J Krishi Vigyan 2018, 7(1) : 4-9 DOI : 10.5958/2349-4433.2018.00091.0

Agro climatic Conditions, Cropping Pattern and its Profitability in South Andaman district of Bay Islands

B K Nanda[1], N Sahoo[2] and B Panigrahi[3]

ICAR-KVK, Port Blair 474101 (Andman &Nicobar Islands)

ABSTRACT

South Andaman district is a group of 10 inhabited islands spread over an area of 310.6 thousand ha as a part of Andaman and Nicobar group of islands in Bay of Bengal. Shifting cultivation on slopes, land degradation, high intensity rainfall, poor crop harvest,low cropping intensity, non availability of labour, high price of agricultural produce imported from mainland and limited employment opportunities resulted into acute poverty in this region. The study revealed that major cultivated crops(vegetable: 1317 ha, paddy: 216.1 ha, maize: 55 ha,ginger: 51.5 ha, sweet potato: 46 ha, tapioca: 26.5 ha, turmeric: 19.5 ha, green gram: 7.2 ha, black gram: 6.5 ha)were not at all economic due to lower net returns and lower benefit-cost ratios (BCR). It was found that the higher net returns were obtained from ginger cultivation (Rs 4,23,900) followed by tapioca (Rs 3,68,160), sweet potato (Rs 2,42,760), vegetables (Rs 2,07,760), turmeric (Rs 1,15,450), mustard (Rs 19,125), maize (Rs 11,430) and arhar (Rs 10,375). Benefit cost ratio (BCR) was found to be highest in case of tapioca (3.06) followed by sweet potato (2.68), vegetables (2.17), ginger (2.00), arhar (1.53), mustard (1.46), green gram (1.38), turmeric (1.30) and black gram (1.23). In order to avail maximum returns, crops having higher net returns and BCRs need to be allocated more area. Therefore, limited area should be put under paddy, maize, green gram and black gram to meet the minimum food requirement of the district and surplus area to be used for growing crops like ginger, tapioca, sweet potato, vegetable having higher BCRs and net returns to make the agriculture profitable and sustainable.

Key Words: Bay islands, land degradation, shifting cultivation, cropping pattern, net return, benefit cost ratio (BCR).

INTRODUCTION

The Union Territory of Andaman and Nicobar Islands are located in the Bay of Bengal extending North-South between 6° 45′ to 13° 4′ N latitudes and 92° 15′ to 94° E longitudes with an area of 8249.0 sq. km which is 0.25 percent of total geographical area of the country. The state has 3 districts *i.e.,* South Andaman, North and Middle Andaman and Nicobar. The bay islands are characterized by low ranges of hills interspersed with narrow valleys leaving narrow coastal strip. The general strikes of the hill ranges are from N-S with ridges and spurs striking out in all directions. Mostly the hills on the eastern side of the islands are higher in comparison to west. Among all the districts South Andaman has relatively wider flat surfaces. The general physiographic of the islands can be divided as hilly terrain with escarpments, rolling to undulating land dotted with sporadic hillocks and mounds, interspersed valleys, river valley, coastal plain, swampy coastal alluvium (mangrove swamp) and beaches characterized by rocky coast lines. Land degradation, subsistence farming with poor crop harvest, low input uses and lack of employment opportunities have resulted into poverty in this region of our country. Thus, to meet the challenges of employment, food security and economic growth, crop diversification through system approach in rainfed areas is essential, which can reduce the risk and improve stability, efficiency and employment opportunities (Premsekar and Sivanesan, 2003).

Corresponding Author's Email:er_bijaya@yahoo.co.in

[1]Subject Matter Specialist (Ag. Engg), ICAR-KVK, Port Blair; [2]Professor and [3]Professor and Head, Department of Soil and Water Conservation Engineering, CAET, OUAT, Bhubaneswar

In addition, the rising population, limited land for agriculture and more food demand have led to the cultivation of crops on steep slopes vulnerable to erosion. Shifting cultivation is a most acute problem responsible for land degradation and is prevalent among the farming community of South Andaman district of this region. Other than undulating topography, these groups of islands are subjected to inherent problems like intense rainfall, severe soil erosion, low fertility of soil, traditional farming practices, less intensive and low remunerating cropping systems, poor crop yield and low income from agriculture. All the three districts have distinct cropping pattern as per the food requirement based on the food habits of the habitants. Keeping in view the above and to find out a solution, a thorough investigation has been carried out to ascertain the existing land uses, climatic features, soil types, major crops/cropping pattern, crop wise investments and net returns and crop economics (benefit cost ratio) in respect of South Andaman district.

