SEED SUPPLY DEVELOPMENT
OF NEW TROPICAL PASTURE SPECIES IN COLOMBIA

J. E. FERGUSON

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1 Paper to be presented at Second International Herbage Seed Conference, Oregon State University, Corvallis, Oregon, USA, June 9-14, 1991.

2 Agronomist, Tropical Pastures Program, CIAT, AA 6713, Cali, Colombia.
I. INTRODUCTION

The high eastern plains of Colombia (altillamura in Spanish) include some 1 million ha of grassland savanna where the predominant production system is extensive cattle ranching based upon native grasslands. Since approx. 1980, extensive areas of Brachiaria decumbens have been established, initially by vegetative propagation then by seed. Levels of animal productivity are relatively low and the management systems are simple and involve many absentee owners. Kleinheisterkamp and Habich (1982).

In the more fertile piedemonte (or foothills) region, rice is the major crop, as well as cotton and sorghum, while soya beans are expanding. A well developed seed industry serves these agricultural crops and in addition offers grass seeds, some produced locally, or imported from Brasil.

Pasture research in the region has been centered traditionally at CNIA Carimagua with collaborative research by ICA and CIAT since the mid 1970’s. While early research emphasized animal health and herd management studies, the main thrust has been to improve the quantity and quality of forage. An extensive effort of plant introduction was followed by agronomic then animal evaluation of grass and legume species, planted either alone (grasses), or in associations. In addition to on-station experiments, series of on farm experiments and monitoring has been conducted to assess persistence, productivity and the economics of pasture improvement.

Based upon results of these efforts, several species, totally new to agriculture, the region and graziers, have been released by ICA. Included herein are the grasses, Andropogon gayanus ‘Carimagua’ released in 1980, Brachiaria dictyoneura ’Llanero’, in 1987, Brachiaria brizantha ‘La Libertad’, in 1983, and the legumes, Stylosanthes capitata ‘Capica’, in 1982. and Centrosema acutifolium ‘Vichada’, in 1987. see Tabla 1.
Official release of these new materials raised expectations of researchers for adoption and led to the initiation in 1989 of a technology transfer program organized by CRECED-Altillanura, based at Puerto Lopez. CIAT has provided technical assistance in establishment and management and in seed production activities in support CRECED.

This paper aims to describe and assess a seed project designed to support the pasture technology transfer initiatives in eastern plains of Colombia between 1989-1991, with a particular emphasis upon seed supply development experiences with cv Capica, cv Vichada and cv Llanero.

1. PROJECT ORIENTATION (OPERATIONAL METHODOLOGY)

A. Objectives

While the goal of the seed project was to initiate a flow of seeds to allow grazier adoption of new pastures species, specific objectives were:

- generate and deliver an initial seed supply of the most relevant materials for the farm pasture project of CRECED-Altillanura.

- increase and consolidate the participation of graziers and seed enterprises in activities of production, harvesting, conditioning and marketing of seeds of the new species and cultivars.

- identification of the principal constraints to an expansion of seed supply for the new species and cultivars and initiate relevant research.

- promote communication and interaction between the various possible participants in both research and development of improved pastures and also the production and marketing of seeds.

B. Materials. See Table 1.
C. Seed Generation Activities

Expansion of seed production was promoted by means of:

1. Self-production.

2. Share-farming with graziers.

3. Contract seed production. The contract specifies a maximum quantity field area at a defined value with a defined set of seed quality standards. The contract defines the responsibilities of both the multiplier and CIAT and also provides a summary of agronomic practices for seed crop management. The multiplier assumes all the costs and risks of production plus the implementation. CIAT provides basic seed, technical assistance and responds for purchase of seed which meet contract specifications.

4. Technical assistance to novice multipliers.

5. Managing or rotating Fund for seed production/purchase marketing.

6. Promoting the strategic role of seeds.

In the prevailing environment, (within research technology transfers and grazier circles), seed issues had little or no tradition and were rarely viewed in proper perspective. It was necessary to promote;

- seed as limited strategic resource, not available by purchase (as were other physical inputs such as, fertilizer, posts, etc.),
requiring a relevant priority in the overall planning of the pasture project, in seed distribution, etc. etc.

