*Report on B.1 Action*

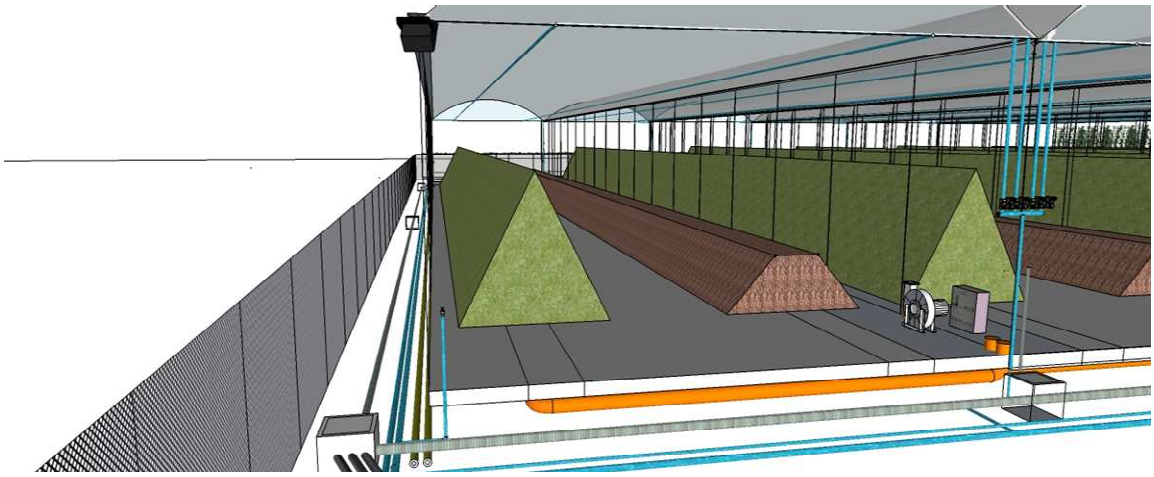
A preliminary inspection was carried out at "Prima Luce" farm in order to collect technical and logistic information (available spaces, volume availability of starting matrices, etc) useful to design the prototype composting plant according to the well-established knowledge acquired by UNIBAS.

Piles of starting matrices were sized assuming that the fresh material was generating a triangular prism while the mature compost was generating a solid figure with a trapezoidal section. The calculation of the volume of the piles are shown below.

| **Starting (fresh) pile** | **Volume of triangular prism = area of cross section x length = ½*b*h*l** | **Volume ($m^3$)** |
|---|---|---|
| **Triangular section** | ½(2.5x2.5x36) | 125.5 |
| **2 compost piles** | 2x125.5 | 250 |

| **Final (mature) compost** | **Volume of trapezoidal section = area of cross section x length = [½*(b1+b2)*h]*l** | **Volume ($m^3$)** |
|---|---|---|
| **Trapezoidal section** | ½(2.5x0.8x1)x36 | 60 |
| **2 compost piles** | 2x60 | 120 |

The design of the composting plant showing the piles of fresh materials and final compost is reported below.

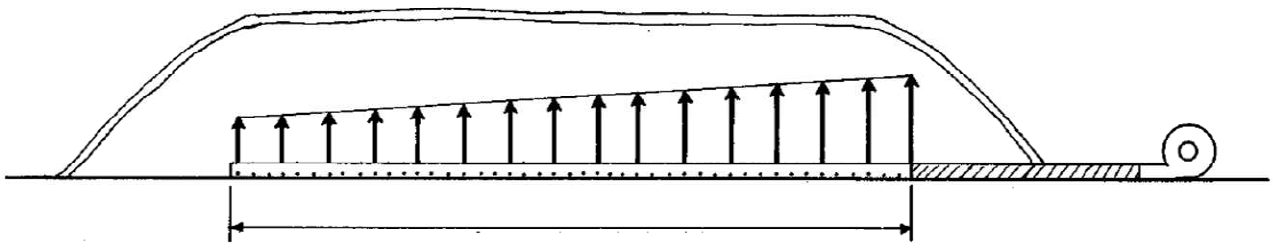


On farm composting equipments:

- Air distribution system
- Moisten system of composting pile
- Collection system of liquids and sludge
- Drainage system
- Automatic control of temperature, oxygen, moisture content

