ROLES AND EFFORTS OF THE IRRIGATION SECTOR IN MYANMAR AGRICULTURE PRACTICE

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ABSTRACT

Agriculture has always been the dominant sector in Myanmar economy. Agriculture sector contributes 22.1% of GDP (2014-2015), 20% of total expert earning and employs more than 61.2% of the labor force. Presently, the country produces enough food to supply its people and export the surplus production. The total land area of Myanmar is 67.7 million hectares (Mha), the cultivable land is 26% of total area i.e., 17.65 Mha of which only about 11.95 Mha is net sown area. Most of agricultural land (about 3.96 Mha) is currently cultivated by small farmers with an average holding of 2.16 ha. Myanmar is rich in water resources in which surface water is about 108200 Mm$^3$ per annum from a drainage area of about 738,230 km$^2$ while ground water potential is about 49500 Mm$^3$ in eight river basins in the country. As a part of water resources utilization in agriculture sector, 581 Nos of irrigation dams have been completed, further increasing the irrigable area of 2.78 Mha by the end of March, 2016. In Myanmar, plot-to-plot irrigation is very common (based on bilateral agreement between upstream and downstream water users) and almost all canals are unlined. Hence, the water use efficiency (WUE) is only 40%. In order to improve WUE as well as environmental conservation, farmers’ participation is of vital importance

Keywords: Potential water resources, Irrigation water management, Irrigation facilities, Water user groups, Myanmar.

1. GENERAL DESCRIPTION

Myanmar is endowed with abundant land and water resources, has a population of over 51 million, 70 per cent of them live in rural areas and employed in the agriculture sector. Agriculture is the mainstay of national economy. Hence, improving the farming methods is important in fighting poverty and fostering rural development.

Due to the importance of agriculture sector, the government accords priority to its development by with great potential including additional irrigation facilities to ensure water supply for crops cultivation all year round. Moreover, the irrigation facilities constitute the diverse function call for provision for adequate storage of water, for irrigation as well dual protection from inundated areas of farm lands and residential areas especially in deltaic region and along the main rivers system.

1.1 Climatic Condition

Myanmar has three distinct spells as the dry, wet and cold seasons. The rainy season stretches from May to October and the cold spell from November to January. The south-west monsoon usher in the rains, giving rise to precipitations of 2,030 mm to 3,050 mm in the deltaic area, 2,030 mm to 3,810 mm in the north, about 1,520 mm in the Shan State, rising to 5,080 mm in the Rakhine and Tanintharyi Regions, and dipping to less than 760 mm in the central dry zone. And incidentally such localities experience temperature of 40°C to 43°C during summer, while dropping to 10°C to 16°C during winters. The rainfall varies in intensity and time of occurrence and it also varies among.

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Usually crop cultivation season starts at the beginning of the rainy season if the south-west monsoon is regular, the precipitation falls from May to October giving sufficient amount for agricultural purpose.

However, nowadays Myanmar is experiencing climate change impacts on weather and rainfall intensity. Thus successful crop cultivation relies on irrigation facilities.

1.2 Water Resources Potential

1.2 (a) Surface Water

The river basin characteristics in Myanmar are quite variable due to the differences in physiographic features. 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 Thanlwin river which of trans-boundary nature can be considered national water assets. Their drainage area spreads rather extensively over the country, with some 108200 Mm³ of water volume per annum from a drainage area of about 738,230 km².

The monthly distribution of river flow varies according to the pattern of rainfall, about 80% during the rainy season (May - October) and 20% in the dry season (November - April). The estimated groundwater potential is about 49500 Mm³ in eight principal basins. On the basis of stratigraphy, there are eleven different types of aquifers in Myanmar. Depending on their lithology and depositional environments, ground water from those aquifers has disparities in quality and quantity. Out of these, ground water from Alluvial and Irawaddian aquifers are more acceptable for both irrigation and domestic use. However, on the water scarcity regions, ground water from Peguan, Eocene, and Plateau Limestone aquifers are extracted for domestic use.

1.2 (b) Groundwater

In Myanmar, perennial supply of surface water is not available. As a result, groundwater is utilized, and sometimes at a high cost. In the dry areas, groundwater is exploited not only for agriculture purpose but also for drinking water supply, especially in the summer season. The total estimated groundwater potential in Myanmar is 49500 Mm³ and river basin-wise break up is shown in Figure 1.

