

WATER AND LAND PRODUCTIVITY CHALLENGES IN MYANMAR

DEFIS QUE POSE LA PRODUCTIVIT DE L'EAU ET DE LA TERRE AU MYANMAR

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ABSTRACT

Myanmar is an agrarian country. The agriculture sector is the backbone of her economy, contributing 36% (2007-2008) of the GDP leading to 23% of total export earnings and employing more than 61.2% of the labor force. The national surface water amounts to 1082 km³ and the total estimated ground water potential is 495 km³. The land area of the country is 67.659 million hectares and presently, there are about 11.965 million hectares of net sown area in Myanmar. Rice is the staple food in Myanmar and its consumption per head per annum is about 187 kg. Today paddy production is more than 1558 million baskets (32.5 million MT) annually surpassing the national requirement of 850 million baskets. Construction of irrigation works for crop cultivation started historically since the days of Myanmar kings. Subsequently, with the construction of dams, weirs, tube wells and river pumping stations, the irrigation coverage increased from 12.5% of the sown area in (1987-1988) to 17% in (2008-2009). The Irrigation Department has been implementing thirty on-going projects and already planned to implement new irrigation projects which could irrigate additional areas and generate hydropower in future. The government is trying hard to increase water productivity to lead social-economic growth and to combat poverty also. Myanmar has still potential in water resources to fulfill the water demands of increasing agricultural lands. It is quite certain that implementation of new irrigation projects would facilitate in improving the status of water productivity and also promote sustainability in the environmental conservation process.

Key words: *Water and land productivity, Myanmar, climate change, productivity challenges, paddy and pulse production*

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RESUME

Le Myanmar est un pays agricole où le secteur agricole représente la base de son économie en contribuant de 36% (2007-2008) du PIB (produit intérieur brut) qui mène à 23% de recettes totales d'exportation. Ce secteur emploie plus de 61,2% de main-d'œuvre. La quantité totale de l'eau de surface nationale est de 1082 km³ et le potentiel estimé total de l'eau souterraine est de 495 km³. La superficie totale du pays est de 67.659 millions d'hectares dont environ 11,965 millions d'hectares de terre est cultivée. Le riz est la nourriture de base du pays. Sa consommation est d'environ 187 kgs par personne par an. Aujourd'hui, la production annuelle de riz paddy est plus de 1558 millions de paniers (32,5 millions de MT) qui est supérieur à la demande nationale de 850 millions de paniers. Depuis la période des rois au Myanmar, le pays a construit des travaux d'irrigation à but agricole. Par la suite, en raison de la construction des barrages, des déversoirs, des puits tubulaires et des stations de pompage, il était possible d'augmenter la superficie irriguée de 12,5% en 1987-1988 à 17% en 2008-2009. Le Département d'Irrigation a mis en oeuvre trente projets et a planifié de mettre en oeuvre les nouveaux projets d'irrigation pour irriguer les régions supplémentaires et produire l'hydro-électricité à l'avenir. Le gouvernement essaye d'augmenter la productivité de l'eau pour diriger la croissance socio-économique et atténuer la pauvreté. Le Myanmar possède assez de ressources en eau pour satisfaire les demandes supplémentaires en eau agricole. Il est certain que la mise en oeuvre de nouveaux projets d'irrigation aidera à améliorer la productivité de l'eau et à promouvoir la durabilité du processus de conservation de l'environnement.

Mots clés: *Productivité de l'eau et de la terre, Myanmar, changement climatique, dégis que pose la productivité, production de riz paddy et de légume sec*

1. INTRODUCTION

1.1. General information of Myanmar

1.1.1 Location

Myanmar is the largest country in South-East Asia and is situated between 9° 32' and 28° 31' N Latitude and 92° 10' and 101° 10' E Longitude. It has common international borders with China in the North, Thailand and Laos in the East, India and Bangladesh in the West and again with Thailand in the South.

1.1.2 Topography

Myanmar has mountain ranges in the North, East and West. Lengthwise, it stretches about 2061 Km North to South and approximately 945 Km East to West. Myanmar also has a long coastal line of 2229 Km in the South. Sea frontier comprises Rakhine coast line 713 Km, Delta coast line 438 Km and Tanintharyi coast line 1078 Km. The highest lands are at the North of the country and it inclines towards the South, resulting in most of the rivers flowing from the North to the South.

