

Economic Performance of Agricultural Sector in the Selected Area of Nay Pyi Taw

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Abstract

In Myanmar, paddy crop is important not only for local food security but also for foreign exchange earning. Black gram is also a major export item. A survey was conducted in 4 villages of Pyinmana Township and the data were collected from 160 paddy-based triple cropping and double cropping farmers. According to this survey, farmers were facing increased labour cost, high inputs cost and low price received and these were major constraints for farmers. Their benefit and income were low due to soil fertility and disease problem, increasing production cost and low crops price. The study found that the average crop yield and benefit-cost ratio (BCR) of triple cropping farms was lower than those of double cropping farms. Farmers' household incomes in the study area were mainly from black gram. Soil fertility and disease problem became serious in monsoon paddy and black gram production for sustainable crop productivity. It was evident that the government's assistance of crops price guarantee has been crucial in order to achieve appropriate cost and benefit ratio.

Key words: double cropping, triple cropping, benefit - cost ratio.

1. Introduction

After adopting market-oriented economy, the degree of government control over on cropping and pricing and marketing decisions of farmers has diminished and the reforms undertaken have altered substantially.

Over the past decades, it was considered that the construction of dams and reservoirs throughout the country is a top priority in order to increase crop productivity in Myanmar. Total irrigated area had 0.54 million hectare before 1988 and increased to 1.14 million hectare in 2010. The net sown area has been increasing from 8.05 million hectare (19.9 million acre) in 1988/89 to 13.64 million hectare (33.69 million acre) in 2010/11 (DAP, MOAI, 2011). However, price received by farmers is still low while encouraging for increasing crop productivity.

Currently, price volatility of agricultural commodities becomes significant in the world. After the Asian financial crisis in 1997 and global financial crisis in 2008, food prices have been increasing gradually at international level and became an issue for food security and income of farmers, producers and exporters. It was considered that there has no direct effect of global financial crisis on Myanmar's agricultural sector. However, the exporters

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would receive less income in terms of domestic currency due to depreciation of U.S dollar and it affects the domestic food crops prices. Moreover, increasing the prices of agricultural inputs such as fertilizer price affects the crop yield and incomes of farmers. In parallel, availability of quality seeds and agricultural credit also became crucial for the farmers to improve their productivity and economic competency.

Currently, farmers sell agricultural products at farm gates to the local brokers, primary collectors and farmers receive only small marginal profit. Increased labour cost in sowing and harvesting time, and high inputs cost are major concerns of increasing agricultural production cost at farmers' level. Most farmers have been facing the limitation of financing for the farm. Most farmers, therefore, sell the products to local merchants, primary collectors and brokers with low price during harvesting time with immediate effect and sometimes sell the products in advance to pay credits for agricultural inputs used. Moreover, most farmers have limitation on market information for wholesale and export markets while merchants, exporters and brokers received the market information through commodities exchange centers (CEXCs). The paper is mainly aimed to analyze the benefit-cost ratio of major cultivated crops and to reveal the major constraints on crop production in the selected area of Nay Pyi Taw. The study was designed to collect the data from 160 sample farmers through the personal interview. The assessment focused on monsoon paddy-black gram farming system for 2010-2011 season and structured interviews were undertaken in January and February 2012. Pyinmana Township is currently one of the potential areas for paddy production in Nay Pyi Taw District and contributing local food sufficiency. Black gram production is the second largest area in their region and contributing higher income for farmers rather than paddy crop.

2. Brief Overview of Agricultural Performance in Myanmar

After 1988, with the introduction of market-oriented economic policy, the government control over cropping decisions was relaxed substantially, and still with the exception of summer paddy production on irrigated paddy land, farmers are now free to make own cropping decisions. In 1992/93, the government introduced summer paddy production and enhanced the irrigation facilities. Micro and macro dam and irrigation system/networks projects were implemented over the country. Due to this effort, cropping intensity has been increasing and irrigated area reached to 2.31 million hectare in 2011. Private exports of agricultural produce such as rice, corn and oilseeds have been permitted with certain intervention and control of the government from time to time over the past decade.

Policies conducive to the improvement of agriculture sector leading to the uplift of national economy are laid down by the Ministry of Agriculture and Irrigation. These policies are (1) to allow freedom of choice in agricultural production, (2) to expand agricultural land and to safeguard the rights of farmers, and (3) to encourage the participation of private sector in the commercial production of seasonal and perennial crops, and distribution farm machineries and other inputs.

Myanmar is rich in potential land, water and human resources for crop production, and the agriculture sector is crucial for accelerating the economic growth of the country. Agricultural sector is also supporting on other socio-economic development of the country, particularly on rural economy. Moreover, two-third of processing and manufacturing sector is agro-based and exports are dominated by agricultural products. The agriculture sector in Myanmar's economy is still important although share of GDP has been decreasing over the decade. According to Table (1), the share of agricultural sector in GDP was 52.1 per cent in 1997/98 and 29.5 per cent in 2010/11. Cultivated area of crops from 1995/96 to 2010/11 is shown in Table (2).

Due to its major reform measures on liberalization and market economy after 1988, Myanmar remains at top ten world rice exporters, and is a lead country of pulses producer and exporter among ASEAN member countries in 2009. According to FAO, Myanmar rice export was 0.82 million metric tons in 2009 and it was lower than other rice exporting countries although total harvested area and production of paddy was high. Paddy production of Myanmar and neighboring countries is shown in Table (3). Harvested area of black gram in Myanmar was 4,382 thousand hectare and production was 27,557 thousand metric tons after India. According to Table A.4, Myanmar is the largest exporter among ASEAN countries accounted for 2,734 thousand metric tons in 2009.

