

Soil and nutrient losses from different land uses and vegetative methods for their control on hilly terrain of South Andaman

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Received: 25 September 2009; Accepted: 12 March 2010

ABSTRACT

A study was conducted during 2003–05 to find out suitable vegetative methods of arresting soil loss from different land uses in South Andaman islands. The study reports soil and nutrient loss due to water erosion from 5 major land uses, i.e. vegetable fields, coconut plantation, arecanut plantation, home garden and moist evergreen forest on the undulating topography of the island. Soil loss under the land uses was quantified using replicated runoff plots for 2003–05. Vegetative methods, i.e. *Gliricidia* hedgerow + crop, hedgerow + mulch + crop, hedgerow + mulch + crop + grass barrier, for vegetable field under till conditions, and *Pueraria* cover crop (coconut + *Pueraria phaseoloides* cover crop) for coconut (*Cocos nucifera* L.) plantation were tested to know their potential to arrest soil erosion in the respective system. Soil loss from the vegetable field under no till conditions, coconut plantation, arecanut plantation, home garden and forest was 3.8, 12.4, 10.6, 8.4 and 2.3 tonnes/ha, respectively. Soil working in vegetable fields (till + crop treatment) made soil loss of 124 tonnes/ha. Erodibility was the lowest (0.06) in the forest and highest (0.26) in the vegetable field under till condition. Among the nutrients, the highest loss, across the treatments, occurred for nitrogen and lowest for phosphorus. The hedgerow alone in vegetable fields reduced the soil loss substantially (66%). However, it together with mulch and grass barrier reduced the soil loss nearly equal to that found in the forest. Likewise, *Pueraria* cover crop (19 years old) brought down the soil loss under the coconut plantation equal to that in the forest. These observations suggest that *Gliricidia* hedgerows for vegetable cultivation and cover crop for coconut plantation may be good vegetative methods for soil erosion control in the island.

Key words: Erodibility, Islands, Runoff plot, Soil erosion, Soil texture, Undulating terrain, Vegetation cover, Vegetative control methods

Topographically the Andamans are undulating, characterized with hills, hillocks and flat bottomed vallies (Pandey *et al.* 2007). The islands were once thickly covered with tropical rainforests. They were settled in mid 20th century. The settlers were provided with 2 ha forested lands on the hillocks and 2 ha lands in the valley. Those settlers removed the forest, constructed houses and planted trees round the houses that met their maximum basic needs because markets as well as roads were not available at that time. This led to the development of homegarden in the islands. At present, coconut and arecanut plantations and homegarden (29 000 ha) are second major land uses after forest (86% of total geographical area) in the islands (Pandey *et al.* 2007). Some portion of the cleared forest lands are in use for vegetable cultivation by farmers. Vegetable fields cover about 3 000 ha in the islands. Generally, farmers perform deep soil working in the vegetable fields and remove weed for the

vegetable cultivation. They follow vegetable–vegetable and maize– (*Zea mays* L.) vegetable rotations in the vegetable fields. Before tsunami 12 000 ha land in the valley was under banded paddy cultivation (Pandey *et al.* 2007).

The islands experience torrential and high rainfall during wet season from south-west monsoon (Pandey *et al.* 2009). Agricultural activities, particularly vegetable cultivation exposes surface soils to the rainfall which carry away a huge amount of fine soil particles to sea through low-lying streams and makes soil poor in nutrients (Pandey and Singh 2009). Loss of soils is known to increase many folds in hilly area due to accelerated rate of runoff (Narain *et al.* 1998). The landmass of the islands is precious not only from the soil-fertility view point, but also for the existence of the islands as well. Tsunami in 2004 has already engrossed about 4 000 ha low-lying rice fields in the islands and several thousand hectare lands (rice fields) are still being inundated once in a day by high tides making them unfit for rice cultivation. After tsunami height of tides has been increased and frequency has been doubled.

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Land-use wise information on soil erosion, estimated using runoff plot, so far is not available for the islands because it is expensive and time consuming (Velmurugan *et al.* 2008). Recently, Velmurugan *et al.* (2008) carried a soil erosion study in Dhanikhari watershed at South Andaman using revised Morgan, Morgan Finney model (RMMF) with the aid of remote sensing and GIS, but no ground truthing was carried out for a long term (even for one annual cycle) to validate the model's results. Objective of the present study was (i) to quantify soil loss under different land uses being practised in the islands using runoff plots on long-term basis (3 years); (ii) to understand how soil erosion occurs in the land uses; (iii) and to find out suitable vegetative methods for arresting soils loss from the land uses in the islands.

