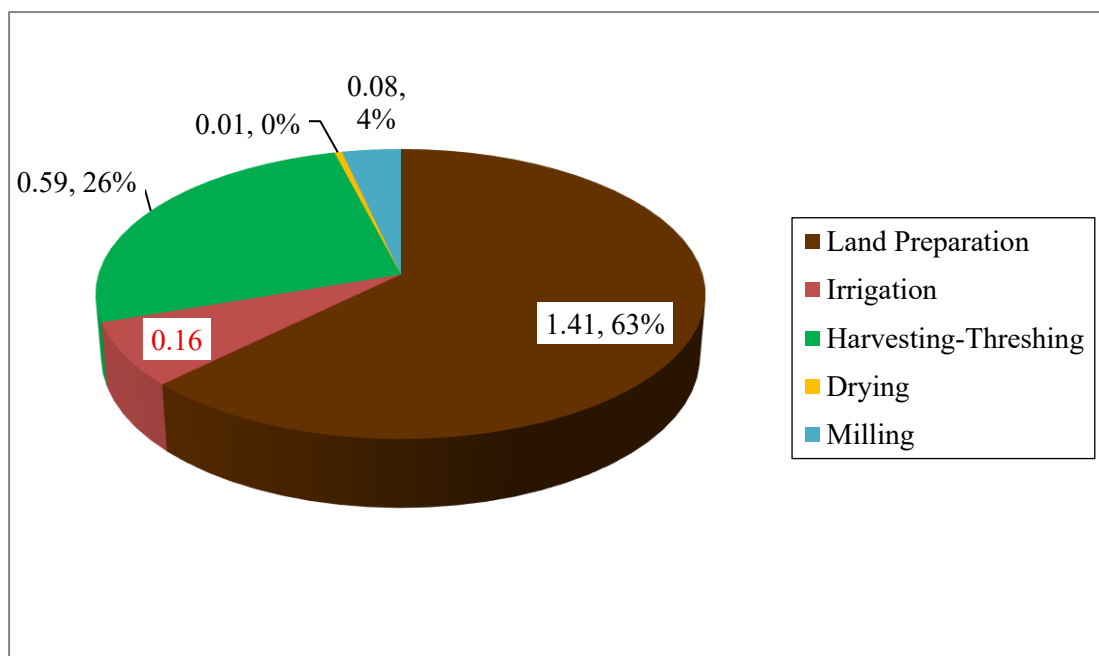


Figure 5. Distribution of mechanical power available per operation, Philippines, 2022

Rice mechanization level in the Philippines.....

The provinces with the highest levels of rice mechanization include Ilocos Sur, Ilocos Norte, La Union, Quezon, Aklan and Capiz (Fig. 6). These provinces have a mechanization level higher than 4.0 hp/ha. Other provinces that recorded high levels, with rice mechanization index of 3.0 to 4.0 hp/ha, were Cagayan, Isabela, Quirino, Tarlac, Cavite, Albay, Sorsogon, Bohol, Misamis Occidental, Misamis Oriental, Davao del Sur, Davao de Oro and Davao Oriental. Majority of the provinces (41%) have mechanization index ranging from 2.0 to 3.0 hp/ha. Meanwhile, 15 provinces (26%) have less than 2.0 hp/ha mechanization level. These provinces were Aurora, Palawan, Antique, Southern Leyte, Zamboanga del Sur, Zamboanga Sibugay, Davao del Norte, North Cotabato, Sultan Kudarat, South Cotabato, Agusan del Norte, Agusan del Sur, Surigao del Sur, Maguindanao and Lanao del Sur.

