Enhancing nutritious food availability through promotion of native edible tree/shrub species in Sub-Saharan Africa (TREEFOOD)

Centre Régional Recherche Agronomique/Institut d'Economie Rurale

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Thought For Food initiative - Full project

COORDINATION

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BASIC INFORMATION

Full title
Enhancing nutritious food availability through promotion of native edible tree/shrub species in Sub-Saharan Africa (TREEFOOD)

Short title
Native food tree species in Sub-Saharan Africa

Thematic Strand

Both strands 1 and 2

Consortium members

Country	Stakeholder category	Institution	Unit, if any

Mali	Research organization	Centre Régional de Recherche Agronomique/Institut d'Economie Rurale	CRRAS/IER
Benin	University organization	Laboratoire de Biomathématiques et d’Estimations Forestières/University of Abomey-Calavi	LABEF-UAC
Burkina Faso	University organization	Institute for training and research on life and earth sciences/University Ouaga/Pr Joseph Ki-Zerbo	UFRSVT-UOI
Niger	Research organization	Institut de Recherche Agronomique de Niamey	IRAN
Denmark	University organization	Department of Bioscience/Aarhus University	UA
Belgium	University organization	Ghent University	UG

Budget

Project's full cost
1465121 €

Funding request
499337 €

EXECUTIVE SUMMARY

ABSTRACT

The present project will be carried out in Benin, Burkina Faso, Mali and Niger (Sub-Saharan Africa). This region is characterized by high population growth, unpredictable food provision and high poverty rates. Improving people's livelihoods is a major challenge for all West African countries, especially concerning vulnerable rural communities. The latter faces recurrent food crises including food shortage and high malnutrition rates (23.2% in 2014-2016). This situation is already and will further be worsened by climate change effects which affect agricultural production. Food crop production growth rate still lags behind population growth rate (approximately 2% versus 2.5% per year, respectively). So the question is: how will these (rural) populations continue to survive if staple food production cannot keep pace with population growth rate? Part of the answer lies in the diversification of food sources. In this line of thinking, domestication and more consequent use of native trees and shrubs from agroforestry parklands that local communities have used for food for generations must be highlighted and promoted. The latter offer food including fruits, seeds, nuts, leaves, flowers, oils can supplement staple crops. Some of them are of high importance particularly during the long dry and lean season where the risk of food shortage is high. However, most communities lack sufficient technical knowhow and support to adequately and sustainably manage them. Numerous national research institutes and universities have conducted research on agriculture and agroforestry, but most of this research was designed by scientists and implemented on research stations without active involvement of the rural poor. In order to achieve sustainable implementation of research findings, local communities should be involved in all stages of domestication research/development process. The present overall research objectives are to 1) develop adapted 'agroforestree' plant material for introduction into local agroforestry systems, 2) assess biochemical compounds and nutritional value of native edible tree/shrub species products, 3) develop improved processing of products, 4) promote sustainable management of edible tree/shrub species and develop (inter-)national marketing strategies of their products. Field research will be conducted in two different agro-ecological zones per country. The project aims at supporting so-called farmer-led innovation platforms in improving collection, production, processing and marketing of products from edible tree/shrub species, whereas field schools will be established to disseminate technologies. This holistic approach will allow the sustainable development, use and conservation of a number of local tree species occurring in the different agro-ecological zones. Additionally, preservation and improvement of the ecosystem services they provide will ensure/improve the livelihoods of rural communities. The main activities are grouped in six work packages:
(WP1) Literature review and traditional knowledge survey on native edible tree/shrub species;
(WP2) Assessment of biochemical compounds and nutritional value of selected native edible tree/shrub species products;
(WP3) Analysis and development of value chains and improvement of marketing and processing of selected edible tree/shrub products;
(WP4) Development of locally adapted domestication of selected native edible tree/shrub species;
(WP5) capacity building; and
(WP6) Coordination and management.
The expected results of the project are:
- Local knowledge on food trees is documented and a database on species and products is built
- Biochemical composition of products is analyzed and their nutritional value is known
- Improved processing of products is developed and sound marketing is promoted
- Sustainable harvesting and best-plantation techniques are developed
- Capacity building is done.
The coordinator will be assisted in his task by a steering committee which will be composed of work package leaders.

