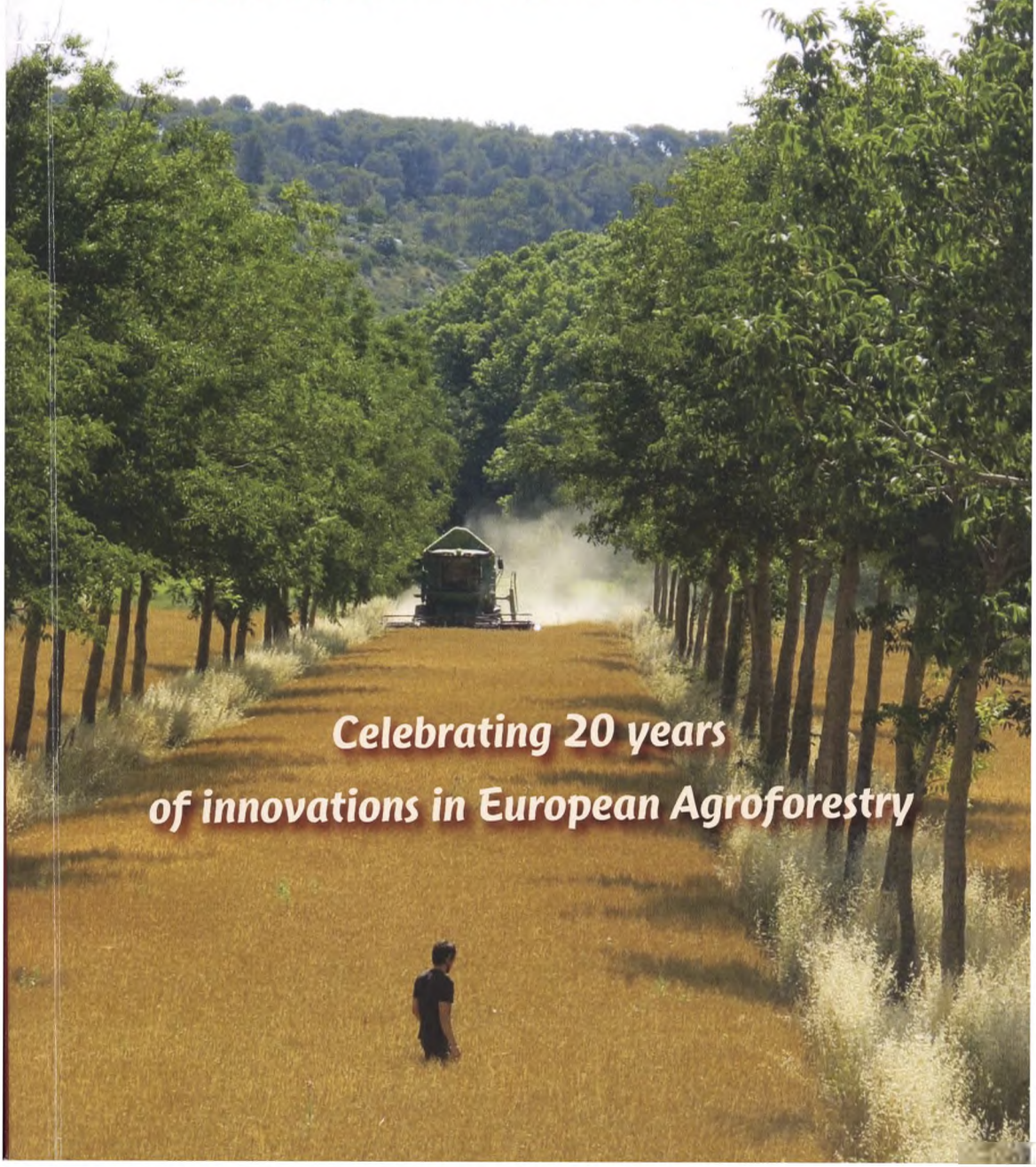
Book of Abstracts

3rd European AGROFORESTRY Conference 2016

23-25 May 2016 – Montpellier SupAgro, France



Celebrating 20 years of innovations in European Agroforestry

EURAF

EUROPEAN AGROFORESTRY FEDERATION

3rd European Agroforestry Conference

Celebrating 20 years of Agroforestry research in Europe

Montpellier, France, 23-25 May 2016

Book of Abstracts

Editor-In-Chief:
Marie Gosme

Editors:

Joana Amaral Paulo
Robert Borek
Paul Burgess
Christian Dupraz
Nuria Ferreiro Domínguez
Dirk Freese
Pilar Gonzalez-Hernandez
Marie Gosme
Tibor Hartel
Norbert Lamersdorf
Gerry Lawson
Bohdan Lojka
Delphine Meziere
Gerardo Moreno
Rosa Mosquera-Losada
Joao Palma
Anastasia Pantera
Pierluigi Paris
Andrea Pisanelli
Tobias Plieninger
Bert Reubens
Mercedes Rois
Adolfo Rosati
Jo Smith
Andrea Vityi

We thank Esther Lauri for her help on formatting this document, and the local organizing committee, in particular Sandrine Renoir

INFLUENCE OF THE SHEA BUTTER TREE ON AGRICULTURAL YIELDS IN NORTHERN IVORY COAST

Louppe Dominique [1*]

Corresponding author: dominique.louppe@cirad.fr

(1) CIRAD, UPR BSEF, F-34398 Montpellier, France

Introduction

The shea butter tree is of crucial importance in the Sudan and Sudan-Guinea zones of West Africa. Farmers protect this tree in their crops mainly because it produces fruits used in traditional meals, cosmetics and medicine. With the possibility of adding 5% of shea butter to chocolate, the economic value of this tree has grown

Consequently, in shea tree parklands, it seemed worth finding out whether there might be conflicts between the tree's fruit yields and crop yield. The effect of the shea tree on agricultural yields was therefore studied over four consecutive years, in smallholder crops in the Korhogo region (northern Ivory Coast).

Material and methods

Preliminary cotton yield measurements taken near 10 trees, in plots measuring 5 meters wide by 15 m long, divided into subplots one meter wide from the foot of the tree to outside the canopy, showed that no influence of the tree on cotton yield was significantly detectable beyond five meters from the tree trunk. It thus appears that no control plot is necessary beyond 10 meters from the foot of the tree, justifying the use of the protocol described below.

Yields were harvested in concentric rings centered on the trunk of the trees and divided into four sectors directed towards the cardinal points (Figure 1). Harvesting was carried out up to ten meters from the foot of the tree. For each tree, a total area of 300 square meters was harvested. The shea trees sampled were isolated, and more than twenty meters away from their nearest neighboring tree. The mean canopy radius was 4.6 m. The harvests concerned 53 trees or 1,272 plots of land amounting to a total area of 1.59 ha.

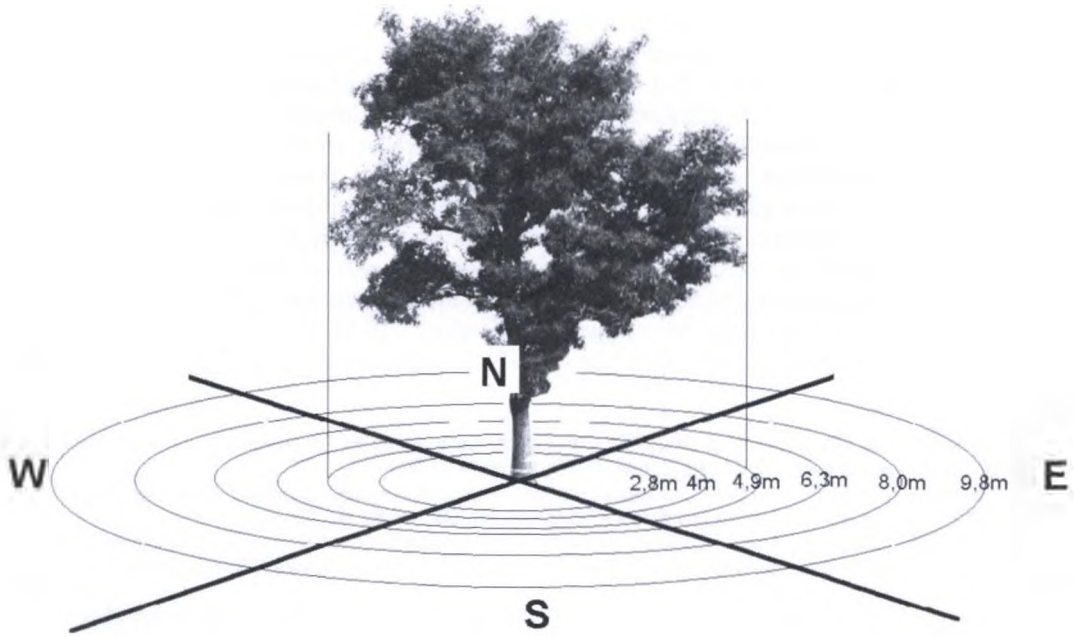


Figure 1: System used to measure agricultural yield variations under a shea tree.