MATERIALS AND METHODS

The study sites were located at Sipighat and Garacharma within a radius of 5 km in South Andaman Island of India (10°31'–13°42'N lat. and 92°14'–94°14' E long.). The soils of the sites were Entisols. It was gravelly-sandy-loam in texture, low-to-moderate in nutrients and slightly acidic in reaction (Pandey *et al.* 2007). Climate is an equatorial hot humid tropical having high temperature (23 to 30°C) and relative humidity (71 to 85%). About 12 years data (1994–2005) indicate that an average 3 000 mm rainfall occurs in the study region with mean monthly variation of 300–500 mm/month during wet season (May to October), 100–200 mm/month during post-wet season (November to January) and <100 mm/month during dry season (February to

April). Generally no runoff is observed during the dry season.

The study included 5 land use systems, i e (1) vegetable field; (2) coconut plantation, (3) areanut plantation, (4) home garden and (5) native moist evergreen forest at similar slope. Detailed treatments are given in Table 1. To know the effect of soil working in the vegetable field, 2 treatments namely till and no till were included. To assess how *Gliricidia* hedgerows and its mulch help arrest soil erosion in the vegetable fields, 3 treatments under till (till + hedgerows + crop, till + hedgerows + mulch + crop, till + hedgerows + mulch + crop + grass barrier) and 2 treatments under no till (no till + crop, no till + hedgerow + no crop) condition were arranged. One hedgerows was 4 m away from its neighbour hedgerows. Within a hedgerow plant-to-plant distance was 50 cm. The hedgerows were planted against the slope, and were 4 years old. To know if grass cover help arrest soil erosion, 2 rows of napier grass 30 cm × 30 cm were planted between 2 plants of the hedgerows. At the time of sampling the grass tussocks overlapped each other. In the vegetable field, crop rotation was maize (wet season) and okra (*Hibiscus esculentum* L.) (post-wet season). In the coconut plantation, coconut (*Cocos nucifera* L.) was planted at 7.5 m × 7.5 m. To assess the potential of a cover crop for arresting soils from erosion, coconut plantation having *Pueraria* as a cover crop (19-year-old) was selected. Arecanut was planted at 2.7 m × 2.7 m distance. Age of both coconut and arecanut plantations was 25 years. Weeds (3–5 tonnes/ha) in both the plantations as well as the homegardens were removed once in a year in October by local made swards. Dominant trees

Table 1 Vegetation cover, erodibility and soil loss under different treatments under prominent land uses at South Andaman island

Treatment	Crop		#Vegetation cover (%)	Erodibility			Average	Soil loss (tonnes/ha)			Average (tonnes/ha)
	Season			2003	2004	2005		2003	2004	2005	
	Wet	Post-wet									
<i>Vegetable field</i>											
till + crop	Maize	Okra	112 ^a	^a 0.15 ^a	^b 0.24 ^a	^c 0.40 ^a	0.26 ^a	^a 122.3 ^a	^b 120.18 ^a	^c 130.5 ^a	124.3 ^a
till + hedgerow + crop	Maize	Okra	123 ^b	^a 0.13 ^b	^b 0.18 ^b	^c 0.25 ^b	0.19 ^b	^a 45.97 ^b	^b 40.27 ^b	^b 41.87 ^b	42.7 ^b
till + hedgerow + mulch + crop	Maize	Okra	135 ^c	^a 0.13 ^b	^b 0.15 ^c	^c 0.25 ^b	0.18 ^b	^a 12.29 ^c	^a 10.95 ^b	^a 11.87 ^c	11.7 ^c
till + hedgerow + mulch + crop + grass barrier	Maize	Okra	140 ^d	^a 0.14 ^b	^b 0.15 ^c	^c 0.18 ^c	0.16 ^c	^a 2.04 ^d	^a 2.57 ^c	^a 2.89 ^d	2.5 ^d
no till + crop	Maize	Okra	140 ^d	^a 0.10 ^c	^a 0.10 ^d	^a 0.11 ^d	0.10 ^d	^a 4.32 ^d	^{bc} 3.87 ^d	^c 3.21 ^e	3.8 ^e
no till + hedgerow + no crop	Maize	Okra	130 ^e	^a 0.12 ^d	^a 0.13 ^e	^b 0.16 ^e	0.14 ^c	^a 7.18 ^e	^a 5.18 ^c	^a 6.25 ^f	6.20 ^f
Coconut plantation			104 ^f	^a 0.07 ^e	^a 0.08 ^f	^c 0.11 ^d	0.09 ^f	^a 12.58 ^e	^a 13.87 ^e	^a 12.65 ^f	13.0 ^g
Coconut plantation + cover crop	<i>Pueraria phaseoloides</i>	<i>Pueraria phaseoloides</i>	160 ^g	^a 0.05 ^f	^a 0.05 ^g	^a 0.05 ^e	0.05 ^g	^a 2.80 ^f	^a 2.64 ^f	^a 2.25 ^d	2.6 ^d
Arecanut plantation			110 ^a	^a 0.06 ^f	^b 0.08 ^f	^c 0.10 ^d	0.08 ^h	^a 10.54 ^g	^a 10.01 ^g	^A 11.14 ^f	10.6 ^c
Homegarden			124 ^b	^a 0.06 ^f	^a 0.07 ^{fg}	^a 0.09 ^f	0.07 ^h	^a 8.04 ^g	^a 9.0 ^g	^a 8.14 ^g	8.4 ^h
Evergreen forest			180 ^h	^a 0.05 ^f	^a 0.06 ^g	^a 0.06 ^e	0.06 ^g	^a 2.45 ^f	^a 2.25 ^f	^a 2.30 ^d	2.3 ^d

