

## Experiences with *Lathyrus latifolius* in agriculture of high elevation zones of Central America

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### Introduction

The utilisation of cover crops and green manures in the sustainable management of soil fertility in zones over 1400 meters above sea level (masl) presents a challenge. Species are sought that can be adapted to conditions of temperate climate with temperatures below 10 °C during the coldest months, in degraded soils and besides, which could be included in the cropping systems or existing land use in the region. There are few species that have such characteristics, amongst them are the chinapopo beans (*Phaseolus coccineus*), an edible species utilised as a cover crop in association with corn; milpero beans (*Phaseolus vulgaris*) which are similar to chinapopo, faba beans (*Vicia faba*) that can be associated with corn or potato providing in addition to a regular ground cover, food rich in protein. Dolichos beans (*Dolichos lablab*) also grows well at altitudes of 1700 masl providing a good biomass production, although it is affected by freezing temperatures. Other species with potential for zones of higher elevation include the tarwi (*Lupinus mutabilis*), species utilized in the Andes of Bolivia, several species of the genus *Vicia*, clovers (*Trifolium* sp) and alfalfa (*Medicago sativa*).

Another not so well known but very promising legume is choreque beans (*Lathyrus latifolius*). This plant possesses good tolerance to frost, adaptation to high altitude, abundant biomass production and above all, rapid growth and easily associated with corn. This document presents a summary of the utilisation of choreque beans by indigenous groups in the higher region of Chimaltenango, Guatemala and the results of trials conducted at Santa Catarina Experimental Station of the Honduran Foundation of Agricultural Research (FHIA) at La Esperanza, Intibuca, Honduras.

Choreque is an annual plant of bushy-vine type growth (Fig. 1). At La Esperanza it grows up to 1.4 m high. Its flowers are pink in colour and abundant, the pods normally have 4-5 seeds which are brown in colour.

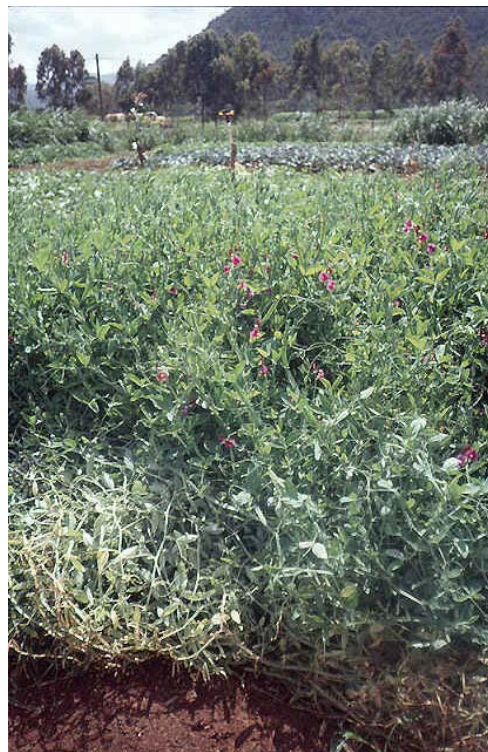


Fig. 1. Choreque (*Lathyrus latifolius*) in Honduras.

In Honduras, studies on the behaviour of choreque as green manure is being conducted in the fields of organic agriculture of the Honduran Foundation of Agricultural Research (FHIA) at La Esperanza, Intibuca. The altitude of the region is 1680 masl and has a mean annual rainfall of 1350 mm. Average annual temperature of 16 °C and a minimum of -2 °C which occurs between December and February (these are commonly frost events) and a maximum of 30 °C in March. Average relative humidity is 85%. Soils are clay loam with a pH of 4.5-5.0.

In this region, potatoes, vegetables, corn and altitude fruits are extensively grown. Soils are degraded due to intensive use and excessive application of chemical fertilisers, especially in the case of potatoes.

The idea of testing choreque originated from information from Guatemala and there was special interest in testing its tolerance to frost. In the high plateau of Chimaltenango, Guatemala, choreque is utilised in association with corn for soil improvement and increasing yields. This region is over 1800 masl and has rainfall of 1300mm between May and October. Soils are volcanic, clay loam with slopes of more than 10%.

Farmers plant in May at the beginning of the rains. Choreque is planted from the middle of July up to September, when the corn has already developed. Planting is done at the time of the second "earth up" of corn. One to two choreque seeds are planted per hill every 10 cm. Between each hill of corn, which in this region, is planted in square at a distance of 1x1 m. At this density, 14 kg of choreque seed are needed per hectare.

Apparently, choreque does not limit the growth or yield of the corn, which is harvested in November when choreque is 60 cm high. During harvest of corn, choreque is not damaged since it only has between 2-3 small branches. From this time on its development is accelerated. After harvest, choreque remains on the ground and tangles on the corn stalks providing a complete ground coverage. All this material can be incorporated into the soil in the next cropping season and some farmers also utilise it as a forage reserve for the dry season.