Results

Table 1: Crop yields (kg/ha) depending on the distance from the foot of the tree (mean canopy radius = 4.6 m)

Crops	Number of sampled trees	Mean quadratic distance from the foot of the tree						Means [1]
		1.99 m	3.45 m	4.46 m	5.64 m	7.19 m	8.92 m	
Cotton	Year 1 : 14 trees	868 $_{D}$	1184 $_{C}$	1240 $_{BC}$	1318 $_{BC}$	1547 $_{A}$	1333 $_{B}$	1325
	Year 2 : 10 trees	453 $_{C}$	724 $_{B}$	708 $_{B}$	795 $_{AB}$	876 $_{A}$	903 $_{A}$	810
	Year 3 : 10 trees	490 $_{B}$	786 $_{A}$	798 $_{A}$	759 $_{A}$	777 $_{A}$	789 $_{A}$	757
Peanut	9 trees	234 $_{C}$	275 $_{B}$	332 $_{A}$	310 $_{AB}$	303 $_{AB}$	297 $_{AB}$	296
Corn	10 trees	1183 $_{B}$	1584 $_{A}$	1620 $_{A}$	1492 $_{A}$	1512 $_{A}$	1250 $_{B}$	1409

[1] Total yield in a total of 300 square meters (kg/ha).

$_{ABCD}$: 2 data items (in the same row) with the same letter are equivalent at the 5% statistical limit.

Table 2: Yield losses and gains (kg/tree and kg/ha) compared to ring 6, which was considered as a control outside the direct influence of the tree

Crops	Yield variations (kg/tree) compared to ring 6	Yield variations (kg/ha) with 20 trees/ha (distance between trees: 22 m)
Cotton year 1 - total yield: harvest 1 + harvest 2	- 0.24	- 4.8 (- 0.4%)
Cotton year 2 - total yield: harvest 1 + harvest 2	- 2.80	- 56.0 (-6.2%)
Cotton year 3 - total yield: harvest 1 + harvest 2	- 0.97	- 19.4 (-2.5%)
Cotton years 2 and 3: on fertile soils	- 0.86	- 17.2 (-2.3%)
Cotton years 2 and 3: on infertile soils	- 2.73	- 54.6 (-8.6%)
Peanut on fertile soils	+ 0.47	+ 9.4 (+3.2%)
Peanut on infertile soils	- 0.24	- 4.8 (-3.9%)
Corn on fertile soils	+ 4.78	+ 94.0 (+7.5%)

The influence of the orientation (data not presented) was not perceptible except for corn (yield was lower in the South and was better at the canopy limits in the E, W and N directions) and for the second cotton harvest (better cotton yield in the North than in the South).

There were fewer cotton bolls per plant in the shade than in full sunlight, but the bolls were heavier in the shade. Shade also delayed cotton maturation, so the cotton had to be harvested in two goes.

Discussion

Overall, yield was lower within the first few meters around the foot of the tree. The shea tree generated low yield losses (under three kg per tree) for the cotton and peanut crops on less fertile soils. Conversely, the tree led to better corn and peanut yields at the canopy edge, on the most fertile soils.

This may have consequences for the future of shea parklands if cotton is the main crop. Harvesting cotton in two goes was very important to prevent fouling of the cotton fibers by dust in the wind (which reduced the cotton selling price for the producer). This gives much more work to the farmer and it may encourage some farmers to fell their trees and sell them for firewood or charcoal making, especially if the loss in cotton yield is greater than the monetary income resulting from the sale of shea fruits or butter. (NB: it is slightly more complex than presented here because the money from cotton sales is for men and the money from shea trees is mainly for women).

References:
Kessler JJ (1992). The influence of karité (*Vitellaria paradoxa*) and néré (*Parkia biglobosa*) trees on sorghum production in Burkina Faso. Agroforestry Systems 17: 97-118
LouppeD, N'Dour B, and Samba ANS (1996) Influence de *Faidherbia albida* sur l'arachide et le mil au Sénégal Méthodologie de mesure et estimations des effets d'arbres émondés avec ou sans parcage d'animaux In : Peltier R (ed.) Les parcs à faidherbia. Bois et forêts des tropiques, Cahiers scientifiques n°12: 123-139.

Keywords: Shea (*Butyrospermum paradoxum* syn. *Vitellaria paradoxa*), crop yields, peanut, cotton, corn, Ivory Coast.

Book of Abstracts

3rd European AGROFORESTRY Conference 2016

Celebrating 20 years of innovations in European Agroforestry

23-25 May 2016 · Montpellier SupAgro, France

EURAF · INRA SCIENCE & IMPACT · Hérault Département · Supported by the the AGFORWARD project · Fondation de France · AGFORWARD · System · Montpellier SupAgro · cirad AGRICULTURAL RESEARCH FOR DEVELOPMENT · AGROFORESTERIE association française

Conception: Cirad, [illegible], April [illegible]