The country is divided into five topographic regions: the Western and Northern hilly regions, Shan plateau (Eastern part), the central dry zone or central semi-arid regions, the deltaic zone, the Rakhine and Tanintharyi coastal strips and mountainous regions.

1.1.3 Climatic condition in Myanmar

The climate and hydrology of Myanmar are much influenced by the Indian Ocean in the South. Two-third area of Myanmar has tropical climate while one-third, especially in the Northeast enjoys temperate conditions. The South-West monsoons usher in the rains. Usual precipitations are 2030 - 3050 mm in deltaic area, 2030 - 3810 mm in the North, about 1520 mm in the Shan state, rising to 5080 mm in the South, Southeast and Southwest parts and dropping to less than 750 mm in the central dry zone. Temperature varies from near 0° C to 40° C or more depending on geographic locations in the country.

1.1.4 Population

The Union of Myanmar is made up of many races. The main ethnic groups are Kachin, Kayah, Kayin, Chin, Bamar, Mon, Rakhine and Shan. With an annual population growth rate of 1.29% (2009), the present population of the country is about 60 million of which the rural population is 40 million and the urban population is 20 million. The official language is Myanmar and the majority of the people are Buddhist.

1.1.5 Agriculture and crop production

Myanmar is an agrarian country and agriculture sector is the backbone of its economy. The agriculture sector is contributing 36% (2007-2008) of the gross domestic product leading to 23% of total export earnings and employing more than 61.2% of the labor force. The main crops cultivated in Myanmar are Paddy, Pulses, Oilseed crops, Cotton, Sugarcane and other industrial crops.

Rice is the staple food in Myanmar. Its annual per capita consumption is 187 kg. Today paddy production is more than 1558 million baskets (32.5 million ton), annually surpassing the national requirement of 850 million baskets. Summer paddy programme was introduced in 1992. By using short duration high yielding varieties together with proper irrigation, 323,900 hectares of summer paddy were grown. As the yield of summer paddy is more than monsoon paddy, sown area of summer paddy has increased significantly.

Presently, Myanmar is standing as a lead country of pulse production among ASEAN member countries. Major exportable varieties of pulse are Mung bean, Green gram, Pigeon pea, Soy bean, Cow bean and kidney bean.

Table 1. Paddy production

Year	Sown area (million acre)	Yield (baskets/acre)	Production (million basket)	Production (million MT)
1996 - 97	14.52	59.43	847	17.67
1998 - 99	14.23	60.68	818	17.07
2001 - 02	15.94	66.29	1050	21.91
2002 - 03	16.03	66.32	1045	21.81
2003 - 04	16.17	68.74	1109	23.14
2004 - 05	16.95	70.52	1186	24.75
2005 - 06	18.26	72.71	1327	27.69
2006 - 07	20.08	74.28	1482	30.92
2007 - 08	19.99	76.14	1507	31.45
2008 - 09	20.00	78.21	1561	32.57

Table 2. Production of pulses in Myanmar

Year	Sown Area (million acre)	Yield (baskets/acre)	Production (million basket)	Export (million MT)
1996 - 97	4.85	9.04	43.20	0.595
1998 - 99	6.08	9.04	53.10	0.622
2001 - 02	7.90	10.65	83.70	1.035
2002 - 03	8.08	10.78	86.90	1.038
2003 - 04	8.38	11.67	97.50	1.211
2004 - 05	8.75	12.71	111.20	0.873
2005 - 06	9.41	13.42	126.20	0.865
2006 - 07	9.89	14.15	139.90	1.156
2007 - 08	10.46	14.99	156.70	1.142
2008 - 09	10.57	15.70	165.90	1.450

2. WATER POTENTIAL IN MYANMAR

Myanmar is endowed with abundant land and water resources. The surface water amounts to 1,082 Km³ and the ground water potential is 495 Km³. Only about 10% of the fresh water resources of Myanmar currently utilized: mainly for agriculture sector and some smaller quantities for domestic, industrial and other purposes.