Keywords (max. 5)
Food security
Agro-biodiversity
Native edible tree/shrub
Innovation platform
Sub-Saharan Africa

PROJECT DESCRIPTION

1. Background, State of the art, rationale

Background

The Sub-Saharan region of Africa (SSA) has registered the most rapid demographic growth in the world during the last decades (2.4 % in 2001 as against between 0.8 and 2 % in the other developing regions). The region is also characterized by very high feritlity (in average 5.5 children per woman) and high mortality rates (life expectancy of 47 years) (Tabutin and Schoumaker, 2002), whereas it has the most critical economic and social situation in the world. According to FAO and WHO, Benin, Mali, Niger and Burkina Faso (all 4 SSA countries) are characterized by: 1) high rates of rural poverty; 2) low basic health infrastructure; 3) problematic and unstable food supply; and 4) unsustainable use of natural resources. Over 70% of people in SSA reside in rural areas where they use African traditional medicine for addressing their routine health needs. Traditional medicine, an important element of the cultural heritage, remains until now the principal recourse for a major part of African populations to treat diseases. Indeed, in such situations, in order to continue to survive and guarantee a healthy diet, populations there need diversified food that is tasty, with adequate organoleptic quality, and that is accessible at any time and in sufficient amounts (food sovereignty). The gap between the rapidly increasing populations in this part of Africa and their growing food (and health) needs should be filled by an increase in agricultural productivity (rather than via an increase in crop surface area which would destroy scarce valuable natural resources). An alternative to bridging this gap could come from sustainably sourcing non-timber forest products (NTFPs) in general and wild edible tree/shrub products in particular. Forests occupy almost 22% of the African continent. Lots of these species have been documented to produce well with limited input use whereas they also do not require much labor input, and are thus termed "zero-cost" species. In addition, women often play a major role in the gathering of fruits and other products that can be derived from these species, whereas they are also frequently involved in selling these products. Other studies revealed that the cost of food is

increasing globally with the loss of forest cover. In Niger, assisted natural regeneration of 5 million hectares contributed to the additional production of 500,000 tons of food per year (see Great Green Wall Initiative). Despite the considerable contribution of forest species to food provision and in the fight against malnutrition, they remain undervalued and underutilized. The project will seek to contribute to enhance food availability and to improve food quality through the promotion of underutilized native edible tree species.

State of the art

Sub-Saharan Africa's efforts to mitigate malnutrition are lagging behind the rest of the world's, with 30% of the population remaining undernourished (FAO 2005a). Indeed, eight of the 20 nations with the highest burden of undernutrition worldwide are in this region (Bryce et al. 2008). In this part of Africa, 23.2% of the population was undernourished in 2014-2016 (FAO et al., 2015). The main development problems in SSA are malnutrition, food insecurity, vitamin deficiency, and lack of financial resources to sustainably produce (and access) good-quality food. Given this situation, priority must be given to improving food security and vitamin intake. A more balanced diet can be realized through diversification of locally grown food use and by accessing wild edibles. Tapping the production potential of native edible tree/shrub species offers an opportunity to enhance the availability of highly nutritious, low-cost food. During lean and famine periods, these species are often the only source of food for rural populations. In West Africa, malnutrition is considered as a serious constraint to economic development. Malnutrition not only affects adults but also more than 18 million children under 5 years of age who suffer from multiple deficiencies (Maundu and Johns, 2006). The fight against malnutrition is one of the main objectives of the National Agricultural Investment Plan in Mali; the Economic and Social Development Plan and 3N Initiative in Niger; and the National Rural Sector Program in Burkina Faso. All these initiative are in line with the African Union's Malabo Declaration (2014) and the Comprehensive Africa Agriculture Development Program (CAADP) principles and values that stress enhancing investment in agriculture and ending hunger in Africa by 2025.

Cereals are generally considered to be the basis of any food security programme. In SSA, however, food crop (including cereal grain) production growth rate still lags behind population growth rate (approximately 2% versus 2.5% per year, respectively). Alternative products and value chains which could contribute significantly to food security and could complement more traditional staples in West Africa are very rarely taken into account in public policies targeting food provision, however. In general, underutilized species are subject to disadvantaged situations such as 1) failure of national and local governments to make conservation and use of wild edible tree/shrub species a priority, 2) lack of funds for *ex* and *circum situ/m* conservation, 3) failure of governments to support scientific research on wild edible tree/shrub species, 4) lack of characterization, breeding and evaluation information, 5) absence of enabling legal frameworks, policies, projects, national programmes and strategies.

