

# INFRASTRUCTURE





## *Vegetables Processing Toolkits*



## **INFRASTRUCTURE**

### **1.- Physical layout**

#### **Infrastructure and processing site layout**

When setting up a vegetable processing industry it is essential that the condition of the building - the materials of construction and its position - are all suitable for food production. The plant should not be located near swamps, ditches or refuse dumps where insects and rodents are likely to be found. The site should allow waste water to drain away freely and have suitable facilities to dispose of waste food and rubbish. A supply of clean water is essential.

Physical layout

Basic services

Equipment

#### **Physical layout**

Ideally the operational areas of the vegetable processing industry building should be at ground level, with the raw ingredients entering at one end and the finished goods leaving at the other.

The different operations should be kept separate from each other to prevent contamination. For example, perishable raw materials should be kept separate from non-perishable ones.

Packaging materials should be stored separately from the food items.

If possible, toilets should be located outside the processing building. If they are in the main building, there should be two doors between the processing room and the toilet.

Workers must have access to handwashing facilities with soap and clean towels.

The building should be constructed with smooth walls. The joint between the wall and floor should be rounded for easy cleaning. The building lines should be simple and square, without crevices and small places that can attract dust and may become birds nests. Windows should be covered with mosquito mesh to prevent the entry of flies and other insects.

The floor should be made of good quality concrete and should slope to a central drainage channel so that at the end of the day the whole area can be hosed down.

The drainage channel should be fitted with a heavy iron grating that can easily be removed for cleaning. The outlet of the drain should be covered with wire mesh to prevent rodents entering.

The ceiling and walls must be made from washable and easily dried materials. They must not be absorbent or porous.

The lighting should be natural if possible. If artificial lights are used they must not get in the way of the processing. The bulbs should be protected to prevent glass falling into the products if the lights are broken.

It is important to have good ventilation, especially where heating takes place. Large window openings should be covered with mesh to allow air and natural light into the building, while preventing insects and birds.

## **2.- Basic services**

Three basic services are required for a basic food processing operation:

### **Electrical power**

It is preferable to have access to electricity for lighting and for the operation of machinery. The electricity points should be situated high up the walls and away from water supplies so that they do not get wet during hosing down of the building.

### **Drinking water**

Drinking water should be available in sufficient quantities to allow for the safe, hygienic processing of food. Water must be protected from all possible sources of contamination. The storage tank must be covered. Clean water is often a scarce commodity and therefore efforts should be made to conserve it. Clean water must be available at all times. It is recommended that an elevated storage tank is used that is not reliant on the use of electricity. The use of a storage tank allows the water to be treated with a disinfectant. It is recommended that chlorine is added to water as a disinfectant. The recommended dosage is 2 ppm of free chlorine, which is equivalent to 100ml sodium hypochlorite solution per 2000 litres of water. At this level, the chlorine disinfects, but does not affect the taste of the water.

### **Disposal of waste water and material**

Provision should be made for the disposal of waste water and waste material

### **Basic facilities**

A small to medium scale fruit and vegetable processing unit must have the following basic facilities:

#### **Reception of raw material**

The plant must have a special area for the reception and storage of raw material until it is required. This area may simply be a shed or an appropriately designed room. The area should be clean, away from direct sunlight and with control over the temperature and humidity according to the type of material being stored. Care should be taken to ensure that rodents, birds and insects cannot get into the store building. The raw material storage area should not be used for the storage of other products that could contaminate it such as cleaning materials and pesticides. The quality of the finished product is directly dependent on the quality of the raw material. Thus the conditions of the storage area are of great importance. The storage area should have basic equipment such as weighing scales for the reception of raw material.

## **Processing room**

The processing room is the main place of activity. The different materials used during processing and the various pieces of equipment are kept here. Ideally, the room should be large enough to house all the equipment needed for the various stages, to allow the process to be continuous and improve the efficiency of processing.

## **Quality control**

Quality control operations should be carried out in a separate room. The room should be equipped with basic equipment such as a sink, running water and a bench or table where the tests can be carried out. The equipment for testing should be kept in this room.

