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Assessment of Socioeconomic Situation and Analysis of Farming Systems in the Cyclone Affected Region Case study (Bogale, Myanmar)

Estudio socioeconomico y analisis de la situacion de los sistemas de producción agropecuaria en la región afectada por el ciclón. Caso de estudio Bogale, Myanmar.

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Resumen

El presente estudio se realizo en la región afectada por el ciclón, los objetivos de evaluar la situacione socioeconómica de los agricultores vulnerables después del evento Nargis y recomendar el mejor sistema de cultivo desde el punto de vista económico y medio ambiental. Se suponía que si los campos están inundados con agua de mar, el rendimiento de la cosecha se reducirá y el suelo necesaria remediación. Se estudio el mapa de la línea isogénica de salinidad para la división a la que el área de estudio pertenece para definir el agua del mar que llega a los ríos y afluentes periódicamente de acuerdo a las regiones. Después de Nargis, la producción de arroz se redujo 19,25% en la producción de arroz de los monzones y 22,75% en el verano de arroz en la parte norte mientras que 43,75% de la producción de arroz del monzón se redujo en la parte media. Se encontró que la producción agrícola era riesgosa y los agricultores no estaban usando los recursos de tierra y el trabajo de manera eficaz. Sistemas de cultivo que aumentan la eficiencia del trabajo de la tierra y se propusieron en el estudio. Se suponía que al aumentar la eficiencia del uso de recursos, los ingresos de los agricultores se incrementarán. En cuanto al resultado el sistema de cultivo 5, de arroz de pulsos y la cría de pato, a pesar que necesitaban de la mayor cantidad de trabajo generaban más ingresos a los tres primeros pequeños grupos de agricultores. El sistema de cultivo 2 de arroz doble genera los ingresos mas altos para el grupo mas grnade de agricultores. Los datos analizados han demostrado que el trabajo es excedente para todos estos sistemas de cultivo, excepto en el mayor grupo de agricultores (de propiedad de más de 8,09 ha) en la parte media

Palabras clave: Myanmar, Ciclon Nargis, intrusion de agua de mar, arroz, ingreso de agricultores

Abstract

This study has been done in the cyclone affected region with aims of assessment the socioeconomic situations of the vulnerable farmers after Nargis event and recommendation of the best farming system from economic point of view and environmental maintenances. It was assumed that if the fields are flooded with sea water, yield of crop will be reduced and this soil is needed to be remedied. There were two problems in the area. Currently, all the fields were flooded with sea water due to cyclone occurred in May, 2008 and another problem was seasonal sea water intrusion into the rivers. Studying the map of the salinity isogenic line for the division where study area belongs to said that sea water comes to the rivers and tributaries periodically respecting to the regions. Therefore cropping patterns and type of crop have to be relied on this situation. After Nargis, yield of rice have reduced 19.25% in monsoon rice production and 22.75% in summer rice in the northern portion whereas 43.75% of yield of monsoon rice have reduced in the middle portion. It was found that crop production was risky and farmers were not using the resources of land and labor effectively. Farming systems which increase land and labor efficiency were proposed in the study. It was assumed that by increasing the efficiency of resources use, farmers' income will be increased. As to the result, farming system 5 of Rice-pulses and duck farming needs the highest number of labors but it gives highest income to first three small farmer groups not to the biggest farmer group. Farming system 2 of double rice gives the highest income for the biggest group of farmers. Analyzed data has been showed that labors are still surplus for all of these farming systems in the all type of farmers groups except in the biggest farmers group (owned more than 8.09 ha) in the middle portion.