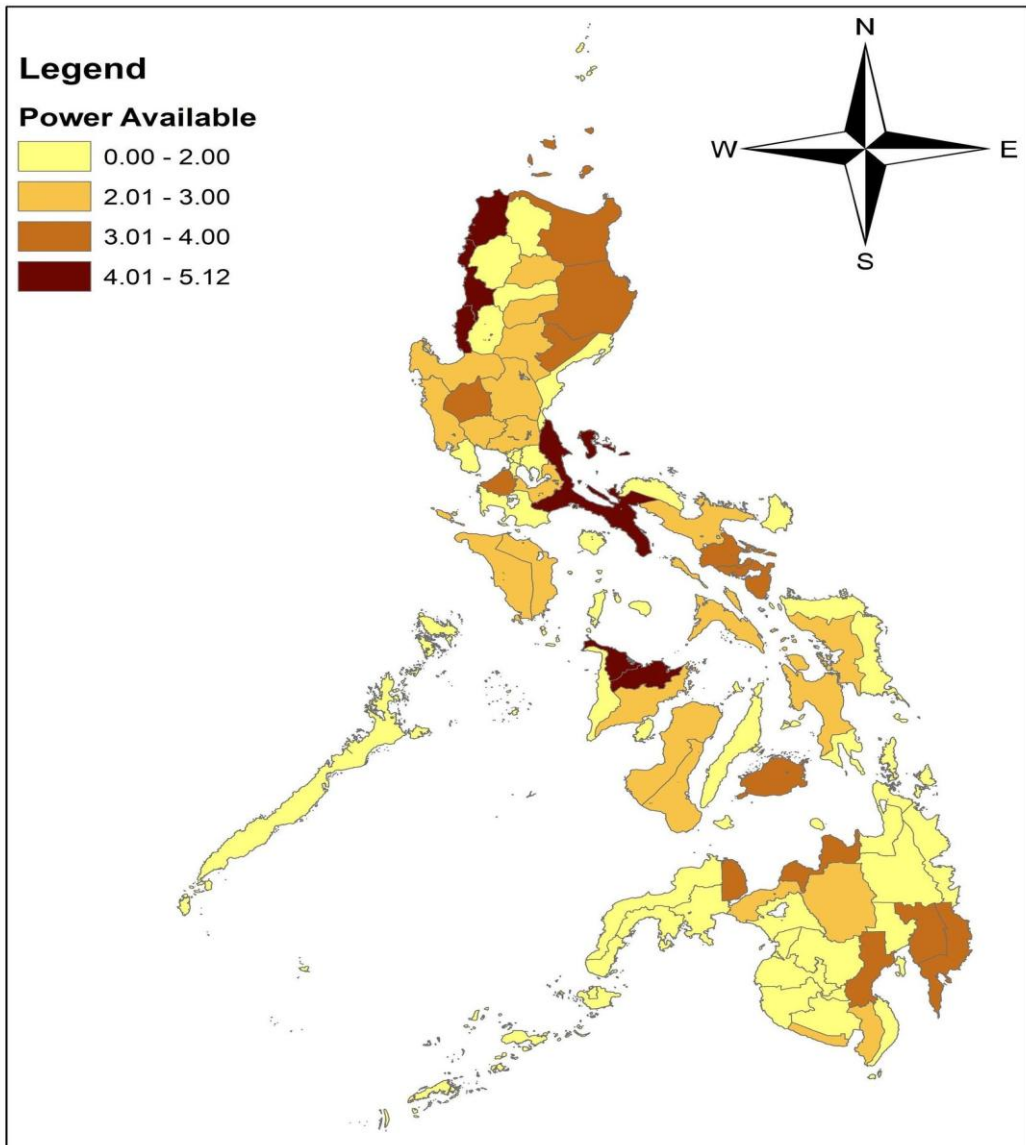


Figure 6. Level of rice mechanization per province based on power available, Philippines.

In terms of regional data on the level of rice mechanization, Region II (Cagayan Valley) recorded the highest level of mechanization based on power available while the Bangsamoro Autonomous Region of Muslim Mindanao (BARMM) registered the lowest mechanization level (Fig. 7). Other regions that have relatively high levels of mechanization includes Region IV-(CALABARZON), Region I (Ilocos Region), Region VII (Central Visayas) and Region V (Bicol Region). The regions that approximate the national average were Region III (Central Luzon), Region XI (Davao Region), and Region VI (Western Visayas). Meanwhile, the Cordillera Administrative Region (CAR), Region IV-B (MIMAROPA), Region VIII (Eastern Visayas), Region X (Northern Mindanao), Region IX (Zamboanga Peninsula), Region XII (SOCCSKSARGEN), CARAGA, and BARMM recorded mechanization indices lower than the national average. Moreover, four regions in Mindanao – Region IX (Zamboanga Peninsula), Region XII (SOCCSKSARGEN), CARAGA, and BARMM all recorded less than 2.00 hp/ha mechanization index.