![Figure 1. Groundwater Potential in Myanmar](Source: Than 2008: Current State of Water Resources Management in Myanmar)
1.3 Agricultural Land

In Myanmar one fourth of total area is cultivable land among them about 11.95 Mha are net sown area. For the expansion of new agricultural land, remaining 0.44 Mha of fallow land and 5.26 Mha of cultivable waste land, can be developed. Most of agricultural land, which is about 3.96 Mha, are currently cultivated by small-scale farmers. The total cultivated average size of holding is 2.16 ha. (Myanmar Agriculture in Brief 2015)

The development of agricultural land includes reclamation of fallow and culturable waste land, development of farmers’ and protection of soil erosion and development of terrace farming in high-land areas. At present, land improvement is also being undertaken in the existing agricultural land through proper drainage, irrigation and farm roads. Apart from the traditional small-scale crop cultivation, development of modernized large scale agricultural farming by the private sector is being encouraged.

Table 1. Land Utilization in Myanmar 2014 - 2015

<table>
<thead>
<tr>
<th></th>
<th>Million ha</th>
<th>Per cent</th>
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</thead>
<tbody>
<tr>
<td>Net Sown Area</td>
<td>11.95</td>
<td>17.7</td>
</tr>
<tr>
<td>Fallow Land</td>
<td>0.44</td>
<td>0.7</td>
</tr>
<tr>
<td>Culturable Waste Land</td>
<td>5.26</td>
<td>7.8</td>
</tr>
<tr>
<td>Reserved Forests</td>
<td>18.62</td>
<td>27.5</td>
</tr>
<tr>
<td>Other Forests</td>
<td>14.73</td>
<td>21.8</td>
</tr>
<tr>
<td>Other</td>
<td>16.65</td>
<td>24.6</td>
</tr>
<tr>
<td>Total</td>
<td>67.66</td>
<td>100.0</td>
</tr>
</tbody>
</table>

(Myanmar Agriculture in Brief, 2015)

2. IRRIGATION IN AGRICULTURE PRACTICE

Construction of irrigation works for crop cultivation started historically since the days of Myanmar kings. Meikhtila Lake, Kinda and Ngapyauing diversion weirs in Kyaukse area and the old Muu Canal and Maha Nanda Lake in Shwebo area are significant irrigation scheme in Myanmar. In 1861, during the colonial period, commissioning of irrigation facilities started for agriculture and flood protection, particularly in Lower Myanmar.

Since Independence in 1948, the government has been promoting irrigation scheme in agriculture sector by raising large sums of capital required to meet the development through agriculture sector. The government made continuous efforts in the construction of dams and reservoirs throughout the country by utilization of large capital investment, man power and fleet of machineries making use of the available domestic resources and expertise. As a result, local irrigation facilities were constructed throughout the country.

Up to the end of March, 2016, close to 600 irrigation facilities have been completed, with a total irrigable area of about 2.78 Mha. Besides, rural water supply has been provided to 15 million rural populace out of 41.8 million in the country. Irrigation coverage increased gradually with 23.42 % of the net sown area in 2015 - 2016.

Apart from construction of reservoirs on river system, pump irrigation schemes were also commissioned catering to the need of about 201,095 ha through 327 river pumping stations. In addition groundwater facilities of 7,734 deep tube wells and 4,524 shallow tube wells were implemented for an area of 65,695 ha. All these water resources developmental activities have not only increased agricultural sector development through increasing cropping intensity but also provided access to drinking water supply (Outline of the Irrigation Department, 2015).
3. IRRIGATION WATER MANAGEMENT

In accordance with the importance of the agricultural sector, Myanmar has given high priority to its development, and created numerous irrigation facilities throughout the country since the last two decades for irrigation of monsoon and summer paddy and domestic water supply. However, irrigation efficiency is rather low due to plot-to-plot irrigation practice and most of the distributor canals are unlined. For all irrigation operations of distributors and operations of drainage outlets, the farmers generally consult and negotiate bilateral agreement with the farmers who keep the adjacent paddy fields in the plot-to-plot irrigation. Water from a branch canal flows into a paddy field at the farthest upstream and then plot-to-plot to the lower reaches. By doing so, the traditional water management is inefficient and farmers who actually use water are to be more sensitive and more serious in water management. In order to increase the efficiency of water, farmers should be more serious in water management. And also, management system should be more upgraded in irrigation water.

However, in most of the irrigated areas, farmer’s participation in water and land management is relatively rare in recent history. Farmers still have insufficient experiences of collectively maintaining and managing water and water related facilities. Organizational management, water allocation plan, Operation and Maintenance process should be undertaken by farmers and farmers’ groups.

