Land Reclamation and its Impact on Agriculture-A Case in Tamil Nadu

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Land Reclamation and its Impact on Agriculture-A Case in Tamil Nadu

T. Vasantha Kumaran[1] and N. Annammadevi[2]

Abstract

Desertification is a significant global ecological problem. It is also common in many areas in the Theni district. The study villages in the Theni district are affected by the aeolian sand deposition, forming linear dunes along the Western Ghats. They have been so for hundreds of years. Arable/agricultural land has been covered by dunes for an area of 12,000 ha. There are even now high dunes stretching for almost 20-25 km all along the Western Ghats, after about 40 per cent of the area has been sand quarried in the last several years. The villages get very low rainfall of about 650 mm to 750 mm a year.

Purpose of the Study. The purpose of the study is to look at what has happened after sand quarrying/mining of the area by the human agency and how the reclaimed areas used, particularly for small-scale agriculture, in the last several years.

The Objectives of the Study. The objectives of the study are: (1) To examine the process of land reclamation in the study area through sand mining from the dunes and sand encroached areas; and (2) To analyse the use of reclaimed land for agriculture, particularly by the marginal and small farmers of the study villages.

Land Reclamation and Agriculture of the Study Area. Land reclamation hereabouts has been happening for several years, but it has been primarily an individual effort. Some farmers have decided either on their own or the advice of someone or in some cases they have simply followed others. Lands of considerable extent have been reclaimed from the sands in the villages of Sillamarathupatti and Silamalai, which are our current focus. The paper speaks about the impacts of land reclamation on the agriculture of the villages from a questionnaire survey.

Keywords. Desertification, Land Reclamation, Sand mining, Marginal and Small Farmers

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Introduction

More than a fourth of India is turning into a desert (Srinidhi, 2017). This includes the degradation of agricultural areas of the country as well (ISRO, 2016). Analysis of satellite images has shown that India has about 32 per cent of its land degraded, with desertification as a major component of degradation. Newer areas in Jammu and Kashmir, Odisha and Jharkhand are turning arid, with 9 states of the Indian Union accounting for about 24 per cent of desertification. Worse still, Jharkhand, Rajasthan, Delhi, Gujarat and Goa account for more than 50 per cent of the land under desertification.

Desertification is a process by which fertile land becomes desert, typically as a result of drought, deforestation, or inappropriate agriculture. It is the loss of vegetation due to deforestation that causes the degradation of the lands. Deforestation is on the increase because of the cutting of forests beyond permissible limits, unsustainable fuel wood and fodder extraction, shifting cultivation, encroachment on forest lands, forest fires and also overgrazing. In India, however, the main cause is water erosion (26 per cent) followed by degrading vegetation (nearly 9 per cent) and land or soil erosion due to wind activity. Of the 328.73 million hectares of the total geographical area of India, 105.2 million hectares are currently being degraded. As much as 82.2 million hectares of land is under desertification. While Rajasthan accounts for 23 million hectares under desertification and expansion, Gujarat, Maharashtra, Jammu and Kashmir account for 13 million hectares each, and Odisha and Andhra Pradesh have 5 million hectares each. More than two-thirds of the country (68 per cent) is prone to drought and this is further heightened due to the impact of climate change, particularly in drylands (Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), 2018; Srinidhi, 2017; The Pioneer, 2018).

In Combating Desertification in the global context, India is a signatory to the United Nations Convention on Combating Desertification (UNCCD). It is committed to combating desertification and land degradation and intends to achieve land degradation-neutral status by 2030. However, India does not have a specific legislative framework or policy for combating desertification. On the other hand, the concern for arresting and reversing land degradation and desertification gets reflected in many of India's national policies: Desert Development Programme; Integrated Wasteland Development; National Watershed Development Project for Rain-fed Areas; Soil Conservation in the Catchment of River Valley Projects; National Afforestation Programme; Arid Zone Research; Mahatma Gandhi National Rural Employment Guarantee Scheme; National Rural Drinking Water Programme and so on (Press Information Bureau, 2016).

Land Reclamation has been a preferred activity the world over. Although India has managed to reclaim about 1.87 million hectares of land that was under degradation during 2003-05, it has been offset by nearly double the area of productive land (3.63 million hectares) lost to degradation from 2005 to 2013 (The Hindu, 2016).

In the present paper, the discussion is on land reclamation and its impact on agriculture in an area under desertification (12,000 ha) for a long in the Theni district of Tamil Nadu. The purpose is to look at what has happened after sand quarrying/mining of the dunes and encroached areas by the human agency and how are the reclaimed areas used, particularly for small-scale agriculture, in the last several years.

Reclamation of Land, the Rationale

There are several examples of land reclamation for a variety of reasons (Bandaragoda and ur Rehman, 1994; Gowda, 1996). Reclamation from the sea has a long history (Thorn 1960: 106). Land reclamation has played a significant role in the urban development process in coastal areas in many parts of the world, including India, Sri Lanka, China, Britain, Japan, Korea, the Netherlands and the United States (see Jiao, 2002, for example).

Reclamation is a means to increase land supply for economic activities. The purpose has also been to recover land that has lost its productivity to make it reusable. It is also commonly used to refer to creating dry land from an area covered by water such as sea, lake and swamp (Hopkinson, 2003). It also means a process of creating new, dry land on the seabed (UNESCO, 2005).

> *Reclamation is defined as the utilization and improvement of water and land resources for agricultural and other purposes through irrigation, drainage of tidal marshes, restoration of strip mine areas, and other construction activities* (Microsoft_® Encarta® Encyclopedia, 2002).
>
> *Reclamation means any work or project carried out for reclaiming land from the seabed or foreshore so that it may be used for dry land purposes. In other words, reclamation also means work that could turn an area of water into an area used for dry land purposes* (Paper for the House Committee meeting, 1998).
>
> *The land can strongly affect the sea. Reclamation projects are not without potential harmful effects on the environment* (Microsoft® Encarta® Encyclopedia, 2002; Gowda, 1996).

In summary, the term 'reclamation' can be simply defined as a process of 'dredging', followed by 'filling' to increase the land area for dry land purposes such as for agriculture, industry, housing, recreation, airport and so forth. The benefits of land reclamation have been investigated and an index system has been achieved in (mining subsidence in the eastern plain at the middle prelatic level) using quantitative research (Liu et al., 2012).

