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Economics of Fertilizer Use for Economically Important Crops in Tatkon Township

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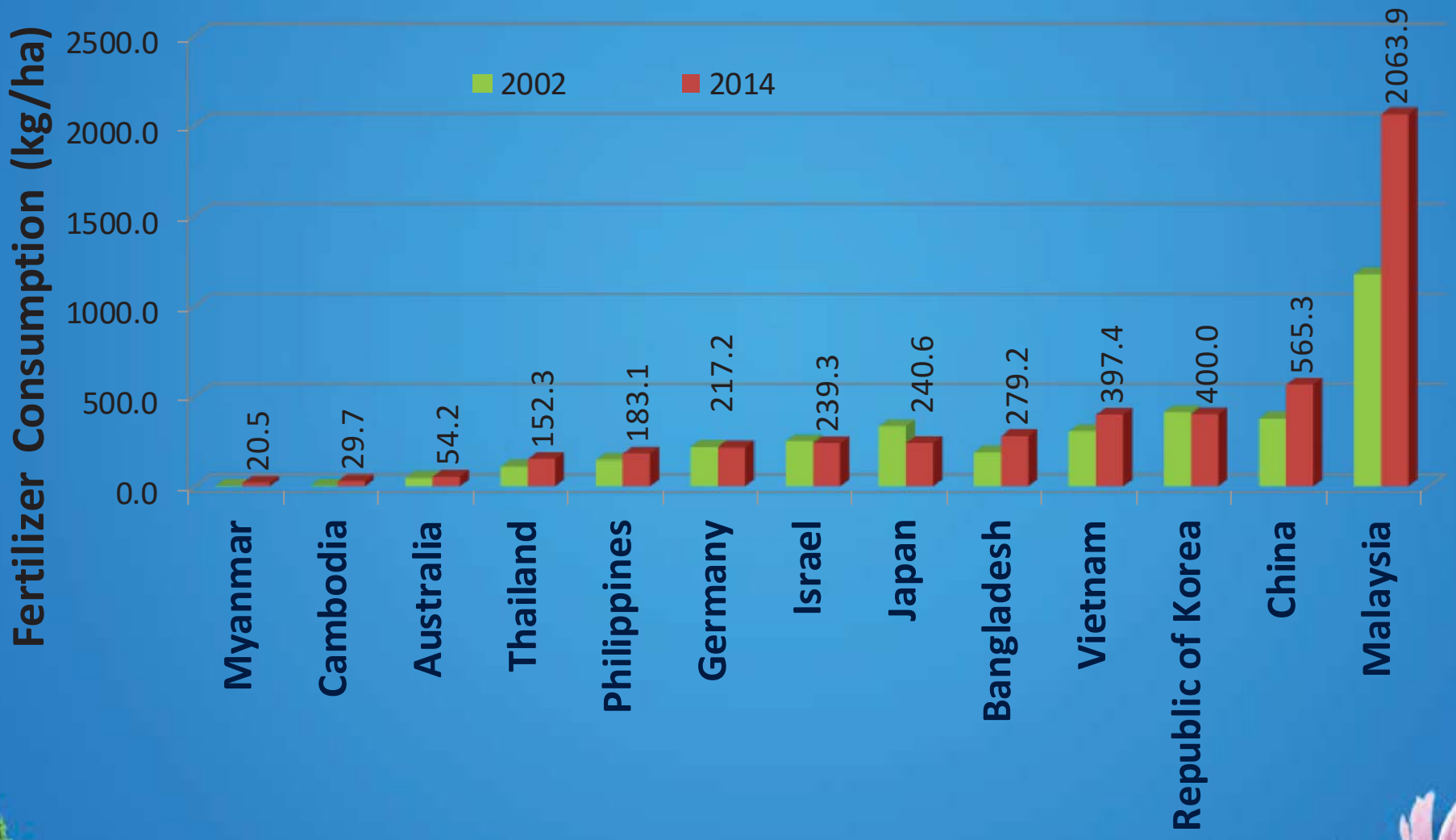
Introduction

- Myanmar has been probing for right drive of policy for vertical expansion of agricultural production for so long.
- Technology and investment in agriculture are generally recommended.
- Among agricultural technologies fertilizer technology is highly recommended one to get potential yield for crops.
- The word "*Fertilizer Jump*" has been cited as one of the policy drives during last government.
- Fertilizer is obviously the most expensive input for agriculture.
- The ultimate goal for farmers is to reap maximum profit with minimum cost.

