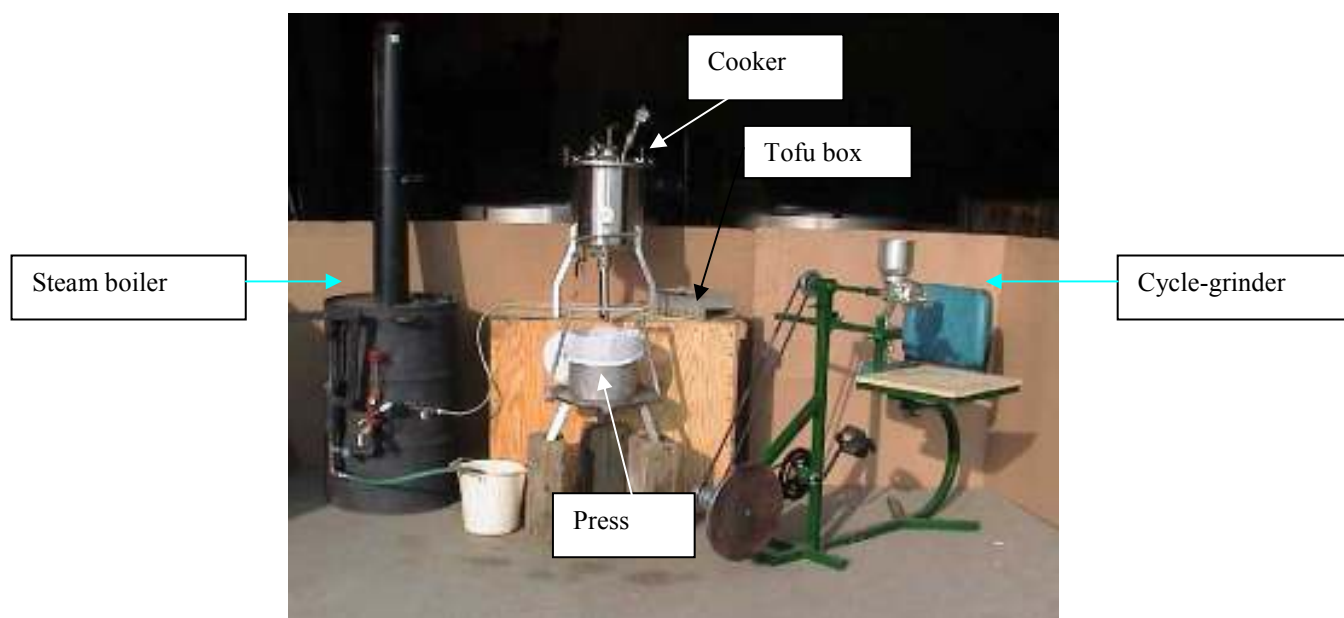


The **VitaGoat** is a food processing system that can be used to create value-added products from cereals, grains, nuts, fruits and vegetables, enabling local groups to increase food security, improve health and create micro-businesses and employment. Primary foods can be processed into flours, pastes or wet slurries and used “as is” or further cooked with steam, as for soymilk and its various derivatives. Cooked foods can also be used “as is” or pressed in a manual filter press to make juices and energy-dense beverages. The key feature of the VitaGoat is that it can make all of these foods without the need for electricity; grinding is provided through “pedal power” while cooking energy is provided via an innovative and fuel-efficient steam boiler.

### Types of Foods and Productivity

Foods	Production capacity	Full System	Cycle grinder only
<b>Soymilk</b> from whole soybeans and soymilk-derived foods such as tofu, soy yogurt and sour soymilk. The fibrous by-product “ <b>okara</b> ” also has many food applications.	30-40 liters/hour (8-10 USG/hr)	√	
<b>Fruit or vegetable</b> sauces, purees and juices	20-30 liters/hour (5-8 USG/hr)	√	
<b>Flour or meal</b> from corn, sorghum, wheat, soy, rice, millet, etc	8 – 12 kg/hour (20-30 lbs/hr)		√
<b>Peanut or other nut</b> butter or paste	8 – 12 kg/hour (20-30 lbs/hr)		√
Ground roasted <b>coffee</b>	6 – 8 kg/hour (12-20 lbs/hr)		√

### VitaGoat General Components



**VitaGoat System**

## Components

The VitaGoat has four main components although one of these, the bicycle grinder, can be used on its own in situations where only dry foods are processed without cooking.

- 1) **Steam boiler:** Operating on either wood or other hard fuels or liquid gas, the boiler is about 10 times more fuel efficient than traditional open fire cooking and more efficient than stove-top cooking. Water is heated in an inner chamber and the resulting steam is re-heated in a tube, creating a “superheated steam” that is much hotter than regular steam. The boiler is inexpensive to build, safe, and can be taken apart for cleaning. This latter feature is critical since most boilers accumulate scale on their inner shells and eventually fail. **An electric boiler is also available at added cost.**



- 2) **Bicycle grinder:** Based on a design created in the mid-70s in the US, energy is produced through a pedal-powered system that uses adjustable-speed pulleys, permitting fast and easy grinding of a variety of foods. An inexpensive modified hand mill using metal plates grinds foods 10-50 times faster than with traditional methods. Seating is adjustable depending on the operator's height and the pulleys can be matched to the individual's power.