Rationale

The continuing threat to the world's land resources is exacerbated by protracted rural poverty and food insecurity in the Third World, and wider climatic variations resulting from global warming. During the last decade, food security was not a global priority, but studies such as IFPRI's 2020 Vision (1996) show that rural poverty in the Third World is one of the main global concerns of our time, and that food insecurity is a major factor and characteristic of rural poverty. Therefore, the three interlinked factors for reversing rural poverty are (i) income generation, (ii) increasing food and nutritional security and (iii) protecting the environment. Coupled with their manutrition and poverty situations, it urges to find a way to provide high-quality food to rural people.

Several indigenous tree/shrub species are protected and managed by farmers on farms as part of a traditional approach to land use in the tropics. Promotion of indigenous fruits and vegetables is an attractive option to fight hunger in these areas, as it allows consumers to take responsibility over their diets in culturally relevant, and therefore potentially more sustainable ways (Keatinge et al. 2010). Furthermore, the nutritional profiles of these indigenous species in supplying micronutrients, fat, fibre and protein are often better than those of staple foods (Leakey 1999). In addition, continued deforestation, currently estimated at 3.4 million hectares annually for Africa as a whole (FAO 2010), means that many communities can no longer gain easy access to natural stands of fruits, nuts and other edible non-timber forest products (NTFPs) that they once collected to supplement their diets. In these circumstances, agroforestry is an approach adopted by farmers to meet their needs for essential resources and improved livelihoods (Garrity 2004). Worldwide, it is estimated that more than 1.2 billion people practise agroforestry in some form, and that approximately 560 million people live in farm landscapes that have more than 10% tree cover, many of which are found in the SSA region (Zomer et al. 2009). Rural women in particular can benefit, as markets for fruits, vegetables and other edible tree species have a lower capital threshold for involvement than other sectors of the economy (Awono et al. 2002, Akinnifesi et al. 2006). In Africa, special potential for cultivation lies in the great biological diversity of indigenous fruits, nuts and other edible products found in the forests of the continent (IPGRI et al. 2005, Akinnifesi et al. 2006). There are hundreds of indigenous fruit tree species (IFTs) that, although relatively unknown in global markets, are important locally. These are now the focus of domestication initiatives which could contribute significantly to the livelihoods and nutrition of local people (Leakey et al. 2005, Schreckenberg et al. 2006). The promotion (value chain development) of native edible tree/shrub species contributes to achieving the Millennium Development Goals (MDGs), in particular with regard to eradicating extreme poverty and hunger (MDG1) and ensuring environmental sustainability (MDG7), as well as promoting gender equality and empowering women (MDG3).

2. Objectives

Overall developmental objective

Contribute to food security and the fight against malnutrition through improved sustainable management and use of a selected number of edible tree/shrub species.

Overall research objectives

- Make a literature review and inventory local knowledge and practices on native edible tree/shrub species and products.
- Assess/characterize biochemical compounds and nutritional value of native edible tree/shrub products.
- Analyze and develop value chains and improve marketing and processing of selected edible tree/shrub products for longer shelf life and improved nutritional quality.
- Develop locally adapted domestication of high-potential native edible tree/shrub species
- Strengthen institutional and innovation capacity of local communities.

APPROACHES AND METHODOLOGY

1. **Overall approach**

The project rationale hinges on a farmer-led, multidisciplinary and multi-institutional approach (involving local and international research institutes, and private company). The project activities will be carried out in 4 SSA countries namely Benin, Burkina Faso, Mali and Niger. The outputs of the project will be important at local level and also for the regional scale (SSA).
The eventual objective is to induce lasting dietary behavior changes through capacity building geared at sustaining actions initiated under the project. This holistic approach will allow sustainable use and conservation of species, preservation and improvement of natural resources and ecosystem services while ensuring and improving the livelihoods of rural communities. Using an innovation platforms approach, the project will increase the social and political awareness around the problems of sustainable management of native edible tree/shrub species. The project will also strengthen the capacity of stakeholders to develop and implement/adopt sustainable production and productivity strategies. Interaction between project stakeholders from Africa and Europe will allow knowledge sharing for better achievement of project objectives.