The Study Area

In 1999, an area of 120 km^2 (or 12,000 ha) was covered with dunes and sand encroachments in five villages of Theni district, Tamil Nadu, namely, Bodi Ammapatti, Maniampatti, Pottipuram, Rasingapuram and Silamalai, all within 10 km of Bodinaickanur, the Cardamom town. The five villages of the study are located in the northwestern part of the Thevaram Basin (FIGURE 1). In 2017, roughly 40 per cent of this area has now been cleared through organized sand mining/quarrying in the villages. So a considerable extent of land, which was under sand beneath the dunes and encroachments, has now been reclaimed.

Land reclamation hereabouts has however been happening for several tens of years, but it has been a primarily individual effort. Some farmers have decided either on their own or the advice of someone - or in some cases, they have simply followed others. It is now an accidental result of sand mining, which is an act of greed of the contractors and colluding politicians, who found an opportunity to make ‘fast bucks’, so to say. Lands of considerable extent have been reclaimed from the sands in the villages of Sillamarathupatti and Silamalai, which are our

current focus in the present study**.** The farmers have also been cultivating their reclaimed lands. In other villages and hamlets, the sand from the dunes has been quarried and the process is still on in Maniampatti and Rasingapuram villages. Contrary to this ongoing sand quarrying, there is considerable opposition to quarrying the sand in the village of Pottipuram, especially in Thevaram Pudur, also known as Ramakrishnapuram, and Chinna Pottipuram, which are two of the hamlets of Pottipuram.

The Thevaram Basin has a semi-arid environment, with a mean annual temperature of 27.20° C and a mean annual relative humidity of 67 per cent. Wind activity has a significant effect on climate, vegetation and land use. There is severe wind activity, which has in the last century built a stretch of dunes, sands from which are drifting or encroaching upon the agricultural fields (Plate 1). Thus, the winds and the resulting sands cause land degradation. This has caused concern among the people and researchers in the interest of the community. In this study, land reclamation and its impact on agriculture is the focus and the study has been made during the months of June-September 2017 under the auspices of a Revisit Project 2016-18.

Objectives

The objectives of the study are:

a) To examine the process of land reclamation in the study area through sand mining from the dunes and sand encroached areas; and
b) To analyse the use of reclaimed land for agriculture, particularly by the marginal and small farmers of the study villages (Silamalai and Maniampatti).

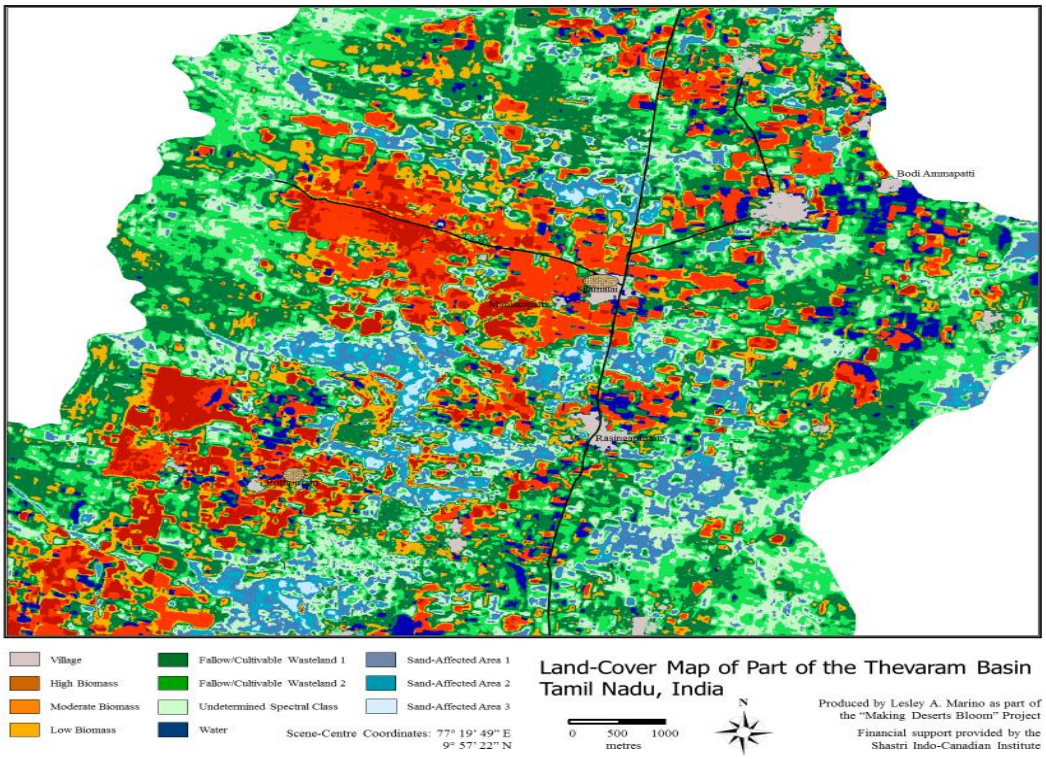

FIGURE 1

Methodology

The minor field study reported here has used a ***simple mixed method approach***, with a cycle of 2 participatory appraisals (qualitative, participatory), 2 group discussions, 15 key informant interviews, a questionnaire survey using a custom-designed questionnaire (of 33 different and good questions) and relevant photographic and video documentation.

For ***participatory appraisals*** (2), the people of the villages, particularly those farmers and their spouses who have reclaimed their lands from under the sand, were informed of the kind of appraisal to be done on the previous day of the event by the intern while the appraisals themselves (one in Silamalai and another in Maniyampatti) were carried out in a common place like the village social space (Maniampatti) and the Pillaimar community hall (Silamalai). A total of 23 women and 14 men participated in the two appraisals, with about 73 per cent or 27 people (16 women and 11 men) from Silamalai and Sulapuram, a hamlet of Silamalai and the rest, 27 per cent or 10 people (7 women and 3 men) from Maniampatti.

Plate 1. The undulating dunes west of Maniampatti village July 16, 2017.

Group discussions (2) were done on the streets as the team gathered a few people who could give us their studied opinions on matters relating to the topic, one each in the two villages: 4 women from Silamalai and 6 men from Maniampatti. On the other hand, ***key informant interviews*** were held with a semi-structured questionnaire with people who were chosen for their involvement in and knowledge of land reclamation (9 from Silamalai and 6 from Maniampatti) using a list of such farmers, stratified randomly for questionnaire survey. Mr SVP Veerakumar of Sillamarathupatti in consultation with some of his friends at Silamalai and Maniampatti made a list which could be first verified for actual land reclamation and then used for conducting the survey.