MATERIALS AND METHODS

The South Andaman district is located in the southern part of the Andaman group of island and is a hot per humid island eco-region in Bay of Bengal. The district is a group of 10 inhabited islands with 3 nos. of tehsils and 99 revenue villages covering a total of 310.6 thousand ha. The smallest and the biggest inhabited islands are the Flat Bay island (9.36 sq km) and South Andaman island (1347.97 sq km), respectively. As per the 2011 census, the total population of the district is 238142 with population density of 89 per sqkm and the scheduled tribe population of 4091. Since pre-historic times, these Islands have been the home of aboriginal tribes namely, the Great Andamanese, Jarawa, Onge & Sentineles, all of Negrito Origin. Major portion of population is of Settlers from the mainland.The economy of South Andaman district is primarily based upon agriculture, forestry and fishery. (Anon, 2011a). Agriculture during the monsoon is largely affected by the heavy rainfall that occurred during the months of May to July and October to December in the calendar year. In this period, farmers are not able to cultivate any crop other than paddy in the low-lying areas and during the post monsoon months the crops are affected by the severe water scarcity.

Information on land uses, land holding, climate, soil types, major crops, cropping pattern, productivity etc. were collected from available published reports of District Statistical Hand Book of Andaman and Nicobar Islands, Directorate of Economics and Statistics, Andaman and Nicobar Administration. Crop-wise investments details i.e. expenditure towards land preparation, seed, farm yard manure, fertilizer, pesticides, plant protection, intercultural operation, harvesting etc. were collected from farmers, line department officials and Directorate of Agriculture, Andaman and Nicobar Administration, Port Blair. Since there is no minimum support price exists in these islands for the agricultural produce other than copra from coconut, the farm gate price of different field crops are collected from the farmers directly. Gross return from crop is calculated by multiplying the farm gate price with total yield. Net return is computed by subtracting total cost of cultivation from gross return. Benefit cost ratio (BCR) is calculated by dividing gross return by production cost. All the data were critically analysed to have a better agriculture scenario of the South Andaman district.

RESULTS AND DISCUSSION

Land use

The land use details of South Andaman district is given in Table 1. The reporting area for land utilization is 90 per cent of the total geographical area (310.6 thousand ha). Net sown area and area under forest of the district is about 2.5 per cent and 95 per cent of the reporting area for land utilization. This indicates the high degree of forest cover in these groups of islands. Out of the total forest area, 99.4 per cent and 0.6 per cent are reserved and protected forest areas respectively. Gross cropped

area is 7141.04 ha and cropping intensity is about 104 per cent.

Table 1. Land use pattern of the South Andaman district.

Particular	Area(ha)
Net area sown	6894.19
Not available for cultivation	2729.48
Other uncultivated land excluding fallow land	1860.98
Current fallow	342.75
Fallow land other than current fallows	1321.06
Forest area	267294.00
Reporting area for land utilization	280442.46
Total geographical area	310600.00

Source: District Statistical Hand Book of Andaman and Nicobar Islands, Directorate of Economics and Statistics, Andaman and Nicobar Administration

The past land use data reveal that the area under cultivation is continuously increasing by converting the fallow land and other uncultivated land to cultivable land whereas the area under forest is not affected. The growing demand for food grain production due to increase in population is a major factor towards it.

Land holding

Majority of the farmers (39.2%) come under marginal (<1 ha) and 20.5, 26.6, 13.5 and 0.3 per cent under small (1-2 ha), semi-medium (2-4 ha), medium (4-10 ha) and large (>10 ha) category, respectively with average land holding of 1.85 ha (Anon, 2011b). Majority of the farmers (59.7%) under marginal and small category and decreasing size of land holding in district may be due to population rise and rapid fragmentation of land holding. Non availability of adequate land for cultivation and food demand is forcing the farmers to go for shifting cultivation on the hills.

Climate

These Islands fall under agro-climatic zone XV and have a true maritime climate of warm and humid with mean maximum and minimum temperatures of 31°C and 21°C, respectively. The average annual rainfall in the district amounts to 3054.0 mm occurring in 131 rainy days. May to November is the usual wet period, where 90.4 per cent rainfall is recorded in about 117.3 rainy days. The monthly distribution of rainfall and rainy days is given in Fig.1. Relative humidity varies from 67 to 95 per cent in monsoon and 56 to 84 per cent in post monsoon season. Bright sunshine hours vary from 0 to 11.3 hr in monsoon period and from 0 to 11.1 hr in post monsoon season. The mean wind velocity varies from 2.7 to 28.2 km/hr in monsoon period and from 2.0 to 14.6 km/hr in post monsoon period.