1. **Description of the various work packages, including a graphic representation of possible interactions**

Work package 1 (WP 1). Literature review and traditional knowledge survey onedible tree/shrub species
A literature review will be conducted in each partner country. This review seeks to identify major native edible tree/shrub species already documented, their availability, nutritional and/or dietary importance for local populations; their main auto-consumed and marketed products; and their marketing opportunities if existing, in the target countries. A literature database will be completed with a literature search in the databases of Web of Science, Science direct, World agroforestry, etc. including PROTA's database, using combinations of relevant keywords related to studies listed above. We will explicitly exclude studies that are solely concerned with pharmacological screenings or agricultural practices. We will use the number of references citing the nutritional/dietary/economic/ethnobotanical use of a given species and the number of use categories per species to calculate the relative importance index and to rank species according to their usefulness (the focus will be on nutritional and dietary uses). The relative importance index is defined as the half value of the sum of the maximum relative frequency of citation (frequency of citation divided by the number of references), and the maximum relative number of use categories (number of uses/maximum number of uses of a given species). The survey will highlight knowledge gaps, especially at the level of domestication/propagation potential, and nutritional composition of the species (by-) products (the latter being the most important problem hampering species' development into wider markets and for better food/nutrition).
Assessment of species preferred by user groups
Local knowledge on selected edible tree/shrub species will be facilitated by the innovation platforms. Surveys will concern the rich, average and poor households per village. Semi-structured interviews using open-ended, indirect and direct questions will be carried out. Interviews will combine free-listing and well- structured interviews based on lists of known species. Interviewees will be asked to list the edible tree species they know, grow, harvest, and use, and rank them according to their perceptive value, for home and sale use. Interviewees will be stratified by gender (men will be separated from women for surveys).
Ranking of products and final choice
Edible tree/shrub species products and services will be ranked in order of their potential importance for solving the present and future problems of farmers. This ranking will be based essentially on a market survey. At the end of this step, only species that provide the most important products are considered in the following stages. Then, we refine the list further by ranking species on their potential of research to achieve impact in domesticating the species and developing value chain of their main products, expected rates of adoption (is the species easy to propagate and grow? Is there any marketing opportunity at local and or regional scale?).
Furthermore, a field work will be conducted to collect detailed data from farmers and markets. This survey will allow estimating the value of products of species remaining on the priority list, and to update information on research facilities, expected adoption.
Data that will be collected during the focus group discussions will be analyzed with relevant and appropriate statistical tools. The results of these activities will be synthesized and the choice of priority species will be approved in a final consultation (Maximum three species will be considered per country, in order to be efficient and well achieved the remains objectives of the project).
At the end of this package of activities, the project will provide the following outputs: 1) target species are identified, 2) local management, propagation and processing practices of selected native edible tree/shrub species and their products to be valorized are identified.
Work package 2 (WP 2): Assessment of biochemical compounds and nutritional value of selected nativeedible tree/shrub speciesproducts
Species to be considered
In each partner country, the top most important species for valorization as identified through the ranking system (see WP1) will be considered for physicochemical analyses. As such, species parts (fruits, leaves, seeds/kernels) and processed products will be analyzed for parameters that are of importance for sustainably improving the nutritional status of the populations.
Sample collection and pre-treatment
In the communities where survey took place, sampling of species parts and their processed products will be done. Dry samples will be collected as such, packed in a plastic bottle, adequately labeled and stored in a dry bag. Wet samples will be collected according to the same procedure but will be rather stored in isolated boxes with ice and carbogaz to keep them at a low temperature until they are transported to the laboratory where they will be frozen until analyses. When needed, frozen samples will be freeze dried before analyses.
Physicochemical analyses/nutritional value

Collected and pretreated samples will be analyzed for macronutrients, minerals, selected vitamins (carotenoids or pro-vitamin A and vitamin C), antioxidant activity, anti-nutritional factors and total phenols. All analyses will be performed in duplicate or triplicate. Macronutrients will be determined using AOAC methods AOAC (1984). Micronutrients especially the ones of public health importance in partner countries (Na, K, Ca, Fe, Zn, Mg, Mn, S and iodine) will be determined according to Temminghof (1997). Vitamin C and carotenoids contents will be determined using HPLC. Total phenols will be determined using spectrophotometry with the Folin-Ciocalteu reagents (Swain and Hillis, 1959). Antioxidant activity will be measured using the DPPH (1,1-diphenyl-2-picrylhydrazyl) method (Brand- Williams *et al,*1995). Concerning the anti-nutritional factors mainly encountered in foods from plant origin (Sulphates, Oxalates, Nitrates, phosphate, Citrate IP6), they will be investigated according to Bentsink et al. (2003)

Food formulation for the vulnerable groups

The nutritional value of plant parts and their derived foods will allow comparing them with codex standards of various classes of the populations, especially the most vulnerable ones (women and children). Adequate combinations of wild edible plant species or food formulation integrating the staple foods will be elaborated for a sustainable improvement of the nutritional status to the population in general and the ones of the vulnerable groups in particular. Anti-nutritionals factors will be used in ration with most important micronutrients to forseen their bio-availability. Such an information will be considered in the food formulas to be proposed.

