



African Food Tradition rEvisited by Research
FP7 n°245025

Start date of project: **01/09/2010**
Duration: **51 months**

Deliverable number: D 7.3

Title of deliverable: Final report on Transfer of the improved processes and technologies

Deliverable type (Report, Prototype, Demonstration, Other): Report

Dissemination level (PU, PP, RE, CO)*: PU

Contractual date of delivery: September 2014

Actual date of delivery: January 2015

Work-package contributing to the deliverable: WP7

Organisation name of lead contractor for this deliverable: CIRAD

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This document has been sent to:

The coordinator by WP Leader	Date: December 2014
To the Commission by the Coordinator	Date: January 2015

* PU: Public; PP: Restricted to other programme participants (including the Commission Services); RE: Restricted to a group specified by the consortium (including the Commission Services); CO: Confidential, only for members of the consortium (including the Commission Services)

Abstract

The improved process demonstration (WP6) and the dissemination and exploitation phase are both related to the transfer of AFTER results. The five demonstrations done are here summarized: the richness of the discussions which took place in the meetings and debates all testify of the movement begun and invites to share the information more widely. Guidelines for the industry have been enriched through the participant contributions, as tools used to transfer the improved processes and technologies to SMEs.

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Introduction

By generating and sharing knowledge on food technology, the AFTER project intends, for each product group, to improve, to develop or to create a product or a technology of interest to both European and African food companies. The AFTER project contributes directly to improving the competitiveness of these products and technologies, and it facilitates their implementation and uptake by food companies and their marketing on African and European markets.

The aim of the improved processes and technologies demonstration (WP6) is to transfer the scientific results to the private sector represented by SMEs. Five pilot products have been selected during AFTER Porto meeting in June 2013 (cf D 6.1.1): Baobab, Bissap, Kong, Akpan, Gowé. For the 5 other products, “showcases” represent a good way to share the results with companies, along with the distribution of guidelines. The dissemination and exploitation phase (WP7) focus on delivering ready-to-use information for food companies including SMEs and transferring the results to stakeholders from Africa and from the EU. These two work-packages are both related to the transfer of AFTER results and their activities were therefore strongly linked.

The demonstration activities constituted a special occasion to gather the main players in the sector (researchers, official representatives, processors and also consumers) and were a really helpful exercise to summarize the useful information for these targets.

The AFTER final workshop was organized on the 30th of June, 1st and 2nd of July 2014 in Montpellier, France (cf D0.1 *project beneficiary meeting minutes*). The meeting focused on dissemination activities, using the opportunity to get an overview of progress on activities planned. The demonstrations done for the 5 selected products had also been presented (WP6). Indeed, the results coming from all the work packages were needed to complete the dissemination tasks, including the creation of guidelines for industry.

This deliverable draws conclusions of the demonstrations and links it with the tools used to transfer the improved processes and technologies to SMEs, guidelines especially. It could in this way amount to a milestone.

Conclusion of pilot tests

According to the selection made during the Porto meeting (June 2013), demonstrations or pilot tests focusing on the improvement of traditional processes have been organized for five pilot products:

- Bissap & Baobab : 23 & 24 September 2013, Dakar (Senegal)
- Kong : 30 November 2013, Dakar (Senegal)
- Akpan & Gowé : 14 May 2014, Cotonou (Benin)

(cf D6.1.2 to D6.1.6: reports on tests results for the 5 pilot products).

For Bissap and Baobab, the demonstration has been divided in two phases (cf M6.1.2). First, pilot tests have been organized in a technical center as a global presentation of results (i.e., in ideal conditions). The research findings were then shared with each company involved (i.e., in real-life working conditions). Although this second phase was a really good way to transfer the results to SMEs, sharing them directly with the entire team, it was only possible in a few targeted companies because of time and financial limitations. For Kong, the demonstration took place in the economic interest group “Seuti Ndiaré”, where researchers, students and producers have had the occasion to share experiences. The results obtained for Akpan and Gowé have been presented to 14 Beninese SMEs. With limited premises, the day has been organized at the scientific library of the UAC, around two main oral presentations illustrated by two workshops (akpan mixing and bottling / gowe reconstitution from gowe flour).



