Yezin Agricultural University
Department of Agricultural Economics

Economic Analysis of Direct Seeded Rice Productions in Zeyarthiri Township, Nay Pyi Taw Union Territory

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Outline

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- Problem Statement
- Objectives
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Introduction

- Rice is a staple food for over half of the world 7.7 billion people (Bhandari, 2019)
- Important economic, social, political, and cultural commodity in most Asian countries
- About 90% of the total rice is produced in Asia
- Rice production is central to the economy and food security of Myanmar
- Rice is not only know as the main staple food but also as an important national crop
- Among the regions, Ayeyarwady, Sagaing, Bago, Mandalay, and Yangon are major rice grown areas (MOALI, 2021)

(Birhane, 2013)

Introduction (Contd.)

- Rice cultivation method was done in different ways in the world
- Common methods of cultivation - transplanting and direct seeding methods
- Direct seeded rice is a major yield declining factor and if managed well can help to increase yields by substantial level
- DSR method avoid transplanting shock
- DSR was 5-10% more than the yield of transplanted rice (Gangwar et al., 2008)

Introduction (Contd.)

- Farmers got 13% higher net economic return under wet or dry DSR than TPR (Chakraborty et al., 2017)
- Input and cost of cultivation, 13-16% labor saving in DSR as compared to manual puddled transplanted rice (Sahrawat et al., 2010)
- Benefit cost ratio was highest in DSR in zero till condition 1.74 as compared to TPR 1.62 (Kumar et al., 2015)
- Drum seeder methods, the highest BCR of 1.92 were obtained whereas TPR recorded BCR of 1.73

Problem Statement

- Appropriate agricultural practices have positive and sustainable impacts on rural farmers' livelihood and decision making activities
- Necessary to improve the production of rice in order to have sufficient domestic food consumption and foreign income
- Manual transplanting is the common method of rice cultivation but it is
  - too much laborious
  - slow and inefficient
  - time consuming and a lot of expenditure on raising
  - uprooting and transplanting of nursery (Rana et al., 2019)

Problem Statement (Contd.)

- In Myanmar, different DSR methods were cultivated nationwide area for long period
- In Nay Pyi Taw, rice is one of the major income earning crops for farmers, it is 79,334 ha of total rice sown area in 2022 (DOA, 2022)
- Farmers need to know the different costs and benefits of rice production by using three types of direct seeding methods in Nay Pyi Taw

Objectives

1. To conduct economic analysis and factor share of direct seeded rice production by selected farmers in Nay Pyi Taw Union Territory
2. To examine the reasons and constraints of the farmers for using direct seeded rice methods in the study areas