Introduction …

- The costly inputs must be efficiently and optimally utilized.
- Research workers in agronomy and agricultural economics, recognizing the importance of economics of fertilizer use for crop production, began cooperating on research projects designed to estimate the most profitable rates of plant nutrients for different soils (Munson and Doll, 1959).

National Fertilizer Consumption



Source: http://data.worldbank.org/indicator/AG.CON.FERT.ZS

Fertilizer Use Efficiency

- Fertilizer use efficiency depends on physical and chemical properties of soil and fertilizer characteristics.
- To get maximum benefit from using fertilizers the correct choice of fertilizer from wide selection of different brands, and different chemical composition are required.
- Steward (2002) had made the long-term studies for 157 years of crop production.
- Yield = ***f*** (crop species and varieties, soil and climate conditions and use of agro chemicals and management practices)
- However some have estimated that nutrient inputs are responsible for between 30 - 50 percent of crop yield.

Role of Fertilizer in Crop Production

Fertilizer has a great impact on crop yields. But, poor management of fertilizer will result negative impacts on the environment and society.

Fertilizer use efficiency

Increased by

- using quality fertilizers
- slow release of nutrients
- use suitable rate
- split application

Depends upon

- agronomic
- economic
- environmental factors

Rationale of the Study

- Successive governments of Myanmar has favoured on **rice** for food security, agricultural development and for export promotion. And, as rice is our main staple food that its role will be remain important in future as well.
- **Pulses** came into picture of important and lead agricultural export crops since 1989 when the government adopted open-door economic policy in 1988.
- **Maize** also has an export market and private sector is well developed for maize supply chain and related industries.

Rice in Myanmar

- The stable food and the most cultivated crops
- Sown acre - 7.21 million ha
- Production - 28.21 million metric ton
- Yield - 3.97 MT/ha (MOALI, 2016)

Pulses in Myanmar

- Myanmar - the world's second largest exporter

  and the largest exporter in ASEAN

  - national production is mostly for export and

  important source of cash income and protein

- Green gram - sown acre - 1.21 million ha,

  production - 1.595 million metric ton

  yield - 1.32 MT/ha (MOALI, 2016)

- Profitability - higher than monsoon rice and black gram

  (LIFT, 2016)

Maize in Myanmar

- The second most important cereal after rice
- Important crop for animal feed not only for domestic livestock farms but also for export market
- Sown acre - 472 million ha
- Production - 1779 million metric ton
- Yield - 3.79 MT/ha (MOALI, 2016)

Figure 2 Nitrogen Use Efficiency of Asian Countries

Source; (LIFT, 2016)