The officials from the IWUMD have now become aware of the importance of water management with the participation of the farmers, and are presently exploring the possibility of creating a new structure for setting more Water Users’ Groups and Water Users’ Committees. For that, IWUMD encourages to set up awareness program me for farmer’s participation in on-farm level management.

Moreover, the IWUMD strongly recognized that human capacity building is a key prerequisite for irrigation and drainage management and improvement to enhance water and land productivity. In fact that, the Government exerts its efforts to share the knowledge for water use efficiency by participatory trainings and workshops conducted by local and the international organizations.

In irrigation water management, community participation is important for not only efficient and effective utilization of water but also equity of upstream and downstream users. Without proper community participation in the field of water management, the expected outcome cannot be fulfilled particularly in water scarcity area. For this situation, it is recognized that Water User’s Group should be formed for providing sustainability of the water resources development and efficient and effective utilization of water for increased crops production. And also, the Water Users’ Groups will support the irrigation water management by the following objectives. They are:

1. Use of irrigation water effectively in paddy fields through appropriate irrigation water supply in irrigation areas managed by the government.
2. Increase the irrigated areas yearly by reserving appropriate irrigation water without any waste.
3. Supply water immediately after prompt repairs as carried out by collaborate group members comprising water users.

Some part of the area, especially in Yaw Chaung and Yin Chaung Region of Magway Division, the Irrigation and Water Utilization Management Department (IWUMD) is carrying out a community development programme to promote private participation in the water resources sector. The people living in these area have long term experiences for establishing of Water Users’ Groups indigenously and management works for construction of temporary weirs, distribution canals and also repairing and maintenance works of water distribution systems. Village electrification works developed by the Micro hydropower schemes managed by the community base Water Users’ Groups contribute also for development of the areas.
4. **CHALLENGES**

Like other countries, Myanmar also suffers climate change impacts on agricultural productivity by sudden change of weather pattern such as long draught and flood and thus sustainability of the crop production is facing difficulties. Due to the climate change impacts rainfall pattern and rainfall intensity is significantly changed. Sometimes intervals of no rainy days last more than a week and standing crops suffer water stress affecting the yield of the crops. Thus most of the areas need supplementary water even in the rain-fed conditions. At the same time reservoirs also suffer lesser inflows resulting irrigation water shortage problems particularly in dry season.

Moreover, to overcome the drought and flood condition caused by climate change, it should be noted that the timely maintenance and surveillance of water related infrastructures in conjunction with proper irrigation and drainage systems must be carried out.

As a developing country, the water resources projects, particularly in the irrigation sector are mainly operated and managed by the government agencies. In this situation, authorized persons may find ways and means in improving the productivity of water and land use and the achieve sustained improvement in irrigation systems. In order to move away from fragmented sectors and change to water management to an overall integrated management, new solution of technical institutional linkage should be encouraged. Myanmar has to strengthen the capacity to undertake IWRM practices thus developing projects in water supply, irrigation and hydropower without regard to the inter sectoral effects. The institutional issues related to irrigation management by low-level institutional arrangements can affect the performance of irrigated agriculture participatory irrigation management at on-farm level. At present, the irrigation water management component of the water resources management has facilitated the implementation of co-management of water users in project planning. Co-management should be strengthened by government agency (especially IWUMD) and organize user groups in cooperative decision making.

Introducing an integrated water management scheme at on-farm level is not an easy job. Although the presence of legislation, co-operation and co-ordination among decision makers and field operators, it should be transparent. Sometimes, irrigation engineers must take into account social factors and such factors can determine the success of water management improvement programs. Typically, an irrigation project involves various stakeholders who have different backgrounds and interest. These facts sometimes cause the conflict in sectoral integrated water management and solutions are explored to justify the conflicts.

5. **CONCLUSION**

Improvement of agriculture water management and farm management is the key to increase water and land productivity. Although water and land requirements are competitive on limited resources, invocative application of engineering concepts and management measures in Irrigation and Drainage Improvement and water management practice should be applied to overcome the constraints and limitations. Presently, the government is also striving to create opportunities so as to contribute better knowledge of water and land utilization practice for ensuring the long-term benefit and improvement of socio-economic life of farmers.

It is important to disseminate new practices for farmers’ participation at on-farm level for effective use of irrigation water. In Myanmar, several agencies are engaged with supply and management of water. Cooperation and coordination among them is the main issue for the proper management of water resources. It is important to enhance public awareness and participation for successful implementation of IWRM. It is also desirable to call on the stakeholders, national entrepreneurs, and international organizations to participate in the development of agriculture, livestock, and hydropower and forestry sectors in Myanmar.
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