RESEARCH METHODOLOGY

Wet DSR

Dry DSR

DSR with Drum seeder

General Description of the Study Areas

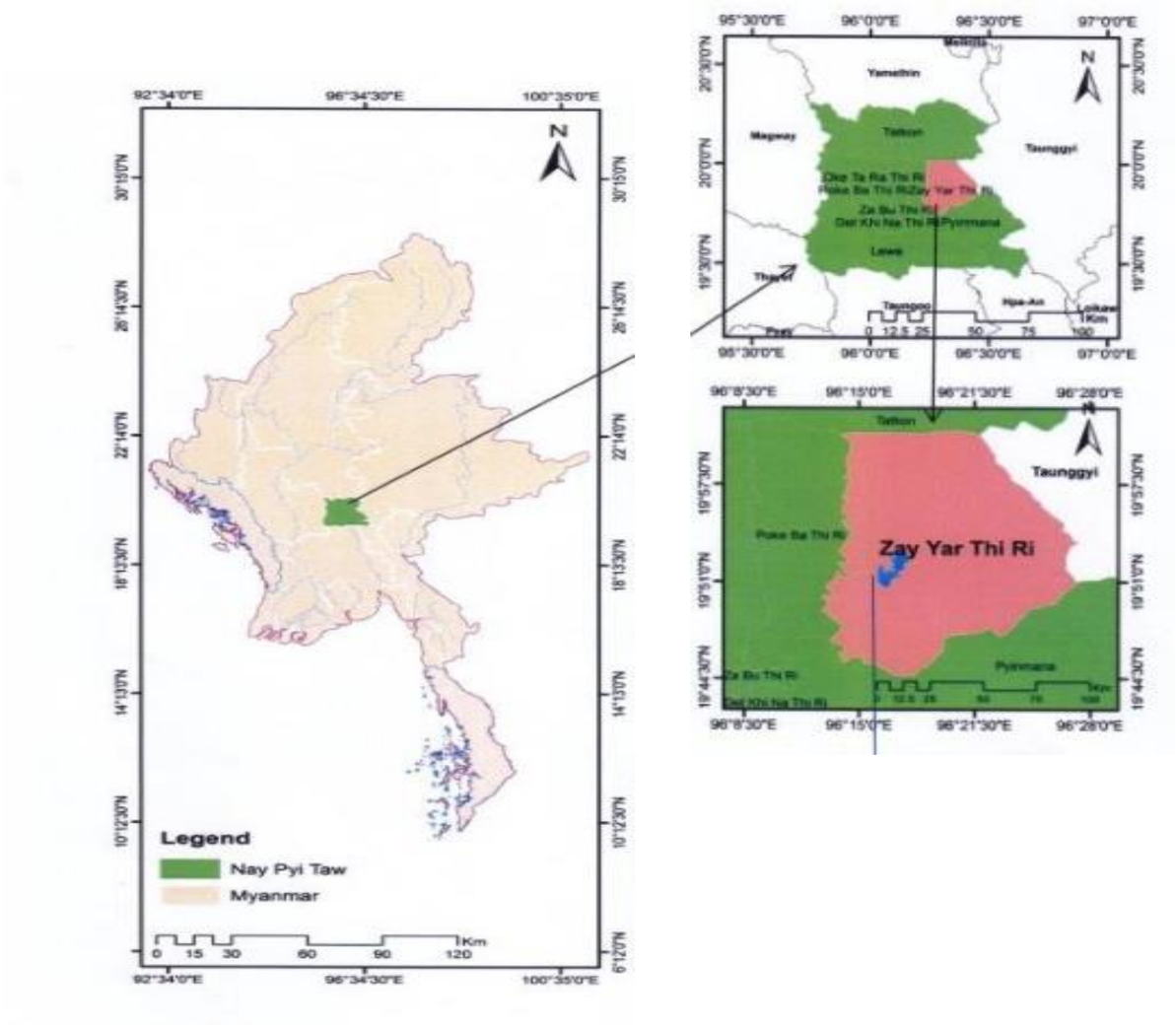
- Nay Pyi Taw is located between the Bago Yoma and Shan Yoma mountain ranges
- The city covers an area of 7,054 km^2 (2,724 sq miles) and had a population of 114 (′000) (GAD, 2022)
- Zeyarthiri Township was selected as a sample survey area in this study
- Research was conducted in Ma Au Taw, Kyun Yaung, Khit Aye village tracts in Zeyarthiri Township

General Description of the Study Areas (Contd.)

The reasons for choosing these areas were

- Zeyarthiri Township had total rice sown area 4,931 ha and utilized 4,882 ha as direct seeded area about 99.00% of total rice sown area (DOA, 2022)
- Yezin Agricultural University and Department of Agricultural Research are closely located to this area
- To save cost and time due to time limitation for research

Description of the Study Area



- Study Area - Zeyarthiri Township
- Location - N 19° 24' and E 96° 40'
- Area - 597 km^2
- Population - 114,816

(DOA, Zeyarthiri Township, 2023)