2.1 Surface water

The principal water courses flowing in Myanmar comprise four Major rivers, The Ayeyarwady,

Chindwin, Sittaung and Thanlwin and other Major tributaries such as Mu river, Myitnge river and Mone, Man, Salin rivers. All rivers with the exception of the trans-boundary Thanlwin River, can be considered national water assets. Their drainage area spreads rather extensively over the country, with approximately 1082 Km³ of water volume per annum from a drainage area of 737,800 km².

2.2 Groundwater

Where a perennial supply of surface water is not available, ground water is naturally utilized, and sometimes with higher costs. Nowadays, ground water is being exploited not only for domestic water supply, but also for industrial and agricultural purposes in areas where conditions are favorable. The total estimated ground water potential in Myanmar is 495 Km³. Annual surface and ground water potential in Myanmar is shown in Table 3.

2.3 Water utilization in agriculture

Naturally, rain-fed crops depend on natural rain conditions. But the occurrence of rainfall varies in intensity and time of year and is different between regions. The diverse conditions call for provision of adequate storage of water, for irrigation on one hand, and flood protection from inundation on the other hand, as to ensuring crop-cultivation all year round. Therefore Irrigation Department plays a major role as the prime water user, for the main purpose of supplying irrigation water for agriculture and is responsible for protection of cultivable areas from floods. The Irrigation works include storage dams, weirs, barrages, sluice gates, canals of both irrigation and drainage, and canal facilities.

Construction of irrigation works for crop cultivation started historically since the days of Myanmar kings. Various irrigation projects were implemented after the independence in 1948. After 1988, the Government pushed forward incessant and continuous efforts in the construction of dams and reservoirs throughout the country by spending large capital investment, with sufficient manpower and machinery inputs making use of the available domestic resources and expertise. As a result of such an effort, tremendous irrigation facilities now emerge almost all over the country.

Before the year 1988, total numbers of irrigation and drainage facilities was 138 Nos. and total irrigated area was only about 0.54 million hectares. Between 1988 and 2010, the number of irrigation facilities is increased up to 233 and by these facilities, area under irrigation is also increased by 1.14 million hectares. Therefore, at present 1.69 million hectares of cultivated land is irrigated by the reservoirs having the gross total storage volume of about (17965) million m³.

Table 3. Annual surface water and groundwater potentials in Myanmar

Sr. No.	Chindwin River	115.30	141.293	57.578
2	Upper Ayeyarwady River (up to its confluence with Chindwin River)	193.30	227.920	92.599
3	Lower Ayeyarwady River (from confluence with Chindwin to its mouth)	95.60	85.800	153.249
4	Sittaung River	48.10	81.148	28.402
5	Rivers in Rakhine State	58.30	139.245	41.774
6	Rivers in Tanintharyi Division	40.60	130.927	39.278
7	Thanlwin River (from Myanmar boundary to its mouth)	158.00	257.918	74.779
8	Mekong River (within Myanmar territory)	28.60	17.634	7.054
	Total	737.80	1081.885	494.713

Table 4. Irrigation works implemented by Irrigation Department

Year	Number	Beneficial area (ha)
Myanmar Kings era to 1961-62	69	345315
1961-1962 to 1988-89	69	195430
1988-1989 to 2010 August	233	1144638
Total	371	1685383

Apart from construction of dams and weirs, establishment of 322 river pumping stations and 7932 of tube wells were kept in operations for rural water supply and agricultural use. Hence, the irrigation coverage increased from 12.5% of the sown area in (1987-88) to 17% in (2008-09) and the cropping intensity also increased up to 171%.

Table 5. Other types of irrigation

Project	Number	Beneficial area (ha)
Pump Irrigation from river	322	188959
- Electric pumping	129	141085
- Diesel pumping	193	47874
Underground water for agriculture	8490	50730
- Tube wells	7932	39478
- 99 ponds (Natural flow)	417	3310
- Group Electric pumping	141	7942

Table 6. Comparative statement of net sown area and irrigated area

Year	Net Sown Area (million ha)	Irrigated Area (million ha)	Per cent
1987-88	7.98	0.99	12.5
1996-97	9.27	1.55	16.8
1998-99	9.67	1.69	17.5
2001-02	10.65	1.98	18.6
2002-03	10.81	1.86	17.3
2003-04	11.04	1.95	17.7
2004-05	11.41	1.93	16.9
2005-06	11.93	2.13	17.9
2006-07	12.61	2.24	17.8
2007-08	13.22	2.25	17.0
2008-09	13.46	2.28	17.0

3. LAND UTILIZATION PRACTICE IN MYANMAR

The Land area of the Myanmar is 67.659 million hectares and presently, there are about 11.965 million hectares of net sown area in (2009-2010). Expansion of new agricultural land to the remaining 0.243 million hectares of fallow land and 5.618 million hectares of cultivable waste land is being encouraged.

