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The rice competitiveness enhancement fund mechanization program: Implementation, outcomes, and impact on rice farmers in Kalinga province, Philippines

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Abstract

The Rice Competitiveness Enhancement Fund (RCEF), established under Republic Act No. 112031 (Rice Tariffication Law), allocates 50% of its annual Php10-billion budget to the Farm Machinery and Equipment (Mechanization) Program. In Kalinga Province, 145 farmer-beneficiaries received mechanization support through farmer cooperatives and associations (FCAs). This study assessed the level of implementation, attainment of objectives, factors affecting implementation, and impact of the RCEF Mechanization Program in Kalinga Province from 2020 to 2024. A descriptive research design was used, employing survey questionnaires, interviews, focus group discussions (FGDs), and document analysis (n = 145). Data were analyzed using weighted means on a five-point Likert scale. Objectives were very much attained (mean = 4.42) and the program was very much implemented (mean = 4.53). Factors moderately affected implementation (mean = 2.64), with insufficient drying/milling facilities as the main concern (mean = 3.94). Very high farmer impact was recorded (mean = 4.44). The program significantly improved productivity, reduced costs, and enhanced livelihoods. Additional dryer/milling units and localized training are recommended to sustain gains.

Keywords: Farm mechanization, rice competitiveness, RCEF, Kalinga province, postharvest technology, Philippines

Introduction

Agricultural mechanization is globally recognized as a transformative strategy for achieving food security and improving rural livelihoods [7, 8]. In the Philippines, Republic Act No. 11203 (Rice Tariffication Law) [1], enacted in February 2019, created the Rice Competitiveness Enhancement Fund (RCEF), 0061 Php10-billion annual appropriation to modernize rice farming [1]. The Mechanization Program, implemented by the Philippine Center for Postharvest Development and Mechanization (PhilMech), commands 50% of the RCEF budget [2].

Despite national distribution of over 26,412 equipment units benefiting approximately one million farmers by 2024, the national mechanization level remains modest at 2.68 hp/ha.³ The Cordillera Administrative Region (CAR), where Kalinga Province is located, recorded 2.35 hp/ha classified below the national average [4]. Kalinga Province is the top palay producer in CAR with a 34% regional contribution in 2023 and approximately 31,926 hectares of rice area [5], making it a critical site for evaluating RCEF outcomes.

Figure 1 shows the distribution of RCEF program beneficiaries across all four components in Kalinga Province, while figure 2 presents rice farm area and production trends from 2019 to 2023, providing context for assessing mechanization impact [5].

Figure 1 shows the distribution of RCEF program beneficiaries across all four components in Kalinga Province.

Table 1: Distribution of RCEF Farmer-Beneficiaries by Component Program in Kalinga Province (n = 1,063)

RCEF Component Program	No. of Beneficiaries	Percentage (%)	Rank
Rice Farm Mechanization Program	145	13.64	4
Rice Seed Development Program	398	37.44	1
Credit Assistance Program	252	23.71	3
Extension Services Program	268	25.21	2
Total	1,063	100.00	

Figure 2 presents rice farm area and production trends from 2019 to 2023, providing context for assessing mechanization impact

Table 2: Rice Farm Area and Production in the Province of Kalinga (2019–2023)

Year	Area Harvested (Has.)	Production (MT)	Yield
2019	39,130.01	158,166.75	3.28
2020	34,950.63	164,686.35	4.74
2021	35,261.20	196,387.01	5.63
2022	32,499.68	161,141.94	5.00
2023	31,926.16	215,532.70	6.70

Source: Philippine Statistics Authority, CAR (2023) [25]; Office of the Provincial Agriculturist, Kalinga

Objectives

This study aimed to: (1) describe the socio-demographic profile of mechanization beneficiaries; (2) determine the level of attainment of objectives; (3) assess the level of implementation; (4) determine the extent of factors affecting implementation; and (5) assess the impact of the mechanization program on farmer-beneficiaries.