Values in a column suffixed with different superscript letter are significant at $P < 0.05$

Values in a row prefixed with different superscript letter are significant at $P < 0.05$

Vegetation cover included ground weed cover + crop cover + tree canopy cover according to the treatment.

in the forest were: *Dipterocarpus grandiflora* (Blanco) Blanco, *Calophyllum* spp, *Artocarpus chaplasha* Roxb, *Hopea odorata* Roxb. The forest (>100 years) was multistory similar to that of the homegarden. Thus, there were total 11 treatments under 5 land uses for the soil erosion study.

Three runoff plots, 2 m × 5 m were installed in the each treatment at 22–25% slope. Generally, coconut plantations and vegetable fields are located at the above slope. Big size runoff plots were not possible due to hilly terrain. Dikes of the runoff plots were made by galvanized iron sheet. The each runoff plot was connected with a 500 litre tank by 4 inch PVC pipe to collect runoff water from the plot.

Runoff volume in each tank was measured, total runoff water was computed and five liter runoff water was sampled after thorough stirring. One litre water sample was coagulated by alum, decanted off and dried on a water-bath to estimate soil loss. The other portion of the sample was preserved by addition of 1 ml toluene and analyzed for total N, P, exchangeable K, Ca and Mg (Jackson 1962). Each study year during dry season (when rainfall was over) soils were sampled from 6 random places in each runoff plot and composited as one replicate. The composited soil samples were analyzed for soil texture, soil organic carbon and pH. Soil erodibility was calculated following Wischmeier and Mannering (1969) as:

$$\text{Erodibility} = \frac{0.043R + \left(\frac{0.62}{\text{OM}} \right) + 0.0082S - 0.0062C}{\text{Si}}$$

where R, pH; OM, organic matter; S, fine sand (%); C, clay (%); Si, silt (%). Soil texture analysis was done by hydrometer. Soil pH was measured with glass electrode (1:2, soil: water ratio). Organic C was estimated by Walkley and Black rapid titration method and total P was estimated after HClO₄ digestion. Total N was measured by microkjeldhal digestion method using a Kjehl plus auto N analyzer. For exchangeable cations the soils were extracted with 1 M ammonium acetate at pH 7 and K was measured by a flame photometer, and Ca and Mg by Shimadzu (AA-6200) atomic absorption spectrophotometer.

Cover of trees in coconut and arecanut plantations, home garden and moist evergreen forest was measured by line intercept method. Cover of trees was calculated as: $3.14 \times r^2$ (r = radius of tree canopy). Cover of herbaceous vegetation (crop, grass and weed) was measured by point intercept method using ten 1 m × 1 m² random quadrat for pin contacts with 100 pins placed in a grid pattern over quadrat. Each grid consisted of 10 transects placed 10 cm apart. The points of contact were noted and cover was computed as per cent of total contacts made (Pandey *et al.* 2007).

