***Original Research Article***

**Cost and Return Analysis of Rice Farmers Growing Domestic and Export-Oriented Rice Varieties during the Monsoon and Summer Seasons in Nay Pyi Taw Union Territory, Myanmar**

**Abstract**

Rice is essential to the livelihoods of farmers in Myanmar. Rice producers experience varying benefits depending on their techniques and rice varieties. While summer rice yields are generally higher than those of monsoon rice, only a limited number of farmers cultivate summer rice. This paper aims to analyze the costs and returns associated with rice production among selected farmers, focusing on domestic and export-marketed rice varieties in Nay Pyi Taw. Data was collected in June 2024 through face-to-face questionnaires employing a purposive sampling method. Descriptive and cost and return analyses were used to achieve the research objectives. Of the 180 selected rice farmers, all grew in monsoon rice, but only 68 grew summer rice. During the monsoon season, all selected farmers grew ten domestic-marketed rice varieties (DMM) and seven export-marketed rice varieties (EMM) were grown. The 68 summer rice farmers grew four domestic marketed rice varieties (DMS) and five export-marketed rice varieties (EMS). The selected farmers allocated the largest share of average production to marketed surplus in both seasons. According to the benefit-cost ratios, the highest return was from EMS (2.24), followed by EMM (2.15), DMS (2.08) and DMM (1.99). Farmers growing EMS reported higher profits than those growing other varieties. Therefore, farmers are encouraged to expand summer rice cultivation. The public sector should support this increase by ensuring a sufficient supply of irrigation water, agricultural infrastructure and equipment. By enhancing summer rice cultivation, overall rice production can increase facilitate trade for both domestic consumption and the export market, and boost foreign income.

*Keywords: Benefit-cost ratios, Domestic marketed rice varieties, Exported-marketed rice varieties, Monsoon season, Rice production and Summer season*

1. Introduction

Rice is also a hugely important crop for the livelihoods of Myanmar’s farmers. Data from the 2017 national Myanmar Livelihood and Consumption Survey (MLCS) showed that 60% of the farm households nationwide grew paddy during the monsoon season (the major agricultural season) (UNDP, 2020). Myanmar rice production was maximum in 2011-2012 according to Ministry of Agriculture, Livestock and Irrigation. After that the rice production was decreasing. Especially in 2020-2021, the rice production was at a minimum level. After that the rice production was increased in 2021-2022 and 2022-2023. The rice production was increased up 27.51 million MT in 2022-2023 (MOALI, 2023).

Myanmar has been increasing its rice surplus and has been exporting varying quantities of rice each year (i.e. self-sufficient at the Union level). Regarding the liberalizing export policy through border trade and the formation of the rice specialization companies, rice export reached to 1.32 million MT in 2012-2013. After that, from 2017 to2018, the exports increased up 2.95 million MT, calling for the continuation of reforms to achieve the above export targets. However, the heavy flood in 2015-2016 negatively impacted the rice export Even though the export lagged behind the target, there are favorable market prospects to accommodate higher rice exports for Myanmar (MRF, 2023).

In 2020-2021, major varieties of paddy are Sinnthukha, Manawthukha, Ayeyarmin, Pawsanyin, Sinakayi-3, Meedone, Shwewarrtun, Hnannkarr, Sinthwelatt, Yatanartoe, Theehtetyin, 90-Days, Pakhanshwewar, Shwethweyin, Supernankauk, Hmawbi-2 and Yezinlonethwe (DOP, 2021). The most popular consumed and preferred rice varieties in Myanmar are Pawsan, Ayeyarmin and Manawthukha varieties (Theingi Myint *et al*., 2016). The main exported rice variety is Emata, a long-grain, slender, and translucent rice (World Bank, 2014). For the market potential, Pawsanhmwe, Lonethwehmwe, Zeeyar varieties are preferred by Middle East market, Inmayebaw is preferred by South East Asian market, Sinthwelatt is preferred by EU and Asian market (Khaing Khaing Htwe, 2019).

In Nay Pyi Taw Union Territory, the rice varieties that are mostly sown are Manawthukah, Sinthukha, 90-Days and Thai hnankauak varieties. Farmers have grown the first two varieties as monsoon crops and the others as summer crops. Manawthukah and Sinthukha varieties are high consumer preference on eating quality, high yield and marketable in domestic and 90-Days and Thai Hnankauak varieties are Emata group that is the main exported rice group (DOA, 2024).