A total of 66 farmers and spouses were thus listed and verified before they were contacted for interviews by the interns using the questionnaire. In the chosen households, land

reclamation was a household affair, as men and women of the households were directly involved as participants. For the study, 40 women and 26 men were randomly chosen for interviews from the two villages, with an overall distribution of 55 from Silamalai, 6 from Sulapuram and 5 from Maniampatti (66 in all). The ***questionnaire survey*** was done over 45 days from June-July 2017 (Plate 2).

The data collected from the questionnaire survey were fed into a spreadsheet of MSEXCEL and used for a simple frequency and percentage analysis to generate mainly one-way tables for analysis and interpretation, using the SPSS package. For the description of the sample and respondent-related characteristics and revealed perceptions on resources and livelihood-related problems and socio-economic problems, and on varied aspects of land reclamation, a ***frequency and percentage analysis*** was done for all variables extracted from the questionnaire and put into a dataset. But only select variables and their interpretations are given in this paper, to illustrate what happens, how and why and what can be inferred as findings and conclusions.

Plate 2: (Left) A discussion in progress on land reclamation with organic farmer Mr SVP Veerakumar of Sillamarathupatti in a parcel of his lands reclaimed and planted with tamarind trees about 5 years ago. (Right) Ms R. Geetha, the project intern, interviewed Mr SVP Veerakumar at his home on June 11, 2017.

A simple frequency of each of the fields with column percentages was made and thus one-way tables were generated, to measure variations. The analyst begins to explore the data, by measuring the central tendency of the data, and more importantly, the dispersion of the data around this central tendency. Frequency analysis is particularly useful for describing discrete categories of data having multiple-choice or yes-no response formats. This analysis involves constructing a frequency distribution. The only technical requirement of the frequency analysis is that the categories of response be mutually exclusive and exhaustive. This means that the same observation cannot be counted as belonging to more than one response category. The frequency analysis must be exhaustive in the sense that all respondents must fit into a category. The tables so generated are several, and are included in the text with interpretations to show the variations therein.

Table 1 and FIGURE 2 show the distribution of samples by villages. It is evident that 83.5 per cent of the samples were drawn from Silamalai as the village has a large number of farmer-households which reclaimed their lands from under the dunes recently, in the last 6 years; 9.1 per cent of the samples were drawn from the hamlet of Sulapuram which is part and parcel of the village of Silamalai. On the other hand, 7.6 per cent of the samples were drawn from Maniampatti as the village has the least number of farming households who reclaimed

their lands from the dunes. Currently, however, a large number of the farmers of Maniampatti are involved in land reclamation and the process is ongoing.

Table 1. Distribution of Samples by Villages

Village/Hamlet	Per cent	Number
Silamalai (V)	83.5	55
Sulapuram (H)	9.1	6
Maniampatti (V)	7.6	5
Total	100.0	66

Source: Questionnaire Survey 2017.

Reclaiming Lands from the Sands of the Dunes

It was sometime last September 2016 we heard that the dunes and sand encroachments were mined and taken away. It was done by the local, influential politicians as sand mining contractors using the licences obtained in the name of marginal, small, and medium land owners. The procedures for obtaining licences for sand mining from the dunes followed the administrative decisions of the local government to allow sand mining at the behest of the policy directives issued from the State Government – Approved mining plan of the State Level Environment Impact Assessment Authority and the Minor Minerals Regulations Act 1959, Articles 17 and 18.

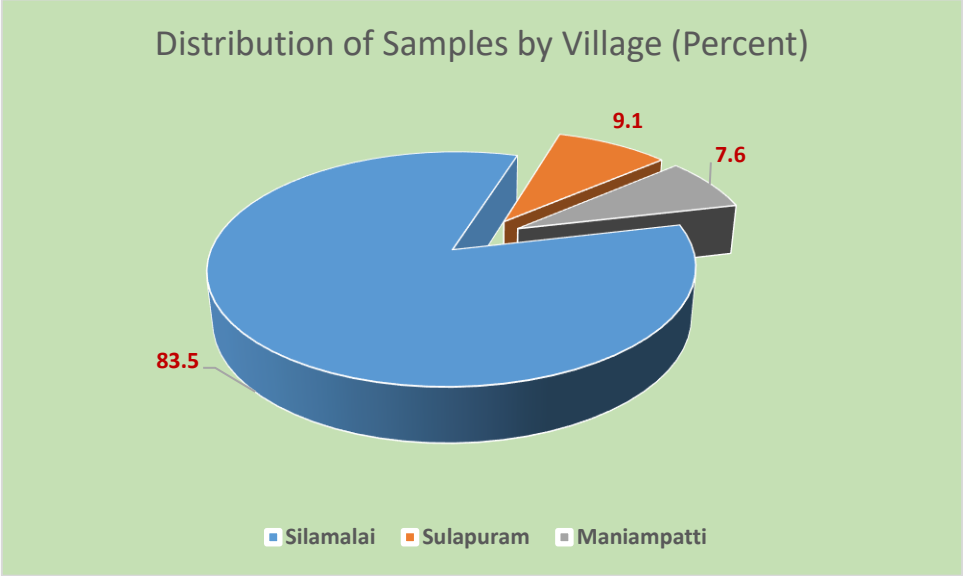

FIGURE 2

The procedural stages are:

1. The land owner/farmer makes an application of intent to the Tahsildar of Bodinaickanur taluk, stating the intention of mining for either personal use or sale. The applicant also indicates the modes of removal (normally transport) and the duration of mining along with the sketch of the land with its extent, survey number/s and location/s, duly signed by the village administrative officer.

2. Subsequently, he makes an application to the District Collector of the same intent and content. He also pays an application fee through challan from a nationalized bank.

3. On scrutiny, the District Collector writes to the Tahsildar of the taluk and requests him/her to make inspect the lands and submit his/her recommendations to him (the District Collector).

4. The Tahsildar, for his/her part, seeks reports and recommendations, individually, from the Village Administrative Officer and the Revenue Inspector of the area.

5. On receiving their reports and recommendations, in the positive, the Tahsildar forwards the same to the District Collector with his recommendations, with information back to the Village Administrative Officer and the Revenue Inspector.

6. Upon further scrutiny of the reports and recommendations from the Tahsildar and also the VAO and Revenue Inspector, the District Collector issues an order for sand mining by the land owner/farmer/licensee, as the case may be, and asks for a further fee under the Tamil Nadu Minor minerals Regulations Act 1959 Art. 17 and 18, with information to Regional Revenue Officer, Tahsildar, VAO and Inspector of Police of the village jurisdiction.

