Evaluation of Large Seeded Bean in Brazil

M. Thung [1], H. Aidar, I. P. de Oliveira, J. Kluthcouski, J. L. D. Cabrera, and G. E. S. Carneiro
Embrapa Arroz e Feijão. Cx. Postal 179. 75.375-000 Santo Antônio de Goiás.Brazil

Brazil is the largest producer and consumer of dry bean (*Phaseolus vulgaris* L.) in the world. Bean is planted on 5 million hectares and produces 2.8 million t $year^{-1}$. An additional of several hundred thousand tons are imported from neighboring countries such as Argentine (black) and Bolivia (Carioca type). Small seeded bean of Meso-american race dominates the market such as Carioca (striped bean with creme background), black and too lesser extend mulatinho (cream) and Jalo (medium size yellow bean). Due to this exclusiveness of the grain types, any fluctuation in production reflects immediately in the consumer price of this important staple food. Unfortunately these grain types do not belong to any international market class, hence no supply is available when import is needed to satisfy the internal demand.

The demand for dry bean is increasing because of the population growth rate at 1.8% $year^{-1}$. To keep the annual consumption at 14 kg $capita^{-1}$, Brazil needs to increase yearly about 50 000 tons of beans or an equivalent to 250,000 hectare of new land to be planted with bean.

On the other hand varieties of medium to large seeded beans are sold in small quantities in the local market, where consumer preference varies from one region to the other. These beans command higher price (at least 50%) than the small seeded beans, which are classified according to international market class: Cranberry/Sugarbean, Calima type, large seeded yellow bean and white bean. White bean is exclusively imported from Argentine, about 15 000 t $year^{-1}$. These large seeded beans are mostly of Andean race and normally do not adapt to the tropical condition. CIAT has generated different market classes for the tropics and these lines are now available in Brazil.

The Brazilian Savannah during wintertime is expected to be suitable for large-scale bean production with high input and irrigation for these large seeded beans. This planting season offers an excellent growing condition because of less insect and pest incidence, allowing a healthier bean, produced with less agrochemical applications. Many farmers have irrigation system and plants bean with high technologies. For the large mechanized bean farmers, these large seeded give a new option for diversification and when the production is established, they can produce for export too.

Small farmers can also take the advantage in growing small quantity of these beans to supply the local market. This is a good alternative to escape the already crowded area in producing the traditional grain type among thousands of small and large farmers.

Eighty six advanced breeding lines were grouped into 5 market classes and each group was evaluated separately in a randomized block design with two repetition in a net plot size of 4.5 m^2. The common checks are IRAI (Sugar bean market class) and Jalo precoce (Manteigão market class). Group 1 =White seeded (26 lines), Group 2 = DRK and LRK (23 lines), Group 3 = Calima, Guali and Pompadour (19 lines), Group 4 = Cranberry and Sugarbean (10 lines) and Group 5 = Yellow (8 lines).

The experiment was conducted in Santa Helena/GO during winter 1999 on Oxisol with irrigation. Before planting the field was fertilized by 400 kg/ha of complete fertilizers of 4:30 :16 on corrected highly fertile soil under no till system for more than 10 years. Side dressing with N was given at 18 kg ha^{-1} N at 21 days after germination. Water was given at 40 mm/week and crop was protected against insect and pest for maximum yield potential.

In general, the adaptation of these large seeded beans in Savannah agroecosystem was good when planted in the winter season (May - August). Angular leaf spot, rust and powdery mildew incidence was low. White mold did not proliferated in this field because no tilled management used the *Brachiaria* as a cover crop that protects the soil surface. The main stem remained green into late physiological maturity, when the pod already scattered the seeds. This may be a limiting factor for mechanized harvesting. More genetic improvement is still needed.

[1] Supported by CNPq fellowship

Average yields (Table 1), in all groups, were very high, due to the high soil fertility, well irrigated and the small plot size (4.5m^2). About 20% discount should be made considering the commercial quality, where off color and seed-size has to be purged. On average bean yield of these large seeded is less than those Meso-american grain type (>4t ha^{-1}) under this farm condition.

Among the white seeded WAF 33, WAF 74, WAF 83 showed to be highest yielder, but in term of seed quality WAF 124 is the best. This line can compete with the Alubia bean from Argentine. In the group of the Dark and Light Red Kidney DRK 18, AFR 331, DOR 831 and DOR 837 were the outstanding lines. The outstanding lines from the Cranberry/Sugar bean group were DOR 868,SUG 31, MAM37 and AFR 245. The best seed quality was SUG 33, but with lower yield potential. In the Calima, Guali and Pompadour group, DOR 850, CAL 28, AFR 197, PVAD 791 and A 193 were the top yielders. The outstanding lines in the yellow seeded bean are A 195, BAN 30, G 9603, SIN 15 and A 463.

Table 1. Yield of selected large seeded breeding lines grouped in five market classes

Identification	Yield kg ha^{-1}	Market class	Identification	Yield kg ha^{-1}	Market class
White large seeded			**Dark and light Red Kidney**		
WAF 33	3781	Large white	DRK 18	4365	DRK
WAF 74	3592	Large white	AFR 331	4032	LRK
WAF 83	3169	Large white	DOR 831	3740	DRK
WAF 9	3078	Large white	DOR 837	3706	DRK
WAF 124	3017	Large white			
n= 28; Exp. mean = 3092 kg/ha; LSD 5%= 756.6 kg/ha; CV = 11.98%			n= 25; Exp. mean = 3090 kg/ha; LSD 5% = 610.0kg/ha; CV = 9.35%		
Cranberry and Sugar bean			**Calima, Guali and Pompadour**		
DOR 868	4018	Sugar bean	DOR 850	3660	Pompadour
SUG 31	3882	Cranberry	CAL 28	3492	Calima
MAM 37	3678	PINK	AFR 197	3428	Guali
AFR 245	3257	Cranberry	PVAD 791	3369	Calima
SUG 33	2821	Cranberry	A 193	3351	Guali
n= 12; Exp. mean = 2964 kg/ha; LSD 5% = 776 kg/ha; CV = 11.39%			n = 21; Exp. mean = 3010 kg/ha; LSD 5% = 975.2 kg/ha; CV = 15.1%		
Large yellow (Manteigão and Enxofre)					
A 195	3681	Manteigão	SIN 15	3221	Enxofre
Ban 30	3492	Manteigão	A 463	2744	Manteigão
G 9603	3367	Jalo			
n = 9; Exp. mean = 2980 kg/ha; LSD 5% = 861.3 kg/ha; CV = 12.12%					

These results showed that it is possible to produce good quality large seeded beans under tropical growing conditions, during the dry season with irrigation, provided the nutrient and water is not a limiting factor. Further studies are still needed to evaluate the performance of these beans in other growing seasons (September and March planting date). The cost benefit studies must be conducted before these large-seeded beans can be recommended to farmers.