## **Storeroom for finished products**

The storeroom should be clean and airy, free from damp and away from direct sunlight. The temperature of the room should be kept as low as possible to maintain the quality of the stored products. The storeroom should be fitted with shelves to allow neat and tidy storage of the processed foods. Processors should regularly test the quality of the stored products and make sure they rotate the stock, selling the oldest stock first.

## **Other facilities**

Some equipment needs to be stored outside the main processing area, but still accessible to the processor. The boiler or steam generator needs to be housed outside the main processing area to avoid contamination of the foods.

## **Sanitary facilities**

All sanitary facilities - changing rooms, toilets and hand washing areas should be kept separate from the processing area to avoid cross contamination.

## **3.-Equipment**

Buying vegetable processing equipment requires careful thought to decide what is the best for the individuals specific needs. It is a good idea for buyers to visit trade fairs, manufacturers, equipment retailers and operating vegetable processing industries to see the equipment in action. First time buyers should seek advice from experts.

Several factors that should be considered when buying new equipment include the following:

- the robustness of the equipment
- the simplicity of servicing, cleaning and maintenance
- what spares must be help
- how long it will take to get replacement parts.

There are many different types of equipment available, some of which are essential to the vegetable processing industries while others are optional, labour saving devices. It is important to think carefully about what is essential and what the plant can manage without.

The following is a guide of additional equipment available.

Cleaning System
Vegetable's Preparation System
Drying Chamber
Freezing Chamber
Heat Treatment System
Weight scale (from 100-1000kg) - floor scale
Weight scale (from 50-100kg) - floor scale
Weighing scale (from 3-5kg) - table scale
Weighing scale (from 100-500g) - table scale
Stainless steel table with water sprinkles
tank and mesh basket of stainless steel (plungeing bath)
Stainless Steel table attached to a sink
Stainless Steel Drainer
3 stainless steel trolleys with wheels to transportate plastic boxes
Stainless steel trolleys with wheels to transportate trays
Stainless Steel Table for general purposes
10 plastic chopping boards
a set of stainless steel knives (7) with thick blade (15-20cm x 2cm)
a set of stainless steel knives (7) with thick blade (10cm x 1cm)
a set of stainless steel spoons (3) with different sizes
3 large plastic spoons
3 stainless steel hand drainers
3 large plastic spoons
5 plastic trays (40x60x5cm)
3 plastic buckets (40 litres)
4 plastic buckets (10 litres)
4 stainless steel buckets (10 litres)
A Sulphur chamber
20 covered plastic boxes
Metallic or plastic storage shelves
Wodden Pallet. Size: 1,2 x 1,0m
Wodden Pallet. Size: 1,2 x 1,0m

#### 4.-Equipment suppliers

The information contained here is adapted from the ITDG publication Small-scale Food Processing (see bibliography number 11). Please note that the list is far from exhaustive. There are many more suppliers of equipment that we could not locate. Contact numbers change, suppliers go out of business and new suppliers emerge. Please inform FAO if you know any suppliers that would like to be included in this database.

FAO and UNIDO do not endorse any of these suppliers or manufacturers and accept no responsibility for the products offered for sale.