7. On receiving the order and on paying the fee for mining (at the rate of Rs. 75 per unit of sand), the farmer/land owner/licensee is allowed to mine the sand for the purposes intended and permitted through licensing by the District Administration.

On field verification in the same month, we learned that only about 40 per cent of the sand piles were mined and the rest were left unmined. In fact, in some places such as Thimminaickenpatti, people were up against mining the sand because they believed that some misfortune might strike them if they did. It was sort of a curse the people of very long ago had to endure and desertification of the villages persisted for very very long. Some even consider it (land reclamation from under the sands) a sacrilege, as they believe '*the Gods would become angry*'.

On learning that Mr SVP Veerakumar of Sillaamarathupatti, our local support for the Revisit Project, had reclaimed his land from under the dunes in his lands in Sillamarathupatti, we have requested and received all the documents he submitted with his application for mining 80 units of sand from his land within the boundary of the village of Bodi Ammapatti, for his new house construction at Sillamarathupatti. He has paid an application fee of Rs. 1,500 and a sand mining fee of Rs. 6,000 and an income tax of Rs. 120, to obtain his permission/licence for mining. He made his application initially to the Tahsildar of Bodinaickanur taluk on January 27, 2016, which took rather a long and winding route through the administrative maze and brought him permission/licence on August 16, 2016, nearly 8 long months. The permission given to him was for just 10 days, from August 17, 2016, to August 26, 2018, and the permission/licence was routed through the Department of Geology and Mines at Theni, the district headquarters.

Mr SVP Veerakumar gave us a very cryptic account of his 'ordeal' in obtaining the permission besides showing us the land from where he has mined the sands from a dune of several hundred years. He has now planted 'tamarind trees' on the land he has cleared using

his permission. He has also spoken to us at great length about sand mining in the area and how the politicians and political influence made a lot of money at the expense of the marginal and small farmers of the area.

Results and Discussion

Socio-Demographics of the Village Communities

Gender. Because the study is women-focused, and the spouses of men farmers took an active part in land reclamation of their lands, our sample is women-dominant with 60.6 per cent of them women in the land-reclaimed households and the rest (39.4 per cent) men. Although men were involved in applying for and obtaining permission/licences for land quarrying from their lands, women have overseen reclamation work. It is only in the case of the contractors or politician-agents, only men have been involved in sand quarrying.

Distribution of Age of Respondents. The respondents have been picked from a list of farmers who have reclaimed their lands in recent months and years. The mean age of the farmers is 53 years, with a minimum age of 25 years and a maximum of 80 years. About 9 per cent of the interviewed are young farmers of 25-35 years of age; middle-aged farmers of 36-55 years account for the largest share of 51.2 per cent; while the elderly (56-70 years) account for 27.2 per cent, the older farmers (71-80 years) account for 12.4 per cent. It is also evident that nearly a fifth of them (19.7 per cent) are in the age group of 41-45 years whereas three different age classes account for 12 per cent of the interviewed each: 46-50 years, 56-60 years, and 66-70 years. Notably, even older farmers of 70-plus years have been involved in land reclamation and are now active in agriculture, cultivating the reclaimed lands. Land reclamation is an activity in which four different generations of people have actively been involved over the last few years.

Caste Communities of the Respondents. Both the backward classes and other backward classes of caste communities in the villages have been engaged in land reclamation. While the backward classes account for a very large majority of 92.4 per cent of the land-reclaiming farmers, other backward classes account for 7.6 per cent of them (FIGURE 3).

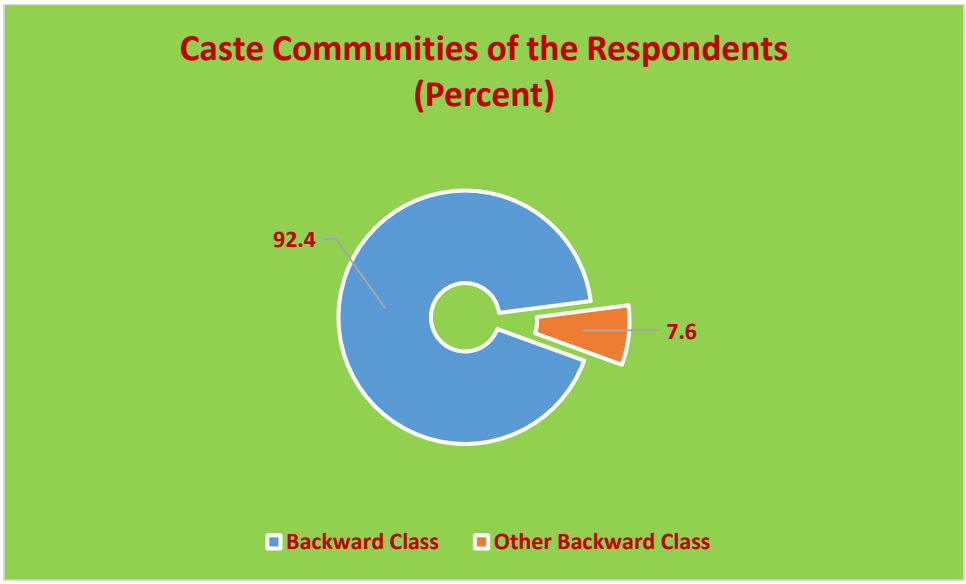

FIGURE 3

Educational Attainment of the People of the Communities. Except for 28.8 per cent of the unschooled, all others are educated with differential levels of attainment. Exactly half of the people have attained only primary education, with lower primary accounting for 27.1 per cent and upper primary accounting for 22.7 per cent of the interviewed (FIGURE 4). While 18.2 per cent of them have had a high school education, only a fraction of them has had higher secondary education completed (1.5 per cent) or a degree education (1.5 per cent). The average attainment is however 5 years with a standard deviation of 3.98.