Keywords: Myanmar, Cyclone Nargis, sea water intrusion, rice filed, farmers' income, farming

INTRODUCTION

Numbers of natural disasters are increasing year after year over the world with an average growth rate of 8.4% in the year 2000 to 2007 period. Among the vulnerable countries, Asia is the most affected by the disasters in the world especially in India, China and Bangladesh (Scheuren et al 2007). In Myanmar, there was a big cyclone in year 2008, which was the most devastating natural disaster in Myanmar history. The cyclone destroyed mainly on three divisions and resulted in 450,000 home and 4,000 schools damages. 783,220 hectares of agricultural land were flooded with sea water (FAO 2008). Myanmar is one of the tropical countries in South East Asia. It is 678,500 sq km wide and agriculture based country. Population is 48 millions. Cyclone destroyed three divisions and among them Ayeyarwaddy division is main rice production regions. One of the townships in the division was selected as the study area called Bogale which is 2,250 square kilometer wide. Population is 253223 inhabitants in 2008.

In the study area, farmers' properties such as labours, machineries, draught animals, stored rice and etc have been lost during cyclone. Besides these, their fields have been flooded with sea water and yield of crops have been reduced. Farmers have started farm works as soon as after the cyclone has finished with provisions of Government and aids of international organizations.

During data collections was done for this study, two time of rice have been produced named as monsoon rice and summer rice. It was found that yield of rice in both seasons were reduced to some extend. At the same time, price of rice were declined due to world economic crisis in year 2008. FAO said that world price of rice declined at the beginning of the year 2009 and it will be under pressure in coming months (FAO 2009). Hence, farmers in the area have been suffered from not only yield reduction due to sea water but also from the price decline

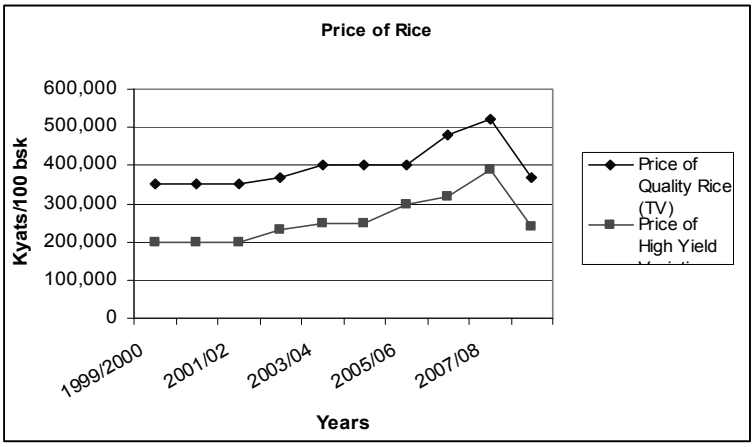

Figure 1. Price of rice in the regional market

Rice production in saline soil

Sea water, rich in Na, is problematic for crop production in coastal area. Amount of electrical conductivity of soil and irrigation water is limited with respect to each type of crop (Maas 1986). Rice production at out of limited amount will cause yield reduction. In fact, rice is recommended as potential plant for the coastal saline of humid tropic region since there have enough rainfall to leach out salt content in the soil and they are climatically, physiologically, and hydrologically suited with rice growing (Akbar and Ponnamperuma 1982).

Nevertheless, tolerance of rice to salt will be different from one variety to another. There are many ways to recover the saline situation in the soil such as washing out unwanted water from the fields, growing salt tolerance varieties, crop

rotation with rice and legume, clover, sesbenia and gypsum application (Dobermann and Fairhurst 2000). Some portions are very low and it is not possible to wash out sea water. Growing salt tolerance varieties is not recommended for long term practices but only for short term. For the reasons, washing out sea water, growing salt tolerance varieties could not be practiced in some portions of the study area. Only double rice cropping and crop rotation with pulses for several years are simple and should be used as a suitable practice for the area. It can be predicted that yield of rice will be increased gradually.

Crop production in the study area

Beside sea water flooded problem, another problem of the study area is seasonal sea water intrusion. Periodical intrusion of sea water into the rivers and tributaries causes fresh water changed into the sea water and it can not used for irrigation no longer. There are three portions divided based on the fresh water availability and land level assumed as northern portion, middle portion and southern portion.

