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**A biochar enriched *Super Vegetable Garden* of less than 60 m<sup>2</sup> provides a balanced diet for a family of 10 with 80% less water consumption**

Pro-Natura International, in association with the social business JTS Seeds, has developed the innovative, ecological and highly productive *Super Vegetable Garden*. Initially planned for Africa, this enriched garden yields a perfectly balanced diet for 10 people on a surface area of 60 m<sup>2</sup>. It is a combination of the Improved Tropical Garden (ITG) of JTS Seeds, and Pro-Natura's Biochar. This garden is a promise for a richer, healthier future worldwide.

The result of 15 years of research and 30 years of field experience, initially demonstrated in Niger and Senegal, the cultivation techniques involved are applicable to all tropical zones. The corresponding kit includes the necessary seeds, soil amendments, adapted irrigation devices together with specially adapted equipment (covering veils, tools etc.).



The GMO-free seeds are the fruit of 15 years of specialist selection. Production in this garden is constant all year round, whatever the season, involving a consistently regular cycle from the fifth week. Water consumption is reduced by more than 80%, the necessary workload limited to two hours per day.

Among the notable innovative aspects of the *Super Vegetable Garden* is the inclusion of biochar, produced thanks to Pro-Natura's *green charcoal* technology. Soil fertilisation using charcoal dust (biochar) is an ancestral practice first employed more than 7,000 years ago by pre-Columbian Indians in the Amazon regions. The exceptional properties of these soils are still discernable today, as has recently been discovered by the scientific community, who are now showing considerable interest in biochar.

Pro-Natura's biochar avoids ecological problems linked to charcoal production since it involves green charcoal, exclusively produced from renewable biomass (agricultural or forest residues not used for cattle feed; organic matter, invasive plants etc.). It is the product of a continuous carbonisation process, both efficient and ecological, using the Pyro-6 machine. Complementary fertilisers are limited to organic products such as compost and manure.

In and of itself, biochar allows for a doubling of productivity of agricultural land, if not more, once the soil has been fertilised by incorporating one kilogramme of biochar per m<sup>2</sup>. In addition to this direct fertilising effect, biochar also acts as a sustainable carbon sink. This induces the sequestration of carbon from atmospheric CO<sub>2</sub>, (one tonne of biochar being the equivalent of 2.7 tonnes of CO<sub>2</sub>), thus mitigating long-term climate change.

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**Innovation Towards Sustainable Development**

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The *Super Vegetable Garden* comes in a basic kit, to which certain options can be added so as to further increase productivity and enable the establishment of the garden.

The kit includes:

- **Plastic lining.** This allows for the limiting of plot size and the restriction of work to a single place (like a flower pot) resulting in subsoil enrichment and pest infestation control, as well as countering water and wind erosion. Plastic lining constitutes the basis of the technique. Its installation leads to deeper work on the soil, and therefore both deeper rooting and better lateral growth of plants;
- **Water retention mini-sponges.** Water absorbers improve the quality of the soil, contributing to better garden management and a reduction in water use (added to the plastic lining and the veils, the water consumption is four times less than in a traditional garden);
- **Organic fertiliser.** Natural fertiliser is very useful to regenerate soil fertility and constitutes a form of security guaranteeing optimum productivity;
- **Cultivation veils.** Indispensable to the technique, they help counter water evaporation by at least 2/3, limit the time when the stomata (foliar cells of the plant indispensable for the photosynthesis) remain closed during the hottest hours of the day thus increasing the photosynthesis period, create a barrier to flying insects, attenuate the early morning cold, and form a protection against sand storms as well as heavy rain;
- **Nursery veils.** These guarantee the same effect as cultivation veils over small surface areas characteristic of nurseries;
- **A fine-nozzled watering-can.** Allows for regular, non-aggressive plant watering and prevents soil compacting;
- **A dibble.** Indispensable for transplanting;
- **An alignment cord.** Delimits the planting area and facilitates planting in a straight line;
- **The JTS seeds:** are the fruit of 15 years of GMO-free agronomical research. The packaging is waterproof, and the seeds are single use with germination verified by JTS laboratory and providing an optimum rate.



Biochar application in Senegal



Setting up of veils



Super Vegetable Garden in Niger



Production of cabbages in the city of Niamey

## In 2002 Pro-Natura won the ALTRAN Foundation's first prize for technological innovation for the ecological production of biochar

### Creating an important piece of the CO<sub>2</sub> reduction puzzle

The method employed here involves unused agricultural residues or renewable biomass which would otherwise go to waste, and transforming them into either biochar or briquettes of green charcoal, a wood charcoal substitute. Pro-Natura thus proposes an alternative domestic fuel made of vegetable carbon, obtained through a proven, clean and efficient process, based on the continuous carbonisation of renewable biomass. Savannah weeds, reeds, wheat or rice straw, cotton and corn stems, rice or coffee



husk and bamboo can all be used to produce green charcoal. Any form of wood, including sawdust, can also be carbonised, with a yield around 3 times higher than would be the case using classical batch processes. A Pyro-6F machine allows for the economical and ecological production of between 4 and 5 tonnes of green charcoal per day. The first French-made machine has been in use in the Saint-Louis region of Senegal since the end of 2007 (see photo above) and the 'Herisson Vert' company now operates it.