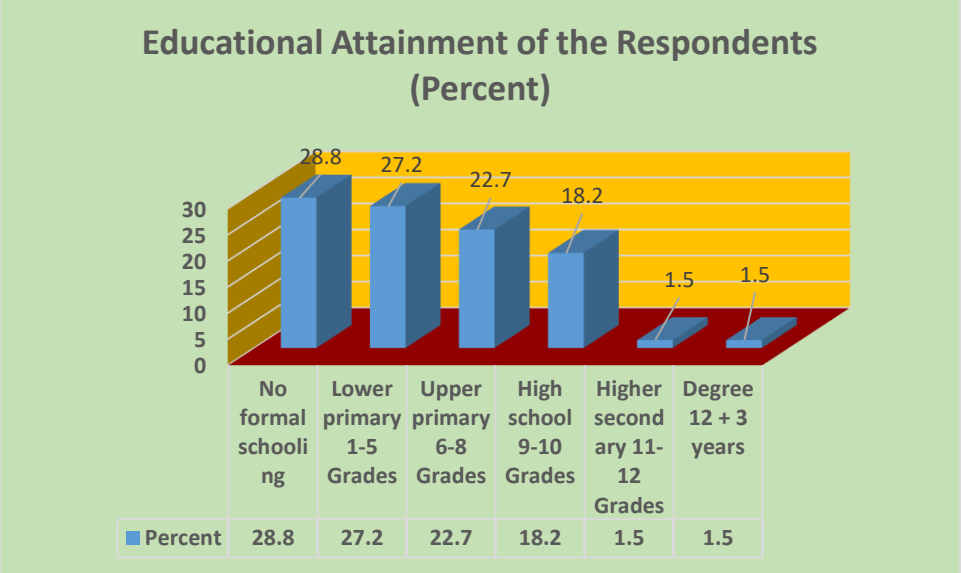

FIGURE 4

Socio-Economics of the Village Communities

House Types. The economic status of the people of the villages can be gauged from the house types in the villages. The fact that a predominant number of the households (71.2 per cent) live in cement or RCC houses indicates that most of them are relatively well-off in the villages under study while 18.2 per cent of them live in brick houses, the two types of houses account for a majority (89.4 per cent) of houses in the villages. The rest of the houses are of mud-built variety (10.6 per cent) indicating the general socio-economics of the entire sample.

Occupation of the Respondents and their Spouses in the Villages. Ninety-seven per cent of the people who had reclaimed were in agriculture while 1.5 per cent each were agricultural labourers and private sector employees.

Land ownership of respondent households in the Villages. As for the land ownership of the farmer-respondent households, 7.6 per cent owned 0.5 acres of land; 19.7 per cent 1.0 acre of land; 12.1 per cent 1.5 acres of land; 30.6 per cent between 1.5 and 3.0 acres of land; 13.6 per cent between 3.0 and 4.5 acres of land; and 12 per cent of them between 4.5 and more than 6.0 acres of land.

Distribution of Family Size. The mean family size of the households is 4 and the standard deviation is 1.8. It appears that a large majority of 60.6 per cent of the households are small with 1-4 members whereas 30.3 per cent of the households are medium-sized with 5-6 members and the rest (9.1 per cent) are large families with 7-9 members. The medium and large households are extended families or joint families (Table 6 and FIGURE 6). As for adult men,

6.1 per cent of the households do not have any men at all; a third of them have one man in each household, 34.8 per cent of the households with 2 men, 22.7 per cent of the households 3 men each and just 3 per cent of the households 4 men each. As for adult women are concerned, half the households have one woman each, 40.9 per cent of them 2 women each, 6.1 per cent of the households 3 women each and 1.5 per cent of the households 4 women each. Also, 1.5 per cent of the households do not have any adult women at all (FIGURE 5).

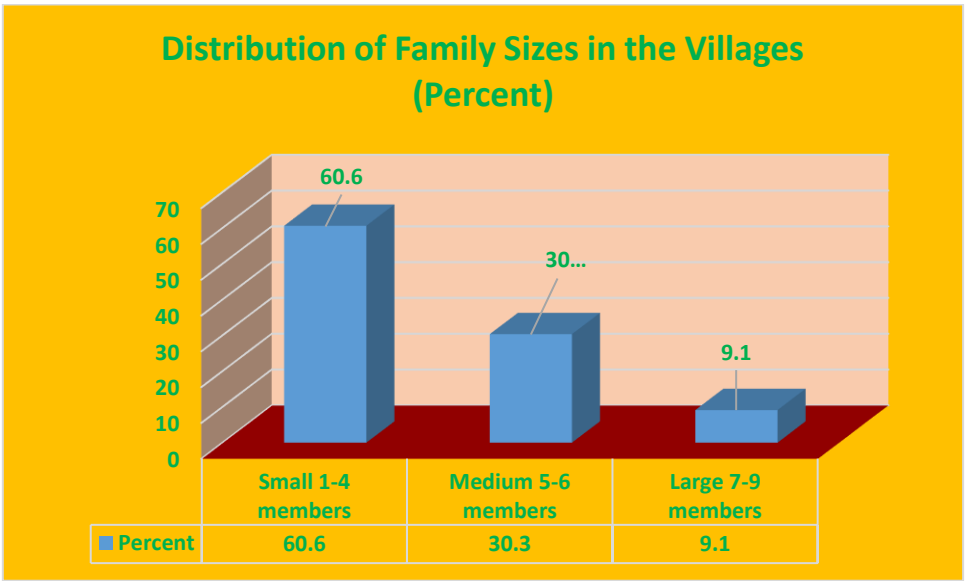

FIGURE 5

Monthly Household Income in the Villages. Dependent on agriculture in an area of desertification, heavy winds and scarcity of water, most respondent households (65.2 per cent) made less than Rs. 3,000 as their monthly household income and 22.7 per cent of them between Rs. 3,000 and Rs. 6,000. A very small segment of them (6 per cent) earned between Rs. 6,000 and Rs. 9,000. While 4.5 per cent of them had a monthly household income of Rs. 9,000 to Rs. 12,000, just 1.5 per cent of them reported Rs. 12,000 to Rs. 15,000 a month (FIGURE 6).