- seed delivery to selected graziers for a real (cash) value.

- primary utilization as basic seed (i.e. for multiplication) followed by utilization for plantings of pasture.

- the need to multiply basic seed, prior to release of new cultivars.

7. Seed distribution/Utilization.

Seeds generated by sharefarming, contract or purchase and received into the rotating fund were sold to the graziers selected as participants by CRECED. In addition, seeds were sold to pasture researchers conducting relevant projects.

8. Applied research on seed production technology.

This was conducted as a secondary and complementary activity to seed production.

Three main projects were: comparisons of harvest methods in B. dictyoneura; agronomic management of C. acutifolium; seed quality of B. dictyoneura.

In addition, the conduct of the entire project allowed progressive definition of real constraints to seed supply development particular to each species.

D. Participants

Such a diverse array of activities was aimed at an expanding number and range of participants see Table 2. These included the following groups;
1) Research - ICA
   - CIAT

ii) Technology Transfer - ICA-CRECED ALTILLANURA
   - Graziers Assoc. Fondo Ganadero del Meta
   Asociación de Ganaderos de
   Puerto López

iii) Selected graziers, as pioneer adopters of improved pastures and in
     some cases as share farmers in seed production

iv) Seed enterprises

v) Others - Banco Ganadero

II. RESULTS AND DISCUSSION

A. Seed Produced.

In the first three years of the project, a composite total of 55 tons of seed were produced, see Table 3. By far, the greatest proportion was of 'Capica', approx 38 tons i.e. 68%, followed by approx 0.6 tons of 'Llanero' 17% approx 4 tons of 'Vichada' i.e. 7%; and approx 3 tons of macrocarpum 5%. In 1990 (year 3), there was a significant production for the first time Arachis and a large increase in the production of 'Llanero'.

Over the three years, total production was very uniform, approx 18.5 tons/yr, the proportion of total production which was received by CIAT, as share of contracts or sharefarming, ranged from 48% (9 tons) to 33% (6 tons) with a tendency to decline in the third year.

Annual composite total production, during the first three years was very uniform approx 18.5 tons/yr. Of this total, the proportion which was received into the rotating fund of CIAT, (from both share farming and
the contract production agreements) range from 8.6 tons (46%), 9.0 tons (48%), and 6 tons (33%) for years 1, 2, 3 respectively. Thus, there was a tendency for a greater proportion to remain in the hands of multipliers in the third year.

The volumes of seeds not received into the CIAT rotating fund were principal of ‘Capica’ and ‘Llanero’. Most of the ‘Capica’ tended to be planted on farm by the same grazier while there was trading of ‘Llanero’.

B. Seed Utilization.

See Table 4.

C. Trends in Participation.

1. Selected grazier share farmers.

From the beginning of their on farm involvement, both CIAT and CRECED entered into, seed production sharefarming arrangements with some early adopting graziers. These graziers contributed land and management, while the project (CIAT and/or CRECED) contributed technical assistance and harvesting capacity. With two combines in the region, CIAT was in a strong position to contribute a pioneering harvesting capacity in return for 25-40% of the seed harvest.

The project benefited from these activities in many ways. Seed was generated in the realities of on farm seed production and crop performance and the constraints there to. Naturally, some graziers were not interested nor attracted to this new activity. They tended to ask for more and more contributions from the project, which soon became untenable.

Each year some graziers new to the project explored this sharefarming approach while a few who had had a successful first experience, continued. The project attempted to conduct sharefarming with those
gaziers with the best chances for success plus those judged to be likely to continue this activity. Efforts were then made to establish contacts between these graziers and existing seed enterprises the objective being that latter could replace the project in contributions such as harvesting, seed conditioning, technical assistance, and seed marketing.

2. CRECED Altillanura

In 1988 and 1989, CRECED-Altillanura utilized seed purchased from the CIAT seed project essentially for establishing improved pastures. In 1990, a significant modification of strategy was made whereby CRECED utilized approximately 30% of available seed of 'Capica' and 'Llanero' for the establishment of seed multiplication areas. In these cases, CRECED-Altillanura responded directly to the selected grazier for technical assistance, while CIAT provided technical collaboration to CRECED. In this way the pasture development project became more a more integrated seed-and-pasture development project. With this added input of technical assistance, the total number of seed multipliers increased to 17, due mainly to increased participation by graziers. (Table 2). This improvement in congruence between graziers participating in both seed production and pastures development is both highly logical and beneficial.