Only northern portion can get fresh water whole year but the rest two portions can not. Although double rice pattern is currently practiced in the northern portion and it is suitable but only rice is production in the middle portion which is potential for cultivation of next crop after rice. Rice- pulses cropping pattern is introduced to the middle portion regarding to the fresh water availability.

This study presents about northern and middle portion and excluded the southern portion. In addition, Nipa plantation is suitable in the region and there is a market for dani, final product of Nipa, and that can be used for construction of dwellings in the villages. Nipa is mostly produced in the study division and 30% of plantation has been destroyed during the cyclone Nargis (Moe Aung 2008). Some people, especially in the middle portion, were working in the Dani (final product of Nipa) making station as daily workers. Development of Nipa plantation in the area can increase the job opportunities for the local people.

Farm management in study area

Crop productions in the study area is high risky. Diversifying the crop is one of the ways in order to reduce the risk of crop production (D.Kaham, 2004). Consideration of other possible sources of incomes and development of these income sources should also be added up in the farming system to food security first and development of the region later on. As to the farmers interview, farmers have experiences on the animal farming and working in the Dani (Nipa) production station as secondary sources of income. Therefore animal farming and working in the Dani production station have been included in the proposed farming systems. Combination of possible rice based cropping patterns and other sources of income can be believed to save the farmers in the region.

METHODOLOGY

Methodology was simply applied as shown in the diagram below. For the first step of literature review, all the possible sources were studied. Secondly, in order to understand the situation of the area, interview with persons of official concerned, government services and staffs in the international organization currently working in the study area, have been made. Then, set up the questionnaires and interviewed with farmers. There are 14 villages tracks out of 71 village track have been selected. 91 farmers in the 14 village tracks have been interviewed. Then, these data have been analyzed by using SPSS and excel.

FINDINGS

Yield reduction of rice in the northern and middle portion

Yield reduction of rice in each group in the northern portion has found in the table (1). Average yield reduction of monsoon rice was 19.25 % and 22.75 % for the summer rice. Type of variety for the summer rice was high yield variety which is more sensitive to salinity than traditional varieties. As to the farmers interview, farmers have washed out sea water from their fields two to three times. However reduced yields of rice can be found until next crop after monsoon rice. Table (2) will show that comparison of yields of rice in the middle portion where only monsoon rice is producing presently. Yields of rice have been reduced average 43.75%. Since land level in the region were very low, it was not possible to wash out the sea water from the fields. Yield reduction in the middle portion was more than that in the northern portion. This region must use the crop rotation practices of double rice and rice-pulses cropping patterns.

Due to the limitation of irrigation water in the middle portion, rice – pulses cropping pattern should be applied even though rice- rice cropping pattern is possible in the northern portion. Consideration of yield reduction, there might be many other problems which can cause the yield

reduction such as pest, fertilizer, seed, weed, seeding time etc. Farmers said, seeding time was in time for both rice productions. According to the report from Myanma Agriculture Services, MOAI after Nargis, salt affects, delay seeding time, less fertilizer use and low adaptability of seed were pointed out as important factors. Farmers in the middle portion have answered their experiences for the yield reduction in monsoon rice that sea water flooding problem was main factor and pest problem was second. All the farmers are cultivating traditional varieties, which can not respond to the fertilizer. All farmers answered that they have broadcasted seeds more than two times.

Income reduction of farmers in the northern and middle portion

In consequence of yield reduction and price decline of rice, incomes from farms have been reduced as shown in the fig (3), (4) and table (3), (4). Income from farms in the smallest farmer group in the middle portion was almost nothing. Cropping intensity in the northern portion was 159% whereas that in the middle portion was 103%. Cultivation of summer rice in the northern portion increased the cropping intensity. Winter crops like pulses, sunflower, sesame, and groundnut were grown very few acre in the region.