Particular of air distribution system

The diagram of the air distribution system is shown in the following picture

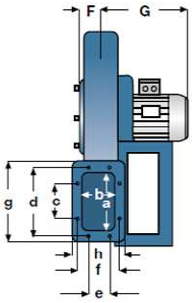


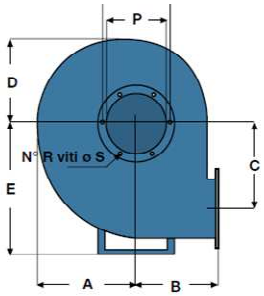
Pipes length, holes distances, number and diameter forming the air distribution system are reported in the following table.

| Lunghezza tubo | Distanza fori | Numero fori | Diametro fori |
|---|---|---|---|
| [m] | [m] | | [m] |
| 12 | 0.35 | 34 | 0.01 |
| 12 | 0.30 | 40 | 0.01 |
| 12 | 0.25 | 50 | 0.01 |
| | TOT | 124 | |

Some technical characteristics of the pumping system are reported.

Dettaglio ventola a pale rovesce

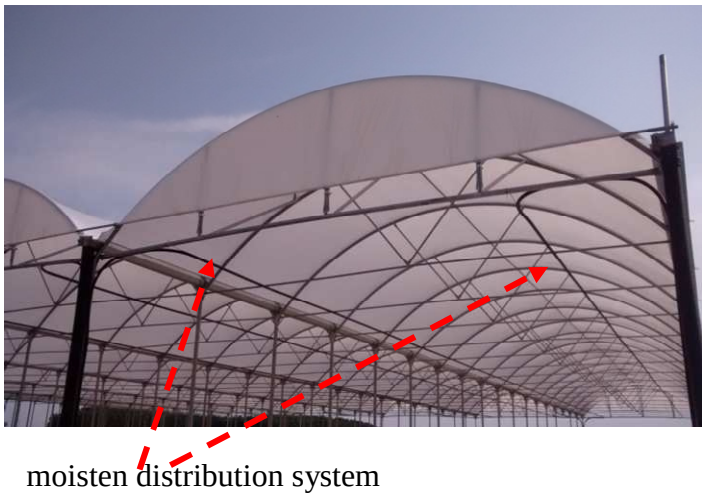



| TIPO | A | B | C | D | E | F | G | P | Q | R | S | a | b | c | d | e | f | g | h | Øi | Kg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HT 360N | 285 | 250 | 215 | 260 | 355 | 65 | 305 | 185 | 219 | 8 | 8 | 146 | 105 | 112 | 182 | – | 139 | 216 | 175 | 12 | 36 |
| HT 410N | 310 | 280 | 238 | 283 | 375 | 71 | 354 | 205 | 241 | 8 | 8 | 166 | 117 | 112 | 200 | – | 151 | 236 | 187 | 12 | 52 |
| HT 440N | 345 | 300 | 265 | 315 | 400 | 78 | 432 | 228 | 265 | 8 | 8 | 185 | 131 | 112 | 219 | – | 165 | 255 | 201 | 12 | 63 |
| HT 470N | 345 | 300 | 265 | 315 | 400 | 78 | 432 | 228 | 265 | 8 | 8 | 185 | 131 | 112 | 219 | – | 165 | 255 | 201 | 12 | 78 |
| HT 500N | 380 | 335 | 297 | 345 | 450 | 86 | 439 | 255 | 292 | 8 | 10 | 207 | 148 | 112 | 241 | 112 | 182 | 277 | 218 | 12 | 93 |
| HT 520N | 380 | 335 | 297 | 345 | 450 | 86 | 499 | 255 | 292 | 8 | 10 | 207 | 148 | 112 | 241 | 112 | 182 | 277 | 218 | 12 | 106 |
| HT 550N | 430 | 375 | 337 | 390 | 500 | 95 | 510 | 285 | 332 | 8 | 10 | 231 | 166 | 112 | 265 | 112 | 200 | 301 | 236 | 12 | 133 |
| HT 560N | 430 | 375 | 337 | 390 | 500 | 95 | 645 | 285 | 332 | 8 | 10 | 231 | 166 | 112 | 265 | 112 | 200 | 301 | 236 | 12 | 141 |

