The BRF technique (Ramial chipped wood)

BRF is a technique developed in Canada in the 1980s, where it is known as the Bois Raméal Fragmenté (BRF). The technique consists of the chipping of small branches, from which a fungal process is initiated. It is led by basidiomycetes as the basis for the **formation of a stable humus** that improves the structure and water retention capacity of the soil.

BRF production

The base material to produce BRF are **branches smaller than 7 cm** (**Figure 1**), which are those that contain soluble or barely polymerised lignin, the necessary base for the formation of a highly reactive humus. **These branches are shredded after cutting** with a shredder (**Figure 2**) before the wood has dried. If the cut is in summer, in a few days the branch is already dry so it must be crushed quickly. In winter, the branches dry more slowly and there is more time to crush them. The chips obtained in this way initiate a fungal decomposition process led by basidiomycetes (white rot), which, from lignin, produces fulvic and humic acids, which are the basis for the formation of aggregates in the soil. Thus, **a stable, long-lasting humus is achieved**, like forest humus, different from the humus produced from other organic residues that do not contain lignin. In this way, compost, for example**, is useful for improving soil life and providing nutrients** to plants, but it is not useful for rebuilding and maintaining the structure, long-term fertility and stability of the soil.

The limiting factor for its production is therefore the presence of significant volumes of freshly cut branches smaller than 7 cm**. In mountain areas**, where the forest is an important resource, **the availability of branches from forest felling usually represents an abundant resource** for BRF production. The size and species of the branches have an important effect on the amount and type of humus produced.

• **The size of the tree** largely determines the weight of branches <7 cm. The amount of material obtained after limbing the tree increases rapidly with its diameter. To obtain an enough quantity of material efficiently it is better to **use trees with a diameter greater than 20 cm at breast height**.

• **The species** used to make the chip also plays an important role in the type of humus produced. All the works carried out recommend limiting the use of conifers to less than 10% of the total material used. **The best results are achieved with deciduous trees**, due to the structure of their lignin. In contrast, evergreen hardwoods perform worse due to the transformation of their lignin by "brown rots" that produce polyphenols and aliphatic compounds.

BRF application

The time of application of these chips can be very different, which conditions the characteristics of the product at the time of application and the ease of handling it.

- In the standard system, **the chips are spread into their final place quickly after the branches are chipped to prevent the material from drying out**. Stacking is avoided because anaerobic conditions occur in large piles that encourage the material to start fermenting.

- In the **Polyfarming system,** on the other hand, **we leave the chips in small piles within the forest for between 4 and 12 months** (**Figure 3**). By making the stacks in winter and being small in size, this partly avoids fermentation with a significant increase in temperatures. When the material is collected to be transported to its place of application after a few months, we find **partially decomposed material**, with an appearance and smell similar to forest humus, and easier to handle and transport than the original chips.

Figure 1. Stack of branches used to produce BRF. Photo: Marc Gràcia.

Figure 2. Chipping the branches in the field with a shredder to produce BRF. Photo: Montse González, AV Video.

Figure 3. Pile of BRF that is left to decompose directly in the field for several months before application. Photo: J. Luis Ordónez.

The application of BRF can also be carried out in different ways:

- **Directly in the field**. The BRF is applied directly to crops, either garden or fruit trees.
- **In the animal bed.** Chips previously decomposed for a few months in the forest can be used for animal litter. In the Polyfarming system they are used mainly in the **litter of the chicks** where, mixed with other materials such as biochar, they offer a healthy environment for the animals while they enrich them with their excrement. This bed is gradually stirred to facilitate the absorption of animal manure and obtain a high-quality substrate that is used for the garden.

Benefits of BRF for farms

BRF can represent significant benefits for farms that use it. In the short term there may be an immediate interest because:

- **It increases soil productivity and reduces management costs.** BRF encourages weed control, which improves the performance of agroforestry farms in disadvantaged areas.
- **It allows the use of forest subproducts. It allows the use of forest biomass** (remnants of margin cleaning, pruning, etc.) that currently has no commercial use..

Benefits of BRF for the environment

BRF can also represent significant long-term environmental improvements:

- **Reduction of water use.** It allows a significant reduction of the use of water, **up to 50%** in some cases, due to the ability of humus to retain it.
- **Increase in carbon sequestration.** It manages to introduce part of the carbon sequestered by the forest in the agricultural production system. This causes a very important increase in the carbon stock sequestered in the soil, which is one of the fundamental elements in mitigating climate change.
- **Improvement of biodiversity**. It is a system that increases the biodiversity of the soil, as it improves the structure of the soil and balances the pH.