Work package 3 (WP 3): analysis and development of value chains and improvement of marketing and processing of selectededible tree/shrub products

Value chain analysis (VCA) characterizes the processes by which products are brought from production to consumption, through a range of activities such as input supply, harvesting, processing, storage, transport, marketing and financing, and seeks to understand how value is created. All activities will be held in each village of the study area of each country with a complete involvement and participation of local communities (innovation platforms). ToTachieve the objectives of this work packages the following actions and events will be implemented:

• **First key stakeholder workshop**: During this workshop preliminary value chain (VC) map will be designed. Value chain mapping concerns the core processes' mapping (this involves distinguishing the major processes that products go through before reaching the final consumption stage); identification and mapping of main actors (this involves categorizing actors according to their main occupation, such as producers, collectors, processors, and transporters); mapping of relationships (relationships between sellers and buyers, and among enterprises pursuing activities on edible tree species transformation); mapping of volumes (this involves quantifying the size of the different components of the value chain of a given target species); mapping of geographical flows (we will start the mapping at the farm and will record how the product of a given species travels from intermediary trader to wholesaler, retailer and finally to consumer); value's mapping (We will identify operational costs and required investments, then we will calculate prices and revenues per actor, calculate also the financial ratios, and we will establish the relative financial position of actors).

• **Initial surveys to complement the preliminary VC map**: A market survey will be carried out as complement to the previous step. Two markets (village scale and communal scale) per village of the study area of each country to implement the survey. We will interview all sellers of a given valuable edible tree species product. They will be submitted to a pre-established questionnaire. Data collected will be subject to an economic analysis.

• **Second key stakeholder workshop**: This workshop will aim at presenting survey results, discussing needs for review of studies, further refining preliminary VC map, and planning main stakeholder workshop.

• **Main stakeholder forum, with broad participation**: The aim is to create awareness and to initiate value chain development (VCD) for various products to be valorized. The key findings will be presented again to stakeholders. Through a participative approach, the preliminary VC will be refined and leverage points (constraints and opportunities) will be evaluated performing a SWOT analysis. In the framework of this forum, VC upgrading strategies will be designed through participative approach.

• **Participatory implementation of the intervention strategy, including participatory monitoring, evaluation and plan revision** : The marketing and processing aims at 1) identifying edible-tree products processing units, 2) analyzing processing techniques, 3) analyzing the marketing channel and 4) proposing solutions to improve the marketing and processing of major food tree species. This activity will focus on the development of sustainable markets for edible/shrub tree species and on the strengthening at the local, national and regional levels while ensuring that benefits are shared fairly. Research to find innovative solutions to mitigate harvest and post-harvest limitations, and to develop profitable local edible/shrub tree species enterprises, will be a priority. Domestic demand for target products will need to be expanded and their trade barriers will need to be identified and removed. Through this activity, we will also strengthen links between farmers, researchers and consumers.

Definition of overall market chain for all target products

Based on the value chain established above for target products, and in collaboration with stakeholders and innovation platforms, researchers will identify the market opportunities and weaknesses that exist for each product at local and regional scale. This task will be done through collaborative discussions in each partner country of the project. Then, a strategy will be established to promote the products on markets. For the market strategies, the focus will be to try to establish a robust local market within 100 km radius for each target product, by using promotion campaigns, awareness-raising strategies, and new recipes in order to add value locally. In addition, plan will be developed to make market linkages at both local and regional levels. The market infrastructure, especially the storage infrastructure of raw materials, will be analyzed by the expert consultant, and better way to conserve raw materials will be provided.

Once strategies are established, trainings will be done for innovation platforms and enterprises, on market operations of target edible/shrub tree species products, previously elaborated by project partner teams.