OBJECTIVES

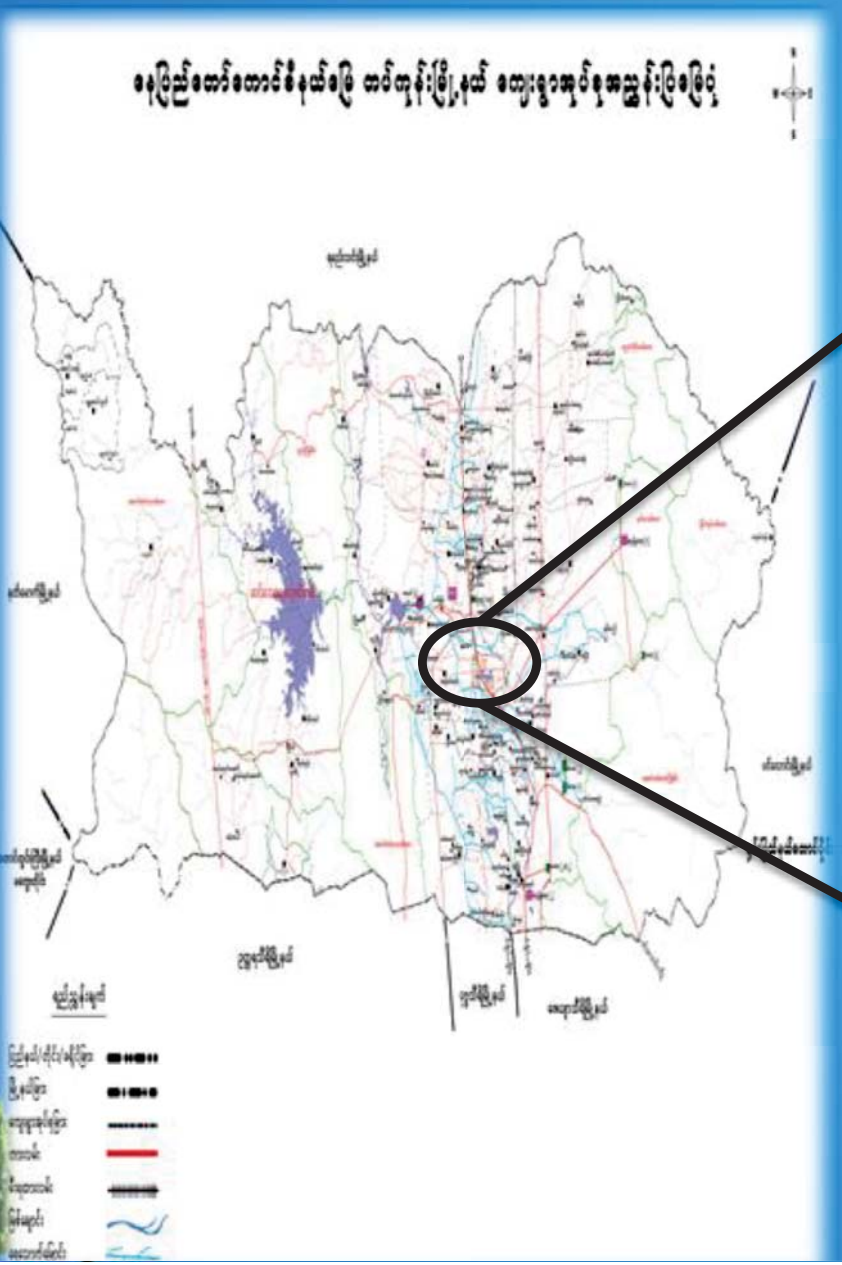
- To study socio-economic conditions of the sample farmers in the study area
- To evaluate economics returns of economically important crops in the study area
- To measure economics of nitrogen use of economically important crops
- To find the factors influencing on the yield of monsoon paddy in the study area