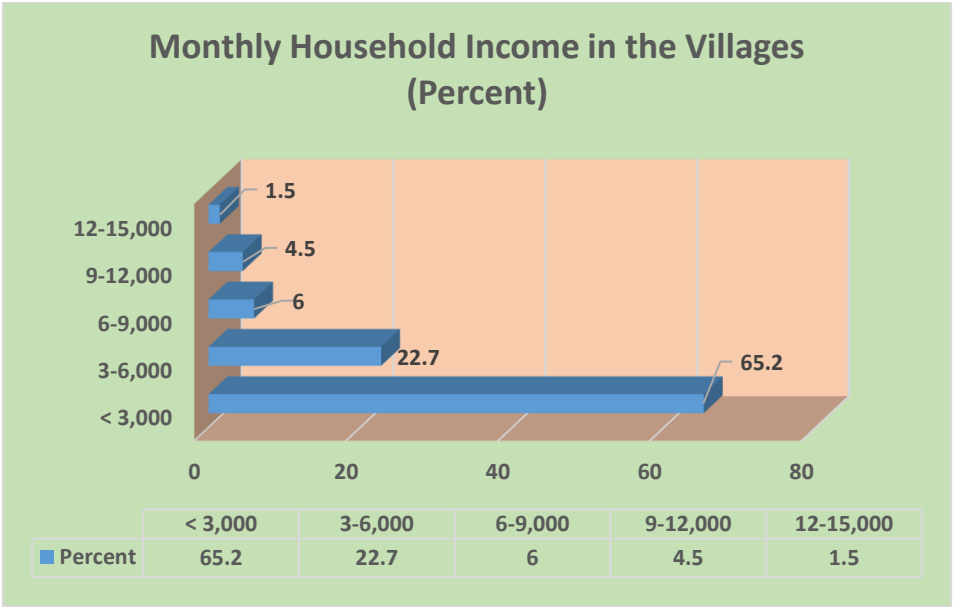

FIGURE 6

Land Reclamation and Cropping

Land reclaimed over time. As much as 91 per cent of the interviewees had landed under the dunes before while about 88 per cent still have landed under the dunes in the villages.

Location of Land Reclaimed in respect of village. As for the location of the lands reclaimed for agriculture, more than two-thirds of the lands reclaimed were in the west of the village and just about 24 per cent in the north of the village. The lands reclaimed in the east and south of the villages accounted for 3 per cent each (FIGURE 7).

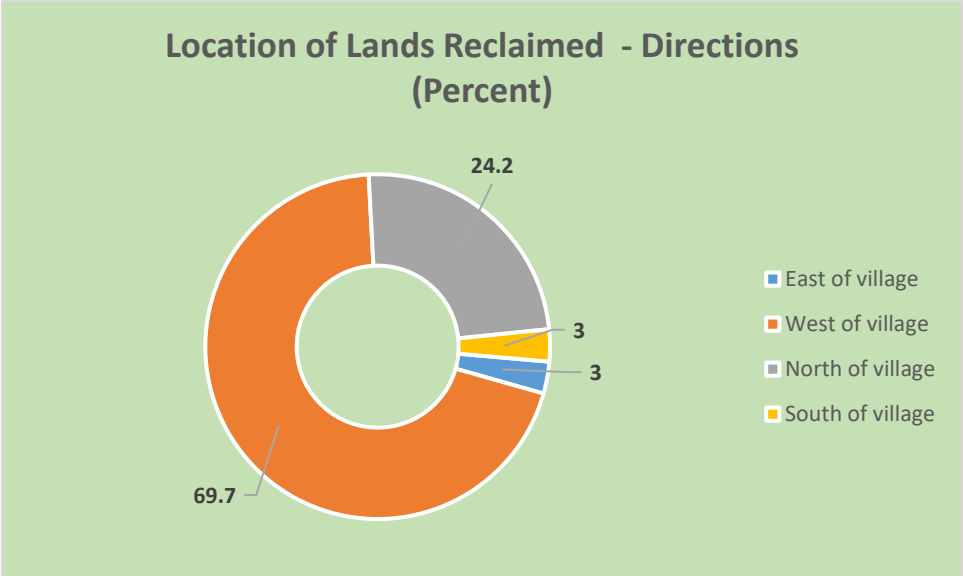

FIGURE 7

The extent of Land under Sand Dunes and Encroachments Now. About 94 per cent of the farmers have lands unclaimed under the dunes and encroachments in the villages (Plate 3, FIGURE 8). Whereas a majority of them (62.1 per cent) reported just one acre of land under the dunes and encroachments, 30.3 per cent reported between 1.0 and 2.0 acres of land and just a negligible proportion of them reported 2.0 to 3.0 acres under them (1 acre = 0.4047 ha).

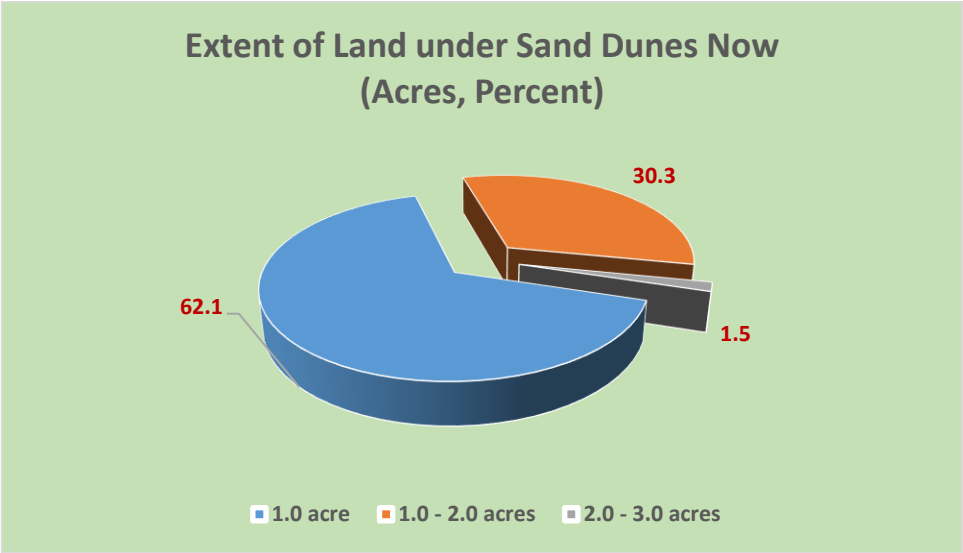

FIGURE 8

Land Reclaimed by Farmers of the villages. Among the farmers who had reclaimed lands were 92.4 per cent of the farmer-respondents of the study (Plate 4). As much as 7.6 per cent of them had not reclaimed any land at all from the dunes and encroachments.

The extent of Land Reclaimed Recently by Farmers. Among those reclaimed, 87.8 per cent had reclaimed only less than 1.0 acres. And 4.5 per cent of them between 1.0 and 2.0 acres and 1.5 per cent of them more than 2.0 acres (FIGURE 9).