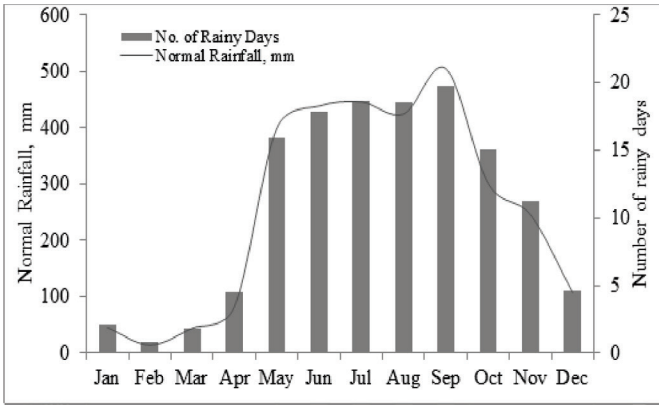

Fig. 1. Monthly distribution of rainfall and rainy days of South Andaman district.

It reveals that overall climatic condition of the South Andaman district is congenial for crop production, but it is suffering from soil erosion/ land degradation and water scarcity problem due to undulating topography and high run off. Hence, soil and water are being the important natural resources, must be conserved carefully and utilized judiciously at farm level or at community level to sustain the ever-increasing human and animal population in these Islands (Ghoshal Chaudhuri *et al*, 2005). Due to high land slope, flooding rarely occurs however sometimes droughts affect the crops during the growth period. In 124 years, probability of occurrence of drought was 13.0 per cent in these islands (Sinha Ray and Shewale, 2001).

Soil

The general soil-scrape of these groups of islands is represented by hilly terrain, rolling to undulating lands enclosing narrow valleys with escarpments and narrow coastal strips. The distribution shows that the soils belong to 4 orders, 8 suborders, 11 great groups and 18 subgroups (Das et al, 1996). Inceptisols are the dominant soils followed by Entisols, Alfisols, Mollisols and occupy 44.2, 37.9, 6.0 and 4.1 per cent of the total geographical area, respectively (Soil Survey Staff, 1998). The soils developed on hill top and escarpments are shallow to moderately deep, well drained, gravelly loamy soils with moderate to severe erosion hazards. The soils on the hilltop are strongly acidic, medium in organic matter and Cation Exchange Capacity (CEC) with high base status. The escarpment soils are very strong to strongly acidic in reaction, medium to high in organic matter, low to medium CEC with medium base saturation.

Soils on moderately steep hill slope are moderately deep to shallow, well to excessively drained with gravelly loam texture and severely eroded with slight to moderate rockiness. These are very strongly to strongly acidic soils, have medium to high organic matter, low to medium CEC and base saturation. The valley soils are deep, imperfectly drained, fine loamy and strongly to moderate acidic in reaction. They have high organic matter, low to medium CEC and medium to high base saturation. The general landscape of little Andaman varies from moderately sloping hills, sloping undulating lands to coastal strips. Soils of coastal plain are shallow to moderately shallow, well drained, fine loamy and moderately eroded. They are neutral to mildly alkaline, high in organic matter, medium in CEC and high in base saturation. The coastal alluvium soils cover mangrove swamps which are moderately deep to deep, very poorly drained loamy soils with moderate to strong salinity and EC of 4.5 to 18.5 dS/m due to tidal marshes. Soils of coastal beaches are very deep, excessively drained and sandy.

Irrigation

The sources of irrigation in these islands are the ponds, wells and check dams. Total number of ponds, wells and check dams in South Andaman districts are 730, 401 and 84, respectively. These sources provide supplemental life saving irrigation to the crops during the post monsoon period from December to April. Surface runoff and deep drainage water was captured in surface tanks and dug wells to provide irrigation to horticultural crops. Overall rainfall use efficiency on watershed basis was greater than 50% in most years (Wani, 2000). Gupta et al (2006) also suggested that the excess rainwater available during May to December in A&N Islands should be stored in-situ or harvested in the dugout farm ponds to provide supplemental irrigation in dry spells during rainy season and life saving irrigation for crop cultivation during dry months. Number of pump sets available in this district is 1123. Low cropping intensity of the district reflects the less irrigated area of the district. Farmers use the irrigation source most of the times as life saving irrigation for the kharif crops.