The major problem in rice sector of Myanmar is marketing management along the value chain. In both domestic and export rice industries, price uncertainty can decrease market efficiency, response and productivity. The performance of participants in the rice value chain can influence the marketing efficiency. While the global rice price fluctuated, the domestic rice production cost in Myanmar increased annually. When the current international rice trade is highly competitive, Myanmar’s rice production depends on economic efficiency (World Bank, 2019).

Research comparing monsoon and summer paddy cultivation highlights that summer paddy, often requiring irrigation, can yield more per unit area due to longer sunshine hours, while monsoon paddy relies on rainfall (IFPRI, 2022). In the future, the importance of paddy cultivation may increase with increasing population. Therefore, it is necessary to extend summer paddy cultivated area to get high productivity (Win Pa Pa Myo *et al*., 2017).

According to Yee Mon Aung (2012), the benefit-cost ratios of broadcasting and transplanting methods were 1.69 and 1.79, respectively, for Shwewarhtun rice variety production; 1.89 and 1.95 respectively, for Manawthukha rice variety production, 1.65 and 1.81 respectively of Sinthiri, Thukhahtun and Baykyarlay rice varieties production and the benefit-cost ratio of broadcasting method was 1.61 of Shwetasope rice variety production. Moreover, the results presented benefit-cost ratios for rice production were 1.79 for the wet direct seeded rice (DSR) method, 1.74 for the dry DSR method, and 2.21 for the DSR method using drum seeder (Ei Thandar Lin, 2024). The benefit-cost ratios of rice production for broadcasting, transplanting and direct sowing methods were 1.74, 1.14 and 1.84, respectively, in monsoon season and 2.65, 1.30 and 2.71, respectively, in summer season (MOALI ,2023).

As a result, rice farmers experience varying levels of benefits depending on the sowing methods and rice varieties. Therefore, this paper’s objective was to analyze the cost and return of rice production by the selected rice farmers growing domestic and export-oriented rice varieties during the monsoon and summer seasons.

1. METHODOLOGY

In June 2024, primary data were collected from 180 rice farmers in the selected townships of Nay Pyi Taw Union Territory using the purposive sampling method. Descriptive and the cost and return analysis were used to achieve the study’s objectives. Descriptive statistics, including frequency and percentage, were used to analyze factors such as age, education levels, gender, farming experience, household size, household farm labor and farm size of the selected farmers. The cost and return analysis determined the profitability of various rice varieties in the study area on an average basis. These measurements were presented using the following equations:

**List 1 : Cost and Return Analysis**

|  |  |  |
| --- | --- | --- |
| **Factor** | **Unit** | **Formula** |
| Return above variable cost | MMK/hectare | TR - TVC |
| Return above variable cash cost | MMK/hectare | TR - TVCC |
| Return per unit of cash cost | Ratio | TR / TVCC |
| Benefit-cost ratio (BCR) | Ratio | TR / TVC |
| Break-even yield | MT/hectare | TVC / Average price per MT |
| Break-even price | MMK/MT | TVC / Average yield per hectare |

*Source: Olson, 2009*

Where, TR = Total revenue

TVC = Total variable cost

TVCC = Total variable cash cost

The relevant secondary information taken from official records of Ministry of Agriculture, Livestock and Irrigation (MOALI), Department of Planning (DOP), Department of Agriculture (DOA), Ministry of Commerce (MOC), Myanmar Rice Federation (MRF), library in Yezin Agricultural University and any other publications.

1. RESULTS AND DISCUSSION

## According to primary data, all 180 selected farmers were involved in monsoon rice production, but only 68 selected farmers were involved in summer rice production. Table 1 shows that the grouping of selected farmers was allocated based on the number of growing varieties during the monsoon season. According to this table, the total number of 206 farmers was based on the number of varieties growing in the monsoon season. And the total number of 71 farmers was based on the number of growing varieties in summer season. The detailed description was listeded in Table 2.

**Table1. Grouping of selected farmers who grew the domestic marketed (DM) and the export marketed (EM) based on rice varieties in Monsoon season, 2023**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Items** | **DMM farmers** | | | **EMM farmers** | | | **Total** | | |
| DMM group |  | 101 |  |  | 15 |  |  | 1161 |  |
| EMM group |  | 15 |  |  | 75 |  |  | 902 |  |
| **Total** |  | **116** |  |  | **90** |  |  | **206** |  |

Note: DMM group = Farmers who grew the domestic marketed rice varieties in monsoon season.