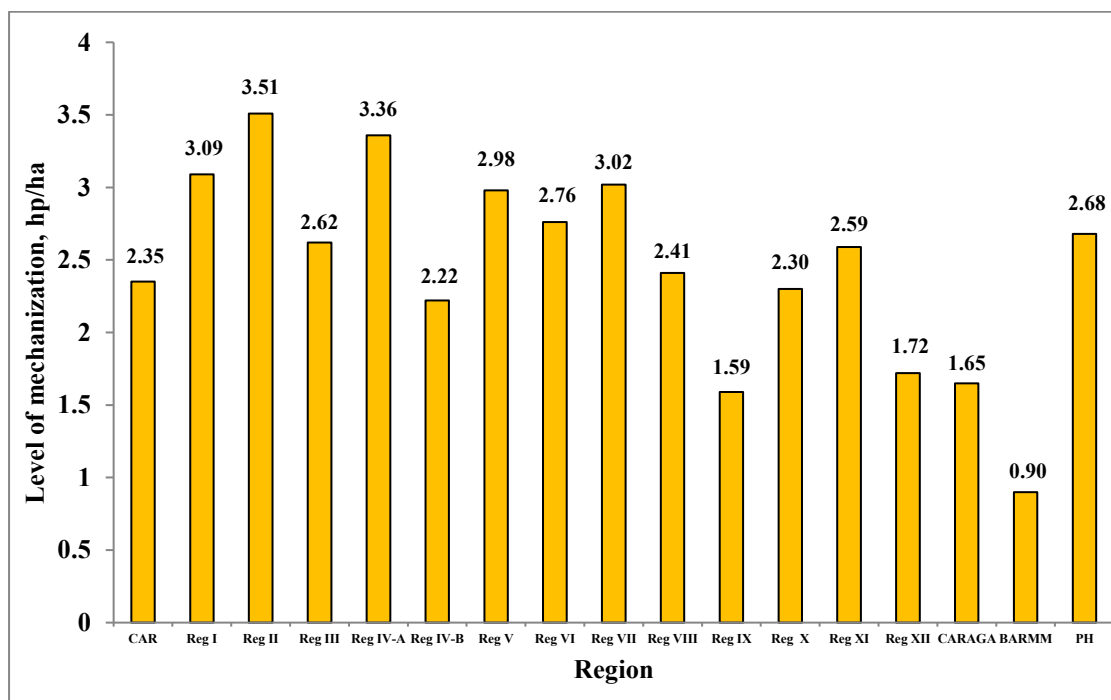


Figure 7. Level of mechanization per region based on power available, Philippines, hp ha^{-1}

Among the sources of power, mechanical power accounts for 84% of the total power available, 11% from animal power and 5% from human power (Fig. 8).

Comparing the national rice mechanization level for 2011 and 2022, mechanical power increased by 0.49 hp/ha while the two other sources of power slightly decreased by 0.02 hp/ha and 0.10 hp/ha, for human and animal power, respectively (Fig. 9). Since 2011, mechanical power increased by 28% while human power declined by 13% and animal power also decreased by 26%. The intensification of mechanical power could be attributed to the growing popularity of larger machinery, such as the use of rice combine harvesters and four-wheel tractors as promoted by the DA rice banner program and RCEF mechanization component. The adoption of machines in rice farm operations as influenced by increasing wage rates, also provides an incentive to enterprising individuals to acquire machines for a custom service provision business. Because of the increase in mechanical power, the other sources of power decreases as a consequence of using labor and draft animal-replacing technologies.

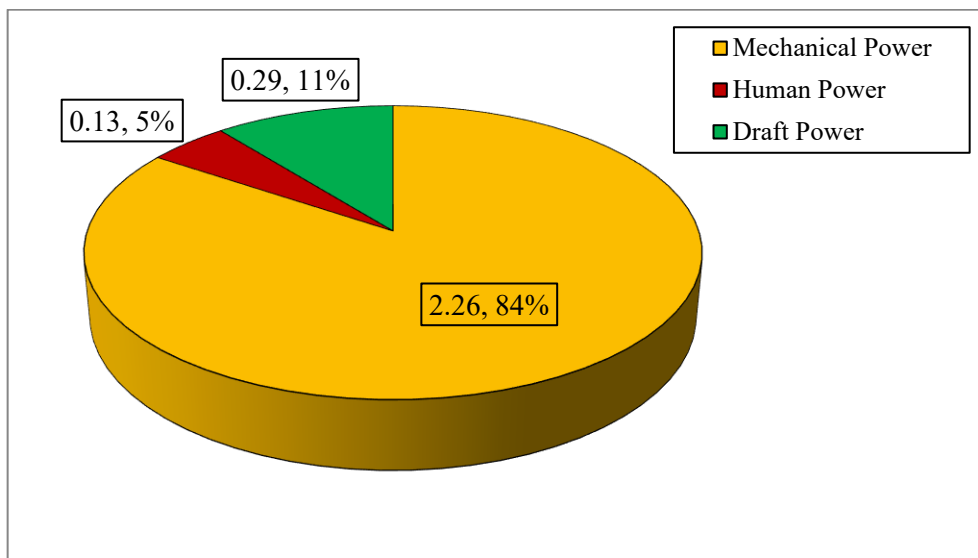


Figure 8. Contribution of mechanical, draft and human power to total power available for rice farm operations, Philippines, 2022

