ENERGY FOR FOOD SECURITY

UN WFP World Food Programme
INNOVATION ACCELERATOR

Solution specifications

NGOs, start-ups and companies

Below you will find the detailed solution requirement for each of the thematic areas. Please note that the equipment list should serve as a general guideline and **point of reference** for you to utilize. However, we welcome innovative applications that propose alternative solutions tailored to address the problem statement.

1. Energizing homes in displacement settings

We are seeking solutions that provide access to **solar induction cooking** and **solar lighting** for internally displaced persons (IDPs) and host communities in protracted displacement settings.

- The solution will be provided for 250 households in internally-displaced (IDPs) and host community settings in the Dan Dadji Makaou site, region of Maradi.
- The cooking energy system must provide sufficient electricity to allow households to prepare three meals a day - breakfast, lunch and dinner. Each household typically consists of seven members, including adults and children. The average daily energy requirement for household cooking in rural areas of Niger is estimated based on the time needed to cook local Nigerien dishes, as detailed in Table 1.

Table 1. Average cooking times of main household meals in Dan Dadji Makaou.

Meal	Dish	Cooking time
Breakfast	Millet-based porridge; cowpea-based cake; or a reheated meal	Approx. 20-60 min
Lunch	Millet-, cowpea- and rice-based porridge; or millet or sorghum paste	Approx. 20-40 min
Dinner	Millet, sorghum, maize (rice, cowpea) paste	Approx. 40 min

- The household lighting system should be able to provide light inside and surrounding the house during dark hours. It should also be able to operate autonomously for approximately 12 hours and 2-3 days, respectively. Households are expected to charge their lights and lamps during the daytime on a daily basis and to use the battery as an alternative power supply option.
- Each solar system will provide power for cooking and lighting, including key components such as solar panels, control electronics, batteries, induction cooktop and pot, fixed lights and portable lamps.

2. Energizing school meals

We are seeking solutions that provide access to **modern institutional clean cooking** for primary schools.

- The solutions will be provided for 30 primary schools in the municipalities of Kantché, Yaouri, Dogo and Gaffati in the Zinder region and for five schools in the municipalities of Tabalak and Abalak in the Tahoua region.
- The cooking energy system will power electricity for schools to cook two school meals per day - breakfast and lunch. The average daily energy needed is estimated based on the cooking time requirement, detailed in Table 2.
- Every system will include components such as solar panels, batteries, institutional cookstoves and large pots, at minimum.

Table 2. Average cooking times of main meals prepared by the targeted schools in the region of Zinder for breakfast and lunch.

	Dish	Cooking time
1	**Millet porridge**	20 min – 1h
2	**Millet paste**	2h - 2h30
3	**Millet couscous**	2h35 - 3h
4	**Millet with beans**	1h30 - 2h

3. Energizing farmer organizations

We are looking for solutions that provide access to **solar-powered grain processing** and **preservation** solutions for farmer organizations.

- The solutions will be provided for six producer organizations in the municipalities of Kantché, Yaouri, Dogo and Gaffati in the Zinder region.

- For every farmer organization, a solar energy system with sufficient capacity to power electricity is required for the production of primary processed products, including **millet flour, millet couscous, cowpea flour and peanut oil.** The production operations will take place during the daytime.

Please see below a detailed overview of the transformation process and equipments required for the four products:

★ **Manufacturing process for millet flour**

#	Operations	Equipment	Description
1	**Storage of raw materials**	N/A	
2	**Threshing**	Sticks Tarpaulin	The method of threshing will impact on the level of impurities in the sacks purchased, affecting the time taken to clean the grain and the quality of the processed products.
	Cleaning	Van or tray	Light iImpurities can be removed from grains using a van or tray. While machines can also be used, it is uncommon.
3	**Dehulling, sorting and washing**	Mortar Sieve / husker Basket and basins	The husk and part of the germ (bran) are removed from millet kernels traditionally with a mortar, sieving, and winnowing, or using a husker. Cleaning with water after hulling starts natural fermentation, improving the product's appearance and separating the grains from residual sand and particles.
4	**Fermentation**	N/A	
5	**Drying**	Dryer	Drying reduces the grain's water content to below 10%. Rapidly reducing moisture to under 30% is essential to limit health risks and prevent undesirable tastes and odors from uncontrolled fermentation or mold growth.
6	**Toasting**	Roaster	The grain roasting phase removes anti-nutritional factors, increases protein availability, and improves digestibility.
7	**Cooling**	N/A	
8	**Milling / grinding**	Hammer mill (or mortar)	Flour is produced from hulled grain, either washed or unwashed, typically using a mortar or a mill in the quarter.
9	**Mixing**	Mixer	
10	**Sieving**	Sieve	It involves using a sieve to separate particles that vary in size and are not homogeneous.
11	**Packaging**	Scale or container Heat sealer or tape	Weighing: use of a commercial scale or a container (measure) containing the equivalent of the desired weight. Manual bagging of products. Closing the bags: using an electric machine (heat sealer) or tape.

12	**Storage of finished products**		Before being distributed, products must be stored in conditions that make it impossible for microorganisms to grow and multiply, so that their presence can be easily detected and they can be easily destroyed.

★ **Manufacturing process for millet couscous**

#	Operations	Equipments	Description
1	**Moisturising & kneading**	Manual operation	Moisturising and homogenizing the flour at a moisture content of 45 to 46% to facilitate granulation
2	**Lump breaking (*émottage*)**	Manual operation	Break up the lumps of flour formed during kneading
3	**Rolling and granulation**	Manual granulation Couscous roller	Form granules of between 1.5 - 3 mm Manual granulation process can include pre-granulation with a sieve
4	**Pre-Steaming (cooking)**	Couscoussier Steam cooker	Pre-cooking and gelatinizing the granules increases their resistance to crushing. Steam cooking, typically using a couscoussier, is employed for processing rolled products like couscous and degue. This operation is repeated one to three times, each lasting 15 to 20 minutes.
5	**Lump breaking**	Manual operation	Break up the lumps to separate the granules and facilitate drying
6	**Drying**	Dryer	Reduce the water content of the granules to less than 10%
7	**Sieving**	Manual / mechanical sieving	Homogenise the granules
8	**Weighing**	Scale	Putting into sales units

★ **Manufacturing process for peanut oil**

#	Operations	Equipments	Description
1	**Cleaning**	Seed cleaner	After harvesting, peanuts are received at the processing facility. The batches contain whole peanuts in the shell, some shelled peanuts, and foreign objects such as leaves, nodes, and weed seeds. The peanuts are cleaned using a machine to prevent oil contamination by foreign materials, ensuring an efficient extraction process. The seed cleaner separates trash, impurities, iron particles, and other debris from the incoming seeds and nuts.

2	**Dehusking (dehulling)**	Decorticator / shelling machine / dehuller	After cleaning, the outer shell must be removed to avoid contaminants in the oil cake, as the shell does not contain oil. This dehulling process is done using a dehuller. Dehulling before oil pressing reduces oil absorption by the shell, increases oil yield, improves the efficiency of the peanut oil processing machine, and minimizes equipment wear and tear. Additionally, this process enhances the quality and value of the oil cake.
3	**Winnowing**	Winnowing machine	Winnowing separates the grain from the chaff. The chaff, being light and airy, is easily blown away, while the heavier grain is collected. There are two main winnowing methods, depending on personal preference and the quantity of grain. One method involves throwing the seeds into the air and collecting them in a basin while the wind blows away the lighter seed coats. It is advisable to perform this on a clean tarpaulin to facilitate the recovery of the husks, which are typically used as pig fodder. Finally, the crop is sorted by hand to remove any remaining impurities.
4	**Drying**	Gaz fabric Drying table	
5	**Roasting**	Roaster Mat for cooling Thermometer	Roasting enhances flavor development and aids in dehulling while influencing extraction yield. This process also eliminates cellular components such as proteins and hydrated starches, which are responsible for oil retention.
6	**Dehulling**	Basins / tanks Winnowing machine	
7	**Winnowing**	Cans Stainless steel trays	
8	**Grinding**	Hammer mill Stainless steel basins	Oil extraction is most efficient with smaller particles, achieved through grinding to reduce seed size. The roasted seeds are ground into a paste between millstones in a mill.
9	**Kneading /mixing / Oil extraction**	Oil press Barrels	Once cooled, typically overnight, skillfully adding cold water and kneading for 30 minutes induces syneresis, resulting in the coagulation of hydrophilic materials into lumps, from which oil emerges. The peanut paste is then worked by pressing the palms on a wooden table for another 30 minutes to expel the oil, with water incorporation adjusted based on dough