EMM group = Farmers who grew the export-marketed rice varieties in monsoon season.

1 describes - (88) farmers who grew one variety + (5) farmers who grew two varieties + (1) farmer who grew three varieties in domestic marketed rice varieties + (15) farmers who grew one each type of domestic marketed and export-marketed rice varieties.

2 describes - (67) farmers who grew one variety + (4) farmers who grew two varieties in export-marketed rice varieties + (15) farmers who grew one each type of domestic marketed and export-marketed rice varieties.

**Table 2. Grouping of selected farmers who grew the domestic marketed (DM) and the export marketed (EM) based on rice varieties in Summer season, 2023**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Items** | **DMS farmers** | | | **EMS farmers** | | | **Total** | | |
| DMS group |  | 6 |  |  |  |  |  | 61 |  |
| EMS group |  |  |  |  | 65 |  |  | 652 |  |
| **Total** |  | **6** |  |  | **65** |  |  | **71** |  |

Note: DMS group = Farmers who grew based on domestic marketed rice varieties in summer season.

EMS group = Farmers who grew based on export-marketed rice varieties in summer season.

1 describes - (6) farmers who grew only one variety in domestic marketed rice varieties.

2 describes - (59) farmers who grew one variety + (3) farmers who grew two varieties in export-marketed rice varieties.

**3.1 Rice varieties diversification by the selected monsoon rice farmers in the study area**

The farm households selected and grew the rice varieties based on the following reasons such as getting higher yield than other varieties, getting higher quality than other varieties, getting strong marketed demand than other varieties, resistance to pest and diseases than other varieties, higher weight than other varieties and other reasons (cultivating like farmers near the farm). Sinnthukha was the most popular variety in domestic marketed rice varieties as 44.83% and Thai Hnankauak was the most popular variety in export-marketed rice varieties as 47.78% among growing varieties by the selected monsoon rice farmers (Table 3). Therefore, this study was found that the most farmers commonly cultivated Sinnthukha and Thai Hnankauak varieties because these two varieties were getting higher yield than other varieties.

**Table 3. Most popular rice varieties in both markets of the selected monsoon rice farmers in 2023**

**(n=206)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **DMM rice varieties** | **Frequency** | | | **Percent** | |  | **EMM rice varieties** | | | **Frequency** | | **Percent** |
| Sinnthukha |  | 52 |  | 44.83 |  | Thai Hnankauak | | 43 | | | 47.78 | |
| Manawthukha |  | 28 |  | 24.14 |  | Byauttun | | 16 | | | 17.78 | |
| Ayeyarmin |  | 19 |  | 16.38 |  | GW-11 | | 15 | | | 16.67 | |
| Machando |  | 11 |  | 9.49 |  | Byautthukha | | 12 | | | 13.33 | |
| Shwewahwin |  | 1 |  | 0.86 |  | Yadanartoe | | 2 | | | 2.22 | |
| Shwewahhmwe |  | 1 |  | 0.86 |  | Palethwe | | 1 | | | 1.11 | |
| Thukha-1 |  | 1 |  | 0.86 |  | 90-Days | | 1 | | | 1.11 | |
| Basmati |  | 1 |  | 0.86 |  |  | |  | | |  | |
| Ayeyar Padaedar |  | 1 |  | 0.86 |  |  | |  | | |  | |
| Paw San |  | 1 |  | 0.86 |  |  | |  | | |  | |
| **Total** |  | **116** |  | **100.00** |  | **Total** | | | **90** | | **100.00** | |

Source: Own survey, 2024

**3.2 Rice varieties diversification by the selected summer rice farmers in the study area**

Machando and Shwewahwin were the most popular variety in domestic marketed rice varieties as 33.33% respectively and Thai Hnankauak was the most popular variety in export-marketed rice varieties as 73.85% among growing varieties by the selected summer rice farmers (Table 4). Therefore, this study was found that the most farmers commonly cultivated Machando, Shwewahwin and Thai Hnankauak varieties because these two varieties were getting strong marketed demand and getting higher yield than other varieties.