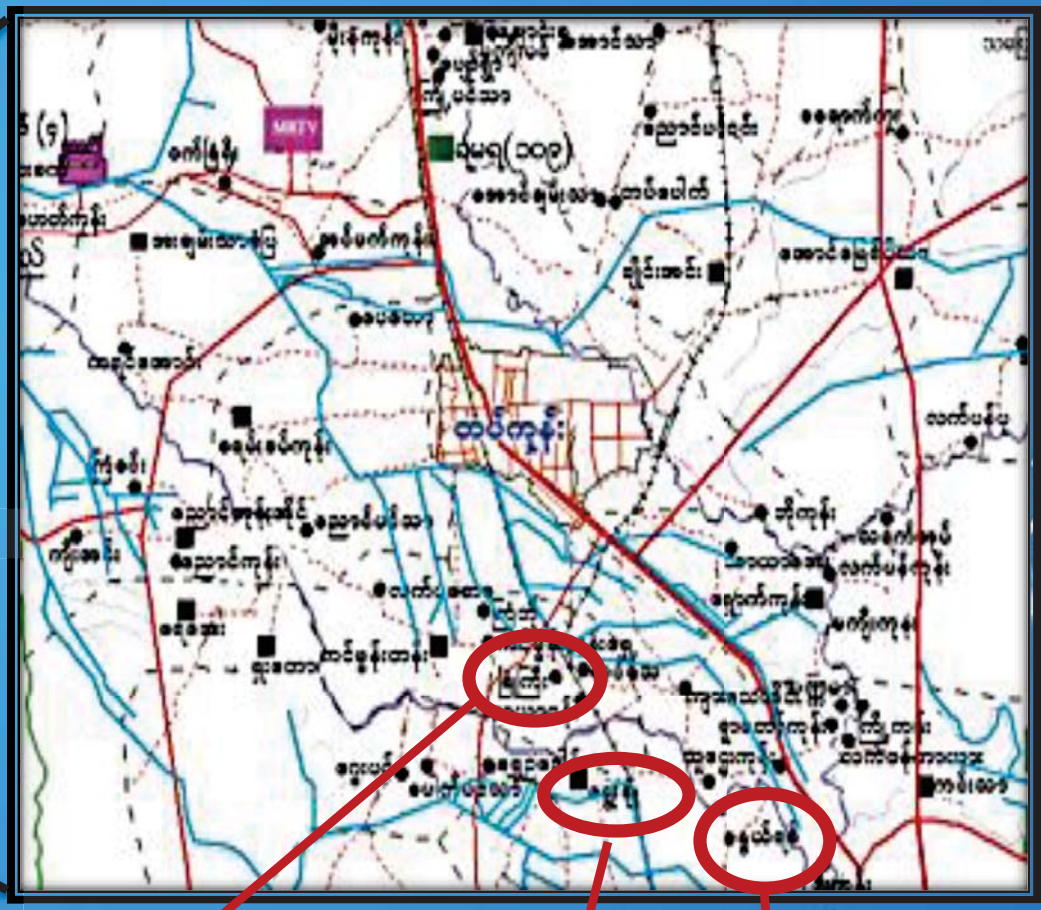
RESEARCH METHODOLOGY

Sampling Method and Data Collection

- ✓ Survey area (Chone Gyi, Yway Su and Nwel Yit village tracts)
- ✓ Primary data collection
  - -117 Sample farmers
  - - Structured questionnaire
  - - Simple random sampling
- ✓ Secondary data collection
  - - DOA, MOALI and other relevant documents
- ✓ Survey period - August 7, 2016

Map of the Study Area, Tatkon Township





Chone Gyi

Yway Su

Nwel Yit

Why Tatkon?

- One of the project areas of ACIAR:

(My Nutrient project ACIAR/SMCN/2014/044)

- Close to Yezin
- Grown various kinds of crops
- Major crops

→Rice (Staple crop)

→Pulses (No.1 export crop)

→Maize (High demand crop)

Table 1 Sown area, yield and production of selected crops in Tatkon Township (2015-2016)

Varieties	Sown area (ha)	Harvested area (ha)	Yield (MT/ha)	Production (MT/ha)
Rice (monsoon)	18,859.57	18,859.57	4.54	85,622.45
Rice (summer)	96.72	96.72	5.61	542.60
Green gram	22,120.19	22,120.19	1.43	31,631.87
Maize	1,258.20	1,258.20	4.92	6,190.34

Source: DOA, Tatkon

Table 2 General description of the study area

Village Name	Low land (ha)	Up land (ha)	Total HHs (No.)	Population (No.)	Farm HHs (No.)	Distance from town (km)
Chone Gyi	38.06	50.61	200	1,210	105	3.2
Yway Su	266.96	190.28	450	3,800	717	5.6
Nwel Yit	65.59	323.48	684	3,030	239	7.2

Source: DOA, Tatkon

Data Analysis Methods

Collected Primary data

- **Farmer's age, education level, family members, farm size, use of seed rate, yield of crops, cost of crop production per acre, rate of fertilizer application**

Data analysis methods

- **Descriptive analysis**
- **Cost and return analysis**
- **Measuring fertilizer use efficiency**
- **Multiple regression analysis**

For objective 2:
Estimating economics returns of crop production

Parameters	Unit	How calculated
Gross benefit (GB)	MMK/ha	Py*Y
Return above variable cost (RAVC)	MMK/ha	GB -TVC
Return per unit of capital (BCR)	MMK	GB/TVC
Break-even yield	kg/ha	TVC/Average price per kg
Break-even price	MMK/kg	TVC/Average yield per ha

For objective 3: Measuring of fertilizer use efficiency

- Fertilizer cost share (%) = $\frac{Total\ Cost\ of\ Fertilizer\ Used}{Total\ Cost\ of\ Production} \times 100$

- Partial factor productivity of N fertilizer

$$= \frac{Total\ production\ per\ acre\ (kg)}{Total\ Nitrogen\ used\ per\ acre\ (kg)}$$

- N fertilizer use efficiency (MMK/kg N)

$$= \frac{Value\ of\ Total\ Production}{Total\ N\ fertilizer\ use}$$

For objective 4: Multiple regression analysis

$$Yi = ß_0 + ß_i X_{1i} + ß_i X_{2i} + ß_i X_{3i} + \ldots + ß_i X_{8i} + \mu_i$$

where,

Y_i = yield (kg/ha)

X_{1i} = age of household head (yr)

X_{2i} = education level of household head (yr)

X_{3i} = farm size (ha)

X_{4i} = seed rate (kg)