Table (1) Gross Domestic Product and Agricultural Output (Current Price)

Year	G.D.P (Kyat Million)	Agriculture (Kyat Million)	Share in GDP (%)
1997/98	1119509.2	583437.1	52.1
1998/99	1609775.6	841222.2	52.2
1999/00	2190319.7	1143169.5	52.2
2000/01	2552732.5	1245437.8	48.8
2001/02	3548472.2	1740174.2	49.0
2002/03	5625254.7	2717625.1	48.3
2003/04	7716616.2	3461961.9	44.9
2004/05	9078928.5	3714681.2	40.9
2005/06	12286765.4	4718474.3	38.4
2006/07	16852757.8	6068007.3	36.0
2007/08	23336112.7	8246217.0	35.3
2008/09	29227535.0	9235953.3	31.6
2009/10	33760927.9	9957062.0	29.5

Source: Myanmar Agricultural Statistics (1997/98-2009/10), CSO (2011)

Table (2) Total Cultivation Area of Different Crops (1995/96-2010/11)

Sr.	Crop Name	1995/96	2000/01	2005/06	2008/09	2009/10	2010/11
		(000' ha)					
1	Cereal Crops	6661	6946	8101	8776	8777	8779
2	Oil Crops	2091	2685	3059	3655	3748	3690
3	Pulses	2046	2934	3808	4277	4383	4501
4	Industrial Crops	710	882	952	1238	1260	1299
5	Culinary Crops	133	221	285	289	335	328
6	Other Crops	1243	1782	2550	4726	4860	4970
	Total Sown	12884	15450	18755	22926	22363	23567

Source: Myanmar Agriculture at A Glance (2011), Department of Agricultural Planning, Ministry of Agriculture and Irrigation

Table (3) Paddy Production in Myanmar and Neighbouring Countries (2009)

Country	Harvested Area (mil Ha)	Yield (kg/ha)	Production (mil MT)	Export (000' MT)
World	159	4,307	686	33,081
Asia	142	4,378	622	24,943
Myanmar	8	4,056	33	818
Thailand	10	2,963	32	9,196
Vietnam	7	5,223	39	4,558
Indonesia	12	4,895	60	1.2
Malaysia	0.6	3,586	2	0.2
Philippines	4	3,770	17	0.4
Lao PDR	0.8	3,546	3	-
Cambodia	3	2,746	7	2.6
China	29	6,556	193	1,325
Bangladesh	12	3,995	47	19
India	44	3,370	148	6,450

Source: Selected Indicators of Food and Agriculture Development in Asia and the Pacific Region, 1999-2009, FAORAP Publication 2010-2012

Table (4) Pulses Production in Myanmar and Neighbouring Countries (2009)

Country	Harvested Area (000' ha)	Yield (kg/ha)	Production (000' MT)	Export (000'MT)
World	71,807	856	61,498	12,006
Asia	34,933	789	27,557	2,734
Myanmar	4,382	1252	5,486	902
Thailand	223	866	193	66
Vietnam	338	754	255	0.7
Indonesia	312	1045	326	46
Philippines	77	804	62	0.03
Lao PDR	17	1052	18	-
Cambodia	46	846	39	-
Bangladesh	225	879	197	-
India	22,672	628	14,245	100

Source: Selected Indicators of Food and Agriculture Development in Asia and the Pacific Region, 1999-2009, FAORAP Publication 2010-2012

In Myanmar, paddy is major crop, and pulses and oil seed crops successively occupy the next largest area planted. Rice production has increased by 1.75 times between 1995/96 and 2010/11, and pulses production increased by 4.32 times at the same period. In Myanmar, black gram is commercial species of pulses and it is contributing the major income source for farmers because price of black gram per basket is higher than that of paddy per basket. Therefore, total sown area of black gram increased from 747 thousand hectares in 1995/96 to 1,055 thousand hectares in 2010/11. According to Table (5), black gram production also increased from 371 thousand metric tons in 1995/96 to 1,604 thousand metric tons in 2010/11.

Table A.5 Black Gram Sown Area, Yield and Production (1995/96 to 2010/11)

Year	Sown Area (^{'000} ha)	Harvested Area (^{'000} ha)	Yield (MT ha)	Production (^{'000} MT)
1995/96	747	473	0.78	371
2005/06	815	815	1.25	1021
2007/08	980	980	1.41	1381
2008/09	988	988	1.46	1446
2009/10	1023	1023	1.48	1509
2010/11	1055	1055	1.52	1604

Source: Myanmar Agriculture at a Glance (2011), Department of Agricultural Planning, Ministry of Agriculture and Irrigation

Cultivation of paddy was being implemented aiming to meet the total area of 8.3 million hectares in 2010/11. According to Table (6), total paddy sown area increased gradually from 6.14 million hectares in 1995/96 to 8.05 million hectares in 2010/11. Total production of paddy was 18.58 million metric tons in 1995/96 and reached to 32.57 million metric tons in 2010/11. Total sown area and production of paddy was increasing gradually during 1995/96 and 2010/11 and production increased in double. Average yield per acre was also targeted to reach 4.1 metric tons per ha. Average yield of paddy was 3.06 metric tons per hectare in 1995/96 and that of 4.07 metric tons per hectare in 2010/11.

Table (6) Paddy Production of Myanmar (1995/96 to 2010/11)

Year	Sown Area (mil ha)	Yield (mt/ha)	Production (mil MT)
1995/96	6.14	3.06	18.58
2000/01	6.36	3.13	21.32
2001/02	6.45	3.42	21.92
2002/03	6.49	3.42	21.81
2003/04	6.54	3.54	23.14
2004/05	6.86	3.64	24.75
2005/06	7.39	3.75	27.68
2006/07	8.12	3.83	30.92
2007/08	8.09	3.93	31.45
2008/09	8.09	4.03	32.57
2009/10	8.07	4.06	32.68
2010/11	8.05	4.07	32.57

Source: Myanmar Agriculture at a Glance (2011), Department of Agricultural Planning, Ministry of Agriculture and Irrigation

Cropping systems and patterns vary according to agro-climatic conditions. Paddy-paddy or paddy-pulses-paddy patterns are mostly practiced in the irrigated areas. In the dry zones and other upland rainfed areas, the mixed cropping or intercropping of pigeon pea with sesame or peanut or other pulse patterns are practiced. In central dryzone, sunflower is also growing as an oilseed crop and as a intercropping and mixcropping in some area. In mountain or hilly region grows upland paddy, maize, millet, oil crops, and pulses. Many farmers in these area still practising shifting cultivation. Fruit crops and vegetables are grown throughout Myanmar all-year-round.