Materials and Methods

Research Design and Locale

A descriptive research design was used across all seven (7) municipalities (Balbalan, Lubuagan, Pasil, Pinukpuk, Rizal, Tanudan, Tinglayan) and Tabuk City of Kalinga Province, covering the 2020 to 2024 RCEF implementation cycle.

Respondents

Total enumeration sampling was used, capturing all 145 registered mechanization beneficiaries: farmer-cooperatives, farmer-associations, irrigators' associations, and local government units (LGUs).

Data Collection

Researcher-administered survey questionnaires, personal interviews with LGU personnel and cooperative officers, FGDs with farmer-beneficiaries, and document analysis of OPAG-Kalinga and PhilMech records comprised the data collection protocol.

Instrument and Statistical Analysis

The survey instrument addressed five areas: The survey

instrument addressed five areas: (I) demographic profile and machinery type; (II) attainment of objectives; (III) level of implementation; (IV) factors affecting implementation; and (V) program impact as all rated on a five-point Likert scale. Figure 3 presents the Likert scale reference for attainment of objectives and Figure 7 for level of implementation.

Table 3: Likert Scale Reference Level of Attainment of RCEF Program Objectives

Arbitrary	Limit	Descriptive Equivalent	Interpretation
5	4.21–5.00	Very Much Attained (VMA)	100% attained
4	3.41–4.20	Much Attained (MA)	67–99% attained
3	2.61–3.40	Moderately Attained (MoA)	32–66% attained
2	1.81–2.60	Less Attained (LA)	1–31% attained
1	1.00–1.80	Not Attained (NA)	0% / Not attained

Results and Discussion

Profile of Mechanization Beneficiaries

As shown in Table 4, of the 145 beneficiaries, the most distributed equipment was agricultural tractors (n = 56; 38.6%), followed by rice threshers (n = 34; 23.4%), rice harvesters (n = 25; 17.2%), and rice seeders (n = 16; 11.0%). Rice mills (n = 8; 5.5%) and rice tillers, reapers, and mechanical dryers (n = 2 each; 1.4%) were minimally distributed [3]. Equipment was channeled through FCAs under signed Memoranda of Agreement (MOAs) stipulating operations, maintenance, and quarterly reporting obligations [2].

Table 4: Socio-Demographic Profile on Rice Farm Machinery and Equipment (Mechanization Program) (n = 145)

Type of Machinery/Equipment Received	Frequency (n)	Percentage (%)	Rank
Agricultural Tractor	56	38.60	1
Rice Tiller	2	1.40	7
Rice Seeder	16	11.00	4
Rice Harvester	25	17.20	3
Rice Reaper	2	1.40	7
Rice Thresher	34	23.40	2
Mechanical Rice Dryer	2	1.40	7
Rice Mill	8	5.50	5
TOTAL	145	100.00	

Level of Attainment of Mechanization Objectives

Table 5 presents the level of attainment of the mechanization program objectives. The sub-area mean of 4.42 (VMA) ranked first among the four RCEF components.¹⁰ Making appropriate postharvest machinery

accessible to FCAs garnered the highest attainment (mean = 4.64), followed by promoting efficient and cost-reducing mechanization interventions (mean = 4.56).⁷ Strengthening the local machinery manufacturing industry was much attained (mean = 4.08) [8].

Table 5: Level of Attainment of the Objectives of the Rice Farm Machinery and Equipment Mechanization Program

Objectives	Weighted Mean	Description	Rank
1. Make accessible to rice farmers appropriate production postharvest machinery and equipment through FCAs.	4.64	VMA	1
2. Promote among Filipino rice farmers the use of efficient and cost-reducing rice mechanization interventions.	4.56	VMA	2
3. Strengthen local agricultural machinery manufacturing industry through aggressive technology development, fabrication, and manufacturing.	4.08	MA	3
Sub-Area Mean	4.42	VMA	

Note: VMA = Very Much Attained; MA = Much Attained.