Bissap & Baobab demonstration: group photo at the technical center, Senegal © AFTER

Kong demonstration: in front of the smoked fish production, GIE Seuty Ndiaré, Senegal © AFTER



Akpan & Gowé demonstration: group photo in front of the UAC scientific library, Benin. © AFTER



In any case the participants had the possibility to ask a lot of questions and the discussions offered to every participant the possibility to voice his concern, sharing opinions about potential partnerships. These events have been a really good occasion to stress the interests that private sector (SMEs) and research have in common. Both have profitability objectives: how is it possible to valorize traditional resources through local products and to earn money

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with those activities? How can we promote this African culinary heritage, sharing it with people all over the world?

The representatives of companies also formulated their own recommendations for further research (e.g. to study the color fastness of the powder of baobab during the storage, or to improve the current equipments in general). By facilitating here the link between the research and the companies, the role of the AAFEX joins well in this group dynamics, where food companies are trying to collaborate nationally and internationally. As a first step, AAFEX engaged to provide SMEs involved small equipment (like thermometers and refractometers). As a matter of fact, some companies already use these results from their own making (e.g. making baobab drink from powder or smoked Kong adding a dipping step).

These events enabled to promote AFTER project and more generally traditional African food in front of all the players of the sector. For Kong particularly, the ministry for Fisheries and Maritime Affairs represented by M. DIAGNE (specialized in the transformation of fishery products) commended the work done and is ready to collaborate, helping to spread the results of AFTER project on a national basis.

The wealth of the exchanges been born within the framework of the demonstrations of the research results testifies of the interest of companies for this type of initiative. The contacts formalized on this occasion must be shared to make this work bear fruit: towards a future and even richer collaboration! The guidelines represent good tools to formalize the results presented during demonstration and transfer them on a wider scale.

Guidelines for pilot products

For each ten products studied, a technical guideline has been created for African producers and industries. With the objective to make scientific information accessible to processors, each guideline presents a detailed process to local processors, giving them all the keys to understand the important parameters of each step of the process. It also demonstrates the advantages of the reengineered steps over the traditional steps of the process, opening the possibilities for producing new products. The same structure has been use for the 10:

- AFTER presentation and explanations about the guideline,
- Presentation of the product concerned (origin,category, sensorial and compositional qualities, comparison with a similar product to demonstrate advantages)
- Presentation of the reengineered process with a diagram
- Good Hygiene practices, as a basis adapted to the product: pictures, tools used, etc
- Description of the re-engineered process, with details for each step, pictures to illustrate, parameters to be able to follow the process, characteristics of the product obtained at the end of each step, utility and reason of each step and for the reengineered steps: advantages of these new steps compared to the traditional process
- Results of consumer's test, to prove the potential of the product and it's acceptance on the market and to show new possibilities of innovative products.

The creation of these ten guidelines for the industry represented a lot of work. Although we had a lot of results with related deliverables, it was a complex task to create a practical tool for food companies with clear and available results.

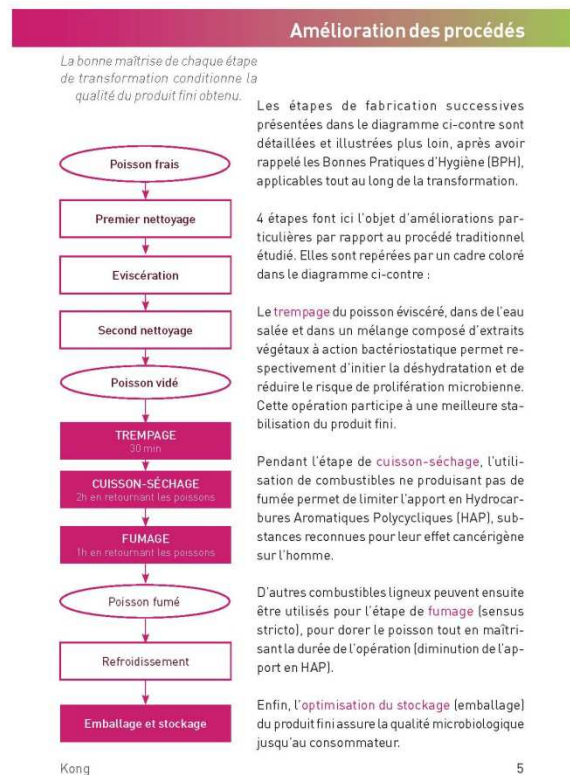
The organization of the demonstrations, leaded by each product champions and in collaboration with CIRAD (coordination of the project) and AAFEX (involved in the dissemination of AFTER results), enabled to work effectively together. These events were occasions to speak about guidelines and their content, starting with the process diagram to

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detail. The content has then been written by each product champion and his team, in strong collaboration with CIRAD. For the 5 other products, for which a different type of demonstration called “show cases” could be planned, it has been more difficult to draft the guidelines. The results to transfer needed to be clarified and the content took more time to be written (more difficult to find and collect photos as well). The information has been shared thanks to skype calls and parallel workshops during the final meeting in Saly, Senegal, were Juliette Devillers and Mathilde Boucher reminded the information to collect before sending them to ACTIA (in charge of the final layout).