In the case of C. acutifolium 'Vichada', however, such congruence is not feasible because such congruence is not feasible because its seed production potential is higher outside the area of utilization as a forage (Table 3).

3. Seed enterprises.

All existing seed enterprises were offered production contracts the commencement of the seed project 1989. Initial participation was high, from a combination of curiosity and optimism. The offer of contracts definitely stimulated seed enterprise participation with these
new materials as it removed any risk associated with seed marketing. They were willing to assume the costs and risks of production. Most tended to accept new contracts with one or two materials only.

Most encountered difficulties immediately, reflecting the fact that they were not organized towards agricultural production. Contracts with such enterprises were very demanding of technical assistance from the seed project. Several contracts failed to result in successful establishment of field areas as consequence of poor site selection, bad access, failure at planting or from weed invasion. Conversely some enterprises performed very well. In 1990 an analysis was made of seed enterprise performance and attitudes and contracts were only offered to those judged most capable and interested.

When negotiating contracts, seed enterprises were encouraged to plant additional plans areas (i.e. without a contract). This was easy in the case of 'Llanero' but more difficult with 'Capica'.

'Vichada' provided the case with most production failures, mostly because of Factor X.

One enterprise, in addition to its contracts to the seed project with 'Llanero', became involved in share farming and contract harvesting with graziers. This was a very positive evolution in their evolution and illustrates the probable mode of expansion for most seed enterprises who wish to expand their non contact production.

In the context of their geographic relationship with the graziers of the CRECED project, seed enterprises fell in two groups. These were a) local or adjacent and b) external or distant. The local group tended to be more in contact with graziers and the CRECED project which was advantageous. The external or distant group tended to be seeking better locations for seed production than was available in the altillanura. This applied especially to 'Vichada', but in some cases to 'Llanero'. The seed project sought to explore production potential outside the
Altillanura, especially in the case of *Arachis pintoi* where potentials were unknown.

D. Individual Species Performance.

1. Capica.

In the case of *S. capitata* "Capica", total seed produced was 13 tons with all produced from within the same region where this species is recommended as a forage. Seed yields (pods) with combine harvesting from 13 areas of 11 ha average ranged from 23-298 kg/ha with an average of 125 kg/ha. As a seed crop, "Capica" is relatively easy to manage and harvest and provides high yields at minimum risk. Graziers can practice on-farm production, with harvesting capacity being their major limitation. Future levels of seed production are limited only by demand forces based upon graziers attitudes to "Capica" as a forage.

2. Vichada.

In the case of *C. acutifolium* "Vichada", total production was approximately one ton, with all production from outside the region of utilization as a forage (altillanura). Seed yields from 6 areas averaging 1.6 ha ranged from 39-350 kg/ha with an average of 106 kg/ha. Economic losses were again encountered from the dieback syndrome (Factor X). As a seed crop, "Vichada" requires intensive management and hand harvesting and is a high risk crop with variable seed yield. At present it appears that graziers have little chance for on-farm production in the high plains while specialized seed multipliers will require a lower cost production system to the post-wire support system. Only high and sustained demand from graziers for this species will allow resolution of these seed production limitations.

3. Llanero.
In the case of *B. dictyoneura* 'Llanero', a total of approximately 4.3 tons of classified seed was produced, both from within and outside the eastern plains. Yields of pure seed ranged from 3-122 kg/ha with an average 79, 30, and 60 for manual, beater, and combine harvesting, respectively. As a seed crop, 'Llanero' requires management to intensify flowering, plus a capacity for rapid harvesting. Graziers can practice on-farm production with the additional benefit of a long period of utilization for grazing. Demand for seed is strong, the material is widely distributed and production will continue to expand. Reduction of seed dormancy remains a problem.