X_{5i} = total no. of labor (md/ha)

X_{6i} = amount of N fertilizer (kg/ha)

X_{7i} = amount of P fertilizer (kg/ha)

X_{8i} = amount of K fertilizer (kg/ha)

RESULTS AND DISCUSSIONS

Results for objective 1

Socio-economic characteristics of sample farmers in the study area

Table 3 Demographic characteristics of sample HHHs

Item	Unit	Average	Minimum	Maximum	SD
Age	Year	49	22	78	11.71
Schooling year	Year	6	2	14	2.76
Farming experience	Year	24	2	59	12.22
Family size	No.	5	1	9	1.63
Farm family labor	No.	3	1	7	1.21
Farm size	ha	2.02	0.81	10.12	1.25

Land Utilization

Table 4 Sown area of sample farmers for economically important crops in Tatkon Township (2015-2016)

Crop	No. of farmer	Percent (%)	Sown Area (ha)		
			Average	Minimum	Maximum
Green gram	79	67.52	2.49	0.25	10
Monsoon paddy	73	62.39	2.65	0.25	10
Maize	22	18.80	1.44	0.10	3

Table 5 Enterprise budget for selected crops in Tatkon Township (2015-16)

Item	Maize N=22	Green Gram N=79	Paddy N=73
Yield (kg/ha)	4,431.45	878.06	4,058.7
Price (MMK/kg)	327	964	292
Gross benefits (Y*Py)	1,449,084	836,809	1,185,140
Total variable cost (MMK/ha)	731,610	496,828	772,855
Material Cost (MMK/ha)	233,325	140,739	317,010
Total Labor cost (MMK/ha)	471,637	337,738	419,043
Interest cost	26,648	18,351	30,731
Return above variable cost (GB-TVC)	717,475	339,981	418,356
Break Even Yield (kg/ha)	2,237.34	515.38	2,626.97
Break Even Price (MMK/kg)	165	572	189
Benefit Cost Ratio	1.96	1.68	1.55

Fertilizer use efficiency of selected crops

Table 6 Partial factor productivity of Nitrogen (PFP_N) and N fertilizer use efficiency (FUE_N)

Crops	Yield (kg/ha)	Price per yield (MMK/kg)	Total amount of N (kg/ha)	Partial factor productivity of Nitrogen	FUE (N) (MMK/kg)
Green gram	876.18	964	13.26	66.06	63,682
Maize	4,431.70	327	112.29	39.47	12,906
Rice	4,152.34	292	109.64	37.87	11,058