There are two seasons for growing paddy: monsoon season and summer season. Monsoon paddy is usually rainfed in lower Myanmar and Rakhine State. Similarly, the upland paddy in Chin, Kachin and Shan States are also rainfed. However, monsoon paddy is grown under irrigation in Sagaing, Mandalay and Magwe Divisions, and in other irrigated area. Summer paddy in Myanmar is grown in irrigated area. In the delta region of lower Myanmar, water from the rivers and creeks can be irrigated gravitationally when the tide is high, and by pumps in some areas.

Among the States and Regions, Chin State and Kayar State were the lowest paddy cultivated area and represented 0.70 per cent and 0.56 per cent respectively of the union total. Ayeyarwady, Bago and Sagaing Regions were the largest paddy cultivated area and represented 25.13 per cent, 17.27 per cent and 11.53 per cent respectively of the union total. Ayeyarwady Region contributed highest paddy production accounted for 26.45 per cent and followed by Bago Region (16.95 per cent) and Sagaing Region (12.61 per cent) respectively. Paddy cultivation of States and Region in 2010/11 is shown in Table (7).

Table (7) Paddy Cultivation of States and Regions (2010/11)

Sr.	State/Region	Total Area (%)	Harvested Area (%)	Average Yield (Bsk/ac)	Production (%)
1	Kachin	3.32	3.33	71.22	3.00
2	Kayar	0.56	0.57	67.77	0.49
3	Kayin	3.42	3.43	69.70	3.03
4	Chin	0.70	0.70	44.66	0.40
5	Sagaing	11.53	11.57	86.01	12.61
6	Tanintharyi	1.87	1.88	70.09	1.67
7	Bago (East)	9.93	9.97	77.57	9.81
8	Bago (West)	7.34	7.37	76.35	7.14
9	Magway	5.30	5.31	84.47	5.69
10	Mandalay	4.85	4.87	86.34	5.33
11	Mon	5.06	5.09	72.50	4.68
12	Rakhine	6.22	5.85	72.58	5.38
13	Yangon	7.01	7.04	70.98	6.33
14	Shan (South)	3.21	3.22	69.10	2.82
15	Shan (North)	2.46	2.47	98.90	3.10
16	Shan (East)	2.08	2.09	77.98	2.07
17	Ayeyarwady	25.13	25.25	82.64	26.45
Union Total		100	100	78.87	100

Source: Myanmar Agriculture in Brief (2011), Department of Agricultural Planning, Ministry of Agriculture and Irrigation

Myanmar has not received any significant official development assistance for nearly two decades and it has been experiencing a serious investment gap in the rural economy. National investments in agriculture and its sub-sectors have been limited by a scarcity of domestic resources and have not always been based on solid feasibility work or underpinned

by necessary policy changes. The result has been low productivity growth and increasing rural poverty in many rural areas (CFSAM, MOAI and FAO/WFP, 2009).

The production of adequate quantities of fertilizer is an important factor in Myanmar's agriculture, as there is a declining rate of fertilizer application. Distribution of farm inputs like chemical fertilizers, pesticides and quality seeds that were formerly handled solely by the Department of Agriculture (DOA) formerly Myanma Agriculture Service (MAS) is being dramatically transferred to the private sector, while subsidies on farm inputs are being removed. However, lack of sufficient incentives, lack of credit and inappropriate technical support services constrain farmers' ability to use the optimum level of fertilizer. The private sector was permitted to import and distribute fertilizer, but its ability to do so is constrained by the requirement of a distribution network, prevailing import and export regulations and insufficiency of foreign exchange.

Furthermore, the provision of quality seeds is necessary to increase yields, and policies on seed production need to be reviewed. The use of chemical fertilizers in Myanmar was relatively low at farmer level, compared to ASEAN countries. Table (8) shows the fertilizer consumption of ASEAN countries and Myanmar. According to this, Malaysia was the highest mineral fertilizer consumption per hectare in 2005 while the lowest mineral fertilizer consumption was found in Cambodia. Myanmar used 0.2 kg per hectare of mineral fertilizer in 2005.

Table (8) Mineral Fertilizer Consumption Per Hectare of ASEAN Countries

No	Country	Unit: kg Plant nutrient/ha				
		1995	2002	2003	2004	2005
1	Cambodia	2.6	5.6	3.7	5.2	0
2	Indonesia	83.2	89.9	79.2	100.6	94.1
3	Malaysia	143.6	156.9	174.6	233.0	200.1
4	Myanmar	17.8	1.5	2.0	0.7	0.2
5	Philippines	60.4	67.5	87.7	88.7	76.0
6	Thailand	73.8	87.8	128.2	113.6	97.5

Source: FAO (2007)

Urea and other fertilizer are imported commodity in Myanmar. The domestic prices of fertilizers were increasing in both Yangon and Mandalay markets. Therefore, the use of fertilizer has been decreasing in Myanmar over the decade. Table (9) shows the domestic prices of fertilizers in Yangon and Mandalay.