Data (soil texture, soil loss, nutrient loss and plant cover) were subjected to one way ANOVA to know the significance of difference due to the treatments. LSD was used to compare

the means. Pearson correlation was calculated between two parameters. All statistical analysis was conducted using SPSS statistical package.

RESULTS AND DISCUSSION

Proportion of clay and silt particles declined but proportion of gravels increased in the runoff plots in the almost all treatments across the land uses (Fig 1a, b, c, d). Similar pattern in the change of proportions of clay and silt in all the treatments seems to have occurred due to same soil type. No significant change in fine sand particles was observed across the treatments ($P < 0.05$). These changes in the proportions of the soil particles caused sheet erosion in all the treatments. The studied soils were poor in organic carbon and fine soil particles (clay and silt), but richest in gravels which made the soils suitable for the sheet erosion. Among the treatments in the vegetable fields, the highest loss of clay (72%) and silt (61%) occurred in till + crop treatment and lowest (11% and 9% clay and silt, respectively) in no till + crop treatment. In no till treatment weed cover most likely provided greater protection to the soils from the rain beating and the weed roots acted as a binder to the soil particles. Introduction of hedgerows under till conditions in the vegetable field reduced the loss of fine soil particles (clay 49%, silt 29%) (till + hedgerow + crop vs till + crop). When mulch of the *Gliricidia* hedgerows was applied, the loss of fine soil particles (silt + clay) was reduced further by 6%. In addition to the hedgerows and mulch when grass was also incorporated as a treatment, loss of silt and clay was reduced to the highest, i.e. 99% and 58% respectively. These indicated that loss of fine soil particles from the vegetable field can be managed to the lowest when mulch and grass barrier are also applied with the *Gliricidia* hedgerows (Senapati and Sharma 2007).

Erodibility of the soils in the vegetable field was the highest under till condition (till + crop) and lowest under no till condition (no till + crop treatment) (Table 1). This indicated that soil working exposed the fine soil particles and increased soil erodibility in the absence of vegetation cover as the weed was removed from the field after the soil working. Introduction of hedgerows in the till condition reduced the erodibility in the vegetable field. It occurred probably because the canopy of the hedgerows reduced the kinetic energy of the rains (Velmurugan *et al.* 2008). Reduction in the soil erodibility in the hedgerows + mulch + crop + grass treatment in the vegetable field was the highest due to additional cover of mulch and grass, besides the hedgerows. In the present study we found that the erodibility was inversely correlated with the vegetation cover ($r = -0.625$, $P < 0.001$). Mulch and grass most likely provided additional protection to the soils from the high intensity rains (Senapati and Sharma 2007). Among the tree-based systems, the lowest erodibility was found in the forest and highest in the coconut plantation. The lowest erodibility in the forest was due to the highest vegetation cover. The cover crop