Table 7. Land utilization (area in '000 ha)

Particular	1995/96	2004/05	2006/07	2007/08	2008/09	2009/10
Net sown area	8910	10516	11379	11707	11878	11965
Fallow land	1231	439	298	264	258	245
Cultivable waste land	7971	6416	5972	5789	5670	5618
Reserved forests	10321	15382	16462	16756	16837	17145
Other forest area	22079	18134	16985	16548	16419	16080
Other land	17147	16772	16563	16594	16599	16609
Total	67659	67659	67659	67659	67659	67659

Most of the agricultural land, which is about 7.89 million hectares are currently cultivated by small-scale farmers. The average size of holding is 2.27 hectares. Among total net sown area, 59% of its average farm size is under 4.05 hectares.

Development works of agriculture land include:

- reclamation of fallow and culturable waste land
- development of farms, embankment and paddy-fish ponds
- integrated farming in deep-water areas and
- protection of soil erosion and development terrace farming in high-land areas

Land consolidation is also being undertaken in the existing agricultural land with proper drainage, irrigation and farm roads. Apart from the traditional small-scale crop cultivation, development of modernized large scale agricultural business by the private sector is under way. At present, 199 private companies were granted with 0.68 million hectares for commercial farming.

4. WATER AND LAND PRODUCTIVITY CHALLENGES IN MYANMAR

Myanmar population is at present about 60 million and 80% of population resides in rural area and most of them are directly engaged in agricultural works and their livelihood depends on the agricultural products. Therefore efforts for promotion and increasing of income for rural people directly benefits them as well as the country. For that reason Government of Myanmar has been making great effort for development of agriculture sector by means of increasing water and land productivity that could contribute to increase crop production. From the comparative statement of Net-sown area and Irrigated area in Figure 1, the trends are upwards and consequently it would be wise to improve land and water productivity in Myanmar.

There are thirty on-going irrigation projects, being implemented by Irrigation Department, resulting in an increase of nearly 100,000 ha of irrigated areas together with generation of hydropower. In addition, some irrigation projects are currently under investigation for implementation in future. Furthermore, forty on-going river pumping projects have been implemented by Water Resources Utilization Department and consequently, it would facilitate approximately 100,000 ha of beneficial areas.

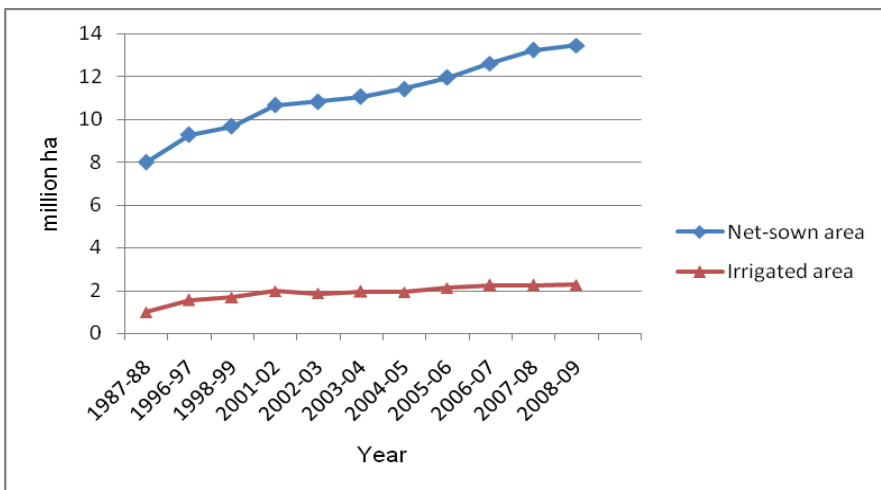


Fig. 1. Status of net-sown area and irrigated area

5. CHALLENGES WITH CLIMATE CHANGE

In Myanmar, late onset and early withdrawal of monsoon, shortened period of rainy season and weakening of monsoon intensity were evident during the period from 1960 to 2009. Like in other countries, Myanmar is also subjected to climate change impacts on agricultural productivity with sudden changes of weather patterns such as long drought and flood and thus sustainability of the crop production is questionable. It is obvious that most of the area needs supplementary water under the rain-fed conditions. In synchronization with the government resolution the 'Irrigation Department' has successfully worked out the following components;