**Table (9) Average Price of Fertilizers in Yangon and Mandalay Markets
(2010-2011)**

(Kyats/50kg bag)

Items	2010		2011	
	Yangon (Kyat)	Mandalay (Kyat)	Yangon (Kyat)	Mandalay (Kyat)
Urea fertilizer -from China (46%)	19271	18493	21776	20464
Potash fertilizer Potash (red)	23789	24959	23789	26000
T-super fertilizer				
(1)GTSP (46%)	19446	18752	25051	24466
(2)GSSP (16%)	9135	8369	10602	10120
(3)GSSP (12%)	8372	9033	10838	9429
Compound fertilizer				
(1)Armo(16:16:8:13)	35487	16:16;8:13	35146	36843
(2)Armo(15:15:15)	40063	15:15:15	40109	41076
(3)Armo(10:10:5)	14238	10:10:5	14275	NA
(4)Golden lion(16:16:8)	25700	15:7:8	NA	19239
(5)Golden Lion (15:7:8)	21900	10:10:5	21743	17138
(6)Golden Lion (10:10:5)	18137	16:16:8	18264	24209

Source: Market Information Service, DAP (monthly data) NA= Not Available

The Myanmar Agricultural Development Bank (MADB) is a state-owned bank established in 1953 as the State Agricultural Bank. Between 1970 and 1975, it became the Agricultural Finance Division of a pooled monolithic system called the People's Bank and was reconstituted in 1976 as the Myanmar Agricultural Bank. It became the MADB in 1990 and was under the Myanmar Agricultural and Rural Development Bank Law, which did not adhere to the Myanmar Companies Act.

There are loan portfolios consisting of three types of loans: (1) a seasonal crop production loan (e.g. paddy 5000 - 8000 ks/ac. 2,0000 ks/ac and later on 40,000 ks/ac commencing 2011), (2) a farm development and investment loan, and (3) a border area development loan available from the MADB. Seasonal crop production loans are given for one year, covering three separate seasons for the cultivation of the following main crops: paddy, groundnut, sesame, mustard, maize, peas and beans, sugarcane, jute and long staple cotton.

The loans for farm development and investment are given for short- term periods up to 4 years and long term periods from 5 to 20 years. The loans for border area developments deal with the substitution and eradication of poppy plantations and to improve the living standards of ethnic nationals in remote border areas. However, the MADB is facing difficult issues with insufficiency of funds to meet the demand for agricultural credit, mismatches in the funding-lending structure and geographical constraints. Currently, the MADB remains the main source of institutional credit for small-scale farmers in terms of proportion, coverage and accessibility. Loan for paddy and pulses of private sector through leading companies was started in 2009 and contributing the needs of farmers in potential area. Loan of private sector could not cover the requirement and had some financial limitation.

Research and Development (R & D) is very important for agriculture development. Department of Agricultural Research (DAR) was reformed as a specialized institute of MOAI in 2004 from the previous institute (Agricultural Research Institute-ARI) under Myanmar Agriculture Service (MAS) of MOAI.

Although the government urged for the development of R & D activities, it was allowed 0.70 per cent of its budget for R & D and it was quite low compared to other agricultural activities such as irrigation (39.54 per cent), farm mechanization (8.63 per cent) and industrial crops (20.72 per cent), MAS's (now DOA) agricultural extension and state-owned farms (10.45 per cent) and policy and planning (0.39 per cent). Budget sharing of different activity of MOAI can be seen in Table (10).

Table (10) Expenditure in Agricultural Sector (2010/11)

Sr.	Title	Expenditure (%)
1.	Minister's Office	0.07
2.	Department of Agricultural Planning	0.39
3.	Irrigation Department	39.54
4.	Myanmar Agriculture Service	10.45
5.	Water Resource Utilization Department	5.28
6.	Myanma Industrial Development Enterprise	20.72
7.	Settlement Land Records Department	3.54
8.	Survey Department	0.45
9.	Yezin Agricultural University	0.68
10.	Myanma Agricultural Development Bank	9.54
11.	Agricultural Mechanization Department	8.63
12	Department of Agricultural Research	0.70

Source: Ministry of Agriculture and Irrigation, Annual Budget Report (2010)

As the availability of adequate water for agriculture is critical factor and remains crucial in enhancing crop productivity, the government accordingly made concerted efforts to construct large, medium and small scale dams and irrigation systems by using large investment. Apart from such established programs, sinking tube-wells, developing artesian wells, using pumps on rivers, streams and lakes, and blockage of streams and creeks, provide sufficient irrigation water for increased yields and cropping intensity.

The potential water resource is 1,576.6 cubic km and less than 10 per cent of the total water resources are annually utilized. Since 1988, following dramatic economic changes, the Government has made continuous efforts in the construction of dams, reservoirs and pump irrigation facilities throughout the country. Total irrigated lands have increased from 1.87 million hectares in 2002/03 to 2.31 million hectares in 2010/11, after the completion of 235 irrigation projects, 307 pumping stations and 7,578 tube wells. The percentage of total irrigable land has reached 17.1 per cent and 16.6 per cent of the total net sown area in 2008/09 and 2010/11 respectively compared to 12.6 per cent in 1988/89. The annual increment of irrigated area could be observed in Table (11).

Table (11) Sown Area under Irrigation (2001/02-2010/11)

Year	Net Sown Area (mil.ha)	Irrigated Area (mil.ha)	Per cent (%)
2001/02	10.65	1.99	18.6
2002/03	10.82	1.87	17.3
2003/04	11.04	1.96	17.7
2004/05	11.41	1.93	16.9
2005/06	11.94	2.14	17.9
2006/07	12.61	2.24	17.8
2007/08	13.22	2.22	16.8
2008/09	13.49	2.28	16.9
2009/10	13.64	2.33	17.1
2010/11	13.75	2.31	16.8

Source: Myanmar Agriculture at A Glance (2011), DAP, MOAI

Before the adoption of the new rice trade policy in 2003, the Myanmar Agricultural Produce Trading (MAPT) coordinated with local regional authorities to convince farmers to meet their obligations to the MAPT. The MAPT had to undertake the process of milling, packaging, storing and distributing rice for target groups with subsidized prices and organize the export of surplus rice as well.

