

# THE COWPEA AS AN ALTERNATIVE IN FOOD SECURITY FOR THE RURAL SECTOR OF BUENAVENTURA

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## RESUMEN

En la vereda Zacarías se evaluó la adaptación de 8 variedades de frijol caupí (*Vigna unguiculata*) a las condiciones edafoclimáticas de Buenaventura, cuyas principales características: suelo ácido y de baja fertilidad, alta temperatura, baja insolación, alta precipitación y alta humedad relativa dificultan el crecimiento del frijol común (*Phaseolus vulgaris*). La siembra se hizo en un terreno perteneciente a la institución educativa Atanasio Girardot, quedando las plantas a 15 cm de distancia y dispuestas en surcos con separación de 50 cm, para una población final de 133.333 plantas por hectárea. La germinación ocurrió entre 5 y 6 días después de la siembra y la floración entre los 45 y 51 días, dependiendo de la variedad. La recolección de las vainas producidas se hizo una vez por semana, desde los 60 hasta los 104 días, sobresaliendo la variedad IT95K-52-34, con una producción de 1.212 kilogramos de grano por hectárea. Se concluyó que la facilidad de cultivo de esta leguminosa de alto valor nutricional, sumada a su alto rendimiento y al corto tiempo en que inicia su producción (70 días), la convierten en una alternativa para mejorar la seguridad alimentaria en el sector rural de Buenaventura.

## ABSTRACT

In the village of Zacarías the adaptation of 8 varieties of cowpea beans (*Vigna unguiculata*) to the edafoclimatic conditions of Buenaventura, whose principal characteristics, acidic soils and low fertility, high temperatures, low insulation, high precipitation and high relative humidity makes the cultivation of common beans (*Phaseolus vulgaris*) difficult. Planting was done on a piece of land belonging to la Institución Educativa Atanasio Girardot with the plants separated at 15 cm distance and the beds at 50 cm for final total population of 133.333 plants per hectare. Germination took place 5 to 6 days after planting and foliation 45 to 51 days after that, depending on the variety. Harvesting of the varieties produced was done once a week, from day 60 to day 104, with the variety IT95K-52-34 excelling with a production of 1.212 kilograms of grains per hectare. It was concluded that the ease of cultivation of this legume of high nutritional value added to its high performance and short production time of (70) makes it an alternative to improve the food security in the sector of rural Buenaventura.

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## INTRODUCTION

Food security refers to the permanent availability of innocuous and nutritional foods in sufficient quantities to lead a healthy and active life (FAO, 1996).

In Buenaventura, with a rural area that has a total extension of 99,64%, and with 73,67% of the population in conditions of poverty and misery (DANE, 2002, cited by Flórez and Millán, 2007), the need to encourage the planting of transitory crops for subsistence, that allow for the improvement of a nutritional diet in short periods, is evident.

The common bean (*Phaseolus vulgaris*) which is cultivated in short cycles and of a very complete nutritional level is one of the most consumed foods in Colombia, where its ancestral presence is manifested in varieties inherited from pre-Hispanic indigenous cultures, but is not planted in the Pacific region due to the adverse conditions of the climate and soil.

On the other hand, the cowpea (*Vigna unguiculata*) is a legume originally from Africa, with a high nutritional value, which is widely cultivated in Asia, but also in America (Brazil and Caribbean countries), due to its precocity, tolerance to dry climates and adaptation to acidic and low fertility soils.

In Colombia, the ICA (the Colombian Institute for Agriculture and Livestock) has done an important advance in the selection and improvement of this type of bean, which adapts to regions such as the Caribbean coast where the common bean is also not produced, generating varieties such as ICA-Mocarí and ICA-Calamarí among others, that the small scale farmers generically call "cuarentano" bean and black head bean. They plant it in monocropping or intercropping with other crops such as corn and cassava and they consume it as dry grains or green vines.

The present research consisted in planting an observation plot to evaluate preliminarily the adaptation of the cowpea to the edafoclimatic conditions of Buenaventura, whose principal characteristics are acidic soils of low fertility, high temperatures, low insulation, high precipitation and high relative humidity, conditions that hinder the growth of the common bean.