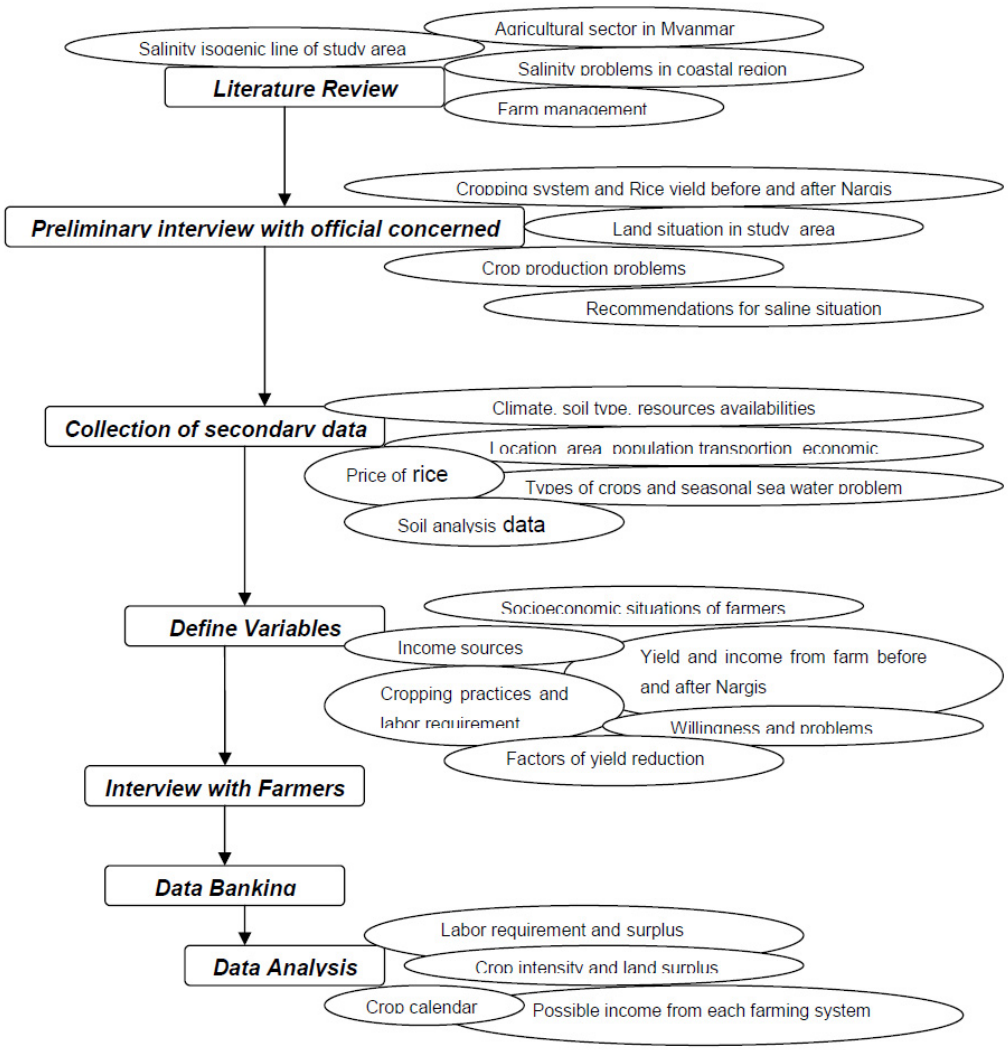

Figure 2. Methodology

Table 1. Comparison of yield of rice before and after Nargis in the northern portion

Groups	Yields of Traditional Varieties (Kg/ha)			Yields of High Yield Varieties (Kg/ha)		
	B. Nargis	A. Nargis	Reduced (%)	B. Nargis	A. Nargis	Reduced (%)
Less than 2.02 ha	2268	1796	21%	4032	3253	20%
From 2.42 to 4.04 ha	2107	1669	21%	4347	3465	21%
From 4.45 to 8.09 ha	2457	2016	18%	4410	3591	19%
More than 8.09 ha	2268	1890	17%	4473	3087	31%

