

## Project update

<b>Project title (Acronym):</b>	Decentralised postharvest processing of underutilised species into innovative value added products for improved food and nutrition security in West Africa (UPGRADE Plus)
Geographical focus:	Sierra Leone, Ghana, Nigeria
Call reference:	Innovative approaches to process local food in Sub-Saharan Africa and Southeast Asia, which contribute to improved nutrition as well as qualitative and quantitative reduction of losses
Cooperating partners:	The University for Development Studies (Ghana), Njala University (Sierra Leone), the National Horticultural Research Institute (Nigeria), German Institute for Tropical and Subtropical Agriculture (DITSL), and Innotech Ingenieurgesellschaft mbH (INNOTECH)
Duration:	15-10-2017 until 31-12-2020
Budget:	Approx. 1,100,000 €

please insert a map of the target region<sup>1</sup>



Figure 1: Map of West Africa – Target regions of the UPGRADE Plus project namely Nigeria, Ghana and Sierra Leone have been highlighted in dark yellow colour (Picture: World Atlas, 2019)

<sup>1</sup> Please make sure, that the copyright and rights of use for images and maps is ensured, as we might publish the project-update.



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### **Aim of the project:**

The project aims to improve the diets of women, infants and young children while at the same time creating income generating opportunities for women's self-help groups in West Africa and reducing post-harvest losses in underutilized agricultural produce. Specifically, the project seeks to:

- i) develop innovative small-scale modular, decentralised photovoltaic and solar thermal driven post-harvest food processing units suitable for local conditions,
- ii) utilise high-value underutilised species for the production of innovative and diverse nutrient-rich processed food products with extended shelf-life,
- iii) to empower women, especially those in self-help groups, in order to prevent micronutrient deficiencies in children as well as increase the health status of pregnant and lactating women,
- iv) Stimulate the rollout of the technologies and processes through training of local artisans who will build the systems using mainly locally available materials and selected members of women groups who will train new users.

The project also seeks to enhance the development of innovative processed food products with extended shelf-life, and stimulate the local uptake of such products in close partnership with women's self-help groups. In doing so, the project seeks to add to the growing evidence suggesting USs can play a central role in nutrition, income generation, and empowerment of women in Sub-Saharan Africa.

### **Results:**

The 2<sup>nd</sup> year of the UPGRADE Plus project showed significant progress in fieldwork surveys and innovative product development in each of the partner countries – Sierra Leone, Ghana and Nigeria.

NU in Sierra Leone has started testing a wide variety of sweet and savoury items that are fortified or enhanced with our target (Vitamin A rich) underutilised (US) crops. Several items have been shown to be clearly preferred to their non-fortified "traditional" versions. None of the fortified foods has performed significantly poorer than the "traditional" versions. Some indication of differences in preferences between young and old and rural versus urban have been identified; but in all cases freshness has been established as a critical criteria (especially for some baked goods). NU also identified that mother-support-groups are primarily established as a result of Government policy, promoted by large NGOs but are not "embedded" within society. Even with such shortcomings, women's work groups and especially the financial groups (VSL's etc.) are often functioning well.

In 2019, the DITSL team researched how to use collaborative learning approaches for capacity building among rural women to create collective enterprises based on processing underutilized species in Nigeria and Ghana. A specific procedure to guide the development of group-based processing businesses was elaborated. The 12 women's groups (7 in Ghana and 5 in Nigeria) that were selected from the research conducted in 2018 were involved in the capacity building activities. These activities were comprised of a sequence of group-based interactions with members of the research team. A variety of facilitation tools were applied during these group sessions to guide them through the capacity development starting with co-identification of underutilized species in their community, establishing their motivations, expectations and interests, identifying existing knowledge and knowledge gaps, collecting information needed



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for business planning, practical sessions experimenting to develop and improve their processing of underutilized species and creating action plans in the form of a participatory business plan to determine the expenses and returns of their proposed business idea and finally to reflect on how to improve profitability and overcome barriers and risks. Throughout these sessions, the researchers have had on-going consideration of gender issues faced by women in the groups and also how to address relevant issues together with men in the communities. By the end of 2019, two women's groups in Nigeria and three women's groups in Ghana had developed action plans for their collective businesses focused on African Locust Bean, Sweet Potato and Cocoyam.