Rice constitutes an important source of foreign exchange in Myanmar. The country exported approximately one million metric tons of rice in 1994/95, but this quantity greatly declined in 2000/01. In 2001/02, rice exports rose again to almost one million metric tons and gradually declined during 2002/03 and 2006/07, mainly due to prioritized on domestic consumption and increasing export limitations. According to Table (12), rice export increased in 2008/09 accounted for 0.71 million metric tons and reached to 0.90 million metric tons in 2009/10. Rice export decreased to 0.54 million metric tons in 2010/11.

Table (12) Rice Production and Export of Myanmar (1995/96 to 2010/11)

Year	Production (mil MT)	Rice export (mil MT)	Value (USD million)
1995/96	18.58	0.35	71.21
2000/01	21.32	0.19	26.17
2001/02	21.92	0.84	104.55
2002/03	21.81	0.63	86.74
2003/04	23.14	0.11	15.26
2004/05	24.75	0.18	33.04
2005/06	27.68	0.17	36.03
2006/07	30.92	0.02	3.05
2007/08	31.45	0.36	104.64
2008/09	32.57	0.71	210.45
2009/10	32.68	0.90	280.03
2010/11	32.58	0.54	198.07

Source: Myanmar Agricultural Statistics, CSO; DAP, MOAI and MOC

Due to adopting market economy and relaxing state intervention in pulses industry since 1988, production and export of black gram has been increased over the period. Black gram production reached to 1.60 million metric tons in 2010/11 compared to 0.37 million metric tons in 1995/96. Black gram export was gradually increasing over the decades. Total export of black gram was accounted for 0.35 million metric tons in 1995/96 and increased to 0.62 million metric tons in 2009/10. Black gram export decreased to 0.46 million metric tons in 2010/11. Production and export of black gram in Myanmar is shown in Table (13).

Table (13) Black Gram Production and Export of Myanmar (1995/96 to 2010/11)

Year	Production (mil MT)	Blackgram export (mil MT)	Value (USD million)
1995/96	0.37	0.12	160.58
2000/01	0.53	0.23	84.20
2001/02	0.62	0.32	101.79
2002/03	0.65	0.31	77.24
2003/04	0.72	0.46	85.27
2004/05	0.90	0.44	102.04
2005/06	1.00	0.39	149.85
2006/07	1.18	0.49	303.85
2007/08	1.35	0.51	281.99
2008/09	1.42	0.53	264.16
2009/10	1.51	0.62	464.26
2010/11	1.60	0.46	458.19

Source: Myanmar Agricultural Statistics, CSO; DAP, MOAI and MOC

In Myanmar, farmers solely rely on village brokers and local primary collectors for price information, and it is a significant characteristic of farmers' marketing system for selling farm products. In general, marketing system and supply chain of agricultural commodities has many intermediaries such as village brokers, primary collectors, millers/processors, mediators/service providers, wholesalers, and exporters, and these steps reflect high transition cost between farmers and exporters. Finally, the result is that price received by farmers is lower than actual market price in wholesale and commodities exchange centres (CEXCs). Myanmar has established 40 CEXCs under the supervision of Ministry of Commerce and additional 20 CEXCs are planning to set up in the major States and Regions in 2011.

As market information is important, all participants in supply chain make decision based on up to date market information and historical trends analysis. Private sector information services in Myanmar are Crop Exchange Centers (CEXCs) and E-Trade. The primary role of CEXC is to facilitate business and market information for its members who have applied the member fee every year. Electric Trade (E-trade) service was established in 2003 to provide trade and business intelligence to Myanmar traders and exporters through internet and Short Message Service (SMS) by mobile phones with some charges. Government market information service (MIS) has been implemented by the Department of Agriculture Planning (DAP) of the Ministry of Agricultural and Irrigation (MOAI) since 2000. MIS is publishing weekly prices especially for agricultural commodities in terms of Agri-Business Journal and Bulletins but it has some limitations to be received by farmers in time. Moreover, farmers' interest on using this information and providing awareness programme for farmers by public and private sector is low so far.

Due to staple food and major export item in Myanmar, farmers have to grow paddy at least one season in monsoon. However, average benefit of paddy was lower than black gram over the decade. Average production cost of paddy was gradually increasing due to higher input cost and labour cost. Total cost of production was 161,800 Kyat per acre in 2007 and 217,750 Kyat per acre in 2010. Production cost has been increasing due to increase in labour cost and input cost. Price received by farmers are 112,001, 133,549, 138,784 and 165,566 Kyat per metric ton in 2007, 2008, 2009 and 2010 respectively. BCR of monsoon paddy was 1.10, 1.13, 1.15 and 1.25 during the period from 2007 to 2010 respectively. Over the period, average BCR was low although yield and price have been increased. Table (14) shows the estimated production cost and benefit-cost ratio (BCR) of monsoon paddy over the period between 2007 and 2010.

Table A.14 Average Production Cost, Gross Margin and Benefit-Cost Ratio of Monsoon Paddy (2007-2010)

Items	2007	2008	2009	2010
Yield (MT/ha)	3.93	4.03	4.06	4.07
Price (Kyat/MT)	112001	133549	138784	165566
Gross return (Kyat/ha)	440164	538202	563463	673853
(1) Family Labour Cost (Kyat/ac)	31350	34250	41700	53500
(2) Hired Labour Cost (Kyat/ac)	65700	103500	92500	104000
(3) Input Cost (Kyat/ac)	64750	55850	64200	60250
Total production cost (Kyat/ac) (1+2+3)	161800	193600	198400	217750
Total production cost (Kyat/ha)	399646	478192	490048	537842
Gross margin (Kyat/ha)	40518	60010	73415	136011
Benefit Cost Ratio (BCR)	1.10	1.13	1.15	1.25

Source: Myanmar Agriculture at a Glance, Department of Agricultural Planning, Ministry of Agriculture and Irrigation (2011)

After the adoption of market economy, black gram became a popular crop and contributing higher benefit. It was major income source for farmers although production cost has been increasing over the years. Total production cost of black gram was 105,700 Kyat per acre in 2007 and 120,384 Kyat per acre in 2010. In 2008, Farmers received low benefit due to high production cost and low price compared to 2007. During 2009 and 2010, farmers received high benefit due to immediate increasing of black gram price from 491,538 Kyat per metric ton (160,58 Kyat per basket) to 863,303 Kyat per metric ton (28,203 Kyat per basket). BCR of black gram was 2.75, 1.60, 5.99 and 4.39 in 2007, 2008, 2009 and 2010 respectively. Production cost and price of black gram has fluctuation over the period. The estimated production cost and benefit-cost ratio of black gram between 2007 and 2010 can be seen in Table (15).

