T E C H N I C A L N O T E

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1. Collection of Two Native Cultivars of *Phaseolus lunatus f. microcarpus* in the Guatemalan Humid Lowland Tropics.

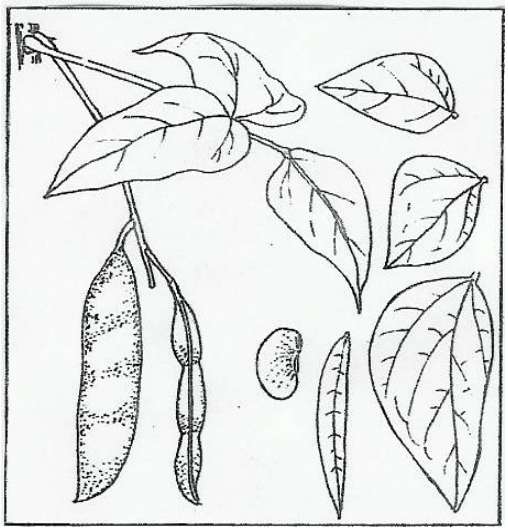
The perennial cultivars of *Phaseolus lunatus* are "multiple-use" grain and fertilizer legumes well adapted to less-fertile hill-lands in the Humid Lowland Tropics. (tropical lands with over 1500mm rainfall/yr and under 900m elevation). (NAS, 1979)

The *Phaseolus lunatus* species consists of 2 cultivar groups native to the American Humid Lowland Tropics. The domestication of the 2 cultivar groups took place in 2 independent areas; the 1st in the Humid Lowland Tropics of Eastern Ecuador and Peru around 5800 B.C., in which the "Pallar" group *(Phaseolus lunatus f. macrocarpus*) of large/flat seeds (weight of 100 seeds: 54-280g) were domesticated; and the 2nd in the Humid Lowland Tropics of Southwestern Mexico and Northwestern Guatemala around 1700 B.C., in which the "Sieva" group (*Phaseolus lunatus f. microcarpus*) of small/flat seeds (weight of 100 seeds: 24-70g) were domesticated. (León, 2000; Domínguez, et al, 2002; Purseglove, 1968)

This Technical Note reports on the seed collection of 2 native cultivars of the "Sieva" group, during the major dry period in years 2008 and 2009. The cultivars were collected in the Humid Lowland Tropics in Southeastern Guatemala in Q'eqchi' Mayan communities in the regions of Sumach-Rio Pita, Izabal (150-300 m elevation; 2000-2500 mm rainfall/yr) and Teleman-Salac, Alta Verapaz (300-600 m elevation; 2000-2500 mm rainfall/yr). The Q'eqchi' Mayan name for these cultivars is **"Frijol Tapakal"**. (Wilk, 1997; Sam, et al, 2003) The Q'eqchi' Mayan population is estimated to be over 1,400,000, and is currently the world's largest Tropical Rainforest Ethnic Group.

The major differences between the 2 collected native cultivars of **"Frijol Tapakal"** are: the duration of grain production, the quantity and length of vines, and the color of seeds and pods. The more common cultivar of **"Frijol Tapakal"** has green unripe pods (**"Frijol Tapakal Verde",** a climbing annual grain legume 1.5 m high) with black seeds, but at times the black seeds are mixed with dark brown, light brown, red, black/painted brown, red/painted black, white/painted red, and white/painted black seeds. The other less common cultivar has both black unripe and ripe pods (**"Frijol Tapakal Negro"**, a climbing perennial grain/fertilizer legume 2 m high) with black seeds, and which is a very determined climber with a prolonged production cycle. The 2 cultivars have other common characteristics. The seeds are small and flat (up to 15 mm long) and both unripe and ripe seeds are eaten (without cyanogenic problems). (See Figure 1)

Figure 1. *Phaseolus lunatus.*



In Q'eqchi' Mayan communities, it is traditional to plant **"Frijol Tapakal Verde"** at the beginning of the major rainy period associated with "Maíz" and "Ayote" (*Cucurbita moshata*) so that **"Frijol Tapakal Verde"** can climb the "Maíz" and at the same time obtain 3 products. The harvest of **"Frijol Tapakal Verde"** begins after 5-6 months in the major dry period and can last for 2-3 months.