Example of guidelines front page (above for Baobab & Bissap) and presentation of re-engineered process (e.g. for Kong). The 10 guidelines have been written in the most appropriate language (French or English). These guidelines are distributed to producers and industries concerned thanks to AAFEX network.



AFTER technology transfer

The main results are summarized by products; most of them are detailed in the guidelines transferred to SMEs.

Akpan

- The **control of the hot dipping conditions (time, temperature)** inhibits the development of undesirable microorganisms, without starting the cooking step.
- Adapted to a large-scale production, the **formulation BEFORE pasteurization** limits the risks of cross contaminations (milk and sugar traditionally added just before consuming akpan)
- The **addition of a pasteurization step** purifies the product by reducing the amount of pathogens (high risks of contamination during milling and sifting) and by favoring the implementation of the starter culture.
- The **fermentation control** by adding *Lactobacillus casei* enables to standardize the process and to obtain a product with reliable and consistent quality.
- The **optimized cooking parameters associated with the standardization of the ratio Ogui cooked/non-cooked** conduct to better sensorial qualities (by avoiding turning to Akassa production, which is a totally cooked product).
- Finally, the **packaging of akpan in individual bottles** (300mL) offers to the consumer a fresh and high quality product, ready to drink.



Mixer-cooker: equipment adapted to control the parameters during different steps (pasteurization, fermentation, cooking)

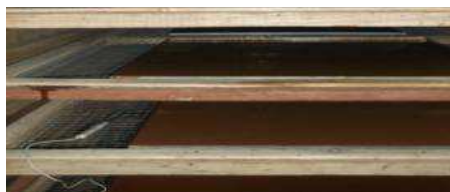


Individual bottle of akpan

Gowé

- The **effective management of the malting process** is essential to obtain a more digestible product. Washing seed with salted water and using poplin as a support for germination enable to inhibit the development of moistures during the germination step.
- The **control (time temperature couple) of the saccharification step** guaranties the natural sweet taste that the consumers are looking for.

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Drying of the saccharified dough



Improved secondary packaging of the gowe flour, ready to be used by consumers

- The **fermentation control** by adding *Lactobacillus casei* and *Kluveromyces thermotolerans* enables to reduce the fermentation time and to obtain a product with reliable and consistent quality.

- The **drying step** of the saccharified dough enables to considerably increase the shelf life of the product, traditionally reduced to a few days.

- Presented in an **improved secondary packaging** (carton box with a 500g packet of flour), the gowe flour can be stored at room temperature during 6 months. It will only need to be cooked after water dilution.

Kenkey

- **Steeping** time and temperature have been mastered in order to control the color and acidity of the final product.
- **Fermentation** time and temperature have been controlled to develop the characteristic taste of Kenkey.
- **Proportions** of pre-cooked and remaining fresh dough are standardized in order to obtain a stable final product.
- **Moulding** has been made more attractive to consumers.
- Shelf-life of white Kenkey has been extended thanks to **packaging**.



Steeping process



New moulding



Packaging

Kishk sa'eedi



Mixing step - fluffy mixture

- The **addition of a pasteurization step** for the buttermilk purifies the product by reducing the amount of pathogens.
- **Fermentation of buttermilk** was controlled by adding a starter culture of *Lactobacillus rhamnosus*, *Lactobacillus gasseri* and *Lactococcus lactis* subsp *lactis*.
- **Mixing** time and temperature of the *hama* mixture was controlled in order to obtain correct texture and to facilitate the 2nd fermentation process.

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- Re-engineered Kishk sa'eedi is **packed in stand up or flat pouches** containing 80 grams or 10-12 balls, depending on their size.