E. Applied Research.
(PENDIENTE)

F. Constraints to Expansion of Seed Supply.

Further expansion of seed supply is limited by a diverse array of variables:

1. The slow nature of perennial pastures improvement.

To a traditional grazier, pasture improvement is an expensive step into the unknown. He has to face the cost, procurement and organization of, land preparation, fertilizers, fencing, seeds, labour and machinery. Only a few are prepared to accept these commitments and challenges. Some newer grazier-farmers are accustomed to the purchase of inputs but even they first explore the process in a limited area. This exploratory phase can take 2-4 years before conclusions are drawn. Perennial pasture improvement is thus a slow and prolonged process. Demand for seed is a derived sub-process. Thus only as pasture improvement gains momentum, will demand for seeds expand concurrently, reflecting a chicken and egg relationship between the two.

2. The nature of demand for seeds of pasture species.
3. The limited availability technical assistance.

As pasture improvement is a new activity for most graziers, they tend to seek or require technical assistance. Obviously there are severe limitations in resource allocation toward this objective, as well as in the number of technicians available with the necessary skills and experience.

Novice seed multipliers also want technical assistance in seed crop establishment, management seed harvesting and conditioning.

4. Low focus on seed issues by regional research and development institutions.

5. Actual seed production of each material.

In general, the total novelty of the new legume species tended to restrict initiatives in their seed production. The lack of known individual identity for each new species was very negative in this regard as it complicated perspectives of future demand.

On farm seed production within the altillanura has been shown to quite feasible with Capica and Llanero, but not with Vichada. With Capica, graziers first encounter difficulties in obtaining contractors with combines for seed harvesting, followed by a lack of seed conditioning to remove weeds (Paspalum panicum and Sida spp. especially). They also have limited contacts for marketing. With Llanero, they also have harvesting problems, to contract either combines or beater harvesters for a crop with a very short period of harvest maturity. Seed conditioning is also required to remove empty spikelets. Crop management must also be timely, a fact that graziers tend to underestimate.

Seed production by seed enterprises evolves only as the enterprise become aware of or assumes increasing demand for seed from graziers.
Their involvement tends to start in the share farming context, by their conducting harvesting, then expanding into seed conditioning and marketing.

6. On-farm seed production and graziers.

7. Seed production by seed enterprises.


Technical assistance to CRECED will be continued. They will be encouraged to concentrate grazier multipliers in adjacent groups to facilitate the involvement of contract seed harvesters.

CRECED will be encouraged to expand their technical assistance to multipliers, such a strategic will progressively increase the proportion of seed available from on farm production by participating graziers.

Contract seed production will be continued only with enterprises that have demonstrated a production capacity. Contracts will be reduced with 'Capica' and 'Llanero' because of the evolving product identity and market expanding seed. In the case of C. macrocarpum, contracts will be suspended until seed inventory is reduced. With Arachis pintoi, contracts will be expanded but only in with those enterprises with a harvest capacity in favoured region and sites.

Share farming will be reduced drastically and phased out. It is too demanding on CIAT-SPS for direct participation in harvesting and too costly for combine maintenance. This activity has served its pioneer role and will be surplanted by increasing participation from a few seed enterprises.
IV. CONCLUSIONS

1. On-farm technology transfer projects in pasture improvement, involving new species, require a seed generation component from the point of initiation. Seed production activities should be the priority in the initial years and should have priority access to available seed stocks. Ideally, therefore, such programs should be integral pasture-and-seed development activities.

2. Integral pasture and seed projects should seek maximum congruence between graziers participating in pasture and seed activities. Such a strategy should maximize the efficiency of utilization of initial seed stocks, mobility and technical assistance.

3. Contract seed production and share farming agreements are relevant and powerful seed generation (or procurement) mechanisms, capable of contributing significantly to both, a rapid rate of seed generation and the involvement of an expanding number of new multipliers.

4. A Rotating Fund for seed production/purchase/marketing is a powerful operational mechanism, providing flexibility not normally associated with a research budget. In addition to expanding seed supply, the Fund can contribute significantly to the initiation of market in the new product.

5. Each new species has a particular blend of merits and constraints, both as a forage and as a seed producer. One cannot generalize about the prospects for seed supply development of different species. New grasses, such as B. dictyoneura, have the advantage that other Brachiarias are well known to graziers. On the other hand, new legumes, have no consumer credits to draw upon and their novelty may even be negative. Each species is a different challenge.