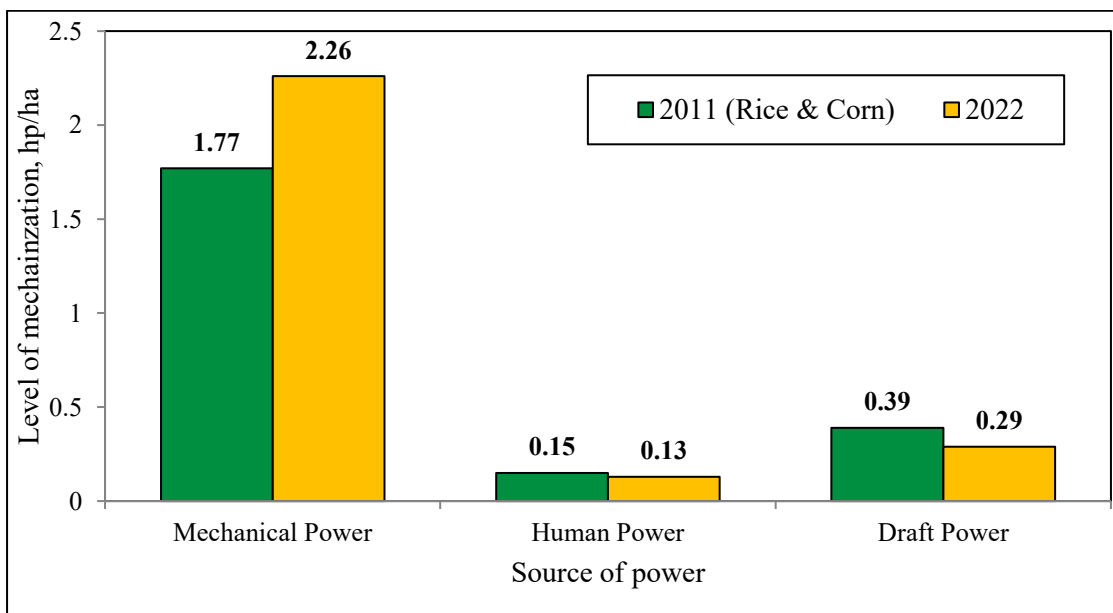


Figure 9. Change in rice level of mechanization based on power sources, 2011 and 2022

Overall, the rice mechanization level in the country improves from 2.31 hp/ha in 2011 to 2.68 hp/ha in 2022, exhibiting a 16% growth rate for the period (Fig. 10). As of October, 2025, the level of rice mechanization was estimated at 2.81 hp/ha.