Close up view of the “Corona mill” grinder. Other grinders and implements can easily be adapted to the pedal-powered mechanism. The grinding system is simple, but the bicycle design is the result of many tests, modifications and ergonomic and functional concerns. The seat position is adjustable according to the person's height and leg length. The first “pass” in the grinder produces coarse output (e.g., flour or cornmeal) while the second pass yields finer flour or cornmeal.

**Ground coffee can also be produced** in one pass from roasted beans and the grind is finer than that produced with North American home type electric mills. The production output for cornmeal is roughly ½ lb per minute for coarse meal and 1/3 lb per minute for fine meal. Grinding output depends on the operator's pedaling speed and selected grinding gear ratio. These outputs are still almost equivalent to motorized grinding speeds and much faster than hand grinding (10 times faster) and traditional “mortar and pestle” methods (on the order of 50 times faster). **Electric grinders are also available on request.**



*Soymilk Production*

3) **Cooker:** Made from stainless steel, this vessel can cook up to 15 liters of food per batch, under pressure, thus greatly reducing cooking time and saving fuel. It is equipped with temperature and pressure gauges and a safety pressure relief valve. Product is fed through an easily removable top opening and steam enters the vessel through openings located on the bottom of the vessel. Cooked product exits the cooker through a valve-controlled bottom opening.

4) **Press:** Also all stainless steel, pressing occurs by turning a screwed rod that pushes onto a sanitary plastic disc, in turn squeezing out liquid from product held within a filter bag. The liquid pours out the bottom into a pail. The press is very simple to operate and clean.

**Spare parts and instructions:** each system includes a set of spare parts such as gaskets, gauges, belt, and a few others. These are expected to be sufficient for at least 1 year's continuous operation. Technical manuals are available in English and French, a training video is also available.

### VitaGoat Projects

Malnutrition Matters, as of 09/07, has installed over 30 VitaGoat systems in Africa, India and North Korea. The first three pilot installations, in Guinea, Mozambique and Chad were done in partnership with Africare in 2004/5. Since then, experience has shown that with minimal training, the VitaGoat can be operated at the expected production capacity in typical field environments (no electricity, limited water supply). The production of soymilk, fruit and vegetable purees, and ground nuts have proven very desirable from a consumer perspective and the VitaGoat can be viable as a business where it is used by a cooperative or as a micro-enterprise. In North Korea, in partnership with First Steps, more than 10 VitaGoats have been installed in social feeding programs in schools, orphanages and collective farms. The first three of 20 VitaGoats for a mid-day meal program operated by women's Self-Help Groups in Orissa (India) are being installed in October 2007. This World Bank supported project has 75% of the capital equipment cost financed by BISWA, the local NGO partner, and is sustainable without additional funding.



*Filling the boiler from a bucket, Mozambique*  
←



*School children drinking soymilk from their lunch plates, Orissa* →

## **Fabrication**

Malnutrition Matters has completed the first technology transfer to India, where the first locally made systems were completed in late 2005. Spare parts and training can now be provided entirely from India. A training and support center also exists in KwaZulu Natal in South Africa, and another one is in progress in Lusaka, Zambia. MM also intends to transfer the fabrication / spare parts / training responsibilities for the VitaGoat to other manufacturers / trainers in Africa, Southeast Asia and Latin America. Other world regions will be considered as and when appropriate sponsors, fabricators and co-operating NGO's are identified.

All key parts of the system, including the boiler and bicycle grinder, were designed to make them practical to produce under developing country manufacturing environments, using mostly common parts and materials. The VitaGoat is available for approximately \$3,500 including spare parts and crating.

## **Economics**

The major investment cost of setting up a VitaGoat system is the cost of the equipment itself, along with a suitable production space. Cows in developing countries produce about 10 liters per day, so a VitaGoat can produce as much milk per day as 25 cows or more. There are no costs associated with installing or consuming electricity or running water. The water source for the system can be as simple as a bucket. It is expected that the investment will pay for itself within a year, assuming at least 3-4 hours daily production. The VitaGoat can be used in a number of settings, such as: direct feeding in humanitarian projects, social institutions (hospitals, schools, etc) and, perhaps most importantly, as the principal vehicle for a food production micro-enterprise which could employ 5 to 10 people. This could be like a "restaurant", food processing "mini-plant", retail outlet, or any combination of these.

## **Food Security**

The VitaGoat can allow a group to help meet its nutritional needs and generate income at the same time. The foods can be processed much faster than with traditional methods, value-added foods can be prepared in greater volumes, freeing up time for women and girls for other activities, including education, care for others and income-generating activities. Also, much less energy is expended in preparing the foods, thus reducing the caloric needs of the women and freeing them from often exhausting work. The VitaGoat can also enable preserving of foods that are in seasonal over-supply by using the steam boiler for sterilization in an additional vessel.

## **Sponsors**

Malnutrition Matters would like to acknowledge the generous support for the past several years from its primary corporate sponsor Alpro, the leading soy foods processor in Europe. MM would also like to thank its partners First Steps (North Korea projects), Rotary Club and Child Haven International, and the generous sponsorship from the Donner Canadian Foundation.

*Serving soymilk, soy  
yoghurt and tofu in Chad*  
→