6. Species which cannot produce seed within the area of utilization as a forage (e.g. Vichada) are at a distinct initial disadvantage. Only very strong and sustained demand will allow production and marketing channels to evolve in a different geographic region.
7. Only real (or actual) demand for seeds from graziers (based upon their perception of the value of each new species as a forage within their production system), will drive the seed generation system at the commercial level. With species cv such as Llanero and cv Capica, this process is gaining momentum, but with cv Vichada the process awaits clearer demonstration of its merit as a forage (especially persistence).

8. New multipliers of new species need time (1-3 yrs) to explore both the agronomic-production process as well as marketing prospects, before expanding production.

Early adopting graziers, wanting seeds for planting on their own farms as part of their own pasture development plans, are not concerned with seed marketing. Therefore, this group should be targeted for initial technical assistance in seed production.

Establishment seed enterprises will only consider seed production of new species, if they are confident of real demand, the production process is comparable with their existing seed products (crops, rice) and not associated with higher risks.

9. The strategy of conducting applied research projects in conjunction with on-farm seed production and with the participation of new multipliers, was highly effective.

10. Seed production research was secondary activity in the total project to date. The analysis of constraints for each species, conducted after five years of on farm experience, will allow efficient use of scarce resources for future seed production research.

V. ACKNOWLEDGMENTS

The technical contributions of J.A.'s. Manuel Sánchez, Carlos Iván Cardozo and Sigifredo Salgado are gratefully acknowledged.
VI. REFERENCES


A seed project was initiated to support a technology transfer project directed towards pasture improvement by graziers in the high plains (altillanura) of eastern Colombia. Pasture improvement was to be based upon recently released novel species of grasses and legumes where in most cases, seeds were not available commercially.

The objectives of the seed project were: a) to generate an initial seed supply for the pasture project, b) to increase the participation of both graziers in and seed enterprises seed production and marketing, c) to conduct some seed production applied research. d) to identify constraints to the progressive expansion of seed supply.

The activities of the seed project were very diverse and dynamic including: a) Promotion of seed production by means of participation in sharefarming agreements with selected early adoption graziers; organizing seed production contracts with seed enterprises; providing technical assistance to novice multipliers; managing a rotating fund for seed production and marketing: promoting the strategic role of seeds in pasture research and development. b) Seed distribution. c) Applied research in seed production technology. Such activities involved a range of participant groups including; transfer agents, researchers, graziers, grazier associations and seed enterprises. Participation by each group was dynamic.

In the first three years of the project, some 55 t of composite seed were produced and utilized between the pasture project and various pasture research projects. The largest volumes were of Stylosanthes capitata 'Capica' (38 t); Brachiaria dictyoneura (9.6 t); Centrosema acutifolium 'Vichada' (4 t). Composite annual production was uniform at approx 18 t/yr, while the net proportion that was received into the rotating fund varied from 47% to 33% between 1989 and 1990.

Contract seed production was undertaken by eight enterprises, of which three have continued with open market production. This reflects in part
the fact that the majority of seed enterprises are not orientated
towards seed production. One enterprise only has begun to share farm
with graziers in the production of 'Llanero'. Several graziers have
explored sharefarming and have been successful with seed production of
'Capica' and 'Llanero'.

Several graziers have explored sharefarming and have been successful
with seed production of 'Capica' and 'Llanero'. The managerial
requirements and performance of key species has been better defined.
Capica' can be produced on-farm with a minimum of management
requirements and risk. Seed supply is expanding and the project can
terminate its production role. 'Llanero' can also be produced on farm,
with moderate management requirements and risks. Supply is expanding
and the project can terminate its direct role in production. 'Vichada'
cannot be produced in the altillanura and until this legume shows more
peristance it is improbable that demand levels will induce out of
region seed production by specialist multipliers. Arachis can produce
high seed yields but with high costs of recovery from the soil so
production must be sited on sandy soils with continuous moisture
availability. Many graziers will proceed with vegetative propagation
until the economics of seed production and marketing become better
defined. Production targets of C. macrocarpum were easily attained by
contract production in a well selected region.