**Table 4. Most popular rice varieties in both markets of the selected summer rice farmers in 2023**

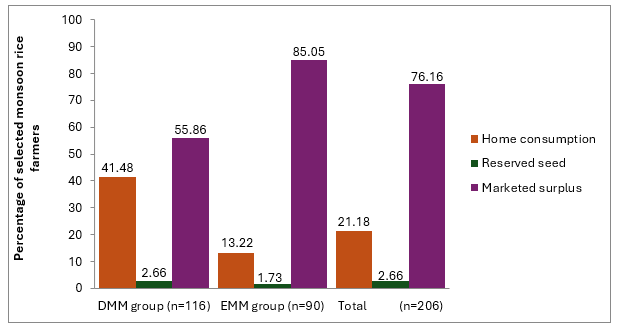
**(n=71)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **DMS rice varieties** | **Frequency** | | | | **Percent** | |  | **EMS rice varieties** | | | **Frequency** | | **Percent** | |
| Machando |  | 2 |  | | 33.33 |  | Thai Hnankauak | | 48 | | | 73.85 | |
| Shwewahwin |  | 2 |  | | 33.33 |  | GW-11 | | 6 | | | 9.23 | |
| Sinnthukha |  | 1 |  | | 16.67 |  | Palethwe | | 6 | | | 9.23 | |
| Shwethweyinn |  | 1 |  | | 16.67 |  | 90-Days | | 3 | | | 4.62 | |
|  |  |  |  |  | |  | Yadanartoe | | 2 | | | 3.07 | |
| **Total** |  | **6** |  | | **100.00** |  | **Total** | | | **65** | | **100.00** | | |

Source: Own survey, 2024

**3.3 Information of rice production and marketing by the selected monsoon rice farmers in the study area**

The percentage share of average production was used by DMM and EMM farmers were clearly illustrated in figure 1. The largest proportion of average production was used by 55.86% of DMM and 85.05% of EMM farmers in marketed surplus. The home consumption was the second largest proportion used for two groups of farmers, 41.48% of DMM and 13.22% of EMM farmers. The small portion share was found in reserved seed for two groups, 2.66% of DMM and 1.73% of EMM farmers. According to this table, the marketed surplus of EMM farmers was obviously higher than that of DMM farmers. Therefore, the export-marketed rice varieties were the variety which has the most supply among the monsoon rice farmers.

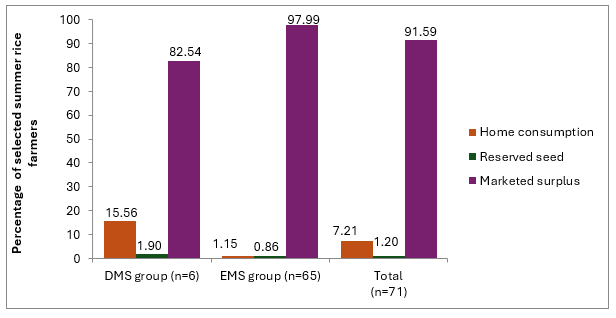


**Figure 1. Proportion of home consumption, reserved seed and marketed surplus based on average production of selected monsoon rice farmers in 2023**

Source: Own survey, 2024

**3.4 Information of rice production and marketing by the selected summer rice farmers in the study area**

The percentage share of average production was used by DMS and EMS farm households were clearly illustrated in figure 2. The largest proportion of average production was used by DMS farm households 82.54% and EMS farm households 97.99% in marketed surplus. The home consumption was the second largest proportion used for both group of farmers 15.56% of DMS and 2.19% of EMS. The small portion share was found in reserved seed for both groups 1.90% of DMS and 2.52% of EMS. According to this figures, the marketed surplus of EMS farmers were obviously higher than that of DMS farmers. Therefore, the export-marketed rice varieties were the variety which has the most supply among the summer rice farmers, similarly the monsoon rice farmers.



**Figure 2. Proportion of home consumption, reserved seed and marketed surplus based on average production of selected summer rice farmers in 2023**

Source: Own survey, 2024

1. **COST AND RETURN ANALYSIS**

**4.1 Economic analysis of rice production of the selected monsoon rice farmers in the study area**

Cost and return analysis of monsoon rice production was determined by enterprise budgeting. An enterprise budget is an estimate of the costs and returns associated with the production of a product or products-referred to as an enterprise (Smith *et al*., 2013). The different costs of rice production for the selected farmers in the study area were presented in Table 5.