Work package 4 (WP 4): Development of locally adapted domestication of selected nativeedible tree/shrub species

Based on the results of DADOBAT, SAFRUIT, SUN and QUALITREE projects, the superior plant material will be collected for activities below.

Tree nursery

Planting material will be produced by farmer group-managed nurseries. The innovation platforms per village will basically manage the nurseries. Within and between innovation platforms, farmers will share information and resources in order to meet the various challenges they face. The project team of each country will provide technical assistance to these group nurseries through leadership trainings as well as on how to make planting material available in adequate quantities. Additionally, this activity will generate an income to farmers, based on selling surplus planting material that goes beyond group farmers' immediate needs.

Propagation techniques

Propagation activities will be focused on vegetative propagation techniques in order to produce true-to-type material, and also to shorten the time required for a tree to reach maturity (flowering, fruiting; adolescence period reduction). For more information on propagation techniques, see ICRAF (2011) and Sanogo et al. (2005). Vegetative propagation will be through grafting, scions and marcotting. Substrates will be sand and sawdust whereas we will also compare/use terrestrial and air marcotting.

Tree/shrub planting techniques

Two improved techniques will be applied and compared to shorten time to tree flowering and fruiting. The first technique is to water the plants for 2 consecutive dry seasons @ 10 liters of water per plant per week using a drip irrigation system. This technique has been used successfully in Mali by DADOBAT project on *Adansonia digitata* and *Tamarindus indica*, PASAOP/IDA project on *Detarium microcarpum* (Kouyate, 2012), and QUALITREE project on desert date. The second technique will be to plant the trees during the dry season, inspired by the PLASA method that has been successfully performed in several localities of Mali (Thera and Mishimassa, 2003). This method significantly reduces the need for watering of several species in dry season and reduces the planter's maintenance work. Its principle is based on the identifying moist soil film in dry season; contacting the main root of the plant with this film; planting hole should have the shape of an inverted funnel, well watered and filled with fine gravel + sand + manure or compost to ¾ of the depth, 4) at the time of planting, make a slow and abundant watering.

Work package 5 (WP 5). **Capacity building**

Capacity building includes several levels from 1) rural farmers over 2) natural research institutions of various kinds to 3) research institutes and 4) international institutions.

1) The capacity of rural women and men will be strengthened through workshops and training in the involved villages. Each of the researchers will go back to the villages where they work and inform about the progress of the work and present the results on food nutrition in a popular manner. Researchers will make workshops to improve processing of products, tree planting methods and sale and marketing methods and routes. Manuals and leaflets will be developed for the most important edible tree species in each of the partner countries to inform about processing of products, tree planting methods, sale and marketing methods and routes as well as food nutrition.

2) Information sessions and discussions with natural research institutions, local NGO's and multi-stakeholder platform about collection, production, processing and marketing of native edible tree products will take place throughout the project and will be intensified the last year.

3) Research results will be published in international peer-reviewed journals. The researchers will also disseminate results to young scientists through teaching. The project will supervise Master's students, who will form a new generation who can continue and intensify the ideas from the TREEFOOD project

4) Finally all researchers will be obliged to take contact to national and international organisations to discuss the application of results in policy and international strategies.

The innovation Platform will be established per village of study and country level. It will be established by the project team. According to Toon and Jugue (2014) such a platform can effectively act as central coordinating bodies between all stakeholders involved, i.e., as a point of entry for the identification, validation, operationalization and monitoring of appropriate improved technologies and interventions identified by the actors themselves. This platform will work with all WPs. It should be considered as a permanent tool creatad by a group of actors. For its implementation, every stage in the value chain will designate his representative. Then members of the platform will elaborate operating procedures and action plan to contribute to the achievement of project objectives. Platforms will be at the beginning and end of the project process. They will aim to contribute to the promotion of edible tree/shrub species. They will facilitate surveys and field experiments, promote the exchange of information between stakeholders and dissemination.