Manufacturer	Country	Main equipment
TPI Technico Plaste Industrie	Benin	Packaging
ASELEC - Atelier de Soudure et d'Electricite	Burkina Faso	Dryers
Atelier KONATE B. Boubacar	Burkina Faso	Dryers
CEAS-ATESTA (SAPE. SATA)	Burkina Faso	Dryers
Kabore Koutiga Jean et freres (Etablissements)	Burkina Faso	Dryers
Kinate et freres (Etablissement)	Burkina Faso	Dryers
Soldev - Soleil et Developpement	Burkina Faso	Dryers
AGCM - Atelier General de Construction Metallique	Burkina Faso	Dryers
Fabasem	Cameroon	Packaging
Helepac	Cameroon	Packaging
Papier Plus	Cameroon	Packaging
Plasticam	Cameroon	Packaging
Printpak	Cameroon	Packaging
Ghana Carton Boxes Mfg Ltd	Ghana	Packaging
John Kojo Arthur	Ghana	Packaging
Plastics Packaging Products Ltd	Ghana	Packaging
Technology Consultancy Centre	Ghana	Dryers
Top Industrial Packaging Products Ltd	Ghana	Packaging
Tropical Glass Co Ltd	Ghana	Packaging
Sada-SA	Mali	Packaging
G North Son PVT Ltd	Zimbabwe	Threshers, winnowers, hullers, mills
H C Bell Son Engineers PVT Limited	Zimbabwe	Hullers, mills
Mark Industries (PVT) Ltd	Bangladesh	Heating, Packaging
Mirpur Agricultural Workshop Training School MAWTS	Bangladesh	Threshers, winnowers
AA Food Machinery Co., Ltd.	China	Packaging
Anko Food Machine	China	Baking
Chieh Song Machine Co., Ltd.	China	Packaging
Chio Sun Pole Co., Ltd.	China	Mixers
Cheng Shin Enterprise Co., Ltd	China	Mixers
Enter Data Co., Ltd.	China	Packaging
Hsiao Lin Machine Co., Ltd	China	Baking
Promarks Vac Co., Ltd	China	Packaging
Seven Castle Enterprise Co., Ltd.	China	Mixers, baking
THC Associate Corporation	China	Extrusion
Tsung Hsing Food Machinery Co., Ltd.	China	Baking
Widen Precision Machinery Co. Ltd.	China	Extrusion
Yang Jenq Machinery Works Co.	China	Baking

Zay Lon Co., Ltd.	China	Packaging
Acufil Machines	India	Cleaners, graders, dryers
Agaram Industries	India	Extruders
Alven Foodpro Systems P Ltd	India	Baking
AMI Engineering	India	Mixers, baking
Apple	India	Baking
Azad Engineering Company	India	Heating
Bajaj Maschinen PVT. Ltd.	India	Packaging
Baker Enterprises	India	Mixers, baking
Bhavani Sales Corporation	India	Packaging
Bijoy Engineers	India	Mixers, baking
Bombay Industrial Engineers	India	Mixers, dryers, heating
Cantech Machines	India	Heating
Central Institute of Agricultural Engineering	India	Cleaners, graders, hullers, mills, dryers, heating
Dairy Udyog	India	Heating, testing
DIW Precision Engineering Works	India	Mills
Essae-Teraoka Limited	India	Testing
Forsberg Agritech India PVT Ltd	India	Threshers, winnowers, cleaners, graders
Gardners Corporation	India	Mills, mixers, baking, heating, packaging
Geeta Food Engineering	India	Heating, packaging
Goma Engineering PVT. Ltd.	India	Heating
Goldin (India) Equipment (PVT) Limited	India	Cleaners, graders, hullers
Gurdeep Packaging Machines	India	Packaging
Hitech Ultraviolet PVT. Ltd.	India	Testing
John Fowler India Limited	India	Cleaners, graders
Kaps Engineers	India	Mills
Karishma Instruments PVT. Ltd.	India	Testing
M.M.M.Buxabhoj & Co.	India	Packaging
M/S Mangal Engineering Works	India	Baking
Machin Fabrik	India	Heating
Narangs Corporation	India	Heating, packaging, testing
Orbit Equipments PVT. Ltd.	India	Packaging
Pharmaco Machines	India	Packaging
Premium Engineers PVT Ltd	India	Cleaners, graders, mills, mixers, dryer, testing
Rajan Universal Exports Manufacturers PVT Limited	India	Threshers, winnowers, cleaners, graders, hullers, mills
Rank and Company	India	Mills, mixers, dryers, packaging
R.P.M. Engineers (India) Ltd	India	Heating