Major crops and cropping pattern

Major field crops grown in the district are vegetables, paddy, maize, ginger, sweet potato and turmeric. Vegetables and paddy are grown in an area of 1317.0 ha and 216.0 ha which are 75.0 and 12.0 per cent of the total cultivated area, respectively. Other crops cultivated are maize (55.0 ha), ginger (51.5 ha), sweet potato (46.0 ha), tapioca (26.5 ha), turmeric (19.5 ha), green gram and black gram (13.7 ha). It indicates that the existing cropping pattern of South Andaman district is vegetable, rice, maize, ginger, sweet potato and tapioca dominant. In low lying areas, farmers are not able to cultivate any crop other than paddy due to the heavy rainfall in monsoon season. Although vegetables occupy the largest cultivated area, farmers are not getting much benefit for cultivating vegetables. During the post monsoon season most of the farmers are cultivating the vegetables, the rate is cheaper and farmers are not getting much profit from the crops

(Ravisankar, 2006). A very few farmers grow vegetable crop during the monsoon months and got good returns due to higher farm gate price.

Cost of cultivation

Based on expenditure incurred on inputs (seed cost, farm yard manure, fertilizer, pesticide, plant protection and labour), ginger cultivation involves the highest investment per hectare (Rs 4,26,000) followed by turmeric (Rs 3,83,000), tapioca (Rs 1,79,000), vegetables (Rs 1,77,200), sweet potato (Rs 1,44,200), maize (Rs 69,650), rice (Rs 54,875), ground nut (Rs 43,500), mustard (Rs 41,850). Cost of investment is the lowest in case of green gram and black gram (Rs 11,300 each).

Crop productivity

The highest yield is obtained in case of tapioca (273.58 q/ha) followed by sweet potato (96.75 q/ha), ginger (84.99 q/ha), turmeric (66.46 q/ha), vegetables (64.16 q/ha), rice (30.46 q/ha) and maize (20.27 q/ha). Lowest yield is obtained in case of black gram (2.77 q/ha). Crop wise productivity of different crops is given in Fig. 2.

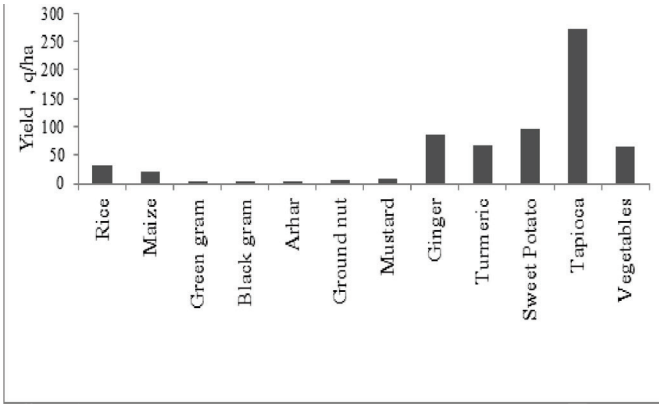

Fig. 2. Productivity of different crops in South Andaman district

Net Return

The highest net return per hectare is obtained from ginger cultivation (Rs 4,23,900) followed by tapioca (Rs 3,68,160), sweet potato (Rs 2,42,760), vegetables (Rs 2,07,760), turmeric (Rs 1,15,450), mustard (Rs 19,125), maize (Rs 11,430) and arhar (Rs 10,375). Lowest net return per hectare is obtained from black gram (Rs 2,550).

Benefit cost ratio

Benefit cost ratio (BCR) is found to be the highest in case of tapioca (3.06) followed by sweet potato (2.68), vegetables (2.17), ginger (2.00), arhar (1.53), mustard (1.46), green gram (1.38), turmeric (1.30) and black gram (1.23). Lowest BCR is obtained for cultivation of paddy (1.11). Crop wise benefit cost ratio (BCR) is presented in Fig. 3.

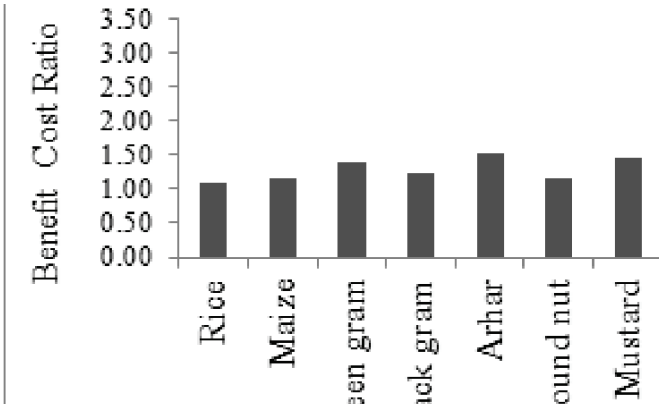

Fig. 3. Crop-wise Benefit cost ratio (BCR)