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EXPECTED OUTPUTS AND OUTCOMES

Expected outputs and outcomes

Expected outputs by work package

WP1 – Literature review and traditional knowledge survey on native edible tree/shrub species
D1.1 List of edible tree/shrub species used as food is available
D1.2 List of edible tree/shrub species used to reduce malnutrition is available
WP2 – Assessment of biochemical compounds and nutritional value of selected native edible tree/shrub products
D2.1. Biochemical compositions of selected edible tree/shrub products are analyzed and documented
D2.2. Nutritional values of selected edible tree/shrub products are known
WP3 – Analysis and development of value chains and improvement of marketing and processing of selected edible tree/shrub products
D3.1 Characteristics and mapping of chain value are known
D3.2 List of edible tree/shrub products processing units is available
D3.5 Characteristics of edible tree/shrub products marketing channel are known
WP4 – Development of locally adapted domestication of selected native edible tree/shrub species
D4.1 Optimal watering regime is known
D4.2 Optimal tree/shrub planting techniques is known
WP5 – Capacity building
D5.1 Innovation platforms are created
D5.2 Curricula of basic education and universities is improved
D5.3Technical brochures and posters on the processing techniques, low cost of propagation and tree/shrub planting techniques are available for wider audience
D5.4 Training courses on the edible tree/shrub species domestication, value chain, improved marketing and processing for wider

audience are available.
Expected Outcomes
- Local knowledge and practices on edible tree/shrub species and products are known;
- Biochemical composition and nutritional values of target edible tree/shrub products are known;
- Value chains of target edible tree/shrub products are analyzed and their marketing and processing are improved;
- An adapted propagation and planting techniques from edible tree/shrub species are developed;
- Institutional and platforms capacity is strengthened.

Illustration(s)
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COMMUNICATION AND DISSEMINATION

Communication will be based first on the presentation of the project to the target groups to sensitize and get their feedback. This presentation will be made as workshops and village meetings. Each year, results will be restored to the villages of study. Also, trade and agricultural fairs, open day visit will be organized to highlight or to ensure the visibility of results whereas a lobbying should be made to involve the decision maker, involvement of rural and community radio.

Illustration(s)
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MONITORING AND EVALUATION

Monitoring and evaluation
The Monitoring & Evaluation (M&E) system has two types of devices in the database: a comprehensive system that takes into account all the information generated at different levels and other complementary device at first mainly focused on targeting of beneficiaries registered shares of the project. It feeds targeting the overall device much more precise information on specific populations target groups. It is done on a sample of villages beneficiaries of the project intervention.
The monitoring and assessment include (i) Rapid monitoring survey, (ii) Inter- villages' workshop at country level, (iii) *ex-ante* and *ex-post* impact assessment.
Rapid monitoring survey will build on baseline assessment and monitoring project interventions addressing constraints and opportunities of the project.
The results of assessment and monitoring will be validated during the inter-villages workshop. These will also serve to planning the platform activities.
Integrated ex-ante assessment aims at assessing the household's situation before the CLT project platform implementation. The team will focus on evaluating the 'development value' of the Project that is, evaluating the contribution of the project to the rural community livelihood.
The collection of information will focus on indicators measuring the progress of the project. Measuring progress will be compared to the performance targets in the implementation of activities and changes in the medium and short term induced at beneficiary level.
The final relevant indicators will result from adapting the existing logical framework of the project to approach the results will be a stage of the project monitoring and evaluation activities. It will therefore be process indicators and indicators of results (output indicators, outcome indicators and impact indicators).
Based on the current logical framework and performance indicators (outputs, outcomes and impact) can be up.

Illustration(s)
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RISK ANALYSIS AND CONTINGENCY PLAN

1. **Risk analysis and contingency plan, including an indicative exit strategy**

The predictable risks may be related to 1) political conflicts, 2) climate conditions, 3) land tenure, 4) intellectual property rights, 5) non-compliance with the terms of the partnership with local communities and 6) non-compliance among scientific partners.
1) The involved countries have experiences political conflicts over the last decade, but the study areas will be located in the safest areas of the countries and the fieldwork will mainly be conducted by local partners, who are less exposed to these political conflicts than the European partners.
2) Droughts are a recurrent problem in the Sahel and it might impact WP4 (tree planting and sustainable management). To avoid problems related to climate change, climate secure species will be planted and tree planting will take place in several places to minimize large failure.
3) Land tenure can be a problem especially in relation to WP4 (tree planting and sustainable management). To avoid land tenure problems the local land tenure system will be investigated and an agreement on land right properties will be made in the local

communities.
4) The project will respect the European and national regulations on intellectual property rights and a strategy will be jointly coordinated and implemented by IER, with the support of the steering committee.
5) I[color=#000000]t is assumed that good relations to local people in study sites are maintained throughout the project. Without their acceptance, some of the project components cannot be carried out. In order to ensure good relations, the African scientists will select study areas carefully and all project participants will make an effort to assure that all partners approach the local societies in the correct manner according to the West African tradition. [/color]
6) To avoid non-compliance among scientific partners, a plan for the work and individual duties will be established as the first thing and an agreement will be signed by all partners.