Shirsat Electronics	India	Dryers
Sree Manjunatha Roller Flour Mills (P) Ltd.	India	Mills
Sridevi Packing Industries	India	Packaging
Sri Rajalakshmi Commercial Kitchen Equipment	India	Mixers, heating
Sunray Industries	India	Packaging
Techno - Equipments	India	Heating, Packaging
Technoheat Ovens and Furnaces PVT Ltd	India	Baking
The Bombay Engineering Works	India	Dryers
Udaya Industries	India	Threshers, winnowers, mills, dryers
Ashoka Industries	Sri Lanka	Dryers
Kundasala Engineers	Sri Lanka	Threshers, winnowers, cleaners, graders, mills, dryers
Amorn Loharyon	Thailand	Mixers
Banyong Engineering	Thailand	Packaging
Charoenchai Company Ltd	Thailand	Mills
Kasetsart University	Thailand	Threshers, winnowers, hullers, dryers
Kongsonglee Kanchang	Thailand	Cleaners, graders
Krungthep Chanya	Thailand	Mixers, baking
K.S.L. Engineering	Thailand	Mixers
Kunasin Machinery	Thailand	Threshers, winnowers
Lim Chieng Seng Ltd.	Thailand	Hullers
Narongkanchang	Thailand	Dryers
Ruang Thong Machinery Ltd.	Thailand	Mills
Sahathai Factory	Thailand	Heating
Usa Patanasetagit Company Ltd	Thailand	Threshers, winnowers
ALFA Technology Transfer Centre	Vietnam	Packaging
Anh Tuan Mechanical Cooperative	Vietnam	Mills
Doan Binh Mechanical Cooperative	Vietnam	Mills
Duc Huan Mechanical Cooperative	Vietnam	Mills
Physics Institute of Ho Chi Minh City	Vietnam	Heating
Sai Gon Industrial Corporation (SINCO)	Vietnam	Cleaners, graders, testing
Technology & Equipment Development Centre (LIDUTA)	Vietnam	Packaging
APV Unit Systems	Denmark	Heating
Actini	France	Heating
Electra	France	Mills
Gauthier	France	Cleaners, graders
Gilson Pere et Fils	France	Heating
Marot	France	Cleaners, graders
Samap	France	Mills, mixers
Gebruder Lodige Maschinenbau GmbH	Germany	Mixers, dryers



Innotech	Germany	Dryers
Pasquali Macchine Agricole s.r.l.	Italy	Threshers, winnowers
C.Van't Riet Zuiveltechnologie B.V.	The Netherlands	Heating
Votex Tropical	The Netherlands	Threshers, winnowers
Alvan Blanch	UK	Threshers, winnowers, cleaners, graders, hullers, mills, heating, extruders
Armfield Limited	UK	Heating
Charles Wait Process Plant Limited	UK	Mixers, packaging
Christy	UK	Mills
Fisher Scientific UK Ltd	UK	Testing
Fullwood Limited	UK	Heating
John Gordon International	UK	Threshers, winnowers
Kemutec Group Limited	UK	Mixers
Mitchell Dryers Limited	UK	Dryers
Natural Resources Institute	UK	Dryers
The Pascall Engineering Company	UK	Mills
Packaging Progress	UK	Packaging
Regis Machinery Sales Limited	UK	Extruders
Scotmec (Ayr) Limited	UK	Mills, mixers
Silsoe Research Institute	UK	Threshers, winnowers
Status Instruments Limited	UK	Testing
West Meters Limited	UK	Testing
Winkworth Machinery Limited	UK	Mixers
ANLIN	Perù	Mixers, baking
DISEG - Maquinarias Para La Industria Alimentaria	Peru	Mills, mixers
FAINSA Fabricantes En Acero Inoxidable S.A.	Peru	Mixers, heating
Industria Peruana Comercializadora Techno Pan Equipamiento Integral	Peru	Mixers, baking
Industrias Technologicas Dinamicas S A	Peru	Hullers, mixers, dryers, packaging
Mecanicos Unidos	Peru	Mills
Servifabri Srl	Peru	Mixers
Vulcano Tecnologia Aplicada Eirl	Peru	Hullers, mills, mixers
C S Bell Co	USA	Hullers, mills
International Ripening Company	USA	Testing
Lehman Hardware Appliances	USA	Mills