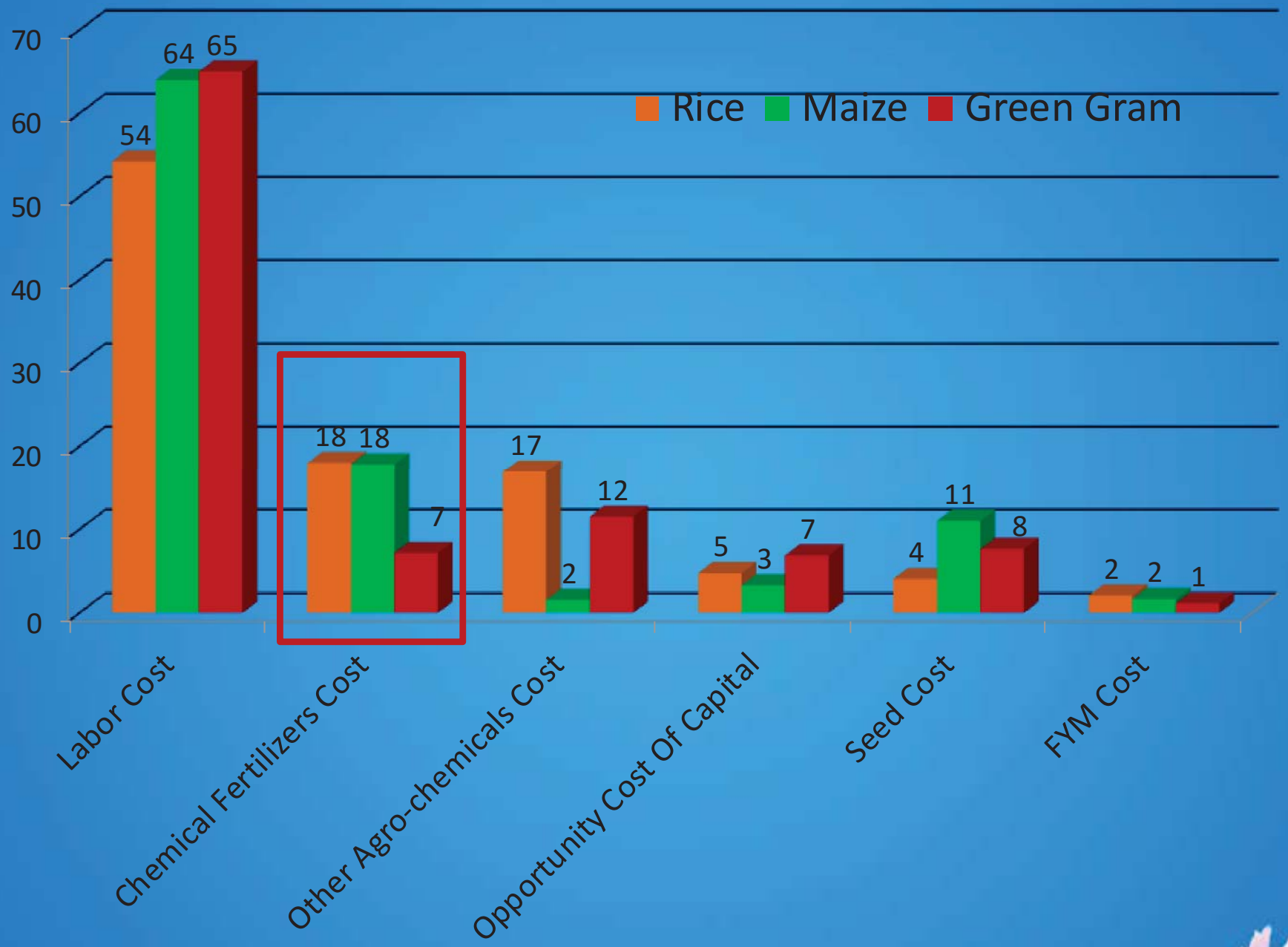


Figure 2 Cost Share in Rice, Maize and Green gram Crop Production in Tatkon Township (2015-16)