STRUCTURE AND GOVERNANCE

Structure and governance

1. Partnership – role and contribution
Please see attached Table partners role
2. Coordination and management
Expected outputof coordination and management
D0.1 Presentation and kick-off meeting of project
D0.2 Production of the first annual report from WP leaders and compiled by the coordinator
D0.3 Production of the second annual report from WP leaders and compiled by the coordinator
D0.4 Production of the third annual report from WP leaders and compiled by the coordinator
D0.5 Production of the final report from WP leaders and compiled by the coordinator.
The project principal coordination will be based to the *Centre Regional de Recherche Agronomique de Sikasso/Institut d'Economie Rurale in Mali*.
The tasks assigned to the project coordinator will be:
- supervise the implementation of the project activities
- ensure the coordination of activities between the project teams;
- ensure the liaison between the project team and the donor;
- organize the project kick-off meeting at which research protocols and accounting manual procedures will be discussed and validated;
- contribute to the organization of national kick-off workshops;
- make available a canvas to follow up the progress and write the annual reports (technical and financial), and the minutes of meeting;
- establish a circulation of information mechanism;
- ensure compliance with the standards defined for the project;
- follow up on the expenditure and budget allocation;
- ensure the budget arbitration;
- make the sharing of progress and annual reports from the different partners to the attention of the donor.

The coordinator will be assisted in his task by a steering committee which will be composed of work package leaders. This steering committee will meet once a year during the Annual Scientific Meeting of the project. This committee will observe scientific quality monitoring and technical reviewing or reports and milestones.
Each work package leader will ensure:
- Conduct of activities and the circulation of information within its work package;
- Verification and adjustment of the technical and financial progress of the work package;
- Transmission of any documents and information connected with the work package between the partners concerned and the project coordinator;
- Transmission of the project deliverables of the partners within the work package to the coordinator;
- Ensuring liaison with the members of other work packages on the one hand and on the other hand the regional coordinator of the project.

The project partners will sign an agreement defining the duties of each partner.

Illustration(s)

- Partners role.doc

OTHER USEFUL INFORMATION

Environmental, ethical and gender issues
Other useful information on the project

1. Environmental

Promotion of edible tree/shrub species will have a positive impact on biodiversity, soil protection, reducing the vulnerability of agricultural ecosystems to climate change.

1. Ethical aspects

Potential participants will be informed about the purpose and the methodology of the study in their own language, and only included in the study if they give informed consent.

1. Gender

Women are often the main users of natural resources, mainly in the preparation of meals and for income generation. The project therefore directly targets women by promoting an improved management of natural resources, particularly valuable species, and by focusing on women in the innovation platforms.

Other useful information

1. Other

The project will achieve the production of value-added products, to provide useful data for national statistics and contribute to increasing the share of food tree species in the gross domestic product. This call will bring a diversification solution in the fight against malnutrition. It will promote the platform specific from native food tree species.

EXPERTS

Identify 3 experts who may be asked to evaluate your proposal

Name
Tabuti

Given name
John RS

Email
jtabuti@caes.mak.ac.ug

Name
Termote

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Céline

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Domain of expertise
Applied Biological Sciences

Name
Martinussen

Given name
Anne

Nationality
Denmark

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anne.martinussen@undp.org

BUDGET

Financial annex

- TFF Project BUDGET TREEFOODfinal(1).doc

Letter(s) of commitment
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ANNEXES

ANNEX 1: Gantt Chart

- TFF Annex 1 Gantt C... TREEFOODfinal.doc

ANNEX 2: LogFrame

- TFF Annex 2 LogframeTreefoodfinal.doc

ANNEX 3: CV of key partners involved

- TFF Annex 3 CV_TREEFOOD.docx

Signature of the Name of the Legal Representative/Research Unit leader/Department Head

- TTF Annex 4 signature Ru CRRA.doc
- TFF Annex 4 Signature RU_UOI.doc
- TFF_Annex 4_Signature_RU LABEF.doc
- TTF Annex 4 signature IRAN.doc
- TTF Annex 4 signature RU UG.doc
- TTF Annex 4 signature UA.doc

ANNEX 5: Bibliography

- TTF Annex 5 Bibliography.doc