B.Nargis = Before Nargis, A. Nargis = After Nargis

Table 2. Comparison of yield of rice before and after Nargis in the middle portion

Groups	Yields of Traditional Varieties (Kg/ha)		
	B. Nargis	A. Nargis	Reduced (%)
Less than 2.02 ha	1890	907	52%
From 2.42 to 4.04 ha	2093	1275	40%
From 4.45 to 8.09 ha	2104	1053	50%
More than 8.09 ha	2051	1393	33%

B.Nargis = Before Nargis, A. Nargis = After Nargis

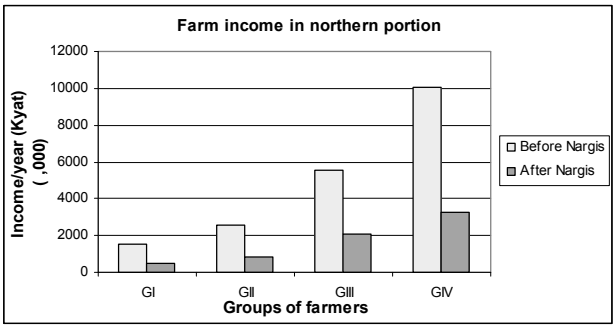

Figure 3. Farm income in northern portion

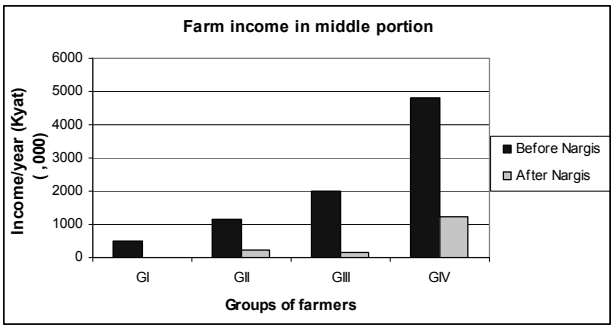

Figure 4. Farm income in the middle portion

Analysis of labor used efficiency in each farming system

Farming system I = Monsoon rice

Farming system 2 = Monsoon rice and summer rice

Farming system 3 = Monsoon rice and pulses

Farming system 4 = Monsoon rice, Nipa (Dani production)

Farming system 5 = Monsoon rice, pulses, duck farming

Farming system 6 = Monsoon rice, Duck farming

Above mentioned farming systems have been proposed in both portions. Labor requirement based on the farmers' practices have been analyzed as shown in the table (4.5). 3.71 and 3.36 family members were working in the farms in northern and middle portion respectively. It was 69% of family members in the northern portion and 66% in the middle portion. There is shortage of labor only in the time of seeding and harvesting. However, labors are surplus in rest of the year. Even farmers practices proposed farming systems, labor used efficiencies do not reach 100% only except in the biggest farmer groups in the middle portion. Labor used efficiency was highest in the farming system 5 in the both portions. The lowest labor used efficiency was farming system 1 and Farming system 2 was second largest labor used efficiency. Moreover, while managing one of these farming systems, labor are still surplus and they can work in the dani making station within time limitation of January until April.

Farmer Groups	Area (ha)	Income (Kyat) (,000)	
		B.Nargis	A.Nargis
Less than 2.02 ha	1.7	1,557	508
From 2.42 to 4.04 ha	3.08	2,563	836
From 4.45 to 8.09 ha	6.37	5,528	2,080
More than 8.09 ha	13.25	10,028	3,284

Table 3. Farm income in the northern portion

Farmer Groups	Area (ha)	Income (Kyat) (,000)	
		B.Nargis	A.Nargis
Less than 2.02 ha	1.61	514	4
From 2.42 to 4.04 ha	3.31	1,161	217
From 4.45 to 8.09 ha	5.66	1,998	155
More than 8.09 ha	13.64	4,821	1,212