Level of Implementation

Table 6 shows that the mechanization program achieved the

highest implementation rating among all RCEF components (sub-area mean = 4.53; VMI). Accessibility of machinery

through FCAs was rated highest (mean = 4.67), while strengthening local machinery manufacturing was rated very much implemented (mean = 4.36) ^[3, 10]. Table 7 presents the

Likert scale reference used for interpreting implementation levels.

Table 6: Level of Implementation of the Rice Farm Machinery and Equipment Mechanization Program

Program Indicators	Weighted Mean	Description	Rank
1. Accessible to rice farmers the appropriate production postharvest machinery and equipment through FCAs.	4.67	VMI	1
2. Promote among rice farmers the use of efficient and cost-reducing rice mechanization interventions.	4.59	VMI	2
3. Strengthen local agricultural machinery manufacturing industry through aggressive technology development, fabrication, and manufacturing.	4.36	VMI	3
Sub-Area Mean	4.53	VMI	

Note: VMI = Very Much Implemented

Table 7: Likert Scale Reference on the Level of Implementation

Arbitrary Value	Limits	Descriptive Equivalent	Interpretation
5	4.21–5.00	Very Much Implemented (VMI)	Full benefits received
4	3.41–4.20	Much Implemented (MI)	Some programs implemented
3	2.61–3.40	Moderately Implemented (MoI)	Active but with bottlenecks
2	1.81–2.60	Less Implemented (LI)	Significant gap from policy goals
1	1.00–1.80	Not Implemented (NI)	Program not yet initiated

Factors Affecting Implementation

Table 8 presents the extent of factors affecting the mechanization program. The sub-area mean of 2.64 (MoA) indicates a moderate level of constraint. The most affected factors were insufficient mechanical drying, milling, and storage facilities (mean = 3.94), sun-drying preference among farmers (mean = 3.93), and widespread use of

manual transplanting (mean = 3.80) ^[6]. These findings are consistent with reports that low-cost solar energy and the capital cost of mechanical dryers continue to drive farmer preference for traditional sun-drying in upland regions ^[4, 8]. Absence of maintenance guidelines was the least constraining factor (mean = 1.77; NI) ^[2].

Table 8: Extent of Factors Affecting the Implementation of the Rice Mechanization Program

Factor Indicators	Weighted Mean	Description	Rank
Insufficient mechanical drying, milling, and storage facilities in the different municipalities/city of the province.	3.94	MA	1
Sun drying is still preferred by rice farmers due to available solar power and high prices of mechanical dryers.	3.93	MA	2
Manual transplanting is widely used as method of rice planting by rice farmers.	3.80	MA	3
Presence of external/political interventions on the mechanization program implemented in different municipalities/city.	2.81	MoA	4
Low acceptability/adoption of machineries and equipment and/or lack of awareness among rice farmers.	2.59	LA	5
Negligible level of mechanization in planting, weeding, spraying, and harvesting in upper Municipalities.	2.49	LA	6
Operators' needs for additional skills training on repair and maintenance, troubleshooting, and retooling.	2.26	LA	7
Very low utilization of machineries and equipment by the beneficiaries/recipients.	2.10	LA	8
Machineries and equipment are not properly maintained and became idle and unutilized after a few years.	1.97	LA	9
Lack of awareness of rice farmer-beneficiaries on new mechanization technology.	1.82	LA	10
Absence/no clear policies and guidelines on operation and maintenance of machineries received by the FCAs.	1.77	NA	11
Sub-Area Mean	2.64	MoA	

Note: MA = Much Affected; MoA = Moderately Affected; LA = Less Affected; NA = Not Affected.

Impact on Farmer-Beneficiaries

Table 9 presents the extent of impact. The mechanization program generated the highest impact score among all RCEF components (sub-area mean = 4.44; VHI). Strengthening training and extension delivery services to accelerate mechanization technology transfer ranked highest (mean = 4.85) ^[10], followed by reducing postharvest losses

(mean = 4.63), improving rice value chain competitiveness (mean = 4.63) ^[7], and reducing production costs by Php 2–3/kg (mean = 4.46) ^[9]. These outcomes align with international evidence that farm mechanization significantly reduces unit production cost and postharvest losses, thereby increasing net farm income ^[7, 8].