Figure 1. Map of the Zeyarthiri Township
Source: MIMU, 2019

Description of the Study Area

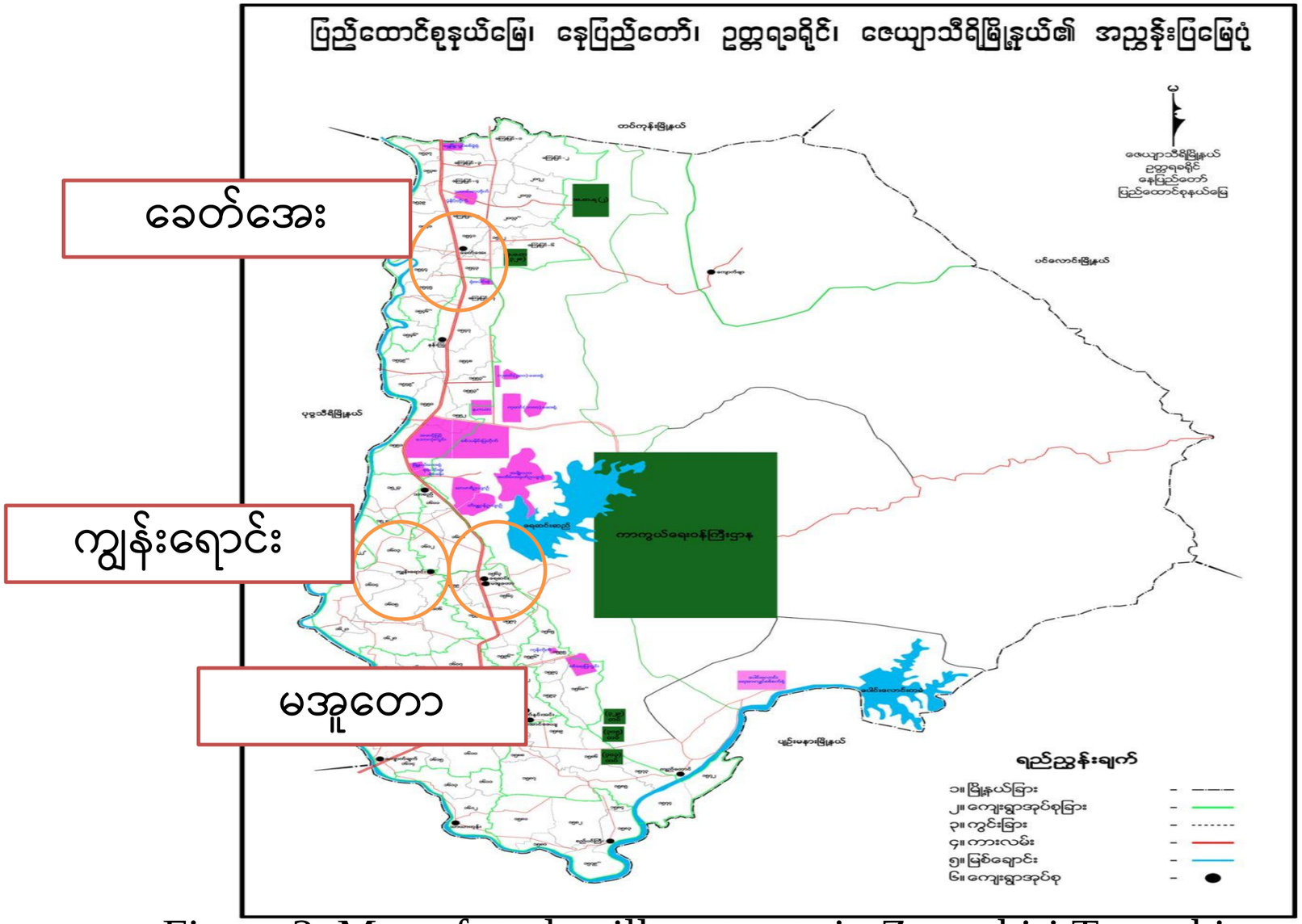


Figure 2. Map of study village tracts in Zeyarthiri Township

Source: DOA, Zeyarthiri Township, 2023

Table 1. Number of respondents in the study areas

No.	Village Tracts	Villages	No. of respondents
1	Ma Au Taw	Seinzabin, Ma Au Taw, Tantabin	18
2	Kyun Yaung	Kyun Yaung, Letha, Shwebe, Kyobinzeik	22
3	Khit Aye	Khit Aye, Inn Thar, Ma Yin Gyi	35
	Total		75