This technology has been transferred to the new Paris-based company Green Charcoal International, which produces the machine.

### New Oasis: Super Vegetable Gardens at the heart of agroforestry systems



Pro-Natura agroforestry development centre in Nigeria

Agroforestry was once a specific traditional type of agronomy practiced by rural communities in the tropics. A rational land-use system that restores and maintains soil fertility, it increases total yield, involving agricultural crops (food-producing annuals) in synergy with trees (perennials) and/or animal husbandry, all on the same land and in varying combinations over time. It should be reintroduced without upsetting the ecological and socio-economic balance of a given local population.

It has taken scientists a long time to fully understand all the benefits of agroforestry.

We advocate the establishment of a pilot project on a small or medium scale before proceeding to larger scale development. Quantitative data on the yield of a pilot agroforestry system can be used to improve technical methods and further refine a system which is generally far more productive than any form of monoculture.

Agroforestry is not only a response to the fight against poverty and malnutrition, it also tackles climate change. The Intergovernmental Panel on Climate Change (IPCC), which was awarded the Nobel Peace Prize, describes the opportunity in these terms: "More than a billion hectares are available for conversion to high-productivity agroforestry systems capable of significantly reducing poverty and deforestation and sequestering carbon on a large scale". According to the IPCC, in the next 50 years, carbon markets could finance such poverty-reduction projects, which have the potential to reduce greenhouse gases in the atmosphere by the equivalent to 50 billion tons of CO<sub>2</sub>.

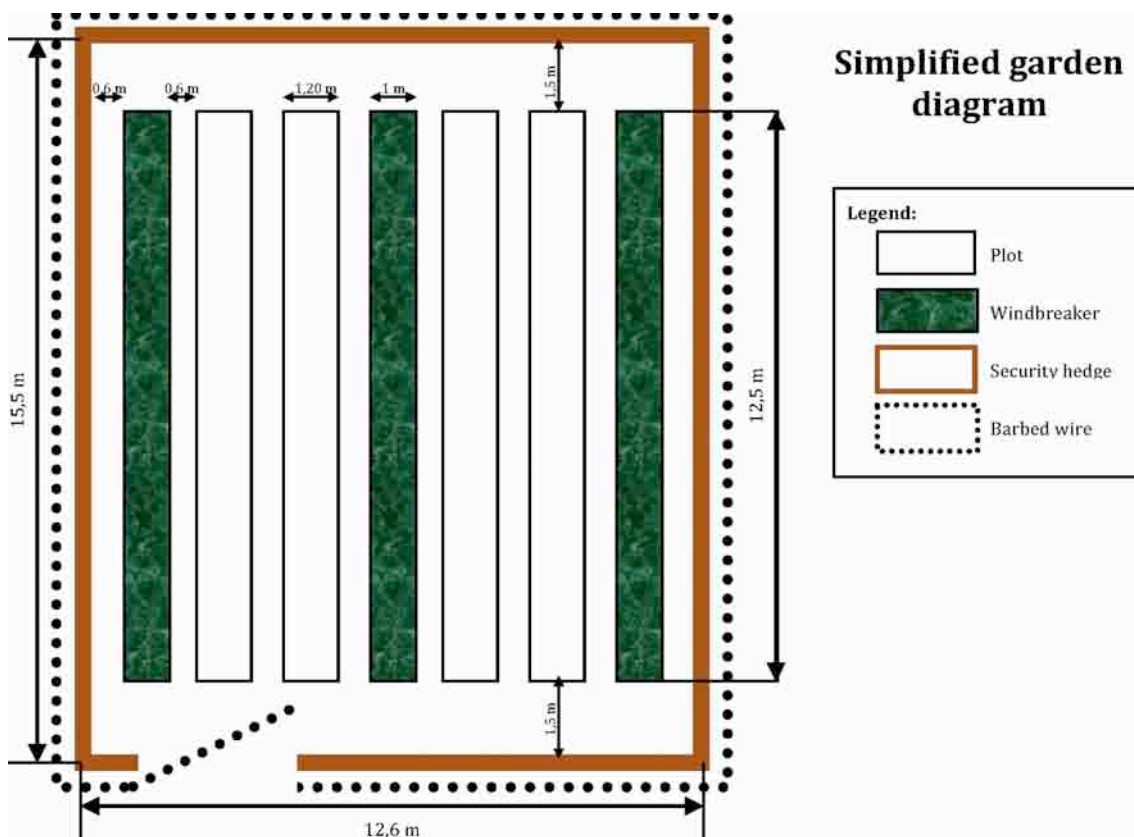
## Innovation Towards Sustainable Development

For two decades Pro-Natura has demonstrated the effectiveness of agroforestry in Latin America, Africa and Asia, developing practical training centres for farmers funded by the French Development Agency and the Leventis Foundation. The full range of this experience is succinctly summed up in handbooks available in both English and French.

**Our chief objective today is to intensify this type of action in arid zones where food problems and the degradation of the environment are alarming.**

### Plan for the establishment of a *Super Vegetable Garden*

An SVG consists of 4 plots, each measuring 1.20 m x 12.5 m. A suitable terrain must be organised for these 4 plots, separated from each other by a walkway of at least 60 cm.



### Contact

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