The return above variable cost (or) gross margin were 2,008,369 MMK/ha in DMM and 2,214,490 MMK/ha in EMM. In addition, return above variable cash cost were 2,290,681 MMK/ha in DMM and 2,424,336 MMK/ha in EMM for selected farmers as presented in Table 5. Return per unit of capital invested and return per unit of cash expensed in the study area were presented in this table. Benefit-cost ratios were 1.99 in DMM and 2.15 in EMM. The findings indicated that EMM rice varieties production in the study area was profitable because farmers get back 1.15 MMK in EMM and 0.99 MMK in DMM if they invest a unit cash expense in rice production. The break-even yield was the yield that could cover the total variable cost at the current rice price, and the break-even price was the price that could cover the total variable cost at the current rice production. Yield and market price of rice production by selected farmers were 4.31 MT/ha and 991,916 MMK/MT in DMM and 4.92 MT/ha and 875,014 MMK/MT in EMM were presented in Table 5.

The break-even yield and break-even price of rice production by selected farmers were 2.08 MT/ha and 530,205 MMK/MT in DMM and 2.28 MT/ha and 429,717 MMK/MT in EMM. These findings indicated that even if the selected farmer’s yield was covered the total variable cost at the current rice price. Therefore, rice productions of the selected farmers in the study area were in a profitable position.

**Table 5. Enterprise budgets of rice production by the selected monsoon rice farmers in 2023**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Items** | **Units** | | **DMM (n=116)** | **EMM (n=90)** | | **Total (n=206)** | |
| Total revenue | MMK/ha | 4,249,641 | | | 4,284,946 | | 4,265,066 |
| Yield | MT/ha | 4.31 | | | 4.92 | | 4.58 |
| Price | MMK/MT | 991,916 | | | 875,014 | | 940,828 |
| Total variable cost | MMK/ha | 2,241,271 | | | 2,070,457 | | 2,128,312 |
| Total variable cash cost | MMK/ha | 1,958,959 | | | 1,860,611 | | 1,896,199 |
| Return above variable cost (or) Gross margin | MMK/ha | 2,008,369 | | | 2,214,490 | | 2,136,754 |
| Return above variable cash cost | MMK/ha | 2,290,681 | | | 2,424,336 | | 2,368,867 |
| Benefit-cost ratio (BCR) (TR/TVC) |  | 1.99 | | | 2.15 | | 2.10 |
| Return per unit of cash cost(TR/TVCC) |  | 2.31 | | | 2.43 | | 2.38 |
| Break-even yield | MT/ha | 2.08 | | | 2.28 | | 2.28 |
| Break-even price | MMK/MT | 530,205 | | | 429,717 | | 478,459 |

## Source: Own survey, 2024

**4.2 Economic analysis of rice production of the selected summer rice farmers in the study area**

The return above variable cost (or) gross margin were 2,417,397 MMK/ha in DMS and 2,550,408 MMK/ha in EMS. In addition, return above variable cash cost were 2,694,561 MMK/ha in DMS and 2,834,155 MMK/ha in EMS for selected farmers as presented in Table 6. Return per unit of capital invested and return per unit of cash expensed in the study area were presented in this table. Benefit-cost ratios were 2.08 in DMS and 2.24 in EMS. The findings indicated that EMS rice varieties production in the study area was profitable because farmers get back 1.24 MMK in EMS and 1.08 MMK in DMS if they invest a unit cash expense in rice production.

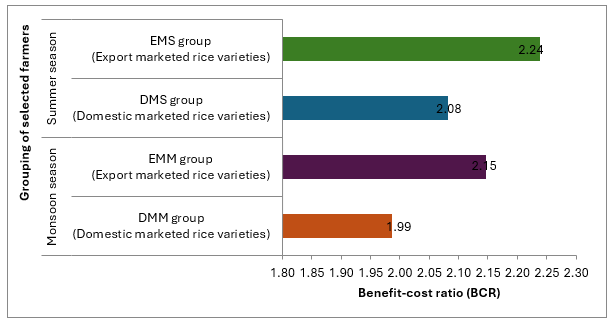
The break-even yield was the yield that could cover the total variable cost at the current rice price, and the break-even price was the price that could cover the total variable cost at the current rice production. Yield and market price of rice production by selected farmers were 4.82 MT/ha and 1,015,609 MMK/MT in DMS and 5.92 MT/ha and 872,089 MMK/MT in EMS were presented in Table 6. The break-even yield and break-even price of rice production by selected farmers were 2.43 MT/ha and 511,734 MMK/MT in DMS and 2.48 MT/ha and 414,473 MMK/MT in EMS. These findings indicated that even if the selected farmer’s yield was covered the total variable cost at the current rice price. Therefore, rice productions of the selected farmers in the study area were in a profitable position, similarly monsoon rice production.