Table 9: Extent of Impact of the RCEF Mechanization Program on Farmer-Beneficiaries

Impact Indicators	Weighted Mean	Description	Rank
Strengthened training and extension delivery services to accelerate delivery of mechanization and post-harvest processing technologies.	4.85	VHI	1
Improve the rice value chain and rice competitiveness.	4.63	VHI	2
Reduce postharvest losses, increase and sustain availability of quality rice supply in Kalinga.	4.63	VHI	2
Reduced cost of production by promoting farm mechanization practices.	4.58	VHI	3
Increase profitability and productivity of rice farmers.	4.51	VHI	4
Reduced production cost of rice-farmer users by Php 2–3 per kilogram.	4.46	VHI	5
Improved farmer-cooperatives and associations livelihood in the province.	4.45	VHI	6
Rice farmers who availed services of farm machinery have reduced production cost and increased income.	4.44	VHI	7
Decreased post-production losses of rice farmers.	4.44	VHI	7
Increased average farmers-cooperatives and associations livelihood.	4.44	VHI	7
Improved farmers and cooperatives—recipients are well-informed, capacitated, and well-trained.	4.41	VHI	8
Reduced marketing cost through mechanization of processing and marketing facilities.	4.44	VHI	7
Improved global competitiveness of rice farmers in the different municipalities/city of Kalinga.	4.32	VHI	10
Reduced post-production losses by 3–5% using appropriate post-production technologies.	4.37	VHI	9
Sub-Area Mean	4.44	VHI	

Note: VHI = Very High Impact; HI = High Impact

Consolidated Summary Across RCEF Components

Table 10 presents the consolidated summary of all four RCEF program components across the four study dimensions. The Rice Farm Machinery and Equipment Program outperformed the other three components in

implementation (4.53), attainment (4.42), and impact (4.44)^[3], while exhibiting a slightly higher factor constraint score (2.64) relative to extension and seed programs, primarily attributable to postharvest infrastructure gaps^[6].

Table 10: Summary of All Four RCEF Component Programs on the Implementation, Attainment, Factors, and Impact

RCEF Component Program	Impl. Mean	Desc.	Attain. Mean	Desc.	Factors Mean	Desc.	Impact Mean	Desc.
Rice Farm Machinery and Equipment Program	4.53	VMI	4.42	VMA	2.64	MoA	4.44	VHI
Rice Extension Services Program	4.32	VMI	4.26	VMA	2.19	LA	4.32	VHI
Expanded Rice Credit Assistance Program	4.27	VMI	4.13	MA	2.62	MoA	4.07	HI
Rice Seed Development, Propagation, and Promotion Program	4.25	VMI	3.85	MA	2.24	LA	4.10	HI
Grand Mean	4.28	VMI	4.02	MA	2.39	LA	4.14	HI

Note: VMI = Very Much Implemented; VMA = Very Much Attained; MA = Much Attained; MoA = Moderately Affected; LA = Less Affected; VHI = Very High Impact; HI = High Impact

Conclusion

The RCEF Mechanization Program in Kalinga Province was effectively implemented from 2020 to 2024, with objectives very much attained (mean = 4.42) and very high farmer-reported impact (mean = 4.44). The program substantially reduced postharvest losses, lowered production costs, and improved rice competitiveness. Persistent challenges as notably insufficient mechanical dryers, milling equipment, and storage facilities moderately constrained implementation in some municipalities. Recommendations (1) additional procurement of rice dryers, reapers, tillers, and rice mills; (2) construction of multipurpose solar drying pavements; (3) intensified operator training on maintenance; and (4) establishment of local agricultural machinery fabrication facilities in Kalinga.

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