Data Collection and Sampling Method

- The sampled villages were selected by using purposive sampling method (DSR farmers only)
- The primary survey data - were taken from 75 farmers through structured questionnaire in August, 2023
- Age, education level, experience, household assets, livestock assets, mechanization assets, farm assets, family labor, hired labor, yield, resources used, input and output prices and transportation costs, etc.
- The secondary data sources were MOALI, IRRI, FAO, and other related publications

Method of Economic Analysis

Factor	Unit	How to calculate
Return above variable cost	MMK/ha	RAVC = TR-TVC
Return above variable cash cost	MMK/ha	RAVCC = TR-TVCC
Gross margin	MMK/ha	GM = TR-TVC
Benefit cost ratio		BCR = TR/TVC
Break-even yield	Ton/ha	TVC/Average market price per ton
Break-even price	MMK/ton	TVC/Average yield per hectare

Where;

TR = Total revenue

TVC = Total variable cost

TVCC = Total variable cash cost

Source: (Olson., 2003)

Method of Factor Share Analysis

Factor share of gross margin (%)	= Gross margin/Total revenue × 100
Factor share of interest cash cost (%)	= Interest cash cost/Total revenue × 100
Factor share of hired labor cost (%)	= Hired labor cost/Total revenue × 100
Factor share of family labor cost (%)	= Family labor cost/Total revenue × 100
Factor share of material cost (%)	= Material cost/Total revenue × 100
Total input share (%)	= Material cost + Labor cost + Interest cost
Farmers' farm income	= Gross margin + Family labor cost

Source:(IRRI,1991)

RESULTS AND DISCUSSION

Table 2. Demographic characteristics of sampled farm household heads in the study areas

Items	Unit	Average	Range
Age	Year	53.81	30 - 80
Farming experience	Year	27.65	4 - 64
Experience by using DSR method	Year	11.33	3 - 51
Experience by using previous transplanted method	Year	12.05	1 - 57
Household size	No.	4.76	1-10
Farm size (Lowland)	ha	2.05	0.5 - 12
Farm size (Upland)	ha	0.80	0 - 8