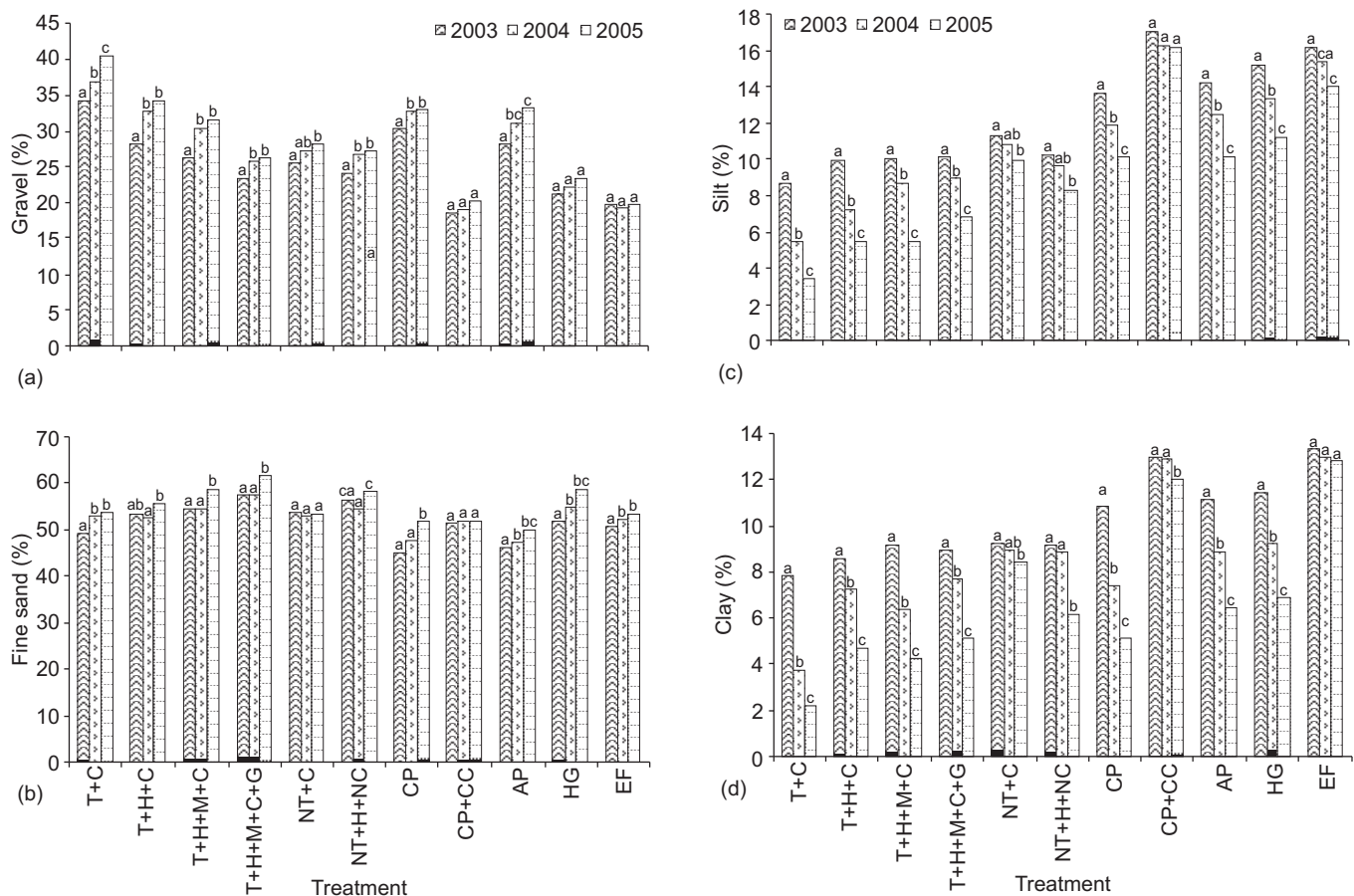


Fig 1 Changes in the proportion of (a) gravel (b) fine sand (c) silt and (d) clay soil particles in the runoff plots under different treatments at South Andaman island. Data (bars) of a treatment with different letters are significantly different at $P < 0.05$. Abbreviations for treatments are: T + C = Till + crop; T + H + C = Till + hedgerow + crop; T + H + M + C = Till + hedgerow + mulch + crop; T + H + M + C + G = Till + hedgerow + mulch + crop + grass barrier; NT + C = No Till + crop; NT + H + NC = no till + hedgerow + no crop; CC = cover crop of *Pueraria phaseoloides*

reduced the erodibility in the coconut plantation equal to that in the forest.

Soil loss from the vegetable field under no till condition, coconut plantation, arecanut plantation, homegarden and forest was 3.8, 12.4, 10.6, 8.4 and 2.3 tonnes/ha, respectively (Table 1). Soil working in the vegetable field increased the soil loss to 124 tonnes/ha. Soil loss, among the tree-based systems, was the highest in coconut plantation and lowest in the evergreen forest. Velmurugan *et al.* (2008) found an average 25 tonnes/ha soil loss across agriculture field (rice/vegetable), plantations (coconut and arecanut) and evergreen forest by remote sensing and GIS methods from the Dhanikhari watershed at South Andaman.

Introduction of hedgerows in the vegetable field under till conditions reduced the soil loss by 66% (till + hedgerow + crop vs till + crop treatment) (Table 1). Role of hedgerows intercropping to arrest soil loss on sloppy land is well documented (Kang *et al.* 1990). In our study, mulch of *Gliricidia* prunings together with the hedgerows (till + hedgerows + mulch + crop) reduced the soil loss further by