Table (15) Production Cost, Gross Margin and Benefit-Cost Ratio of Black Gram (2007-2010)

Items	2007	2008	2009	2010
Yield (MT/ha)	1.41	1.46	1.48	1.52
Price (Kyat/MT)	590312	491538	863303	859414
Gross return (Kyat/ha)	718130	717645	1277688	1306309
(1) Family Labour Cost (Kyat/ac)	50800	21000	36000	42917
(2)Hired Labour Cost (Kyat/ac)	22800	47000	36000	44417
(3) Input Cost (Kyat/ac)	32100	113340	14300	33050
Total production cost (Kyat/ac) (1+2+3)	105700	181340	86300	120384
Total production cost (Kyat/ha)	261185	448091	213247	297469
Gross margin (Kyat/ha)	456945	269554	1064441	1008840
Benefit Cost Ratio (BCR)	2.75	1.60	5.99	4.39

Source: Myanmar Agriculture at a Glance (2011), Department of Agricultural Planning, Ministry of Agriculture and Irrigation

3. Benefit-Cost Ratio in Study Area

A field survey was undertaken in Pyinmana Township of Nay Pyi Taw. In Pyinmana Township, paddy-based double cropping system is the most dominant and irrigated area covers monsoon paddy-black gram- summer paddy cropping pattern and monsoon paddy-black gram. Sesame, groundnut, peas and beans and green gram crops are grown in upland (*Yar*). In mountainous area, upland paddy, rained paddy, coffee and tea are grown in mountainous area and mix cropping pattern (such as maize, chili, cucumber) is more dominant there. Paddy is grown in both irrigated and non-irrigated areas. The populations lived in rural areas of Pyinmana Township directly engage in agriculture for their livelihood. Therefore agriculture is the main stay of the economy of the township. Pyinmana Township is currently one of the potential areas for paddy production in Nay Pyi Taw District contributing local food sufficiency. Black gram production is the second largest area in this region contributing higher income for farmers rather than paddy crop production. The study was based on the data collected from 160 sample farmers through personal interview. Study focused on monsoon paddy- black gram- summer paddy farming system and monsoon paddy-black gram farming system in Pyinmana Township for 2010-2011 season and structured interviews were undertaken in January and February of 2012.

According to the survey results, the average monsoon paddy yield was 75.35 baskets per acre (3.88 ton per ha) in triple cropping area and 84.75 baskets per acre (4.37 ton per ha) as shown in Table (16). The average prices of monsoon paddy had about 3,278 Kyat per basket and 3,180 Kyat per basket. Value of production was 246874. 12 Kyat and 269473.20 kyat in triple cropping and double cropping respectively. Although average yield of double cropping farmers was high the price received was low. Because double cropping farmers could not store their products for longer term as triple cropping farmers.

Table (16)
Estimation of the Yield, Price and Production Value of Monsoon Paddy

Items	Triple Cropping (n=65)	Double Cropping (n=95)
Yield (bsk/ac)		
-Mean	75.35	84.74
-Std.deviation	14.10	16.72
-Maximum	78.84	88.15
-Minimum	71.85	81.33
Price(Ks/bsk)		
-Means	3277.69	3180.00
-Std.deviation	193.05	594.94
-Maximum	3325.52	3301.19
-Minimum	3229.85	3058.80
Value of Production (Ks/ac)	246874.12	269473.20

Source: Field survey (2012)

In 2010/11, farm households in study area received the average yield of 14.80 baskets per acre (1.19 tons per hectare) in triple cropping and 21.46 baskets per acre (1.73 tons per hectare) in double cropping area. The average price of black gram was about 20,230 Kyat per basket (619,443 Kyat per ton) in triple cropping and 21,589 Kyat per basket (661,055 Kyat per ton) in double cropping. Average value of production in double cropping farm households was higher than that of triple cropping farm households. Estimated yield, price and production of black gram in selected villages can be observed in Table (17).

Table (17)
Estimation of the Yield, Price and Production Value of Black Gram

Items	Triple Cropping (n=65)	Double Cropping (n=95)
Yield (bsk/ac)		
-Mean	14.80	21.46
-Std.deviation	6.72	4.73
-Maximum	16.45	22.42
-Minimum	13.1271	20.49
Price(Kyat /bsk)		
-Means	20230.76	21589.47
-Std.deviation	4335.60	1784.95
-Maximum	21305.0797	21953.08
-Minimum	19156.4588	21225.86
Value of Production (Kyat/ac)	299415.24	463310.02

Source: Field survey (2012)

The results of the complementary face to face interview in the selected villages provided actual situation of paddy and black gram production costs and benefit-cost ratio (BCR). According to Table (18), average BCR of monsoon paddy, black gram and summer paddy were 1.20, 2.30 and 1.40 respectively.