The Rotary Fund allowed a research institution to take initiatives to
promote commercial seed production required a progressively market
orientation by the seed project. An initial cycle of applied research
experiments were conducted within production fields and with the
collaboration of the novice multipliers, an operational mode which was
highly beneficial.

General and fundamental constraints to furthur seed supply development
include the following: a) The inherent, slow and complex nature of
perennial pasture improvement in a region of traditional grazing of
native pastures. Until this process gains momentum and generates higher
levels of real demand from graziers, seed production will remain nacent
and confined to a few progressive early adopting graziers. b) The limited availability of technical assistance for pasture establishment and management of pastures and/or seed fields. Most graziers want assistance to explore these processes in a progressive manner. c) From the viewpoint of graziers, the legume species have low levels of individual utility and identity, which consequently restricts demand for their seeds.

VIII. SHORT ABSTRACT

A seed project was initiated to support a technology transfer project directed towards pasture improvement by graziers in the high plains (altillanura) of eastern Colombia. Pasture improvement was to based upon recently released novel species of grasses and legumes but in most cases their seeds were not available commercially. The objectives of the seed project were; a) to generate an initial seed supply for the pasture project, b) to increase the participation of both graziers and seed enterprises in seed production marketing, c) to conduct some applied seed production research, and d) to identify constraints to the progressive expansion of seed supply. The activities of the seed project were very diverse and dynamic including: a) promotion of seed production by both sharefarming and contracting. b) seed distribution. c) applied research on seed production technology. Such activities involved a range of participant groups including; transfer agents, researchers, graziers, grazer associations and seed enterprises.

In the first three years of the project, some 55 t of composite seeds were produced with an annual average of 40% being purchased by a rotating fund of the seed project. The largest volumes were of Stylosanthes capitata 'Capica' (38 t); Brachiaria dictyoneura 'llanero' (9.6 t); Centrosema acutifolium 'Vichada' (4 t). Contraints to further seed supply development include the following: 1. The inherently slow and complex nature of perennial pasture improvement in a region of traditional grazing of native pastures. 2. The limited availability of technical assistance for establishment and management of either pastures
or seed yields. 3. From the viewpoint of graziers, the legume species have low levels of individual utility and identity, which consequently restricts demand for their seeds. 4. Each species has different degrees of difficulty and risk in the conduct of actual seed production. 5. Graziers who wish to conduct on-farm seed production face limitations in their capacity to harvest, condition and market seeds. 6. Seed enterprises require the prospect of a larger volume of sales before they initiate open market production. 7. Many participants in technology transfer and on-farm research initially fail to allocate sufficient priority and resources to generate seeds within their projects.
Table 1. Species, cultivars and accessions (materials) involved in seed project.

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Genetic Status</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a) GRASSES</strong></td>
<td></td>
</tr>
<tr>
<td>Brachiaria brizantha</td>
<td>cv La Libertad</td>
</tr>
<tr>
<td>Brachiaria dictyoneura</td>
<td>cv Llanero</td>
</tr>
<tr>
<td><strong>b) LEGUMES</strong></td>
<td></td>
</tr>
<tr>
<td>Arachis pintoi</td>
<td>Accession CIAT 17834</td>
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<tr>
<td>Centrosema acutifolium</td>
<td>cv Vichada</td>
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<tr>
<td>Centrosema macrocarpum</td>
<td>Accession CIAT 5713</td>
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<tr>
<td>Desmodium ovalifolium</td>
<td>Accession CIAT 13089</td>
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<tr>
<td>Stylosanthes guianensis</td>
<td>Accession CIAT 184</td>
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<tr>
<td>Stylosanthes capitata</td>
<td>cv Capica</td>
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Table 2. Participants.