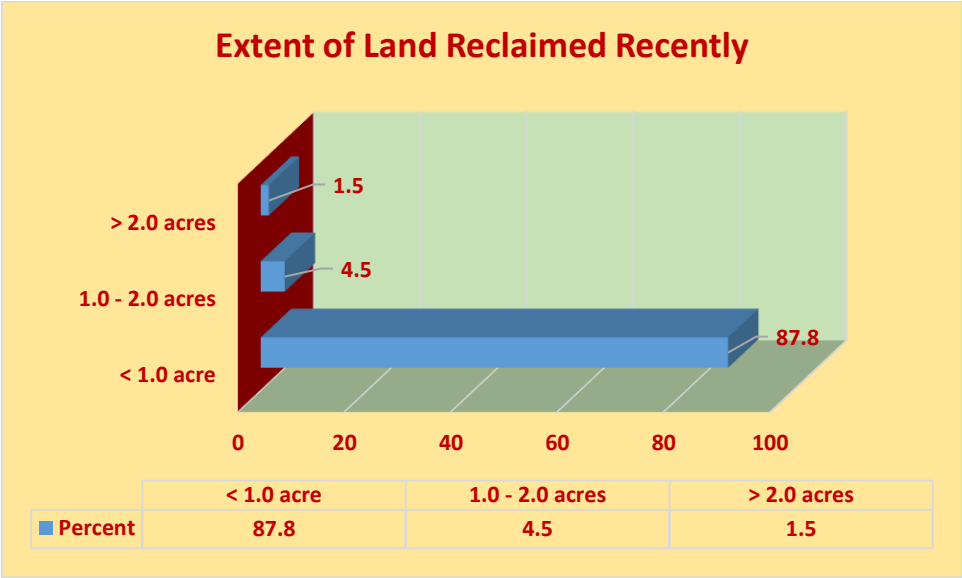

FIGURE 9

Cropping of Land Reclaimed Now. As much as 95.5 per cent of the farmers who had reclaimed land had cropped it now (Plate 5) but 4.5 per cent of them had not done so, because the land could not be readied yet for cropping (FIGURE 10).

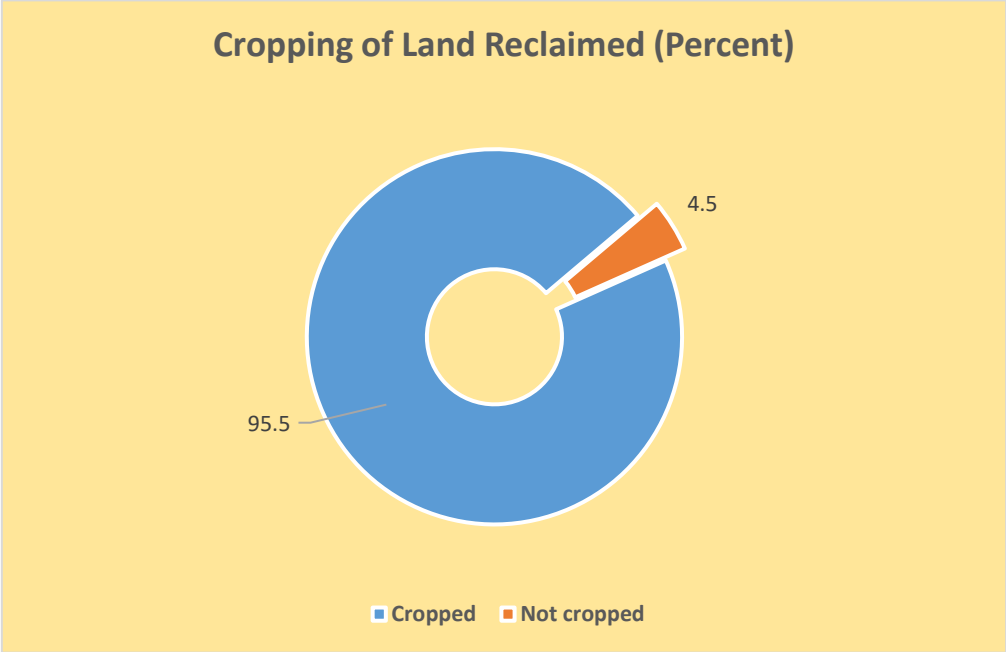

FIGURE 10

Plate 3: Dunes unmined west of Rasingapuram, near Chinna Pottipuram July 15, 2017.

Crops Grown on Reclaimed Land Now. The farmers who had reclaimed land now grow one, two and three crops, alone and often in combinations. They grow as many as 15 different crops, including a variety of vegetables. These crops are staple foods (corn), oilseeds (groundnut), pulses (cowpea, snow pea), vegetables (tomato, onion, brinjal/eggplant, chilli, mochai / lima beans), plantation crops (rubber, coconut, bamboo) and flowers (jasmine). Nearly a fourth of the people/farmers (24.1 per cent) grow only 'one/single' crop whereas more than half the farmers (56.1 per cent) grow two crops and 13.5 per cent of them grow three crops (Table 2). The two and three crops are invariably intercrops (Plate 6), cultivated in a way the farmers could maximize the benefits accrued from cropping through a staggered and extended harvest period. Most farmers plan to have crops which could give them several harvests over some time, but short, a few weeks to a few months.

How of Land Reclamation: The Process. The process of land reclamation has been with the help of both technology (Earth movers or what is known as JCP hereabouts, 1.5 per cent) and with the help and assistance of human labour, wage labourers who rely on wages for a livelihood (54.5 per cent) and farm labourers (34.8 per cent) who are either permanent and attached labourers of the farming households. In all 90.8 per cent of the farmers interviewed had shown the process of their land reclamation. JCP had been used in sand quarrying only in cases of large tracts of dunes because it is expensive to hire JCP for the purpose.

Most farmers being small or marginal, used either wage labour hired from the open market or farm labour which are people who work for them as attached labour. In either case, that is, in both wage labour and farm labour, the reclamation is inexpensive but one that takes a considerable amount of time.

Table 2. Crops grown on reclaimed lands by farmers

Crops	Per cent	Number
Single Crop	**24.1**	**16**
Cowpea	6.1	4
Corn (Cholam)	4.5	3
Groundnut	4.5	3
Gaanam pea (snow pea)	1.5	1
Tomato	1.5	1
Rubber	1.5	1
Coconut	1.5	1
Jasmine	1.5	1
Two Crops	**56.1**	**37**
Cowpea, mochai (Lima beans)	21.2	14
Rubber, cowpea	4.5	3
Corn, cowpea	18.2	12
Bamboo, corn	6.1	4
Chilli, tomato	1.5	1
Groundnut, cow pea	1.5	1
Groundnut, onion	1.5	1
Corn, brinjal (eggplant)	1.5	1
Three Crops	**13.5**	**9**
Corn, mochai, groundnut	4.5	3
Onion, chilli, cowpea	1.5	1
Rubber, chilli, cowpea	1.5	1
Cowpea, mochai, groundnut	1.5	1
Coconut, cowpea, chilli	1.5	1
Corn, cowpea, tomato	1.5	1
Cotton, chilli, vegetable	1.5	1
Total Farmers (Cropped)	**93.7**	**62**

Source: Questionnaire Survey 2017.