As overall, the highest result of the benefit-cost ratio was the benefit from the rice production of export marketed rice varieties in summer (EMS). The second highest was the benefit from the rice production of export-marketed rice varieties in monsoon (EMM). Therefore, the benefit from the rice production of export-marketed rice varieties was higher than that of another varieties. And, according to growing season, there was also found that the benefit from the rice production in summer season was higher than that of another season. So, this result was found that the export-marketed rice varieties should be increased to produce more if there is enough for domestic consumption from the point of view of growing varieties and to expand the summer rice sown area and cultivated along with sufficient supply of irrigation water from the point of view of growing season. The results of benefit-cost ratio by group of selected farmers were shown in the following figure 3.

**Table 6. Enterprise budgets of rice production by the selected summer rice farmers in 2023**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Items** | **Units** | **DMS (n=6)** | **EMS (n=65)** | **Total (n=71)** |
| Total revenue | MMK/ha | 4,843,160 | 4,719,383 | 4,729,842 |
| Yield | MT/ha | 4.82 | 5.42 | 5.35 |
| Price | MMK/MT | 1,015,609 | 872,089 | 884,229 |
| Total variable cost | MMK/ha | 2,425,763 | 2,168,975 | 2,197,438 |
| Total variable cash cost | MMK/ha | 2,148,599 | 1,885,227 | 1,912,681 |
| Return above variable cost (or) Gross margin | MMK/ha | 2,417,397 | 2,550,408 | 2,532,404 |
| Return above variable cash cost | MMK/ha | 2,694,561 | 2,834,155 | 2,817,161 |
| Benefit cost ratio (BCR) (TR/TVC) |  | 2.08 | 2.24 | 2.22 |
| Return per unit of cash cost (TR/TVCC) |  | 2.42 | 2.62 | 2.60 |
| Break-even yield | MT/ha | 2.43 | 2.48 | 2.50 |
| Break-even price | MMK/MT | 511,734 | 414,473 | 423,996 |

Source: Own survey, 2024



**Figure 3. Benefit-cost ratio (BCR) of rice production by the selected farmers in the study area,2023**

Source: Own survey, 2024

## **CONCLUSION**

In the study area, most of the farmers grew ten domestic marketed rice varieties (DMM) and seven export-marketed rice varieties (EMM) in the monsoon season. Sinnthukha was the most popular variety in DMM, followed by Manawthukha, Ayeyarmin and Machando. Thai Hnankauak was the most popular variety in EMM,followed by Byauttun, GW-11 and Byautthukha. Thehe selected farmers grew four domestic marketed rice varieties (DMS) and five export-marketed rice varieties (EMS) during the summer season. Machando and Shwewahwin were the most popular varieties in DMS and Thai Hnankauak was the most popular variety in EMS, followed by GW-11, Palethwe, 90-Days and Yadanartoe.

According to the findings of the percentage share of average production, the largest proportion was in marketed surplus, followed by home consumption and reserved seed. Therefore, the most selected farmers were immediately sold after harvesting at farm gate.

In terms of gross margin in two seasons, the highest return was export-marketed rice varieties (EMS) and the second highest return was domestic marketed rice varieties (DMS) in summer season followed by export-marketed rice varieties (EMM) and domestic marketed rice varieties (DMM) in monsoon season. The benefit-cost ratios were 2.24 in EMS, 2.15 in EMM, 2.08 in DMS and 1.99 in DMM. In terms of profit, the selected farmers earned 1.24 MMK from EMS, 1.15 MMK from EMM, 1.08 MMK from DMS and 0.99 MMK from DMM. Therefore, EMS production was economically more attractive than other varieties production. And, the selected farmers who grew the EMS could earn a profit higher than farmers who grew other varieties.

The profitability of rice farmers is essential for improving their livelihoods. Therefore, the increased rice productivity should be encouraged especially rice production using export-marketed rice varieties for getting more profit. The farmers should cultivate more export-marketed rice varieties which have higher yield if they have enough for home consumption in summer season. To improve the agricultural sector, it is needed to formulate the relevant plan, strategies, policies, instructions and procedures according to the laws and regulations. The public sector should encourage the cultivation of export-marketed rice varieties in summer season with a sufficient supply of irrigation water, agricultural infrastructure and equipment because of labor scarcity at peak season. By enhancing summer rice cultivation, overall rice production can increase facilitate trade for both domestic consumption and the export market, and boost foreign income.

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