## MATERIALS AND METHODS

### Location

The evaluation took place in the installations of the educational institution Atanasio Girardot, located in the village of Zacarías, on the left bank of the Dagua river, at 18m.s.n.m., which presents the following average climatic conditions: annual precipitation 6.400 m; average temperature 25,8°C; relative humidity 87%; sunshine 3,3 hours daily (Eslava, 1994). The land used, of a silty clay loam texture and with a 3% slope, presented the following chemical characteristics: pH 5,06; Al=1,1cmol/kg; M.O.=9,6%; P=3,6ppm y K=0,09cmol/kg.

### Seed used

The seed of the 8 varieties evaluated were provided by the Genetic Resource Unit of CIAT (International Center of Tropical Agriculture), presented a germination of 100% and had the following identification:

Table 1. Varieties Used

VARIETY	CIAT CODE
1	277-2
2	1088-4
3	IT95K-52-34
4	IT97K-1069-6
5	288
6	2884-2
7	716
8	733

## Preparation of soil and planting

The preparation of the terrain consisted in adapting existing beds that measured between 12 to 14 m in length and 1, 0 m wide, for which the weeds were removed and the soil was tilled and mixed . The seeds were planted using one bed per variety, with a distance of 0.5m between rows (2 rows per bed) and placing the seeds at 5cm distance. By the following week all the seeds had germinated (Figure 1), but seedlings of varieties 1 and 8 were attacked by leafcutter ants that caused damage of 30 and 70% respectively, reason for which they were re-planted.

Figure 1.  
Germination (7 days after planting)



One week later, 80% of all the plantlings of variety 8 (adding the planting and re-planting) had disappeared since the ants started eating them from the moment they sprouted. In view that the other varieties were only affected between 20% (variety 1) and 0,3% (variety 6) and then proceeded to disperse, leaving on average one plant every 15 cm, for a density of 133,333 plants per hectare.

## MEASURED VARIABLES

For the description of the varieties evaluated, the following variables were measured: days of flowering, length of main stem, incidence of sickness and plagues, performance (kilograms of grain produced per hectare), length of pods,

number of grains per pod, weight of 100 seeds, ease of de-shelling, color and humidity of seeds.

For the harvest was used plots of 10 m<sup>2</sup>, after discarding the extremes of the beds, in which a weekly recollection of the pods that had acquired a yellow color was done. After drying the pods on the floor they were husked and after a second drying in the ambient, weighed them and a sample was put in the oven to determine the level of humidity. The total production of each variety was the sum of the weekly harvests.

## RESULTS

### Floration and length of the plants

In the varieties 2 and 6, blooming started at 45 DDS (days after planting) and the other varieties between 48 and 51 DDS. As all varieties were reported with type I growth habit (shrub Determined), the height of the plants were evaluated at the beginning of blooming, but with passing of time all continued to grow at an accelerated pace and as they acted like type III (Undetermined prostrate) it was opted to measure the total length of the main stem (Figure 2).

This change in the habit of growth can be attributed to the climatic conditions of the region, in a similar way to what occurs with the common bean, for which has been reported that, apart from the genotype, the factor that influence the most in the duration of the stages of development are, precipitation, temperature and luminosity (Fernández et al, 1985).

At 90 DDS (Figure 3), when the last measurement was taken, the lengths were as follows:

Figure 2.  
Appearance of the crop at 55 DDS



Figure 3.  
Appearance of the crop at 90DDS



Table 2. Length of the plant

VARIETY	CIAT CODE	STEM LENGTH (CM)
1	277-2	158
2	1088-4	136
3	IT95K-52-34	215
4	IT97K-1069-6	223
5	288	265
6	2884-2	196
7	716	169

## Pests and disease

Apart from the initial attack by the leafcutter ants, there was a presence of Chrysomelidae but in such small populations that they did not cause any notable damage. Additionally, in the sector of the corresponding bed to variety 1 there appeared a yellowing which can be associated with a lack of potassium.

## Harvest

The harvesting started at 60 DDS and prolonged until 104 DDS, keeping in mind that the same plant presented both blooms and pods at the same time (Figures 4 and 5). It was frequently observed that the pods not harvested in a week because they are not yellow, in the following week they had fungus that although in small quantities affected the quality of the rain (Figure 6).