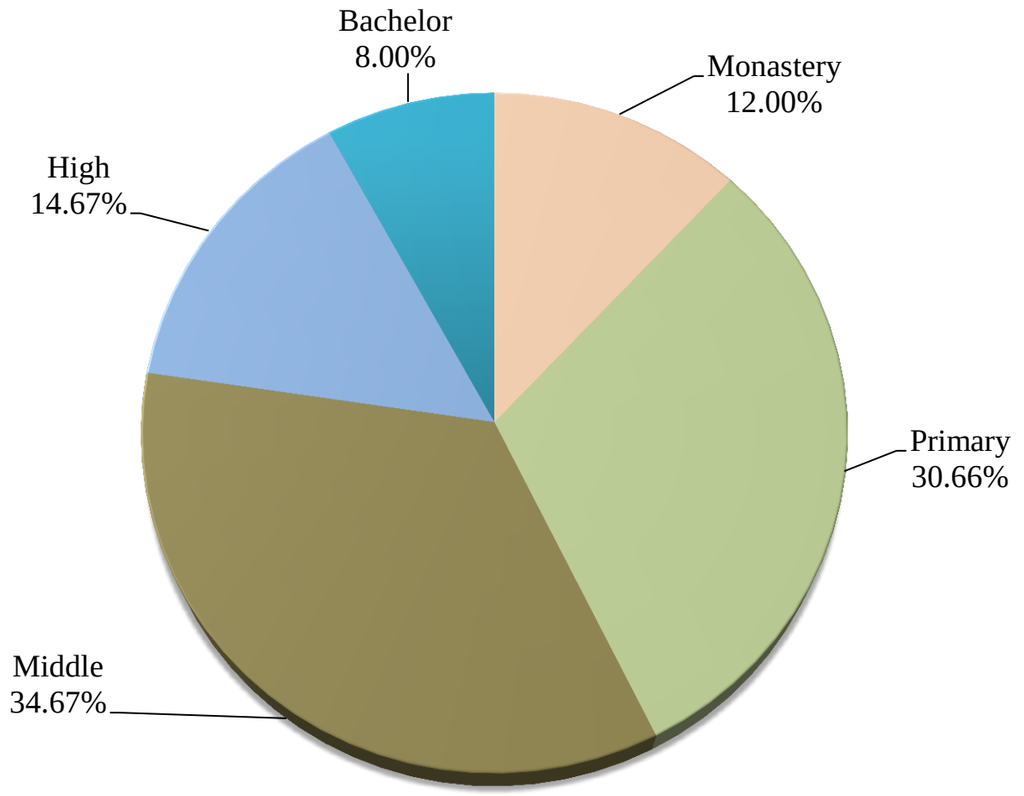


Figure 3. Education levels of sampled farm household heads (n=75)

Table 3. Farm assets of sampled farmers in the study areas

Items	Frequency	Percent
Hoe	72	96.00
Sickle	64	85.33
Sprayer (battery)	46	61.33
Sprayer	43	57.33
Plough/Harrow	36	48.00
Water pump	36	48.00
Bullock cart	35	46.66
Inter cultivator	10	13.33
Threshing machine	7	9.33
Hand tractor	6	8.00
Tractor	2	2.66
Combine harvester	1	1.33

For Objective 1

Economic analysis and factor share of direct seeded rice methods in the study area

Table 4. Descriptive statistics of output based on each sampled farmers

(n=75)

Variables	Unit	Wet DSR	Dry DSR	DSR with drum seeder
Yield				
Average	Ton/ha	4.07	4.00	4.49
Range	Ton/ha	2.47- 5.54	2.00 - 5.00	2.97 - 5.44
Price				
Average	′000 MMK/ton	637	610	832
Range	′000 MMK/ton	400 - 900	425 - 900	600 - 1,750

Table 5. Material costs of different DSR methods of rice production (n=75)

Items	Wet DSR	Dry DSR	DSR with drum seeder	Total DSR
	('000 MMK/ha)			
Seed	121	132	131	128
FYM	39	29	25	31
Urea	228	216	257	234
T-super	13	18	61	31
Potash	8	9	31	16
Compound	165	153	189	169
Gypsum	0.5	7	7	5
Lime	0.3	0	0.34	0.23
Compost	3	0	1	1
Herbicide	40	52	38	43
Pesticide	34	21	39	31
Foliar	16	12	15	14
Diesel	1	15	11	9
Others	16	4	17	13
Total material cost /ha	**690**	**673**	**830**	**731**

Table 6. Family labor costs of different DSR methods of rice production(n=75)

Items	Wet DSR	Dry DSR	DSR with drum seeder	Total DSR
	('000 MMK/ha)			
Ploughing	26	19	24	23
Harrowing	19	13	37	23
Levelling	1	1	13	5
Basal fertilizer application	7	5	5	6
Seed broadcasting	5	6	1	4
Fertilizer application	11	8	20	13
Weeding	7	14	5	9
Irrigation	25	18	24	23
Roughing	2	2	10	5
Pesticide application	6	5	10	7
Herbicide application	10	10	10	10
Transportation (home)	2	3	10	5
Drying	22	23	24	23
Storage	1	3	9	4
Total family labor cost /ha	**151**	**136**	**208**	**165**

Table 7. Hired labor costs of different DSR methods in the study areas(n=75)

Items	Wet DSR	Dry DSR	DSR with drum seeder	Total DSR
		(000 MMK/ha)		
Ploughing	118	103	103	109
Harrowing	75	87	88	84
Levelling	11	9	25	15
Basal fertilizer application	5	4	2	4
Seed broadcasting	8	9	42	19
Fertilizer application	10	9	4	7
Weeding	50	79	54	61
Irrigation	5	0.49	0	1
Roughing	7	9	18	12
Pesticide application	10	3	8	7
Herbicide application	10	10	4	8
Combined harvester	196	186	207	196
Threshing	0	0	4	1
Transportation (home)	25	17	13	17
Drying	19	19	13	17
Storage	9	2	13	8
Transportation (sell)	0	2	1	1
Total hired labor cost/ha	**562**	**554**	**607**	**576**