Lanhouin

- **Ripening treatment in brine** initiates desiccation of the product, reduces the microbiological flora and prevents biogenic amine production. Mastering this step allows a better stabilisation and a better organoleptic quality of the final product.
- **Fermentation** step has been optimised in order to enable the development of the characteristic aroma while controlling the microbiological quality of the product.
- **Immersion** of the fermented and salted fillets in a solution of lime and garlic has a bacteriostatic effect, an insect-repulsive effect and allows a better conservation of the product during storage.
- **Drying** with a shell type dryer prevents contamination from flies and dust.
- The final product is presented in a plastic **packaging**



Immersion step



Shell type dryer



Packaged fillet of Lanhouin

Kitoza



Smoking process



Reengineered Kitoza

- The combustible material used for **drying/cooking** has been chosen in order to reduce the level of HAP in the final product.
- **Smoking** has been separated from the drying/cooking step and the time has been mastered in order to reduce the level of HAP in the final product.

Kong

- When **dipping the eviscerated and washed fish** into salted water, it initiates the dehydration before the cooking and drying step. Baths made from local vegetables like garlic or ginger, which have a bacteriostatic action, also participate to stabilize the final product.
- During the **cooking and drying step**, the use of combustibles which don't produce smoke enables to reduce the PAH inputs.
- Other combustibles are then preferred for the **smoking step** to gold the fish, always controlling the smoking time to limit the PAH final content.
- The improvement of **packaging** solutions ensure the microbiological quality to the end consumer, extending its shelf-life.



Smoking process



Packaging solutions

Bissap

- **Manual or mechanical grinding** of the bissap calyx enables to optimise the **aqueous extraction**.
- **The filtration step** can be facilitated by using simple and reachable equipments.
- **The control of thermal treatment (time-temperature couple)** enables to preserves the organoleptic and nutritional qualities of hibiscus, increasing the shelflife of the final product.
- **Rapid cooling**, which stops the thermic treatment, plays an important rôle in the preservation of the nutritional properties as well.



Manual grinding



Filtration

Baobab

- **The use of baobab powder** (intermediate product from baobab fruit) enables to optimise the **aqueous extraction**.
- **The control of thermal treatment (time-temperature couple)** enables to preserves the organoleptic and nutritionnal qualities of baobab, increasing the shelflife of the final product.
- **Rapid cooling**, which stops the thermic treatment, plays an important rôle in the preservation of the nutritional properties as well.



Baobab powder



*Controlled Thermal treatment
Using existing equipements*

Jaabi

- The introduction of a **complementary step of grinding** of the unrefined flour obtained after pounding in the mortar, followed by a **fine sieving**, allows to obtain a pure and homogeneous flour of Jaabi. The final texture of Yaabande is largely improved there.
- The **control of the cooking time** of preformed pancakes improves the organoleptic qualities of the final Yaabande. Beige, visually homogeneous and firm of texture, it is more appreciated by consumers.



Yaabande

The most relevant results obtained in WP2, 3 and 4 that can be transferred to Europe are reported in the deliverables D7.2.1 to D7.2.3.

Conclusion

The conclusions of the demonstrations are really positive and highlighted the usefulness of guidelines for industry as a good way to formalize the results and a practical tool for transfer. The discussions have led to the notion of network: the AFTER project offers for producers and transformers the opportunity to create a database of contacts that must bring interests. Several concrete proposals of collaboration were able to be shared during demonstrations, with for example the idea to create a center of dialogue where all the actors of the food sector could exchange in a regular way and in a formal frame (Benin). This dynamic is also maintained through the “Senegalese network of actors of innovation in the agro-resources and food sectors”, which is going to be established including AFTER partners (ESP-UCAD, CIRAD). As many means to share information and continue to transfer results for the improvement of traditional African food!

The guidelines are the privileged tool to transfer the results of research to SMEs. These results are numerous and various. In particular, 5 fermentations processes were studied and controlled, 2 smoking and cooking steps were optimized, 5 pasteurizations steps were introduced and 4 new formulations were done. For group one (cereal products) the results transferred to the SMEs concern fermentation control, pasteurization, mastering formulation (proportions of cooked/uncooked, etc...) and more generally mastering time and temperature of all the steps. For group two (fish and meat products) the results transferred to SMEs concern smoking/drying/cooking separation and control, sanitary precautions regarding the raw material (immersion in garlic or salt or ginger bath to limit bacterial proliferation). For group three (plant extract products) the results transferred to SMEs concern pasteurization, optimization of extraction and formulation. For all groups, efforts were made regarding packaging and storage conditions of the final product in order to preserve its qualities and also to be more attractive to consumers.