ISSN NO. 2320-5407

Journal homepage: http://www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH

RESEARCH ARTICLE

A suitability study on the planted species of Eco-restoration task in a portion of Pallikaranai Marsh Land, Tamil Nadu, India – A survey

[1]D. Rajarajeswari, [1*]P. Andipurushothaman, [1]M. Senthilkumar, [1]L. L. Josmin Laali Nisha, [1]M. Bharath, [2]C. Sasikumar, [3]K. Asohan, [4]Mitta Banerjii and [5]S.Balaji

1. Junior Research Fellows, State Forest Research Institute, Kolapakkam, Chennai, Tamil Nadu, India.

2. Research Range Officer, State Forest Research Institute, Kolapakkam, Chennai, Tamil Nadu, India.

3. Deputy Conservator of Forests, State Forest Research Institute, Kolapakkam, Chennai, Tamil Nadu, India.

4. Director and Chief Conservator of Forests (Research), State Forest Research Institute, Kolapakkam, Chennai, Tamil Nadu, India.

5. Principal Chief Conservator of Forests, State Forest Research Institute, Kolapakkam, Chennai, Tamil Nadu, India.

Manuscript Info

Manuscript History:

Received: 18 October 2015
Final Accepted: 26 November 2015
Published Online: December 2015

Key words:

Pallikaranai marshland, species suitability, Eco-restoration, *Acacia nilotica.*

Corresponding Author

M. Senthil Kumar

Abstract

A field survey has been taken up by a team of State Forest Research Institute, Kolapakkam, Chennai to assess the suitability of planted species in marsh area plantation exercised under a part of Eco-restoration task was carried out. This study reveals that, of the planted species, the species *Acacia nilotica* followed by Bamboo sp. were shown the maximum level of suitability to this marsh land. The suitability of the planted species was analyzed based on the parameters such as the survival, average height and average girth. The suitability of the planted species was discussed in the light of Eco-restoration of this marsh land.

INTRODUCTION

A transitional zone between terrestrial and aquatic ecosystem covering water table is usually at or near the surface or the land is termed as wetland (Mitsch & Gosselink, 1986). The resources of wetland can be considered as the global assets with enormous value to the present and future generation economic and social development (Ramsar, 1997). A remnant of natural wetlands in South India is Pallikaranai marshland (The Hindu, 2011). This wet land ecosystem harbors 337 species of flora and fauna including fishes, reptiles and birds (Aravindkumar Kumar *et al.,* 2014). This area experiences heavy anthropogenic pressure and jungled with small and huge concrete industries and have been suffering badly in the increased age of industrialization.

The maintenance and conservation of these water bodies are very high risk due to rapid growth and development of industrial activities. The Eco-restoration project has been implemented with an objective of increasing the roosting area for birds, and also to help in improving ground water table in a portion of Pallikaranai marshland effectively since 2010, exercised by the Tamil Nadu Forest Department. The marsh land harbours several rare or endangered and threatened species and acts as a forage and breeding ground for thousands of migratory birds from various places within and outside the country. The number of bird species sighted in the wetland is significantly higher than the number at Vedanthangal bird sanctuary (Manikandan, 2012). In spite of the highly degraded condition, Pallikaranai wetland was found to be an abode for various birds.

In the present study, a survey was carried out as a trial with an objective of assessing the suitability of the plant species planted in the Pallikaranai Marsh area exercised by the Tamil Nadu Forest Department as Eco-restoration of a portion of Pallikaranai Marsh Land.

MATEREIALS AND METHODS

Site Description

The Geographical area of the Marsh land covers 80 square Kilometers but an established plantation was planted under Eco-restoration of a portion of Pallikaranai Marsh Land has covered an extent of 6.90 hectares and its geographically location was recorded as N 12°55' 10.01' E 80°13' 07.72'. The planted species location has been indicated in the Google Map (Figure - 1). Pallikaranai Marsh Land is a fresh water swamp in the state of Tamil Nadu, Chennai, India. It is located outskirts of the Bay of Bengal and about 20 Km (20 Miles) towards the south of Chennai City center. The study area is focused on 6.90 Hectares of a portion this Marsh land.

Urban development in Chennai has been leading to reclaiming wetlands for waste disposal, housing, commercial, industrial etc., activities. Therefore, associated land form as well water bodies of Pallikaranai Marsh land have been polluted and converted into waste water, resulting in a heavy loss of major part of the marshy area. However, the topography of the Marsh land in such a way that retains some storage, thus forming a unique ecosystem.