			structure.
10	**Oil dehydration**	Dehydration tank	The oil can be heated in a frying pan over low heat to reduce water content and enhance shelf life before storage in cans.
11	**Packaging**	Bottle filling machine or sachet filling machine	For precise filling and minimized wastage, ensuring uniformity in each bottle or sachet, automated filling equipment is employed, reducing human contact and contamination risks while maintaining hygiene standards.

★ **Manufacturing process for cowpea flour**

#	Operations	Equipments	Description
1	**Cleaning**	Sieve shaker / vibrating sieve Stone removing	*Description*: This operation aims to remove impurities (such as stones and straw) from the grains, ensuring their purity. This initial stage prevents impurities from causing premature equipment wear and tear and unpleasant tastes or textures in the final product. *Process*: Cowpea seeds are separated from impurities like twigs and sand as they pass through screens (trieurs). A ventilation system extracts dust during this process.
2	**Shelling / dehulling**	Shelling machine	*Description*: The goal is to eliminate the outer layers of the grain or hulls, which harbor undesirable substances like fiber and occasionally tannins, while minimizing loss of the endosperm and germ. Removing these skins is crucial to prevent them from compromising the preservation of organoleptic characteristics. *Equipment*: The selection of a huller type is based on its performance, which hinges on three factors: extraction rate, theoretical yield, and hulling efficiency.
3	**Milling**	Grinder / mill	*Description*: TThis is the primary stage in flour production, essential for producing various cowpea by-products. It is conducted using a mill. *Equipment*: ● *Grinding wheel mill* is versatile but expensive, ● *Hammer mill* is more efficient and locally manufactured. They consume more energy and are less versatile.
4	**Sieving**	Entoleter (machine used to disinfect cereals) or sieve	*Description*: This step sanitizes the flour by removing impurities such as husks, stones, insects, eggs, and pebbles. It can be applied before packing or storing in flour bins. Additionally, the machine serves as a sterilizer for the ground flour, enhancing its shelf life and storage stability.

5	**Packaging / product labeling**	Bagging/packaging machine	*Description*: This step is undertaken for marketing purposes and to ensure compliance with regulations. *Process*: Biodegradable plastic films will be used, which are available at low cost. These will be 80 to 100 micron polymers that are airtight, impermeable and treated against radiation and light.

For any other inquiries, please contact **global.innovation@wfp.org**.

Application Process

- To submit your application, please fill in the **Application Form** by **23 June 2024, 11:59 pm (CEST)**.
- We will review and select successful applications in June and July 2024. While we value all applications, please note that we are only able to contact shortlisted applicants.
- For more information, please refer to the **call for applications** and **frequently asked questions**.

About the WFP Innovation Accelerator

The WFP Innovation Accelerator was established in 2015 by the United Nations (UN) World Food Programme with the support of the German Federal Ministry for Economic Cooperation and Development (BMZ), the Federal Foreign Office (GFFO) and the Bavarian State Ministry of Food, Agriculture, Forestry and Tourism (StMELF). Its goal is to source new ideas, sprint pilot projects, and scale high-impact innovations by connecting them with WFP's global network and field operations in over 120 countries and territories. From its base in Munich, Germany, the WFP Innovation Accelerator runs programmes addressing a wide range of social impact and sustainability issues, including climate change, primary healthcare, gender equality, and emergency response. Together with the network of WFP regional innovation hubs and country office innovation teams, portfolio ventures and with the support of our partners, in 2023 the WFP Innovation Accelerator ran 14 programmes and its portfolio, comprising over 70 active innovations and 66 alumni innovation initiatives, reached 60.7 million individuals across 70 countries and territories. Since its launch, innovations supported by the WFP Innovation Accelerator have secured over USD 295 million in grant funding.