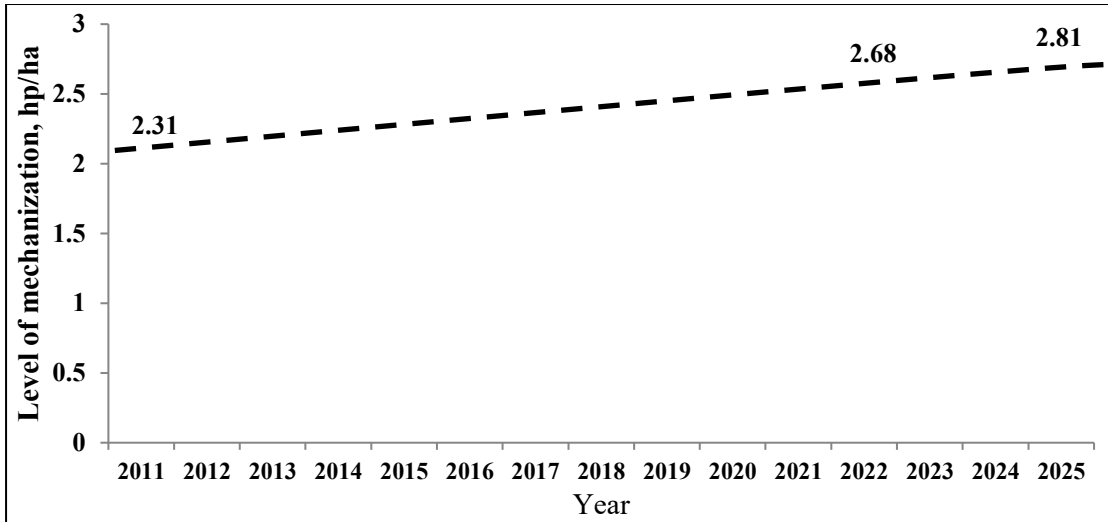


Figure 10. Overall increase in the rice level of mechanization, 2011, 2022, and 2025

Mechanization based on power ratio. Using the power ratio as an indicator of mechanization level, four regions recorded higher than 90% power ratio. These regions include Region II (Cagayan Valley), Region I (Ilocos Region), Region III (Central Luzon) and Region IV-A (CALABARZON) (Fig.11). Meanwhile, Region VI (Western Visayas) and CARAGA regions registered 80% to 90% power ratio. Other regions that had above 70% to 80% power ratio were CAR, Region IV-A, Region V, Region VII, Region VIII, and Region X. Four regions in Mindanao that include Region IX, Region XI, Region XII and BARMM had less than 70% power ratio. This indicates the relatively high application of draft and manual power in these areas.

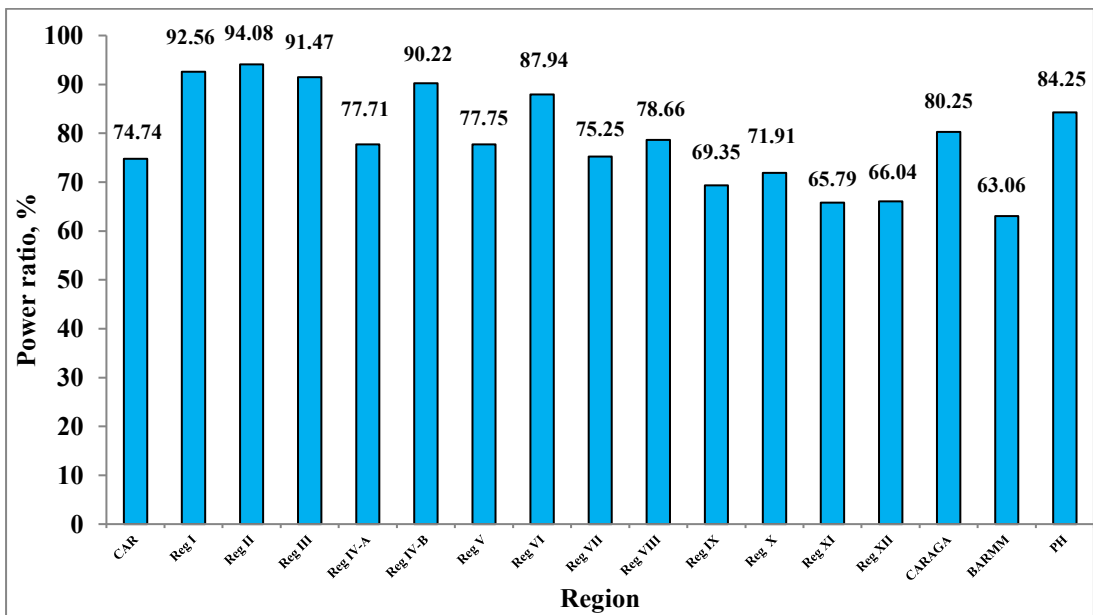


Figure 11. Level of mechanization per region based on power ratio, Philippines, 2022

Mechanization based on the percent of rice farm area mechanized. The percentage of rice farmers mechanizing farm operations was highest in land preparation (77.59%) (Table 4). This is consistent with other research findings indicating that the most difficult farm operations are mechanized first. The development and local fabrication of affordable two-wheel tractors enable farmers to acquire machines, hence, the fast uptake of technology adoption. In terms of land preparation, all regions have more than 50% mechanization degree but relatively high rates of adoption for hand tractor and four-wheel tractors were noted in Region III (Central Luzon), Region II (Cagayan Valley), Region XI (Davao Region), Region I (Ilocos Region), Region VI (Western Visayas), Region IV-B (MIMAROPA) and Region IV-A (CALABARZON). The lowest mechanization degrees were observed in CAR and Region VII (Central Visayas) regions, with less than 60% of farmers using machines in land preparation.