CONCLUSION

In the present study most of the features *i.e.* socio-economic, land use, land holding, rainfall, soil, irrigation, major crops, crop-wise cost of cultivation, productivity, net return and BCR were worked out taking into account the actual scenario of South Andaman district. It was inferred that non availability of adequate land for cultivation and food demand of the district forced the farmers to go for shifting cultivation. Though climatic conditions of South Andaman district is congenial for crop production, suitable soil and water conservation measures are to be adopted to tackle the soil erosion/ land degradation and water scarcity problems. As soils are low in N, P, K and organic matter content having low nutrient value index, adequate inputs may be used for maximization of crop production. The irrigation potential has to be enhanced to increase the cropping intensity by growing more crops during rabi and summer seasons to meet the food demand. So, there is a urgent need for optimal land utilization in the district to maximize the production and also the net return. Net return is found to be higher in ginger, tapioca, sweet potato,

vegetables and turmeric cultivation. When crop-wise BCR compared, it was found that BCR is the highest in case of tapioca (3.06) and the lowest in case of paddy (1.11). As BCR is higher in tapioca, sweet potato, vegetables, ginger and arhar, these crops may be grown to have maximum return. Under the existing cropping pattern, more area is allotted to vegetables followed by rice, but productivity of vegetables in these islands is lower than the tapioca crop. Productivity level of vegetables has to be increased by adopting high yielding varieties to increase its BCR. Since cultivation of rice is not economical, limited area should be put under cultivation of the said crop which can meet the minimum food requirement and surplus area should to be used for growing crops of higher BCR like ginger, tapioca, turmeric and sweet potato. All these information will immensely help the farmers, policy makers, planners and researchers to prepare a comprehensive crop action plan for the South Andaman district to make the agriculture profitable and sustainable.

ACKNOWLEDGEMENT

Authors sincerely thank officers and staffs of Directorate of Agriculture, Andaman and Nicobar Administration, Port Blair, Dr. L. B. Singh, SMS (Horticulture), ICAR-KVK, South Andaman and progressive farmers of South Andaman district for providing the necessary support.

REFERENCES

Anonymous (2011a). http://www. andaman.nic.in/district_ profile?aboutus.php

Anonymous (2011b). *District Statistical Hand Book*. Directorate of Economics and Statistics, Andaman and Nicobar Administration, Port Blair.

Das A L, Goswami A, Thampi C J, Sarkar D and Sehgal J (1996). Soils of Andaman & Nicobar Islands for optimizing Land Use. NBSS Publ. 61 (Soils of India Series), National Bureau of Soil Survey and Land Use Planning, Nagpur, India: 57 +5 sheets Soil Map (1:50,000 scale).

Ghoshal Chaudhuri S, Dinesh R, Raja R, Ravisankar N and Kumar Sashi (2005). Soil diversity of Andaman and Nicobar Islands. *The Indian Forester* **132**(7): 779-784.

Gupta S K, Ambast S K, Singh Gurbachan, Yaduvanshi N P S, Ghoshal Chaudhuri S and Raja R (2007). Cost Effective Solutions for Development of Appropriate Land Reclamation Programs in Tsunami Affected Andaman-Nicobar Islands and Maldives. CSSRI, Karnal: 86.

Premsekar M and Sivanesan M (2003). *Scope for employment opportunities through integrated farming system*. In: Sustainable Ecosystem Maintenance through Farming System Approach, Centre of Advanced Studies, Department of Agronomy, TNAU, Coimbatore, 270-275.

Ravisankar N (2006). Broad Bed and Furrow technique for vegetable production in post tsunami Bay islands. Training on "Revitalization of Tsunami affected farmers – A step towards better tomorrow organized under Consultancy programme with Action Aid International (NGO), 23 September, 2006.

Sinha Ray K C and Shewale M P (2001). Probability of occurrence of drought in various subdivisions of India. *Mausam* **52** : 541–546.

Soil Survey Staff (1998). *Keys to Soil Taxonomy*. 8th Edition. USDA Natural Resource Conservation Service, U.S. Government Printing Office, Washington DC.

Wani S P (2000). Integrated watershed management for sustaining crop productivity and reduced soil erosion in Asia. Paper presented at MSEC Meeting, November 5-11, 2000, Semarang, Indonesia.

Received on 2/7/2018 *Accepted on 10/7/2018*