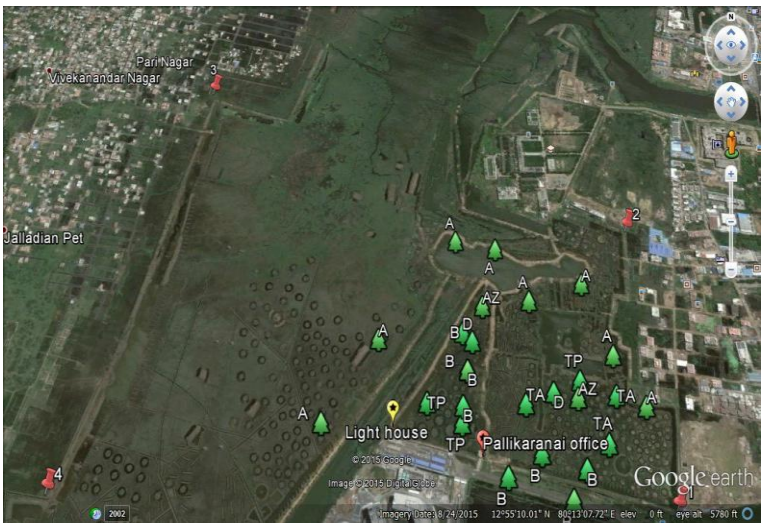
Field establishment

In the core area of Marsh land, site preparation for planting was initiated by the Tamil Nadu Forest Department as Eco-restoration of a portion of Pallikaranai during 2010. It involved enacting mounds in the core area by scooping out earth. The dug out parts were accumulated with water due to rain resulting in a profusion of invertebrates such as snails and fish that in turn attracted by birds (Manikandan, 2012). A bund was created for a distance of more than 3,000 meters along the periphery in order to walk. Bunds and mounds were used for planting as a trial to assess species survival and suitability (Figure - 2).

Experimental design

The bunds and mounds created were utilized for a sequential trial of plantations that have been attempted to sustain, conserve and to understand ecological richness of this marsh land exercised by the Tamil Nadu Forest Department during the month of March of 2010 – 2011and successive years of 2011 -2012 and 2012 – 2013. Chosen planted species to this marshy area was tried randomly.

The species such as *Acacia nilotica* (Figure – 3. a.), *Azadirachta indica* (Figure – 3. b.), Bamboo sp. (Figure – 3. c.), *Derris indica* (Figure – 3. d.), *Terminalia arjuna* (Figure – 3. e.) and *Thespesia populnea* (Figure – 3. f.) were assembled and planted as a trial in the study area, they were planted in the periphery of the available bunds, created mounds and scattered in available area. The survival value and growth performance of these plantations were calculated during the survey of March 2015 based on their survival of the individual species (Nos.), Average height (M) and Average girth (Cm). The suitability of the species in this study area was assessed on the basis of analysis of survival percentage and growth performance of the respective species during the survey of 2015.



A – *Acacia nilotica*; AZ – *Azadirachta indica;* B – Bamboo sp.; D – *Derris indica*; TA – *Terminalia arjuna* and TP – *Thespesia populnea.*

Figure – 1: Google Map image showing the location of study area in Pallikaranai Marsh land

Figure – 2: Showing a view of plantation under Eco-restoration in a portion of Pallikaranai Marsh land

RESULTS

In Pallikaranai marsh area, plantation started during 2010 and work was carried out as an initiative with species such as *Acacia nilotica*, *Thespesia populnea*, *Derris indica* and *Syzygium cuminii* by introducing mound plantation to this marsh land

Table showing the sequence of plantations during 2010 – 2011, 2011 – 2012, 2012 – 2013 and 2013 - 2014 in Pallikaranai Marsh land (Source: O/o The Assistant Conservator of Forest Pallikarani marsh land, Chennai)

Year of planting	Name of the planted species	Total no of seedlings planted	AS ON MARCH 15			
			No. of seedlings survived	Survival (%)	Average height (m)	Average girth (Cm)/ No. of culms (Nos.)
2010-2011	*Acacia nilotica*	1,500	1035	69%	2.6	23 cm
	Thespesia populnea	1,000	600	60%	1.6	18 cm
	Derris indica	200	106	53%	1.5	13 cm
	Syzygium cuminii	300	NIL			
2011-2012	Bamboo sp	1,670	1135	68%	3.2	8 Nos.
	Terminalia arjuna	1,000	650	65%	2.3	21 cm
	Derris indica	400	216	54%	1.2	9 cm
2012-2013	*Acacia nilotica*	4,800	3360	70%	1.8	16 cm
	Terminalia arjuna	2,500	2598	60%	1.9	17 cm
	Derris indica	1,350	715	53%	1.2	8 cm
	Thespesia populnea	1,650	957	58%	1.1	11 cm
	Azadirachta indica	400	200	50%	2.5	7 cm
	Bamboo sp	1600	1088	68%	2.8	6 Nos.

Growth performance of 2010 – 2011 plantation has shown the species *Acacia nilotica* exhibited maximum survival percentage (69%) followed by *Thespesia populnea* with 60 % survival and *Derris indica* 53% survival and it was noteworthy that *Syzygium cuminii* had completely failed. *A. nilotica* with an average height of 2.6 m was recorded tallest species successive results were observed in *T. populnea* and *D. indica.* Similarly, maximum average girth was recorded by *A. nilotica* succeeded by *T. populnea* and *D. indica* respectively (Table).