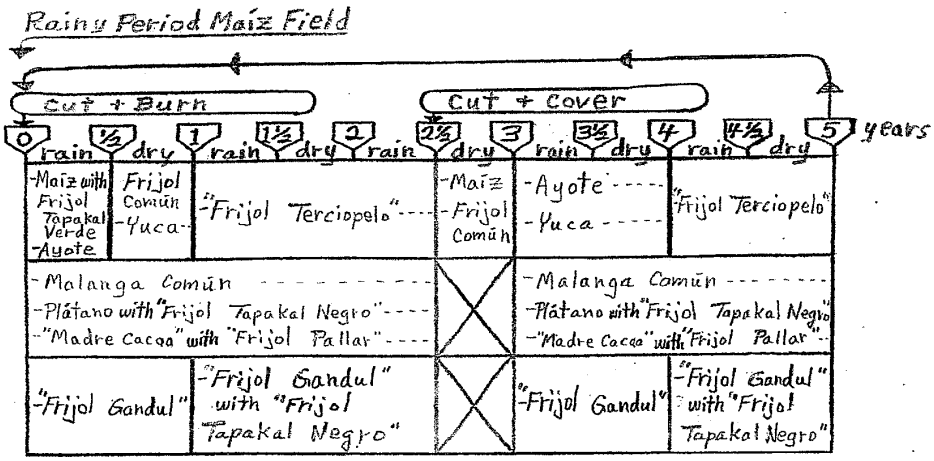
"Frijol Tapakal Negro" is also planted at the beginning of the major rainy period. Since **"Frijol Tapakal Negro"** is a vigorous perennial climber with a long production cycle, it is better to use the associated crops of "Plátano" and "Gandul" as props because both are stronger and more permanent than "Maíz". The harvest of **"Frijol Tapakal Negro"** begins after 6-8 months during the major dry period and can last for 4-18 months. This is because **"Frijol Tapakal Negro"** produces tuberous roots that can persist until the following year. Then, at the beginning of the next major rainy period, its foliage re-grows, and therefore is considered a perennial.

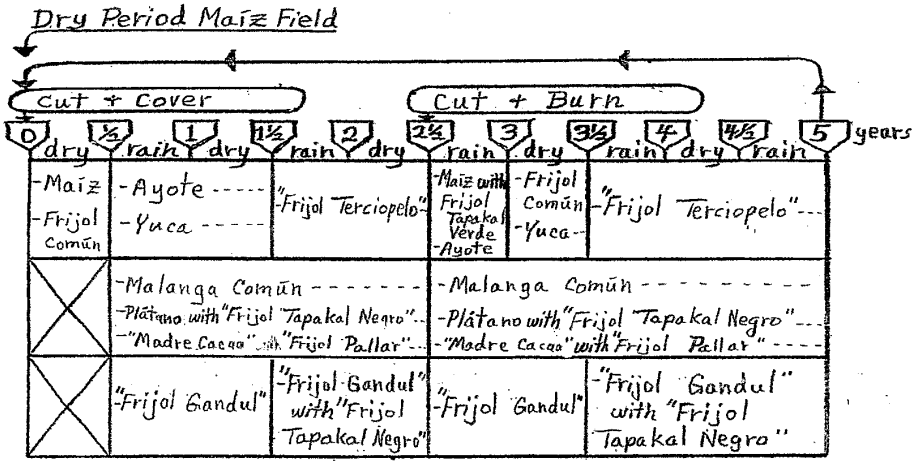
Field trials to evaluate the use of **"Frijol Tapakal Negro"** as a grain/fertilizer legume are in progress at the Instituto Ak'Tenamit (www.aktenamit.org) in the region of Izabal, Guatemala. (Ak'Tenamit, 2009) The perennial cultivar **"Frijol Tapakal Negro"** has good potential as a "multiple-use" grain/fertilizer legume in many regions with less-fertile hill-lands in the Humid Lowland Tropics. (NAS, 1979; Dominguez et al, 2002)

The production of the perennial cultivar **"Frijol Tapakal Negro"** can improve food security as well as also improve the productivity, profitability, sustainability and diversity of agricultural production on less-fertile hill-lands in the Humid Lowland Tropics. **"Frijol Tapakal Negro"** can be produced as a grain/fertilizer legume in association with 4 other complementary fertilizer legumes (see below) and all 5 can be in combination and rotation with the mixed production of the 7 traditional basic food crops of "Maíz" (*Zea mays*), "Frijol Tapakal Verde" (*Phaseolus lunatus f. microcarpus*), "Frijol Común" (*Phaseolus vulgaris*), "Ayote" (*Curcurbita moschata*), "Yuca" (*Manihot esculanta*), "Malanga Común" (*Xanthosoma sagittifolium*) and "Plátano" (*Musa AAB*). (See Figure 2)

The associated production of traditional basic food crops in the Humid Lowland Tropics begins in ***Rotated Fields*** with the basic food grain "Maíz", which is planted 2 times a year in **"*Rainy Period Maíz Fields*"** (which are planted at the beginning of the major rainy period) and in **"*Dry Period Maíz Fields*"** (which are planted at the end of the major rainy period). (See Figure 2)

Figure 2. **Five Year Chronological Sequences** for the Combination and Rotation of 7 Basic Food Crops ("Maíz", "Frijol Tapakal Verde", "Ayote", "Yuca", "Frijol Común", "Plátano" and "Malanga Común") and 5 Fertilizer Legumes ("**Frijol Terciopelo", "Madre Cacao", "Frijol Pallar", "Frijol Gandul"** and **"Frijol Tapakal Negro"**), starting with ***"Rainy Period Maíz Fields"*** and ***"Dry Period Maíz Fields"*** in 5 Rotated Fields. (Ak'Tenamit, 2009)