91%. Pacaredo and Montecillo (1983) observed that *Leucaena leucocephala* planted on the contour greatly reduced runoff and soil loss, especially so when stubbles and prunings were retained on the soil surface. Greater reduction in soil loss under hedgerows + mulch in our study seemed to have occurred due to two advantages of the hedgerows: first it decreased runoff velocity and reduced its sediment carrying capacity; and the second the mulch reduced splash and soil detachment (Lal 1989 a, b). When napier grass barrier was included with the hedgerow and mulch (till + hedgerow + mulch + crop + grass barrier), the lowest loss (2.0–2.9 tonnes/ha) of soil was observed from the vegetable field. Our observations proved the hypothesis of Lal (1989 a, b) that tree + crop cover combinations may be more conservation effective than an arable land use system. Compared to the till treatment, no till treatment also reduced the soil loss substantially (97%) from the vegetable field (no till + crop vs till + crop) (Table 1).

Greater soil loss from the coconut compared to arecanut plantation was mainly due to its wider spacing. As a result,

Table 2 Loss of nutrients from different treatments under prominent land uses in South Andaman island. Data are mean for 3 years (2003–05)

Treatment	Nutrient loss (kg/ha)				
	Nitrogen	Phosphorus	Potassium	Calcium	Magnesium
<i>Vegetable field</i>					
till + crop	^a 50.97 ^a	^b 1.24 ^a	^c 45.25 ^a	^d 14.17 ^a	^e 8.21 ^a
till + hedgerow + crop	^a 16.23 ^b	^b 1.28 ^b	^c 15.20 ^b	^d 4.78 ^b	^e 2.86 ^b
till + hedgerow +mulch + crop	^a 6.79 ^c	^b 0.47 ^c	^c 5.39 ^c	^d 1.42 ^c	^e 0.78 ^c
till + hedgerow +mulch + crop + grass barrier	^a 1.18 ^d	^b 0.08 ^d	^c 0.94 ^d	^d 0.30 ^{df}	^e 0.16 ^d
no till + crop	^a 2.55 ^e	^b 0.08 ^d	^c 1.47 ^e	^d 0.42 ^d	^e 0.24 ^e
no till + hedgerow + no crop	^a 2.11 ^e	^b 0.12 ^e	^c 2.26 ^e	^d 0.73 ^{eg}	^e 0.42 ^e
Coconut plantation	^a 11.31 ^c	^b 0.39 ^f	^c 6.92 ^f	^d 1.56 ^e	^e 0.86 ^e
Coconut plantation + <i>Pueraria</i> <i>phaseoloides</i> cover crop	^a 3.98 ^e	^b 1.07 ^g	^c 1.52 ^d	^d 0.39 ^f	^e 0.18 ^d
Arecanut plantation	^a 10.18 ^f	^b 0.53 ^h	^c 4.63 ^e	^d 1.25 ^{gh}	^e 0.67 ^e
Homegarden	^a 9.24 ^g	^b 5.12 ^d	^b 5.16 ^f	^c 1.02 ^h	^e 0.56 ^e
Evergreen forest	^a 3.20 ^e	^b 0.05 ⁱ	^c 0.55 ^g	^d 0.24 ⁱ	^e 0.15 ^d

Values in a column suffixed with different superscript letter are significant at $P < 0.05$

Values in a row prefixed with different superscript letter are significant at $P < 0.05$

Table 3 Nutrient concentration in runoff soils under different treatments under prominent land uses at South Andaman. Data are mean for 3 years (2003–05)