Reclamation Related Aspects. When asked whether their neighbours have also reclaimed their lands from under the dunes, as much as 50 per cent of the interviewed answered in the affirmative. When further asked as to who helped him/her in land reclamation, 95.5 per cent of them answered that they used ‘self-help’ to complete the process of land reclamation. And for a question, ‘are all reclaimed areas cropped?’ 81.8 per cent of the farmers who had reclaimed said that all areas reclaimed were cropped whereas 18.2 per cent of them said that all were not cropped.

When further queried as to the nature of the fertility of the lands reclaimed, a little more than three-fourths (75.8 per cent) said that they were adequately fertile while the rest (24.2 per cent) suggested that they were largely sandy and hence they were ‘as fertile as they can be’. However, a very large majority almost all of them lamented that there was no adequate water for cropping; and only a minuscule of them (3 per cent) indicated adequate water was available for cropping the reclaimed lands. For most of them, 80.3 per cent to be exact, rain was the only

source of water for cropping. Interestingly 86.4 per cent of the farmers had already harvested crops from their reclaimed lands.

Plate 4. Dunes sand-mined northwest of Chinnapottipuram, quite close to the village October 08, 2017.

Plate 5: Land reclaimed from under the dunes and readied for cropping as soon as rain falls on July 15, 2017.

Plate 6. A reclaimed piece of land intercropped with 5 different crops on October 08, 2017.

Water for Cropping Reclaimed Lands. When asked for further details on the sources of water for cropping reclaimed lands, 34.8 per cent of them used bore wells for irrigating their crops whereas more than half of them (57.6 per cent) used other water sources (traditional '*theppam*' or farm pond), 3 per cent of the tanks and 1.5 per cent of them open wells and a similar proportion used both tanks and wells.

Truly however rains are the sources of water for cropping the reclaimed lands: more rains, more water in the bore wells, wells and tanks. When rain fails, cropping invariably fails.

Value of Production from Cropping in Reclaimed Lands. The farmers who crop the reclaimed lands reported varying values of production of their products, which by themselves varied greatly from farmer to farmer. They got an average value of production of Rs. 4,098 with a standard deviation of 6,651. The reported value of production was anywhere between Rs. 1,000 (6.0 per cent) to as much as Rs. 30,000 (2.3 per cent). As much as 16.7 per cent of the farmers reported less than Rs. 2,000 whereas 12.1 per cent of them reported Rs. 2,000 to Rs. 4,000 and a similar proportion reported a value of production of Rs. 4,000 – Rs. 6,000. Only a small proportion of farmers (1.5 per cent) made between Rs. 6,000 and Rs. 8,000 and 3.0 per cent made between Rs. 8,000 and Rs. 10,000. And those who made more than Rs. 10,000 accounted for 16.7 per cent of the farmers interviewed. There was a sizeable proportion of farmers who had reported crop failures (37.9 per cent) and hence no value of production reported by them. But this was not unexpected in this area as more often than not crops failed mainly due to the failure of the monsoon (rains) and this was a regular feature of this area for years.

Impact of Winds on Crops and Need for Shelterbelt for Protecting Crops. Asked about the impact of the gale force winds, often reaching 160 kmph in June-August in these parts owing to the special alignment of the Western Ghats about here, 83.3 per cent of the farmers who had reclaimed their lands and were cultivating indicated its impact being high and 15.2 per cent of them to its impact being moderate. However, a large majority of 80.3 per cent of them indicated to high need for shelterbelts to protect crops whereas 16.7 of them indicated a moderate need and only 1.5 per cent of them a low need for them to protect the crops of the area in respect of winds.

At this juncture, it is important to remember that there were 40 shelterbelts in the geographical area of the five villages (Bodi Ammapatti, Maniampatti, Pottipuram, Rasingapuram and Silamalai) which have since been cut except for one standing in Thimminaickenpatti as mute evidence to their existence towards preventing/containing dunes and protecting crops of the area. Their objective however was to arrest the march of desertification in the area.

When prompted to speak about the drought the area faces, 93.9 per cent of the respondent farmers rated them as having been severe while the rest (6.1 per cent) rated them as moderate. Speaking of the trees of the area, which are a factor causing rains even in the rain shadow, keeping in view the forests and the community forests (*kuduval*) of Yester years, 97 per cent of them rated them as being low dense while the rest (3 per cent) dense. It is primarily because rain has been rather low in the previous years.

Conclusion and Recommendations

The present paper has discussed the process of land reclamation from under dunes in the five villages of the Theni district of Tamil Nadu. As much as 91 per cent of the farmers interviewed have shown the process of their land reclamation. JCP has been used in sand quarrying only in cases of large tracts of dunes because it is expensive to hire JCP for the purpose. Most farmers, being small or marginal, have used either wage labour hired from the open market or farm labour which are people who work for them as attached labour. In either case, the reclamation is inexpensive but one that takes a considerable amount of time. About 100 ha of land has been reclaimed in the two villages of study.

The small and marginal farmers of the villages have grown as many as 15 different crops, including a variety of vegetables. These crops are staple foods (corn), oilseeds (groundnut), pulses (cowpea, snow pea), vegetables (tomato, onion, brinjal, chilli, mochai), plantation crops (rubber, coconut, bamboo) and flowers (jasmine). Nearly a fourth of the people/farmers (24.1 per cent) have grown only ‘one/single’ crop whereas more than half the farmers (56.1 per cent) grow two crops and 13.5 per cent of them grow three crops. The two and three crops are intercrops, cultivated in a way the farmers could maximize the benefits accrued from cropping through a staggered and extended harvest period. Most farmers plan to have crops which could give them several harvests over some time, but short, a few weeks to a few months.

The respondent farmers had indicated just two items of recommendations, namely, one, the continued reclamation of lands from under the sand for they need their lands for a livelihood and unless the lands are reclaimed, they do not think that their socio-economics could ever improve. But for such an improvement, two, reclaiming lands alone cannot do, for they need rains, very positively, to carry on with their farming with crop production that could provide

them sustainable food security. But if the rains play spoilsport by keeping the area dry, drought-prone making it impossible for a sustained livelihood.

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