NEW TECHNICAL PROGRAMME

Department of Silviculture and Agroforestry

Experiment No. 21.5.3.1

1.	Experiment no. and Title	:	**Development of volumetric equation for Mango (*Mangifera indica* L.) trees from orchards**
2.	Background information	:	
	Mango *(Mangifera indica* L.) is one of the commercial important tree species for its fruit and is grown as commercial horticultural component. Mango is distributed throughout India as a cultivated tree crop in orchard, home gardens and on farm bunds. South Gujarat is considered as hub of horticultural crops and farmers are growing different fruit crops including many varieties of Mango. The wood is used for many purposes, including indoor construction, meat-chopping blocks, furniture, carpentry, flooring, boxes, crates and boat building (canoes and dugouts). With a calorific value of 4200 kcal/kg, the wood makes excellent charcoal and firewood. Young mango is often interplanted with other fruits and vegetables, and the tree is a valued component of the traditional home-garden agroforestry system. Volumetric equation/volume table play a vital role in quick estimation of volume and this value is also used in assessment of biomass and carbon content of standing trees. Many farmers and mango growers need biomass value while felling or converting mango orchards with new variety of mango, orchard rejuvenation or some other crops. Such local volume table is help in determining standing volume, so that biomass can be estimated. In view of carbon farming or carbon project, estimation of carbon per unit area of Orchard is also necessary. In that situation also, volumetric equation and/or volume table helps in determining carbon per individual or unit area. Hence, it is proposed to estimate the suitable volumetric equation as well as development of volume table for Mango grown in orchards. It may also help in estimating biomass and carbon yield. This would be helpful for timber merchant/farmers and other stake holders for biomass estimation.		
	Hypothesis	:	1. Can estimate volume, biomass and carbon content of trees of different diameter classes of Mango using biometric observation? 2. Can determine volumetric equation using growth parameters in Mango? 3. Can prepare local volume table for easy assessment of volume based on height and diameter of Mango trees?
3.	Objectives	:	1. To determine the volumetric equation(s) for Mango trees grown in Orchard land use system of South Gujarat 2. To prepare local volume table
4.	Investigators:	:	**PI:** Dr. Rajesh P. Gunaga, Professor (Forest Biology) **Co-PI:** Dr. L. K. Behera, Associate Professor (Silviculture) Dr. N. S. Thakur, Associate Professor (Agroforestry) **Associate Scientist:** Dr. S. K. Sinha, Associate Professor (FPU)
	SRFs	:	Dr. Ramesh L. Sondarva Dr. Jignesh B. Bhusara
5.	Location and agro climatic sub region	:	South Gujarat (Heavy rainfall zone, AES- III)

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<tr><td>6.</td><td>Name of Res Scheme & B.H.</td><td></td><td>Determination of carbon sequestration potential of forest tree species of South Gujarat (BH-12036)</td></tr>
<tr><td>7.</td><td>Year of experimentation</td><td>:</td><td>Commencement Year =2025-26 upto 2028</td></tr>
<tr><td>8.</td><td>Crop & Variety or Thematic area</td><td>:</td><td>Mango (Mangifera indica L.)</td></tr>
<tr><td>9.</td><td>Experiment details</td><td>:</td><td></td></tr>
<tr><td></td><td>a. Design</td><td>:</td><td>Random method of tree selection in different diameter classes</td></tr>
<tr><td></td><td>b. Treatment</td><td>:</td><td>For this trial, minimum of 1000 trees will be selected randomly from different locations in Navsari and adjoining areas of south Gujarat regions. Trees with DBH >10 cm to 60 cm will be used for measurement of biometric data. Various biometrical parameters as shown in observation column will be recorded. Further, volume of trees is calculated using following formulas/ procedures-
a) Calculation of form quotient (FQ) = Mid-diameter/ DBH
b) Calculation of volume (V, m^3) = S x FQ x H, where H= Tree height, S= Basal area ($\pi D^2/4$) and FQ = form quotient
c) Biomass (kg/tree) (Volume x Basic density of wood)
d) Carbon content (kg/tree) = [Biomass (kg) x Carbon content (%)]
e) Carbon will be estimated by wet digestion followed by titration using Walkley-Black method
<table>
<tr><td colspan="4">Table showing different diameter classes for trees are given below for the volumetric equation</td></tr>
<tr><td>D_1</td><td>10-15 cm</td><td>D_6</td><td>35-40 cm</td></tr>
<tr><td>D_2</td><td>15-20 cm</td><td>D_7</td><td>40-45 cm</td></tr>
<tr><td>D_3</td><td>20-25 cm</td><td>D_8</td><td>45-50 cm</td></tr>
<tr><td>D_4</td><td>25-30 cm</td><td>D_9</td><td>50-55 cm</td></tr>
<tr><td>D_5</td><td>30-35 cm</td><td>D_{10}</td><td>55-60 cm</td></tr>
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</td></tr>
<tr><td></td><td>c. Repetition</td><td>:</td><td>In each diameter class, minimum of 100 trees will be used, whereas in higher diameter classes, minimum of 50 trees will be used depending upon the availability of trees of particular diameter. Trees belonged to 60 to 100 cm DBH, will be used to record biometric data based on its availability.</td></tr>
<tr><td>10.</td><td>Observations to be recorded</td><td>:</td><td>Tree biometric parameters
a) Tree height (m)
b) Basal diameter (cm)
c) Crown length (m)
d) Crown height (m)
e) Crown diameter (m)
f) No. of prominent branch
g) Length of prominent branch (m)
h) Mid diameter of prominent branch (cm)
Estimating parameters
i) Form quotient
j) Volume (m^3)
k) Biomass (kg/tree)
l) Carbon content (kg/tree)</td></tr>
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