Table (18)
Production Cost and Benefit-Cost Ratio of Major Crops in Pyinmana

Items	Monsoon Paddy (n=160)	Black Gram (n=160)	Summer Paddy (n=160)
Yield (bsk/ac)	81.07	18.05	93.71
Price (bsk/ac)	3280.82	20910.63	2969.23
Gross return (Ks/ac)	265953.4	383592.66	285219.23
(1)Machinery cost (Ks/ac)	46594.02	41375.74	43994.62
-land preparation	32855.03	29164.56	27923.08
-threshing	13738.99	11011.18	16071.54
(2)Labor and cattle cost (Ks/ac)	110542.48	56754.70	95079.42
-land preparation (cattle)	9891.32	5039.68	5761.54
-transplanting (labor)	38184.18	1537.27	13784.62
-inputs application (labor)	8447.44	10211.18	6932.06
-harvesting cost (labor)	24056.25	19795.03	25884.62
-transportation cost (cart)	17662.66	6877.42	26078.13
-drying, rolling (labor)	10598.66	10569.12	16638.46

(3)Material cost	59385.47	67889.78	58722.31
-Seed cost (Kyat/ha)	12100.15625	21973.63	11369.23
-Chemical cost (Kyat/ha)	47285.3125	45916.15	47353.08
Total production cost (Kyat/ca)	214820.00	162095.34	198924.00
Gross margin (Kyat/ac)	50695.65	226864.46	86294.62
Benefit cost ratio (BCR)	1.20	2.30	1.40

Source: Field survey (2012)

Table (19)
Production Cost and Benefit-Cost Ratio of Monsoon Paddy in Pyinmana

Items	Triple Cropping (n=65)	Double Cropping (n=95)	Average (n=160)
Yield (bsk/ac)	75.35	84.74	81.07
Price (Kyat/ac)	3277.69	3283.00	3280.82
Gross return (Kyat/ac)	246717.69	278387.37	265953.40
(1) Family Cost (Kyat/ac)	29142.31	38855.79	34909.69
(2)Hired Cost (Kyat/ac)	140399.20	108468.90	121440.63
(3) Input Cost (Kyat/ac)	54318.46	61310.00	58469.69
Total production cost (Kyat/ha) (1+2+3)	223860.00	208634.70	214820.00
Gross margin	28142.31	70494.68	50695.65
Benefit cost ratio (BCR)	1.10	1.30	1.20

Source: Field survey (2012)

Table (19) shows production cost and benefit-cost ratio (BCR) of monsoon paddy. BCR calculation was based on all farm activities to observe family and hired cost. BCR of monsoon paddy in triple and double cropping farmers was 1.10 and 1.30 respectively and double cropping BCR is higher than triple cropping. Black gram contributes major income source for farmers in the study area. Benefit-cost ratio (BCR) of black gram in triple and double cropping households was 2.2 and 2.5 respectively. BCR of double cropping farmers was higher than triple cropping farmers as shown in Table (20). Due to decreasing price of summer paddy in 2010/11 growing season, farmers received the profit at low level and affected the farmers' income. According to Table (21), BCR of summer paddy was 1.4 but it was higher than BCR of monsoon paddy due to higher yield.

Table (20) Production Cost and Benefit-Cost Ratio of Black Gram

Items	Triple Cropping (n=65)	Double Cropping (n=95)	Average (n=160)
Yield (bsk/ac)	14.67	21.48	18.05
Price (Kyat/ac)	20230.77	21505.26	20910.63
Gross return (Kyat/ac)	303476.92	462589.47	383592.66
(1) Family Cost(Kyat/ac)	19523.08	23394.74	21821.88
(2)Hired Cost (Kyat/ac)	67938.46	76442.11	72987.50
(3) Input Cost (Kyat/ac)	43175.38	83519.53	67129.72
Total production cost (Kyat/ha) (1+2+3)	130636.9	183619.5	162095.34
Gross margin (Kyat/ac)	172840.00	279813.1	226864.46
Benefit cost ratio (BCR)	2.2	2.5	2.3

Source: Field survey (2012)

Table 21 Production Cost and Benefit-cost Ratio of Summer Paddy

Items	Average (n=65)
Yield (bsk/ac)	93.71
Price (Kyat/ac)	2969.23
Gross return (Kyat/ac)	285219.23
(1) Family Cost (Kyat/ac)	25700.00
(2)Hired Cost (Kyat/ac)	114502.31
(3) Input Cost (Kyat/ac)	58722.31
Total production cost (Kyat/ac) (1+2+3)	198924.00
Gross margin (Kyat/ac)	86294.62
Benefit cost ratio (BCR)	1.4

Source: Field survey (2012)

According to income crop growing, total estimated gross margin and income of double cropping farmers is higher than triple cropping households due to higher yield and more using of family labour in Table (22).

Table (22) Income Estimation for Triple and Double Cropping Farmers

Item	Triple Cropping (n=65)	Double Cropping (n=95)
1. Monsoon Paddy Income (Kyat/ac)	57284.62	109350.47
- Gross margin	28142.31	70494.68
- Family Cost	29142.31	38855.79
2. Black Gram Income (Kyat/ac)	192363.08	303207.84
- Gross margin	172840.00	279813.10
- Family Cost	19523.08	23394.74

3. Summer Paddy (Kyat/ac)	111994.62	-
- Gross margin	86294.62	-
- Family Cost	25700.00	-
Total Gross Margin (1+2+3) (Kyat/ac)	287276.93	350307.78
Total Income (1+2+3) (Kyat/ac)	361642.32	412558.31

Source: Field survey (2012)

4. Major Constraints of Farmers in Crops production

The farmers indicated that low price of paddy, availability of irrigation water for paddy cultivation, agricultural financing, high inputs cost, labour scarcity, high daily wage and technical problem such as unknown death of black gram and farm road infrastructure are limiting factors to crop production. These factors reflect to the benefit-cost ratio and profit margin of farmers in crop production, and effect the crop production and farmers' income. The farmers from selected villages also pointed out that if the farmers could get fertilizer by subsidized rate, they will apply more fertilizer in order to increase the yield. Farmers also expressed their willingness to get suitable crop price and market stability, particularly farm gate price during harvest period.

According to the paddy yield, the significant influencing factor of summer paddy productivity was high labour cost for transplanting, harvesting and carrying in time. Especially the harvesting time for summer paddy was around May-June and farmers will have to harvest their paddy under the rain. It made increase in labour cost to carry from the field to farm road or highway road. It also caused the post harvest losses. After harvested the summer paddy, farmers will have to prepare their land for monsoon paddy as soon as possible. Therefore, paddy straw could not decay enough and it affects the soil quality and the yield of monsoon paddy.