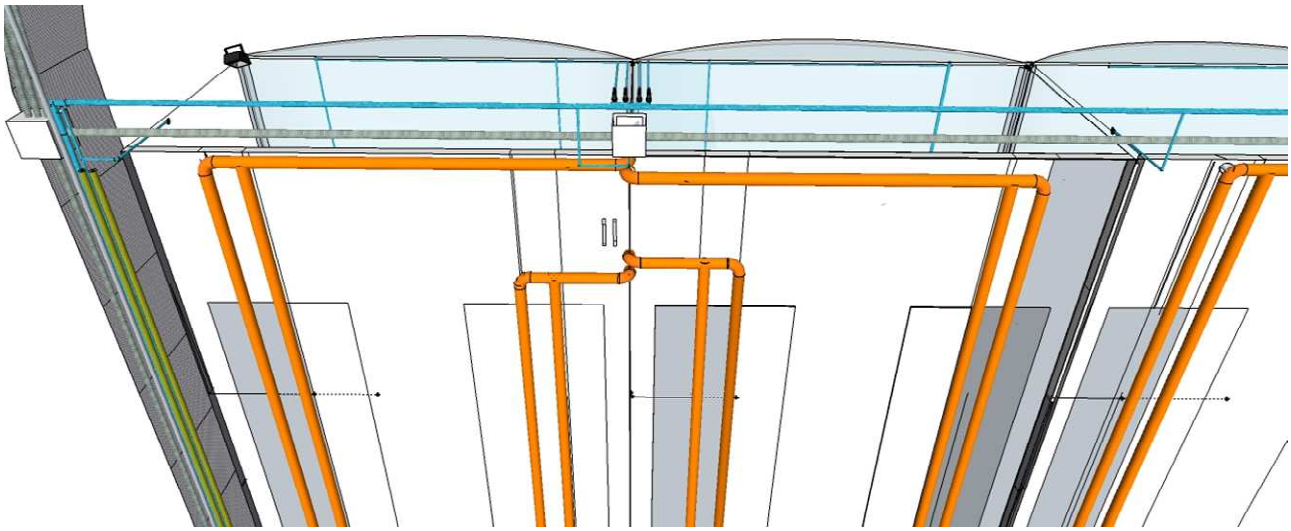
The pump system is programmed as follows: the first 20 days of the composting cycle (the so-called active phase), it starts each 20 minutes for 5 minutes or for temperatures exceeding 65°C. In the second part of the composting cycle (about 40 days, the so called curing phase), the pump is activated each hour for 5 minutes or for temperatures exceeding 55°C.

Details on the water distribution system used to moinsten the piles during the composting procedure



moisten distribution system

Bottom view of the wastewater collection system of composting plant



An automatic control of composting parameters (oxygen, temperature, moisture) is used during the composting procedure.

The specific thermo-probes, used in the on farm composting facility, check the average oxygen and moisture concentration and the temperatures at different levels inside the piles. The central control system is based on a Raspberry PI, connected to a Linux/debian distribution system. The connection with each thermo-probe is based on a wifi/radio transmitter with an XBee Pro module for each probe. Each thermo-probe records the temperature at 4 different levels inside the piles with LM35 sensors. The XBee Pro module is assembled on a PVC IP69 box including also the battery supporting the probe and the module. The thermo-probes have an operating self-autonomy of 12 days. The RaspberryPI control the air distribution by a with GPIO interface and 14 time-delay relays. The timing is based on DS1307 module. The transmission of composting parameters operate through the WiFi system with a daily rate record of processing data (Phyton programming language)

In the following table are reported the effective amounts of recycled biomasses used on the composting lines already activated. The final yield of mature compost is about 40 to 50% of the initial matrix inputs.

| Piles | Input ($m^3$) | Sieved woody retrieval ($m^3$) | Farms N° |
|---|---|---|---|
| **L 7-8** | 100 | 10 | 1 |
| L1 | 100 | 14 | 1 |
| **L2** | 80 | 7 | 1 |
| L3 | 80 | 7 | 1 |
| **L4** | 100 | 15 | 1 |
| L1 A | 130 | 11 | 2 |
| **L2 A** | 218 | 10 | 2 |
| L3 A | 250 | 15 | 2 |
| **L4 A** | 215 | 17 | 6 |
| L5 A | 240 | - | 7 |
| **L6 A** | 280 | - | 8 |
| L7 A | 180 | - | 9 |
| **L8 A** | 160 | - | 5 |
| L1 B | 360 | - | 6 |
| **L2 B** | 250 | - | 2 |