The benefits mentioned by the farmers include the following:

- Serves as green manure, choreque has been recorded as producing 100 t/ha of green matter in a period of 6 months<sup>(1)</sup>. All this material greatly improves soils and make them easier to work with.
- Incorporates nitrogen into the soil. Nitrogen fixation in this species is approximately 62 kg/ha<sup>(2)</sup>, but the most important is the nitrogen content in the leaves, which is approximately 4.6% based on dry matter (see Table 1).
- Improves yield of corn. In previous studies it has been concluded that "the yields of grain corn were greatly increased as a result of the planting and incorporation of choreque. When planting and incorporating choreque, the effects of chemical fertilisers is not significant for local corn variety used in this trial"<sup>(1)</sup>.
- Protects the soil from rains. The coverage of choreque after more than 2 months of growth is 100% protecting the soil from erosion from water drops.

- Control weeds. The coverage of choreque is very thick and does not permit the sunlight to reach to the soil and so avoids stimulating the germination of weeds. Some weeds are eliminated by the greater growth of choreque, which covers them with its foliage and stems.
- Maintains soil moisture. The soil remains soft and easy to work, although land preparation takes more time due to the incorporation of choreque residues.
- Is tolerant to frost conditions. Frost occurs from December to February and choreque resists temperatures down to -2 °C without affecting its growth.
- Remains green during the dry season. Choreque remains green a great part of the dry season, covering the soil and providing fresh forage for animals.
- Is resistant to pests, tolerates drought and is adapted to poor soils. These characteristics makes this species ideal for the high elevation conditions where the alternatives are few in comparison to zones under 1500 masl.

#### Material and Methods

Choreque seed was obtained from Chimaltenango, Guatemala and planted in an area of 350 m<sup>2</sup> at La Esperanza in April. Distance between rows was 0.75 m and 2 seeds were planted per hill every 0.20 m. At this density, ≈1.5 kg of seed was used, 9 kg of 12-24-12 (NPK) fertiliser was utilised at planting (fertiliser was used for seed multiplication needs).

Germination occurred after 15-20 days. No treatment was given to the seed in this trial, however, in Guatemala, the farmers of the high plains of Chimaltenango, recommend sun drying the seed for 4 hours before planting to accelerate germination. Initial growth of choreque is slow but after 1 ½ months it grows very fast and covers the soil. Weeding was done twice with a hoe, the first one month after germination and the second one month later. Additionally, two irrigations were conducted since normally there are no rains in the month of April in this region. Then choreque grew without the need for any additional management and completely covered the soil in 2 ½ months.

#### Results

Two biomass measurements were conducted, the first during flowering in September. In this case, the contribution encountered was 95.5 t/ha of green material (fresh weight), which greatly exceeds the majority of legumes in the high elevation regions and is similar in yield to those reported for choreque in Guatemala<sup>(1)</sup>. The second measurement was done two months later obtaining 65 t/ha of green material (fresh weight). Foliage analysis based on dry matter is given in Table 1.

Seed was harvested in January, 9 ½ months after planting. 8.2 kg of seed was obtained from this plot, equivalent to 233 kg/ha. This yield was affected by excessive rains, especially during the months of flowering, which prevented pod formation. Observations at the garden level indicate that in a less

cold area, choreque produces seeds in a shorter time (3-4 months) and in greater abundance. After harvest, the plants began to dry slowly, but most interestingly maintained the soil cover during most of the dry season and the residue protected the soil from the sun and wind.

**Table 1: Foliage analysis of choreque (*Lathyrus latifolius*). Moisture content was 89%.**

N	P	K	Ca	Mg	Fe	Mn	Cu	Zn
% DM				ppm				
4.6	0.42	3.1	1.03	0.24	168	81	10	33

Source: Chemical-Agricultural Laboratory FHIA. La Lima. Honduras

### Observations on incorporation as green manure

Some small plots (6 m x 4 m) were planted on the same date (April) for observation of choreque as a cover crop. In this case only one weeding was conducted but with two similar irrigations. In this region, to incorporate choreque into the soil it is ideal to conduct it 4 ½ months after planting, when it is in the flowering stage. At the time of incorporation the foliage was slashed with a machete and then the beds prepared with a hoe incorporating the material, the beds were left for 2 weeks for decomposition to occur. The vegetables planted in these beds weighed more than ones planted in the plots without cover crops and with chemical fertiliser.

### Conclusions

- Choreque is a viable alternative as a green manure in rotations in the high elevation zones. It can be planted after potato or vegetables and incorporated at flowering. This rotation contributes to restoring the balance in soil fertility in the soils of this region and to gradually reduce the use of chemical fertilisers.
- In the zone of La Esperanza, it is less likely that farmers will be interested in cultivating choreque

with corn, since the legumes in common use are milpero beans (*Phaseolus vulgaris*) and chinapopo beans (*P. coccineus*), obtaining two or three edible crops in the same plot. Choreque is not edible.

- It may be useful to plant choreque in fallow lands to accelerate their recuperation and to produce seed.
- Due to the urgent need to improve the soils of this region, it is not recommended to use the land with choreque residues for animal grazing since the contribution of nutrients will decrease and soils will be compacted.

### References

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