<table>
<thead>
<tr>
<th>Participant Group</th>
<th>Name</th>
<th>Role/Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Pasture research</td>
<td>1 ICA</td>
<td>Pasture Research, (OFR)</td>
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<td></td>
<td>2 CIAT</td>
<td>Cultivar Release</td>
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<td></td>
<td></td>
<td>Initial Seed Stocks</td>
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<tr>
<td>B Technology transfer</td>
<td>1 ICA-CRRCD-Altillamura</td>
<td>Technical Assistance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and Promotion</td>
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<tr>
<td></td>
<td>2 Graziers Associations of Puerto López</td>
<td>Receive payments for seeds</td>
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<tr>
<td></td>
<td>3 Graziers Fund for Meta</td>
<td></td>
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<td>C Selected, early</td>
<td>(Various)</td>
<td>Pasture Development</td>
</tr>
<tr>
<td>adopting graziers</td>
<td></td>
<td>On-farm seed production and sharefarming</td>
</tr>
<tr>
<td>D Seed enterprises</td>
<td>(Various)</td>
<td>Seed marketing</td>
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<td></td>
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<td>Exploratory seed production</td>
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<td>E Agro-livestock</td>
<td>Banco Ganadero</td>
<td>Training</td>
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<td>service sector</td>
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<td>Finance</td>
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21
Table 3. Total seeds production and CIAT net share of the various materials, during the period 1988-1990.

<table>
<thead>
<tr>
<th>Material</th>
<th>Gross production</th>
<th>CIAT's net share</th>
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<tr>
<td></td>
<td>(kg)</td>
<td>(kg)</td>
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<td>A) GRASSES</td>
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<tr>
<td>Brachiaria brizantha</td>
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<tr>
<td>Brachiaria dictyoneura</td>
<td>2,639</td>
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<td>Subtotal</td>
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<td>2,818</td>
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<td>B) LEGUMES</td>
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<td>ALL MATERIALS</td>
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<td>18,591</td>
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</tbody>
</table>
Table 4. Summary of seed utilization.

<table>
<thead>
<tr>
<th>Descriptor</th>
<th>(Units)</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. CIAT ROTATING SEED FUND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Total inventory (KG)</td>
<td>606</td>
<td>8,601</td>
</tr>
<tr>
<td>2. Sales via CRECKD (KG)</td>
<td>0</td>
<td>2,330</td>
</tr>
<tr>
<td>3. Sales to others (KG)</td>
<td>606</td>
<td>2,982</td>
</tr>
<tr>
<td>4. Carry-over (KG)</td>
<td>0</td>
<td>3,289</td>
</tr>
<tr>
<td>B. FIELD ESTABLISHMENT BY CRECKD-ALTILIANURA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Improved pastures (HA)</td>
<td>0</td>
<td>990</td>
</tr>
<tr>
<td>2. Seed areas (HA)</td>
<td>0</td>
<td>114</td>
</tr>
</tbody>
</table>
Table 5. Comparison of some determinates of commercial seed production of two pioneer legumes in Colombia.

<table>
<thead>
<tr>
<th>Descriptors</th>
<th>( S. ) capitata 'Capica'</th>
<th>( C. ) acutifolium 'Vichada'</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Units)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Actual release, (year)</td>
<td>1982</td>
<td>1988</td>
</tr>
<tr>
<td>2. Seed produced 1985-1989, (tona)</td>
<td>13</td>
<td>1.5</td>
</tr>
<tr>
<td>3. Management requirements</td>
<td>minimal</td>
<td>high</td>
</tr>
<tr>
<td>4. Seed yield potential within RUF (Altillanura)</td>
<td>high</td>
<td>low</td>
</tr>
<tr>
<td>5. Risk level as seed crop within FSPR</td>
<td>minimal</td>
<td>high</td>
</tr>
<tr>
<td>6. Actual seed yields, range, (kg/ha)</td>
<td>75-125</td>
<td>39-350</td>
</tr>
<tr>
<td>average, (kg/ha)</td>
<td>125</td>
<td>106</td>
</tr>
<tr>
<td>7. Average multiplication rate, (kg/ha/yr)</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>8. Production cost, (US$/kg)</td>
<td>2-4</td>
<td>8-12</td>
</tr>
<tr>
<td>9. Market value 1989, (US$/ha)</td>
<td>8-10</td>
<td>12</td>
</tr>
<tr>
<td>10. Pasture establishment seed costs to grazier, (US$/ha)</td>
<td>16-20</td>
<td>24-36</td>
</tr>
</tbody>
</table>

FSPR = favoured seed production region.
RUF = region of utilization as forage.