Whereas 2011 – 2012 plantation the species such as *Terminalia arjuna* and Bamboo species were introduced instead of *Syzygium cuminii,* as a result at the maximum 68% survival was observed in Bamboo sp. followed by *Terminalia arjuna* 65% and 54% in *Derris indica.* Among these species maximum average height was recorded as 3.2 m in Bamboo sp successive results were obtained in *T. arjuna* and *D. indica.* Maximum average girth was observed in *T. arjuna.*

During the 2012 – 2013 tenure plantation species such as *A. nilotica, T. arjuna, D.indica, T. populnea, Azadirachta indica and* Bamboo sp were re-introduced randomly. The survey exhibited that survival percentage was found to be 70%, 68%, 60%, 58%, 53% and 50% in the species *A. nilotica,* Bamboo sp, *T. arjuna, T. populnea, D. indica* and *A. indica* respectively (Table).

3. a. *Acacia nilotica*

3. b. *Azadirachta indica*

3. c. Bamboo sp.

3. d. *Derris indica*

3. e. *Terminalia arjuna*

3. f. *Thespesia populnea*

3. a. – *Acacia nilotica*; 3. b. – *Azadirachta indica*; 3. c. – Bamboo sp.; 3. d. – *Derris indica*; 3. e. – *Terminalia arjuna* and 3. f. – *Thespesia populnea*

Figure – 3: Showing the performance of planted species in a portion of Pallikaranai Marsh land

DISCUSSION

The results of the present study has clearly elucidated that irrespective to the plantation age, the survival of the species *A. nilotica* was performed better than other planted species and it showed maximum survival percentage and also exhibited maximum values in growth parameters. A study conducted by Indian Council of Forestry Research and Education, Dehradun, revealed that *A. nilotica* can tolerate extremes of temperature and moisture and it is suited for planting on marginal lands and can survive both drought and flooded conditions. The present survey results correlates the result of Oswin D. Stanley (2004) who reported that the patches of marsh vegetation or the reed beds of Wetlands of central and eastern Saurashtra and also Wetlands of South Gujarat where Vegetation area covers species such as *Prosopis juliflora, Acacia nilotica* and *Azadirachta indica* are the important tree species in and around Thol dam.

The species *T. populnea* (milo) has shallow roots and are capable of spreading on the surface, especially in shallow, rocky or occasionally flooded soils. In a plantation trial established on private land in 1998 on deep clay soil (Umbriorthox, USDA) all 24 plants has survived (Friday and Dana Okana, 2006). In our observation shown *T. populnea* occupied the next highest level of the planted species in terms of survival percentage and growth performance.

Marcar *et al*, 1991, reported that many tree species such as *Meialeuca* sp., *Eucalyptus tereticornis, E. robusta, Salix* sp., *Syzgium cumini, Terminalia arjuna* and *Albizia procera* are very waterlogging-tolerant species. In our study *T. arjuna* has performed 60% survival in 2010 – 2011, 65% in 2012 – 2013 plantations. Whereas *S. cumini* could not survive in this Pallikaranai Marshy area, this may be due to mismatched soil nature and waterlogging where periodic and seasonal waterlogging occurs. Waterlogging was also found to be an important factor reducing establishment. Waterlogging could be reduced by raising the planting position above ground level (Malcolm, 1991).

This survey describes the suitability of the species planted at different durations in Pallikaranai Marsh land, based on the growth performance concluded that *A. nilotica* followed by *Terminalia arjuna* and *T. populnea* were found to be suitable to this study area.

REFERENCE

Aravindkumar J Saravanakumar K Gokulakrishnan M Indira B. (2014). Assessment of Physio-Chemical Parameters of Water at Environmentally Degraded Pallikaranai Marsh Area, Chennai, India. International Journal of Scientific & Engineering Research, Volume 5, Issue 7, Pp. 1067 – 1070.

Friday JB and Dana Okano (2006). *Thespesia populnea* (milo). Species profiles for Pacific Island Agroforestry. Pp. 1 – 19.

Malcolm CV (1991). The Potential of Halophytes for Rehabilitation of Degraded Land. ACIAR Proceedings No. 42. Pp. 8 – 11.

Manikandan K (2012). "Pallikaranai wetland in makeover mode". The Hindu (Chennai: The Hindu). Retrieved 28 July 2012.

Marcar NE Crawford DF and Leppert PM (1991). The Potential of Trees for Utilisation and Management of Salt-affected Land. ACIAR Proceedings No. 42. Pp. 17 – 22.

Mitsch WI and Gosselink IG (1986). Wetlands, Van Nostrand Reinhold Publishers,
New York.

Oswin D Stanley (2004). Wetland ecosystems and coastal habitat Diversity in gujarat, india. Journal of Coastal Development. Pp. 49-64.

Ramsar (1997). A global Overview of wetland Loss and Degradation: http:/www. Ramsar.org/about- wetland loss.htm.

The Hindu (2011). "Forest Department makes first move to get Pallikaranai marsh declared Ramsar site". Retrieved 28 September 2011.