Figure 4.  
Simultaneous production of flowers and pods



Figure 5.  
Pods in different states of maturity on the same cluster



Figure 6.  
Left and center: mature pods. Right: pod affected by fungus



## Yield

In table 3 is presented the partial weights (kg/ha) obtained in each weekly harvest. In this is amply highlighted variety 3 (IT95K-52-34) with a total production of 1.212 kg/ha obtained until 104 DDS, when the last harvest took place. In table 4 is presented some characteristics of the varieties such as length of the pods, number of grains per pod and ease of husking; the color and size of the grain is also associated in terms of weight per 100 seeds (Figure 7).

Table 3. Yield (kg/ha)

DDS	VARIETY						
	1	2	3	4	5	6	7
62	--	144	--	--	--	253	--
69	208	135	113	24	9	0	150
76	83	50	375	36	6	95	40
83	58	22	416	73	8	48	35
90	167	43	214	73	39	75	110
77	75	52	81	46	24	103	110
104	17	6	13	8	10	63	100
<b>TOTAL</b>	<b>608</b>	<b>452</b>	<b>1.212</b>	<b>260</b>	<b>96</b>	<b>637</b>	<b>545</b>

Figure 7.  
Appearance of the grain of variety IT95K-52-34

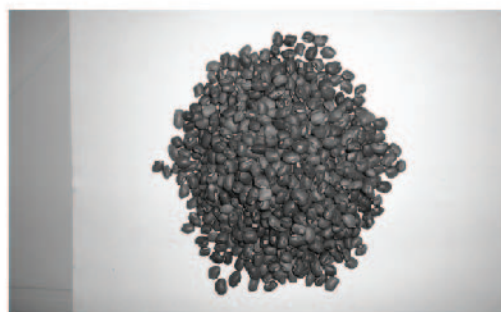


Table 4. Some characteristics of the varieties

CHARACTERISTICS	VARIETY						
	1	2	3	4	5	6	7
Longitud de la vainas (cm)	14	15	16	17	15	17	14
Granos por vaina	8,9	14,5	12,2	15,5	11,9	13,2	12,3
Peso de 100 semillas (g)	17,0	12,0	15,5	16,5	17,0	16,0	11,5
Facilidad para el desgrane	Muy difícil	Difícil	Fácil	Fácil	Difícil	Fácil	Fácil
Color	Blanco	Rojizo	Café- rojizo	Rojizo -café	Blanco	Rojizo -café	Blanco

### Culinary quality

With variety 3 (IT95K-52-34) a taste test was done using half of the harvested grain to prepare a stew, and the result was that out of 10 people consulted, 8 found the taste of the cowpea acceptable.

Apparently its preparation requires the use of less water than the common bean.

### Collection of the seed

The other half of the grain obtained of variety 3 (IT95K-52-34) was reserved for use as seed with the purpose of starting the cultivation of this promissory variety; however, when the germination test was done a viability of only 38% was found. As the seed provided by CIAT had a viability of 100%, it seems that the post harvest treatment was not adequate.

In this respect, Garay et al. (1992) recommends differentiating between seed production and the traditional practice of storing grains of the previous harvest for the next cultivation, and mentions that seed with high vigor and strength is obtained if after the physiological maturation, the agro-climatic conditions are dry, with which the bean dehydrates quickly and reaches harvest maturity in a short time. On the contrary, in warm climates, of high relative humidity and frequent rains, the pods rehydrate with each rain, reason for which they dry slowly giving as a result deteriorated seeds, low quality and, including, with phytosanitary problems.

### CONCLUSIONS

Variety 3 of the cowpea (IT95K-52-34) showed a better adaptation to the climatic conditions and soils of Buenaventura in terms of its high yield and tolerance to pests and disease. Additionally the pods presented ease of husking.

The ease of cultivation of this variety, its high yield and short production time (70 days) turns it into an alternative to improve the food security in the rural sector of Buenaventura.

The pods should be harvested 2 time a week and preferably towards noon to avoid that the excessive humidity favors the appearance of fungus that affect the pods and the grains.

For consumption the grains of all the pods can be used, but for seeds only the pods that change colour from green to yellow should be used (physiological maturity) and leave them to dry in the shade until they are completely yellow.

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