- (i) Renovation services have been provided to the series of levees and embankments in the 'Ayeyarwady Delta', previously being destroyed by the most devastating Cyclone (Nargis) in Myanmar in May 2008.
- (ii) Development and Incorporation of small tanks and modulating facilities in the central arid zone of "Myanmar", where there exists a drawdown tendency of available storage at each dam, lake (or) any other water impounding scheme.

6. SUMMARY AND CONCLUSIONS

Myanmar is an agrarian country and agriculture sector is the backbone of its economy. The agriculture sector is contributing 36% (2007-2008) of the gross domestic product leading to 23% of total export earnings and employing more than 61.2% of the labor force. With an annual population growth rate of 1.29 percent (2009), the present population of the country is about 60 million of which the rural population of 40 million and 20 million of the urban people. Myanmar is a country endowed with an abundance of land and water resources. The national surface water amounts to 1082 Km³ and the total estimated ground water potential is 495 Km³. The land area of the country is 67.659 million-hectares and presently, there are about 11.965 million hectares of net sown area in Myanmar. Expansion of new agricultural land to the remaining 0.243 million hectares of fallow land and 5.618 million hectares of cultivable waste land is being encouraged.

Since rice is the staple food in Myanmar, the consumption of rice per head per annum is about 187 kg. Today Paddy production is more than 1558 million baskets (32.5million MT) annually surpassing the national requirement of 850 million baskets. Construction of irrigation works for crop cultivation started historically since the days of Myanmar kings. Various irrigation projects were implemented after the independence in 1948. After 1988, the Government pushed forward incessant and continuous efforts in the construction of dams and reservoirs throughout the country by spending large capital investment, with sufficient manpower and machinery inputs making use of the available domestic resources and expertise. The Irrigation Department plays a major role as the prime water user, for the main purpose of supplying water for agricultural irrigation and is responsible for protection of cultivable areas from floods. Before the year 1988, total numbers of irrigation and drainage facilities was 138 Nos. and total irrigated area was only about 0.54 million hectares. Between 1988 and 2010, the number of irrigation facilities is increased up to 233 and by these facilities, area under irrigation is also increased by 1.14 million hectares. Therefore, at present 1.69 million hectares of cultivated land is irrigated by the reservoirs having the gross total storage volume of about (17965) million m³. Apart from Construction of dams and weirs, establishment of 322 river pumping stations and 7932 of tube wells were kept in operations for rural water

supply and agricultural use. Hence, the Irrigation coverage increased from 12.5% of the sown area in (1987-1988) to 17% in (2008-2009). There are thirty on-going irrigation projects, being implemented by Irrigation Department, resulting in an increase of nearly 100,000 ha of irrigated areas together with generation of hydropower. In addition, some irrigation projects are currently under investigation for implementation in future. Furthermore, forty on-going river pumping projects have been implemented by Water Resources Utilization Department and consequently, it would facilitate approximately 100,000 ha of beneficial areas.

The government is trying hard to increase water productivity to lead social-economic growth and to combat poverty also. Myanmar has still potential in water resources to fulfill the water demands of increasing agricultural lands. It is quite certain that implementation of new irrigation projects would facilitate in both manners for upgrading the status of water productivity and for promoting sustainability in the environmental conservation process.

The government has just recently initiated the forums for developing efficient food supply chain management systems for principal agricultural commodities especially for paddy and pulse crops, being as the main foreign exchange earners of the agricultural sector of Myanmar. In reality, the government itself is trying hard to increase water productivity to lead social-economic growth and to combat poverty also.

Myanmar has still potential in water resources to fulfill the water demands of increasing agricultural lands. It is quite certain that implementation of new irrigation projects would facilitate, in both manners, for upgrading the status of water productivity and for promoting sustainability in the environmental conservation process.

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