Introduction

Soil erosion is a major constraint to sustaining vegetable production on sloping lands in Southeast Asia. In tree-depleted landscapes with poor soils and risks prone environments, monoculture vegetable farming systems are not sustainable, but integrating trees, as contour hedges to control soil erosion, increase income of farmers, and improve farm environmental services particularly on carbon sequestration, offer better prospects and a viable option for smallholders.

Objective

To integrate trees on intensive vegetable farming systems with minimal negative interaction, thus increasing productivity, adaptability, competition, and complementarity.

Materials and Methods

Existing vegetable agroforestry systems (VAF) were assessed at Lantapan, Bukidnon, Philippines (124°47’ to 125°08’E; 7°57’ to 8°08’N) covering 21 farms: two agroforestry systems, six tree species, eight vegetables and four aspects. Data collected were tree parameters, spatial performance of vegetables, and spatial light transmission. Focus group discussion (FGD) was also conducted with VAF farmers on ways of integrating trees on vegetable farms.

Field experiments were established to evaluate 30 different indigenous and commercial tree, fruit, leafy, root and climbing vegetables perpendicular to a six-year old Eucalyptus torillana tree hedge spaced at 2.5 meter between trees. Crop growth and yield data were collected spatially relative to tree distance in order to determine productivity, adaptability, competition, and complementarity.

Net complementarity was used as a tool for assessing appropriate tree-vegetable integration.

Results

Performance indices of different vegetables based on yield under tree-based system (adapted from managers’ experience):

<table>
<thead>
<tr>
<th>Vegetable</th>
<th>Complementarity Index</th>
<th>Potential Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>White bean</td>
<td>0.57</td>
<td>Increase planting distance (B)</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>0.44</td>
<td>Increase planting distance (B)</td>
</tr>
<tr>
<td>Cabbage</td>
<td>0.98</td>
<td>Increase planting distance (B)</td>
</tr>
<tr>
<td>Carrots</td>
<td>10.00</td>
<td>Increase planting distance (B)</td>
</tr>
</tbody>
</table>

Conclusions

We found out that the optimum tree hedges spacing was between 25-30 meters apart and 3 meters between trees giving 111 – 133 trees per hectare. Suitable tree species were Eucalyptus robusta, Eucalyptus torillana and Acacia mangium; commercial vegetables were cabbages, cauliflower, carrots and bell pepper; leafy vegetables were Amaranthus (TOT 2273), Jute (TOT 6667), and Basella (TOT 5274); climbing vegetable was yard long bean (IVO 2141), eggplant (500-168) for fruit vegetables; and Katuray, Allkway and Malunggay for indigenous tree vegetables. There was a positive relationship between NCI and tree height and amount of canopy left after tree pruning, but had a negative relationship on canopy width. Vegetables grown on east or south side yielded better than those planted either west or north side of the tree line.

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