Currently, the death of black gram in Pyinmana area became a major problem and particularly in triple cropping village in the study area was more serious. It was observed that the problem was due to continuous growing of single black gram variety for over 7 years or soil born disease. Therefore, farmers received very low black gram yield and it affected their income. Death of black gram is widely spread and became serious issues in the region.

5 Conclusion

According to the field study in Pyinmana Township, double paddy cropping pattern (summer paddy after monsoon paddy) affected soil structure and caused decreasing crop yield. Moreover, death of black gram was serious and widely spreading in the area. Black gram seems to be substituted with other crop. Government extension service and its capacity are still insufficient. More problems such as use of fertilizer, quality of seed and crop yield were found in triple cropping area. The use of fertilizer rate was limited due to price increase over the period.

Low food price and price volatilization of food crop affected the households' income directly or indirectly. Paddy crop was not an attractive crop for farmers after the mid 1990s due to low paddy price, high input cost and labour cost. Total income of double cropping farmers was higher than that of triple cropping due to higher income from black gram and more family labour in their farms.

Increased use of chemical fertilizer, double paddy cropping system and soil problem are related. Training and awareness programmes should be provided for proper soil conservation and soil quality control in order to achieve sustainable crop production. Appropriate technology, cropping system and inputs should be provided to increase productivity. Single paddy-based cropping pattern should be more encouraged rather than double paddy-based cropping system.

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REFERENCES

- Burma Economic Watch(2004), http://www.econ.mq.edu.au/Econ_docs/bew/BEW No2-04. pdf.
- Market Information Service (2010), International and Domestic Agricultural Commodities Prices, Department of Agricultural Planning, Ministry of Agriculture and irrigation, Myanmar.
- DAP (2010). *Myanmar Agriculture in Brief 2010*, Department of Agricultural Planning, Ministry of Agriculture and irrigation, Myanmar.
- DAP (2011). *Myanmar Agriculture in Brief*, Department of Agricultural Planning Ministry of Agriculture and irrigation, Myanmar.
- DAP (2011). *Myanmar Agriculture at A Glance*, Department of Agricultural Planning, Ministry of Agriculture and irrigation, Myanmar.
- FAO (2007). *Selective indicators of Food and Agricultural Development in the Asia-Pacific region (1996-2006)*. RAP Publication 2007/15. Bangkok.
- Gary Frank (1988), *Cost of Production versus Cost of Production*, <http://cdp.wisc.edu/Resources/crop/general/cost.pdf>.
- Khin Thanda Win. (2010). *Determinants of Yield and Income of the Non-irrigated and Irrigated Rice Farmer in the Selected Areas of Pyinmana Township*. Unpublished Master Thesis of Economics, Yezin Agricultural University, Myanmar.
- Koichi FUJITA, Fumiharu MIENO and Ikuko OKAMOTO Eds (2008). *The Economic Transition in Myanmar after 1988 Market Economy versus State Control*, Center for Southeast Asian Studies, Kyoto University.
- Koichi FUJITA, Ikuko OKAMOTO (2006), *Agricultural Policies and Development of Myanmar's Agricultural Sector: An Overview*, IDE DISCUSSION PAPER No. 63, Japan.
- Koji Kubo. (2008), *A Policy Analysis of Rice Export Promotion with Subsidies on Fertilizer and Export Tax in Myanmar*, IDE DISCUSSION PAPER, Japan.
- M.S. Qazi. *Fall in Agri-Commodity Prices and Investment Prospects*, *Business and Finance Review*, <http://jang.com.pk/thenews/jan2009-weekly/busrev-12.01.2009/index.html>.

- Market Information Service-MIS (2006-2009). *International and Domestic Agricultural Products Prices*, Department of Agricultural Planning, Ministry of Agriculture and irrigation, Myanmar.
- Michael E. Salassi and Michael Deliberto(2011). *Rice Production in Louisiana, Soybeans, Wheat and Sorghum Production in Southwest Louisiana*, A.E.A. Information Series No. 266, Farm Management Research & Extension, Department of Agricultural Economics & Agribusiness.
- Myat Thein (2004). *Economic Development of Myanmar*, Institute of Southeast Asian Studies, Singapore.
- Nay Myo Aung (2011). *Agricultural Efficiency of Rice Farmers: A Case Study in Selected Areas*, IDE Discussion Paper No.306, Japan.
- Nyein Nyein Thuang. (2003). *Evaluation on HYV of Pulse Crops in Myanmar*. Unpublished Master Thesis of Economics, Kyungpook National University, Thailand.
- Prabhu L.Pingali, Mahabub Hossain, Roberta V. Gerpacio (1997). *Asian Rice Bowls: The Returning Crisis?* CAB INTERNATIONAL. International Rice Research Institute. Philippines.
- Theingi Myint, Khin Oo, Dolly Kyaw and Tin Nyut (2004). *Analysis of profitability and Technical Efficiency of Irrigated Rice Production System*. Myanmar Academy of Agricultural, Forestry, Livestock and Fishery Sciences. Rice Research Activities in Myanmar.
- Tin Htut Oo (2010). *Rethinking Agriculture Baseed Rural Economic Development in Myanmar*, UNESCAP.
- Tin Soe and Brain S.Fisher.(1990). "An Economic Analysis of Burmese Rice policies" in Mya than and Joseph L.H. Tan eds. Myanmar Dilemmas and Options. Institute of Southeast Asian Studies. Singapore.
- Tomek, William G. (1990). *Agricultural Product Prices*, Cornell University Press.
- Saito, teruko. (1981). "Farm Household Economy under Paddy Delivery System in Contemporary Burma". Developing Economies, Vol.19No.4.
- Wen-yuan Huang (2009). Factor Contributing to the Recent Increase in U.S. Fertilizer Prices (2002-08), AR-33, USDA, Economic Research Service.