NIHORT in Nigeria has been evaluating quality attributes of innovative products from USs. They include; tomato paste from snake tomato, juice from Spondias mombin (hog plum), ready-to-eat snack from pigeon pea, fermented cocoyam flour, pondo-cocoyam flour, white sweet potato flours and noodles from OFSP-wheat composite flours. As a part of the quality assessment, the glycaemic index and anti-diabetic properties of cocoyam flours were conducted. Results showed that cocoyam flour has a low glycaemic index and can be promoted among diabetics for consumption. Additionally, the storability tests performed with cocoyam flours showed that it is better stored in flexible packages such as HDPE bags under room temperature. Further tests and sensory analysis for products developed from Cocoyam flours is currently under progress. Initial sensory analysis of dough made from pondo-cocoyam flour received a positive response from the consumers.

In line with the work performed in Nigeria, UDS in Ghana has undertaken series of activities to develop innovative food products from underutilized species. UDS has conducted series of drying trials for Orange Flesh Sweet Potato (OFSP), pumpkin, aerial yam and frafra potato to ascertain the best option for the development of high quality OFSP, pumpkin, aerial yam and frafra potato flours. Quality parameters such as colour, water activity, and nutritional properties of each of these products for each treatment option during processing as well the flour functional and pasting properties based on appropriate instrumentation are also assessed. Based on the results obtained, UDS has developed high quality OFSP, pumpkin, aerial yam and frafra potato flours for commercialization. Furthermore, UDS is currently in the process of developing various food products such as cookies and bread from OFSP and pumpkin flours. It is anticipated that these data when analysed will result into a recipe for commercial production of healthy OFSP bread.

Over the last year, INNOTECH has been designing and developing the modular solar processing unit that will enable smallholder farmers and processors to dry fruits and vegetables. In inline to developing the processing unit, INNOTECH has also been investigating means of solar energy storage so as to ensure that the process unit is operating even in inclement weathers conditions. Therefore, the possibilities of storing energy were investigated in order to be able to dry or otherwise process products even after sunset or during the rainy season. For this purpose, the energy requirement was determined and simulated how different storage media (hot water storage tank/latent heat storage tank) would be suitable. In addition to the investigation on energy storage, INNOTECH is also considering an alternative to solar energy production by using of surplus energy from TucTucs. A more detailed concept is currently being developed to use TucTucs drive units to provide energy for the above mentioned modular systems.



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Based on the data collected through the partners and through the experimental investigations performed on available food products (pumpkin and cocoyam) in Germany, Uni Kassel is currently in the process of forming a processing guideline for processing of innovative food products in Sub-Saharan Africa using the developed decentralised modular solar unit. Uni Kassel has also been supporting INNOTECH in the design and development of the modular unit, which would eventually be delivered to the selected women's group in the partner countries. In addition to the experimental investigation, Uni Kassel also performed market surveys and informal interviews in the Northern region of Ghana. Both market surveys and Focus Group Discussions (FDGs) highlighted the importance of USs not only for nutrition, but also for local trade in general and women's income generation in particular. Strong seasonal patterns in local agricultural production in general, and for USs in particular, were found to have a strong impact on USs value chains and markets, as well as women's livelihoods. A main challenge identified during key stakeholder interviews and FDGs is the availability of trained craftsmen and suitable spare parts for agricultural equipment, with some users having to procure fitting parts from as far as Accra. This highlights the need for capacity development among local craftsmen and the potential benefits of skills training beyond the technology developed as part of this project. Uni Kassel has also established contact with the Siemens foundation for which aims to contribute to improve vocational and skills training in Ghana, as a means to address the existing shortcomings. Over the last year, UPGRADE Plus has also been successfully represented at trade fairs (WACEE 2019, Agro food 2019), various conferences especially at Tropentag 2019 wherein UPGRADE Plus had 8 accepted submissions (5 oral presentations and 3 poster presentations) and participation in the panel discussion on "Participatory and collaborative strategies for out-, up- and deep scaling for post-harvest innovations in West Africa" held by BLE.

#### **Key statements:**

- Based on nutritional analysis, USs are rich in essential nutrients that can meet daily nutritional requirements of all age groups.
- Food products developed fortified with USs crops are preferred over non - fortified products.
- Modular processing units will allow small scale processors to develop innovative food products such as OSFP - Pumpkin flour





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Please insert 2-3 photos (jpeg)<sup>1</sup>



(a)



(b)

Figure (a) Dried Roselle sold at market in Tamale Ghana (b) African locust bean (Dawadawa) on field (Picture Courtesy: (a) (b) Lange, 2019)