Table 4. Farm income in the middle portion

Estimated income from each farming system

Incomes from each farming system were calculated as shown in the table (4.6) and (4.7). Currently, most of the farmers are practicing the double rice (farming system 2) in the northern portion and only monsoon rice (Farming system 1) in the middle portion. From the economic point of view, farming system 5 can give highest income for 3 small farmer groups but not for the biggest farmer group in both portions. The biggest farmer groups can have highest income from the farming system 2 because of their large farm size. For that group, although farming system 5 needs labor highest, it can not give highest income. These groups can count on the income from farms. Moreover, farming system 6 gives higher income for smallest group farmer than that from farming system 2.

Table 5. Labor used efficiency in each farming system in both portions

Groups	Labor used efficiency in each farming system (%)											
	Northern Portion						Middle Portion					
	1	2	3	4	5	6	1	2	3	4	5	6
Less than 2.02 ha	8	18	16	41	43	35	9	20	20	42	49	38
From 2.42 to 4.04 ha	13	29	26	46	53	40	15	32	31	48	60	44
From 4.45 to 8.09 ha	22	50	45	55	72	49	26	55	54	59	83	55
More than 8.09 ha	32	73	65	65	91	59	37	81	78	70	108	66

Table 6. Estimated income from each farming system in the northern portion

Groups	Estimated income from each farming system (Kyat) 1$ = 1040 Kyat					
	1	2	3	4	5	6
Less than 2.02 ha	268,736	495,402	440,895	380,036	701,145	528,986
From 2.42 to 4.04 ha	486,886	897,552	798,798	598,186	1,059,048	747,136
From 4.45 to 8.09 ha	1,006,969	1,856,300	1,652,059	1,118,269	1,912,309	1,267,219
More than 8.09 ha	2,094,560	3,861,222	3,436,387	2,205,860	3,696,637	2,354,810

Table 7. Estimated income from each farming system in the middle portion

Groups	Estimated income from each farming system (Kyat) 1$ = 1040 Kyat					
	1	2	3	4	5	6
Less than 2.02 ha	254,508	469,174	417,553	355,308	677,803	514,758
From 2.42 to 4.04 ha	523,244	964,577	858,448	624,044	1,118,698	783,494
From 4.45 to 8.09 ha	894,732	1,649,397	1,467,921	995,532	1,728,171	1,154,982
More than 8.09 ha	2,156,211	3,974,873	3,537,534	2,257,011	3,797,784	2,416,461

CONCLUSION

Area extension for agriculture in the study area caused the deforestation of mangrove forests which are important for the environment. Consequently, occurrences of natural disaster come more and more. It is concluded that this region is urgently needed to create the better surrounding and to improve the lives of people too. Nipa plantation can improve not only the environment but also increase income for the farmers. Farmers, especially small farmers in the region should not count on the income from the farms since farming is risky and their small farm size. Other sources of income should be concentrated and developed in their farming system. Farmers should use these resources effectively instead of leaving surplus. Respect to the practices used, labor requirement have been calculated and found that all of above mentioned farming systems can be done by using their family labor only except for the biggest farmers in the middle portion. And then income from each farming system have been estimated and it was assumed that the highest labor and land use efficiency can give highest income for the farmers but not for the biggest farmers group in both portion. The biggest farmers can depend on their large farm sizes and they can have highest income from their farms.

Middle portion which is riskier than northern portion for crop productions and collection of rainfall during monsoon for purpose of irrigation in summer is important. Constructions of infrastructures and maintenance of existed infrastructures such as embankments should be done. Monsoon rice is compulsory crop in whole Myanmar but farmers can select the next crops after rice. The problem in the middle portion is that farmers' selected crop should be homogenous for the reason of heavy clay soil type. Otherwise, farmers could not control the moisture in their fields. Therefore, policy management and supports are exactly needed for the portion. Adding up other income sources of animal farming like duck farming can provide something. This is one of the solutions to reduce the risk of crop productions. Consideration of developments of every roles and every corners.

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