Production Function for Green Gram

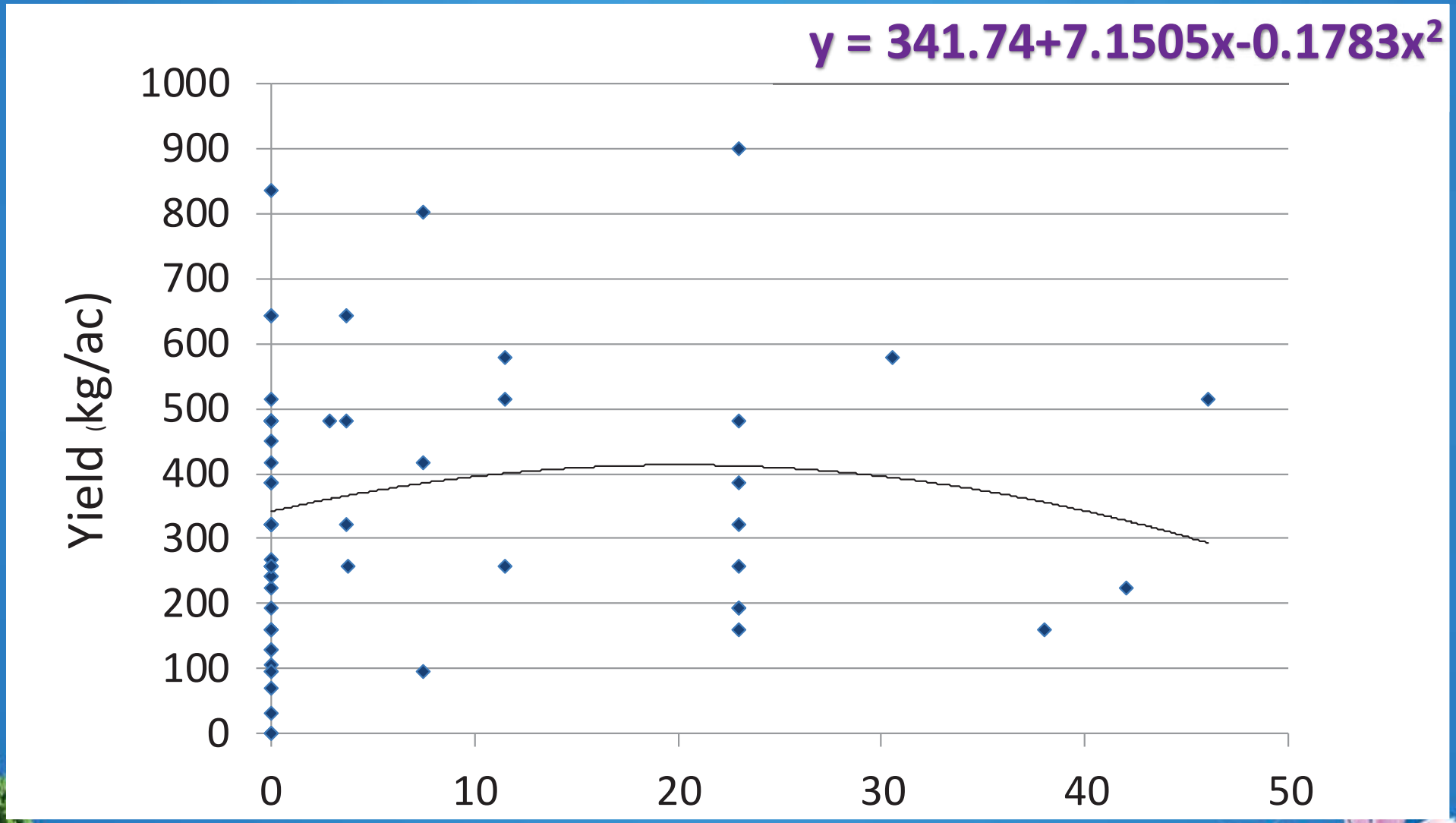


Table 9 Factors influencing on monsoon rice production of sample farmers in Tatkon Township (N=73)

Independent variables	Unit	Unstandardized Coefficients		t	Sig.
		B	Std. Error		
(Constant)		77.478***	13.156	5.889	.000
Education	Yrs	.143	.716	.200	.842
Farm size	ha	-.027	.599	-.045	.964
Seed rate	kg	-3.867**	1.791	-2.159	.035
Age	Yrs	-.066	.165	-.399	.691
Total labor	Manday	-.062	.137	-.452	.653
N fertilizer	kg	.348**	.137	2.544	.013
P fertilizer	kg	1.462	1.254	1.166	.248
K fertilizer	kg	-.864	.980	-.882	.381
R^2	0.219				

Note: *** significant at 1% level and ** is significant at 5% level

CONCLUSIONS

For Objective 1

- Average age of the sample farmers was 49 years, secondary education level and average farm size was 2.02 ha.

For Objective 2

- Maize was the most profitable crop and rice was the least profitable one.

For Objective 3

- N partial factor productivity was the highest in green gram production, followed by maize and rice.
- So, nitrogen use efficiency was also the highest in green gram production and the lowest in rice.

CONCLUSIONS

- Fertilizer cost share for rice production was the highest because most of the farmer apply chemical fertilizer in rice production.
- But, farmers usually grow pulses with the rest of nutrients left by rice. That's why fertilizer cost share in green gram was found to be the lowest with only 7%.
- Maize is known for heavy eater that fertilizer cost share for maize production was also found to be as high as that of rice.

CONCLUSIONS

For Objective 4

According to the results of multiple regression analysis,

- rice yield was negatively and significantly effected by seed rate at 5% level. So, farmers should use quality seeds to get higher yield.
- However, it was positively and significantly influenced by nitrogen fertilizer at 5% level.

Recommendation

- The farmers are encouraged to use more nitrogen fertilizer in rice production because higher yield can be obtained by using more amount of N fertilizer.
- The results suggested that farmers should apply more amount of N fertilizer in green gram production because nitrogen use efficiency for green gram was very high and majority of farmers still enjoying at the intercept yield level.
- Likewise, nitrogen fertilizer should be use efficiently and effectively in rice and maize production.

Thank You For Kind Attention

Your comments and suggestion are warmly welcome

Table 8 Fertilizer cost share

Crops	Total fertilizer cost (MMK/ha)	TVC/ha (MMK)	Fertilizer cost share (%)
Rice	138,961	772,855	**17.98**
Maize	129,736	731,610	17.73
Green gram	36,772	496,828	7.40