While mechanization of harvesting operations had just started several years ago, the rate of technology diffusion has been dramatic since the introduction of rice combine harvesters in the country. PhilMech study revealed that in 2013, only 3% of rice farmers were using RCH and this figure ballooned to 53.66% in 2022. High rates of technology adoption were noted in Region III (Central Luzon), Region II (Cagayan Valley), Region IV-B (MIMAROPA) and CARAGA. The percentages of farms utilizing engine-powered machines in crop establishment were still very low in all regions.

This situation reflects a common pattern in some Asian countries such as China, Pakistan, India and Bangladesh, where rice mechanization tends to progress unevenly among different farm operations. Land preparation and harvesting are typically mechanized earlier, while planting and crop care continue to lag behind (Khan and Rehman 2019; Shi et al. 2021).

The uneven pace of mechanization can be attributed to several factors, including the nature and complexity of specific tasks, as well as the availability and cost of manual labor, draft animals, and farm machinery. Although the cost of mechanized transplanting or seeding is often lower than that of traditional manual methods, adoption remains constrained by technological and practical challenges. These include the intricacies of seedling preparation, the need for thorough land preparation and effective maintenance of irrigation and drainage, issues with achieving optimal planting density, entrenched farming practices, and topographical limitations.

Table 4. Percent of rice farms mechanizing different farm operations, selected rice-producing regions, 2021-2022

REGION	OPERATION		
	Land Preparation ^L	Crop Establishment	Harvesting-Threshing
CAR	54.50	2.67	39.94
Ilocos Region	86.01	1.26	66.12
Cagayan Valley	90.32	3.05	74.76
Central Luzon	91.10	4.01	86.61
CALABARZON	83.90	2.32	60.74
MIMAROPA	84.07	2.90	77.15
Bicol Region	78.27	6.40	38.01
Western Visayas	85.57	7.07	37.37

REGION	OPERATION		
	Land Preparation ^L	Crop Establishment	Harvesting-Threshing
Central Visayas	58.50	3.00	19.50
Eastern Visayas	71.53	4.92	38.63
Zamboanga Peninsula	72.37	2.62	45.38
Northern Mindanao	77.65	5.41	45.60
Davao Region	86.41	6.33	56.04
SOCCSKSARGEN	77.37	3.77	54.12
CARAGA	75.56	4.56	78.57
BARMM	68.26	1.20	40.10

^L Plowing and harrowing, including preparation of the seedbed.

CONCLUSION

This study provided an up-to-date and comprehensive assessment of the status of rice mechanization in the Philippines using machinery intensity, available power, power ratio, and percentage of area mechanized as key indicators. Philippine rice production is slowly but steadily transitioning toward a more mechanized and machine-dependent production system. These trends reflect sustained progress in the modernization of rice farming and the increasing role of mechanization in enhancing production efficiency and reducing labor dependence. Nevertheless, mechanization development remains highly uneven across regions and provinces, indicating persistent disparities in access to machinery, mechanization services available, and supporting infrastructure.

Among rice production operations, land preparation exhibited the highest mechanization level, reflecting the widespread and sustained adoption of hand tractors and four-wheel tractors. Harvesting and threshing also showed substantial mechanization gains, driven largely by the rapid diffusion of rice combine harvesters. In contrast, crop establishment remained the least mechanized operation nationwide, suggesting continuing technological, operational, and economic constraints in mechanized transplanting and direct-seeding systems. This mechanization pattern is consistent with experiences in other Asian countries, where mechanization is generally adopted first in highly labor-intensive operations, whereas crop establishment progresses more slowly because of greater technical complexity, higher operational requirements, and the limited availability of suitable machinery and mechanization systems.

Overall, the study highlighted significant advancements in rice mechanization in the Philippines while revealing critical regional and operational gaps that may constrain the broader transformation of the rice sector. There is a need for more targeted and location-specific mechanization strategies, including the development and dissemination of appropriate machinery, strengthened machinery service provision, improved financing mechanisms, and enhanced technical and institutional support systems. Addressing these constraints will be essential to achieving more inclusive, balanced, and sustainable mechanization across all stages of rice production and postproduction operations, thereby contributing to improved productivity, labor efficiency, and long-term competitiveness of the Philippine rice industry.

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