During the First Year, when the associated production of traditional basic food crops starts with ***"Rainy Period Maíz"*** in rotated fields at the beginning of the major rainy period, one can inter-plant in the "Maíz" field (together with the first weeding of "Maíz") the 4 basic food crops of "Frijol Tapakal Verde", "Ayote", "Plátano", and "Malanga Común"; together with the 4 fertilizer legumes of **"Frijol Gandul"** (*Cajanus cajan*, a perennial grain/fertilizer bush legume 2 m high), **"Frijol Tapakal Negro"** (*Phaseolus lunatus f. microcarpus*, a vigorous climbing perennial grain/fertilizer legume 2 m high), **"Frijol Pallar"** (*Phaseolus lunatus f. macrocarpus,* a very vigorous climbing perennial grain/fertilizer legume 4 m high (Bishop, et al, 2009)) y **"Madre Cacao"** (*Gliricidia sepium,* a perennial fertilizer tree legume 4 m high). In every other row of "Maíz", one can over-plant at 1m (beside a "Maíz" plant, using "Maíz" as a prop) 2 seeds of "Frijol Tapakal Verde", and in alternate rows of "Maíz" one can inter-plant at 1m (between 2 plants of "Maíz") 2 seeds of "Ayote". Between the rows of "Maíz", one can establish at 4m x 4m plants of "Plátano" and beside each "Plátano" over-plant 4 seeds of **"Frijol Tapakal Negro",** and plant at 4m x 4m four seeds of **"Frijol Pallar"** beside a live stake of **"Madre Cacao"** (1.5 m long) to serve as a living prop for **"Frijol Pallar"**. Also, between the rows of "Maíz", one can plant at 2m x 4m two seeds of **"Frijol Gandul"** and establish at 2m x 2m plants of "Malanga Común". (See Figure 2).

Also, when the associated production of traditional basic food crops starts with ***"Rainy Period Maíz"*** in rotated fields at the beginning of the major rainy period, one can inter-plant (after the "Maíz" harvest) at 1m x 2m two "Yuca" stakes. In addition, one can inter-plant at 0.5m x 0.5m two "Frijol Común" seeds at the end of the major rainy period, and all associated with "Plátano" and **"Frijol Tapakal Negro"**, "Malanga Común", **"Frijol Gandul"**, and **"Madre Cacao"** with **"Frijol Pallar"** (already established in the ***"Rainy Period Maíz Field"***). (See Figure 2)

When the associated production of traditional basic food crops starts with ***"Dry Period Maíz Fields"*** (with "Frijol Común") at the end of the major rain period, one can inter-plant (after the "Maíz" and "Frijol Común" harvest) at 1m x 2m two "Yuca" stakes, as well as plant 2 "Ayote" seeds (between the "Yuca" stakes) at the beginning of the following major rainy period. Also, one can inter-plant at 4m x 4m four **"Frijol Pallar"** seeds beside a living **"Madre Cacao"** stake (1.5 m long) as a living prop for **"Frijol Pallar"**. In addition, one can inter-plant "Malanga Común" at 2m x 2m, "Plátano" at 4m x 4m, and beside each plant of "Plátano" inter-plant 4 seeds of **"Frijol Tapakal Negro"**. (See Figure 2)

During the Second Year (at the beginning of the second major rainy period with the associated production of traditional basic food crops) one can over-plant at 2m x 4m (beside each **"Frijol Gandul"** plant already established in the first year) 4 seeds of **"Frijol Tapakal Negro"** (*Phaseolus lunatus f. microcarpus*, a vigorous climbing grain/fertilizer perennial legume 2m high) using as living props the plants of **"Frijol Gandul"** pruned to 1m height. Also, in the location of the "Yuca" plants after its harvest, one can inter-plant at 1m x 2m two seeds of **"Frijol Terciopelo"** (*Mucuna puriens*, a vigorous climbing/trailing fertilizer/cover annual legume 4m long). The fertilizer legumes **"Frijol Gandul"**, **"Frijol Tapakal Negro"** and **"Frijol Terciopelo"** are all associated with the other fertilizer legumes **"Frijol Pallar"**, **"Madre Cacao"** and **"Frijol Tapakal Negro"** (already established in the first year), as well as with the remaining 2 basic food crops of "Plátano" and Malanga Común". The practice of propping **"Frijol Tapakal Negro"** and **"Frijol Pallar"** stimulates their development and production, and facilitates their grain harvest. (See Figures 2 & 3)

The remaining 2 traditional basic food crops of "Plátano" and "Malanga Común" associated with the 5 fertilizer legumes of **"Frijol Pallar"**, **"Madre Cacao"**, **"Frijol Gandul"**, **"Frijol Tapakal Negro"** and **"Frijol Terciopelo"** can all remain for 12-18 months in each rotated field, before the reestablishment of another associated production of the 7 traditional basic food crops of "Maíz", "Frijol Tapakal Verde", "Frijol Común", "Ayote", "Yuca", "Plátano" and "Malanga Común". (Ak'Tenamit, 2009).

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Figure 3. **Spacing Diagram** with the 5 Fertilizer Legumes of **"Madre Cacao", "Frijol Pallar", "Frijol Gandul", Frijol Tapakal Negro"** and **"Frijol Terciopelo",** and the Remaining 2 Basic Food Crops of "Plátano" and "Malanga Común". (Ak'Tenamit, 2009)