

SIDATIM

Novel Pathways of Biomass Production:
Assessing the Potential of *Sida hermaphrodita*
and Valuable Timber Trees.

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This project is sponsored by



Objectives

Aim of SidaTim:

The aim of SIDATIM is to strengthen the bio-economy by researching and promoting potentials of new land use concepts that comprise

- 1) innovative multipurpose plant species and
- 2) novel agricultural management approaches

SIDATIM consists of two Research Pillars.

Research Pillar 1:

Assessing the performance of *Sida hermaphrodita*, a promising multipurpose plant which has received little attention from researchers and practitioners until recently [1, 2].

Potential uses of *Sida* include:

- alternative energy plant to corn for biogas production and direct combustion; pollinator food
- basic compound for fibre products, particle or insulation boards, and substitute for turf.

Research Pillar 2:

Advancing and promoting knowledge about the production of valuable timber on agricultural land, preferably at the edges of fields, in existing hedgerows, or on scarps of low ecological value.

Possible advantages:

- additional income for the farmer
- erosion reduction, wind protection
- ecologic and aesthetic upgrading of a landscape

Merge the two Research Pillars:

Assessing and modelling the economic and ecological potential of growing *Sida* in combination with valuable timber trees.

Methods and Materials

SidaTim consists of eight Work Packages (WP):

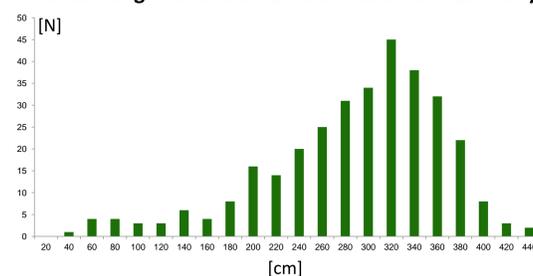
- WP1:** Assess growth performance of *Sida hermaphrodita* and *Silphium perfoliatum* on experimental field sites
- WP2:** Analyse and test biochemical and structural compounds of *Sida* for industrial use, focusing on its fibre compounds
- WP3:** Assess the competitive and invasive potential of *Sida* as well as biodiversity effects
- WP4:** Assess existing valuable timber trees and perform a potential study on valuable wood in a model region
- WP5:** Assess 3D tree structures and the above-ground C-sequestration potential of trees using Terrestrial Laser Scanning technology
- WP6:** Assess soil carbon sequestration
- WP7:** Economic evaluation and modelling of the assessed management systems



Top left: Flowers of *Sida hermaphrodita* with bumble bee; top right: 3D-printed lattice with natural fibres; bottom left: producing *Sida* chips; bottom right: experimental *Sida* plot.

First Results from Research Pillar 1

Shoot length of *Sida* on a field in Southern Germany



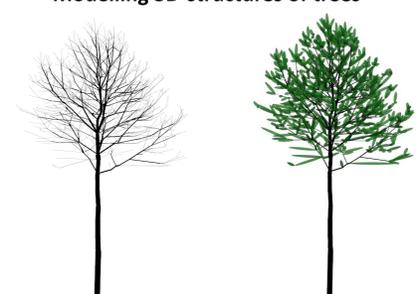
Biomass parameters of *Sida* on test plots

Variants	Height [m]	FM [t ha ⁻¹]	DM [t ha ⁻¹]	DM [t ha ⁻¹]
<i>Sida</i> 1, seeds	0,9	0,8	0,6	
<i>Sida</i> 1, seedlings	1,6	1,7	1,3	6,6
<i>Sida</i> 2, seeds	0,9	0,7	0,5	
<i>Sida</i> 2, seedlings	1,5	2,3	1,4	2,8
<i>Populus</i> , cuttings				5,1

Height, fresh mass (FM) and dry mass (DM) of two *Sida* provenances on plots in Northern Germany and Italy (last column). Here, biomass of *Sida* exceeded that of poplar in the first year of growth.

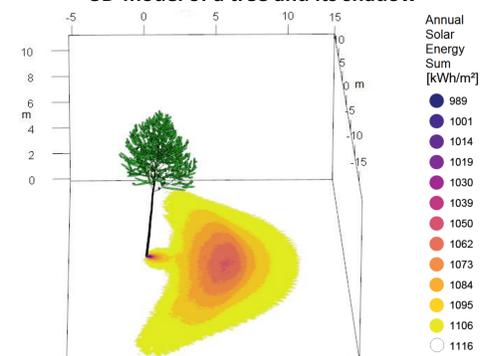
First Results from Research Pillar 2

Modelling 3D-structures of trees



3D-model of a wild cherry tree (*Prunus avium*) scanned with a terrestrial laser scanner. The tree can be visualized as 3D-model using a special software developed at the Chair of Forest Growth (*SimpleTree*). Dynamically developing foliage can be added with an additional software tool.

3D-model of a tree and its shadow



With a specific program developed in SIDATIM, the reduction of the solar radiation caused by the tree (model) can be calculated for 10-minute intervals for the entire year. The coloured areas represent different intensities of the annual solar energy reduction sum on the ground.



Discussing fibre properties of *Sida hermaphrodita* shoots.

Project Partners



Pruning a valuable timber tree

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References

- [1] Borkowska H, Molas R (2013). Yield comparison of four lignocellulosic perennial energy crop species. *Biomass and Bioenergy* 51, 145-153-
- [2] Jablonowski ND, et al (2017). Valorization of *Sida* (*Sida hermaphrodita*) biomass for multiple energy purposes. *GCB Bioenergy* 9, 202-214.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 652615.