Treatment	Nutrient concentration						
	pH	Organic carbon (%)	Nitrogen (%)	Phosphorus (%)	Potassium (mg/kg)	Calcium (mg/kg)	Magnesium (mg/kg)
<i>Vegetable field</i>							
till + crop	6.33 ^a	^a 0.58 ^a	^b 0.041 ^a	^c 0.001 ^a	^d 364 ^a	^e 114 ^a	^f 66 ^{ad}
till + hedgerow + crop	6.30 ^a	^a 0.56 ^b	^b 0.038 ^b	^c 0.003 ^b	^d 356 ^b	^e 112 ^a	^f 67 ^{bd}
till + hedgerow +mulch + crop	6.30 ^a	^a 0.62 ^c	^b 0.058 ^c	^c 0.004 ^b	^d 461 ^c	^e 121 ^b	^f 67 ^{bd}
till + hedgerow +mulch + crop + grass barrier	6.20 ^a	^a 0.54 ^d	^b 0.047 ^d	^c 0.003 ^b	^d 375 ^d	^e 118 ^b	^f 63 ^c
no till + crop	6.19 ^a	^a 0.85 ^e	^b 0.067 ^e	^c 0.002 ^c	^d 387 ^e	^e 111 ^a	^f 64 ^c
no till + hedgerow + no crop	6.25 ^a	^a 0.63 ^c	^b 0.034 ^b	^c 0.002 ^c	^d 364 ^e	^e 118 ^b	^f 68 ^d
Coconut plantation	6.48 ^a	^a 1.14 ^f	^b 0.087 ^f	^c 0.003 ^b	^d 532 ^f	^e 120 ^b	^f 66 ^{ac}
Coconut plantation + <i>Pueraria</i> <i>phaseoloides</i> cover crop	6.72 ^a	^a 1.81 ^g	^b 0.153 ^g	^c 0.041 ^d	^d 583 ^g	^e 148 ^c	^f 68 ^{dc}
Arecanut plantation	6.60 ^a	^a 1.18 ^f	^b 0.096 ^h	^c 0.005 ^e	^d 437 ^h	^e 118 ^b	^f 63 ^e
Homegarden	6.40 ^a	^a 1.31 ^h	^b 0.110 ⁱ	^c 0.061 ^f	^d 614 ⁱ	^e 121 ^b	^f 67 ^d
Evergreen forest	5.94 ^b	^a 1.62 ⁱ	^b 0.139 ^g	^c 0.002 ^c	^d 237 ^j	^e 104 ^d	^f 66 ^d

Values in a column suffixed with different superscript letter are significant at $P < 0.05$

Values in a row prefixed with different superscript letter are significant at $P < 0.05$

leaves (fronds) of neighbour coconut trees did not overlap, hence failed to provide that much cover as much arecanut plantation did in closer spacing. Greater loss of soil under coconut could also be due to the high erodibility under the tall tree (height = 13 m). Soil loss, across the land uses, in our study was positively correlated to the erodibility ($r = 0.771$, $P < 0.001$). Wiersum (1991) found relatively greater soil erodibility under tall trees (>12.5 m). Narain *et al.* (1998) argued that tall tree (>6.5 m) increased terminal velocity of

raindrop from tree canopy (leaf) and increased loss of soils. Greater reduction in soil loss under the evergreen forest than coconut and arecanut plantations, and homegarden was due to multistorey structure of the forest where height of the first storey (shrub and new growths) was less than 4 m, which reduced the erodibility of the soils to the lowest. We found that soil loss under coconut + cover crop (coconut plantation + cover crop) was 82% lower than coconut plantation alone. This indicated that the cover crop together with tree cover

was more effective in reducing the erodibility of the soils in the coconut plantation. Lower loss of soils from the home garden compared to the coconut and arecanut plantations could be due to its multistorey structure (Pandey *et al.* 2007).

Amount of nutrients lost due to the soil erosion and concentrations of nutrients in the runoff soils are given in Tables 2 and 3. Across the treatments, loss of nutrients occurred in the following chronosequence: nitrogen > K > Ca > Mg > P. The loss of nutrients followed broadly the pattern of soil loss. Among the land uses, maximum loss of the nutrients occurred from vegetable fields and lowest from the forest. Like the soil loss, the vegetative methods reduced the loss of nutrients also in the vegetable fields and under the coconut plantation (Table 1). Narain *et al.* (1994) also found almost similar pattern of nutrient loss in the western Himalayan valley.

The study concludes that high rainfall increases erodibility, particularly under till conditions in vegetable field and thereby removes fine soil particles, whereas vegetation cover of the trees, crops and grass in different combinations reduces the erodibility substantially. Loss of soils is more in coconut than arecanut plantation due to greater spacing and taller height of the tree, which together increases erodibility. The lowest soil loss occurs from the native forest due to highest vegetal cover (multistorey structure) that reduced the soil erodibility. Cover crop of *Pueraria phaseoloides* reduces the erodibility in the coconut plantation equal to that in the native forest. Introduction of *Gliricidia* hedgerows in the vegetable field, reduces erodibility and soil loss. But, the hedgerows together with mulch and grass barrier reduce the soil loss equal to that of the native forest. Therefore, vegetable cultivation need to be advocated to be done under hedgerows of *Gliricidia*, and coconut plantation together with the cover crop for the lowest loss of soils from the land uses in the island

ACKNOWLEDGEMENT

Authors thank Indian Council of Agricultural Research, New Delhi for funding through AP Cess Fund Project.

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