Table 8. Enterprise budget by using different DSR methods of rice production

Items	Unit	Wet DSR (n=25)	Dry DSR (n=25)	DSR with drum seeder (n=25)	Total DSR (n=75)
Total revenue	'000 MMK/ha	2,593	2,442	3,736	2,924
Total variable cost		1,442	1,401	1,690	1,513
Total variable cash cost		1,290	1,264	1,481	1,347
Return above variable cost		1,151	1,041	2,045	1,410
Return above variable cash cost		1,302	1,178	2,254	1,576
Gross margin		1,151	1,041	2,045	1,410
Benefit cost ratio		1.79	1.74	2.21	1.92
Break-even price	*MMK/ton	354	329	376	352
Break-even yield	Ton/ha	2.26	2.43	2.03	2.21

Note : *refers to ('000 MMK)

Table 9. Factor shares by using different DSR methods of rice productio

(n=75)

Variables	Factor share (%)			
	Wet DSR	Dry DSR	DSR with drum seeder	Total DSR
Total revenue	100.00	100.00	100.00	100.00
Factor Share (%)				
Gross margin	44.39	42.63	54.74	48.25
Interest on cash cost	1.45	1.51	1.16	1.34
Hired labor cost	21.70	22.70	16.27	19.72
Family labor cost	5.84	5.60	5.59	5.67
Material cost	26.62	27.57	22.24	25.02
Farmers' farm income	50.22	48.23	60.33	53.99

For Objective 2

The reasons and constraints of the selected farmers for using direct seeded rice methods in the study area

Table 10. Reasons for changing DSR methods of sampled farmers

(n=75)

No.	Items	Frequency	Percent
1	Lower cost than transplanting methods	57	76.00
2	Labor scarcity at peak season	24	32.00
3	Getting higher yield than transplanting methods	11	14.66
4	Not available irrigation water	9	12.00
5	Adaptation to climate change than transplanting methods	9	12.00
6	Time saving than transplanting methods	5	6.66
7	Easy to manage because of a little practices in DSR cultivation method	1	1.33
8	DSR by using drum seeder is suitable to produce rice seed	1	1.33
9	DSR by using drum seeder have fertilizer supporting	1	1.33

Table 11. General constraints in DSR methods faced by selected in Zeyarthiri Township

(n=75)

No.	Items	Frequency	Percent
1	Loss of seeds in the field	54	72.00
2	High price of fertilizers	50	66.66
3	Crop loss of over harvesting time due to limitation of hiring combined harvester	44	58.66
4	Labor scarcity at peak season	41	54.66
5	Limitation of quality seed availability	40	53.33
6	Poor germination rate of seed	37	49.33
7	Poor soil fertility	36	48.00
8	Weak extension service for production technologies	34	45.33
9	High fuel cost for irrigation	33	44.00
10	Not available of required agrochemicals in the market	31	41.33
11	Crop loss in the field due to weeds and pests	30	40.00
12	Constraint of available price information in time	20	26.66
13	Limitation for credit availability	20	26.66

Conclusion

- Majority of sample farmers were about 54 years with 28 years average farming experiences, middle school level, followed by primary school level
- Among three different DSR methods, the BCR of drum seeder is the highest
- The main reasons for changing DSR methods of sampled farmers were lower cost than transplanting methods (76.00%), labor scarcity at peak season (32.00%), not available irrigation water (12.00%), and apart from these reasons farmers are trying to adaptable for climate change (12.00%)
- On the other hand, they still had constraints in rice production, particularly the loss of seeds in the field (72.00%), the high price of fertilizers (66.66%), crop loss of over harvesting time due to limitation of hiring combined harvester (58.66%)

Recommendations

- Profitability of rice farming is essential for improving livelihoods
- DSR with drum seeder method should be encouraged for getting more profit
- To remedy the constraint of insufficient irrigated water, the availability of irrigated water sources for rice production should be provided
- Therefore, farmers decide to apply DSR methods in rice production
- DSR by using drum seeder should be used to rice production.
- To overcome these constraints, public sector should be aware and formulate the evidence based plan, strategies and policies

Thank You Very Much for Your Kind Attention