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PN-ACK-983

DISSEMINATION AND ADOPTION OF NEW TECHNOLOGY: A REVIEW OF EXPERIENCES IN BEAN RESEARCH IN EASTERN AND CENTRAL AFRICA, 1992-1996

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Occasional Publications Series, No 21

April 1997

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Correct citation:

S. David, 1997. Dissemination and Adoption of New Technology: A Review of Experiences in Bean Research in Eastern and Cental Africa, 1992-1996. Network on Bean Research in Africa, Occasional Publications Series, No. 21. CIAT, Kampala, Uganda.

PREFACE

This volume is the twenty-first in a working document series that serves research on common bean (*Phaseolus vulgaris*) in Africa. The objective of this report was to review the experiences of member countries of the Eastern and Central Africa Bean Research Network (ECABREN) in disseminating technology and documenting the adoption of new bean varieties from 1992 to 1996. Member countries of the Network are: Burundi, Ethiopia, Kenya, Madagascar, Mauritius, Rwanda, Sudan, Tanzania, Uganda and Zaire. During the period under review much of the bean research that had been launched or reinvigorated during the late 1980s, as a result of generally higher priority accorded this crop by national research systems and of support provided by regional bean networks, started coming to fruition in the hands of farmers. While most of the individual studies reviewed here are available in full elsewhere, this is an appropriate time to assemble an interim regional summary of the status of the initial impact of research. This review, which includes strategic studies on non-formal dissemination methods carried out by CIAT, also allows conclusions and recommendations to be drawn that should help improve the effectiveness of future strategies for technology development and dissemination.

The Network on Bean Research in Africa serves to stimulate, focus and coordinate research efforts on common bean. The network is organized by CIAT in collaboration with two interdependent sub-regional networks of national programs: the Eastern and Central Africa Bean Research Network (ECABREN) and the SADC Bean Research Network (SABRN) for southern Africa.

Financial support for regional bean projects comes from the Canadian International Development Agency (CIDA), the Swiss Agency for Development and Cooperation (SDC) and the United States Agency for International Development (USAID).

Working documents include bibliographies, research reports and bean network discussion papers. These publications are intended to complement two associated series of Workshop Proceedings and Reprints.

Further information on bean research in Africa is available from:

Pan-Africa Coordinator, CIAT, P.O.Box 6247, Kampala, Uganda.

Regional Coordinator, Eastern and Central Africa Bean Research Network, P.O. Box 2704, Arusha, Tanzania.

Regional Coordinator, SADC Bean Network, P.O.Box 2704, Arusha, Tanzania.

ACKNOWLEDGEMENTS

CIAT, and the author, wish to express their appreciation to all those colleagues and collaborators in the Eastern and Central Africa Bean Research Network (ECABREN) whose efforts and ingenuity in developing, promoting and assessing bean technology are cited and summarized here. Without their achievements this publication would have been neither necessary nor possible. We also extend this appreciation to those collaborators, including institutions and individuals not mentioned by name, whose work it has not been possible to treat adequately in this pubication.

This publication was made possible also through support provided by the Canadian International Development Agency (CIDA); the Swiss Agency for Development and Cooperation (SDC); and the Office of Agriculture, Bureau for Research and Development, U.S. Agency for International Development (under Grant No. LAG-4111-G-00-2025-0). The opinions expressed herein are those of the authors and do not necessarily reflect the views of these contributing donor organizations.

PUBLICATIONS OF THE NETWORK ON BEAN RESEARCH IN AFRICA

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No. 7. Proceedings of Second Workshop on Bean Research in Eastern Africa, Nairobi, 5-8 March 1990.

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DISSEMINATION AND ADOPTION OF NEW TECHNOLOGY: A REVIEW OF EXPERIENCES IN BEAN RESEARCH IN EASTERN AND CENTRAL AFRICA, 1992-1996

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INTRODUCTION

The success of any new agricultural technology is judged ultimately by its adoption and acceptance by farmers and consumers and the positive changes it brings about at household, local, national and regional levels. Obviously, problems with dissemination reduce the adoption and impact of even the most acceptable new technology. Yet, dissemination constitutes a recognized weak point in the technology development process in most of sub-Saharan Africa. In bean research this bottleneck is largely attributed to the low priority given by the formal seed sector to beans and the absence of more suitable seed suppliers. While it is clear that the spread of crop and soil improvement technologies must take place largely through non-formal means, appropriate strategies and procedures for speedy diffusion are still the subject of research. This report reviews the experiences of member countries of the Eastern and Central Africa Bean Research Network (ECABREN) in disseminating technology and documenting the adoption of new bean varieties from 1992 to 1996. Member countries of the Network are: Burundi, Ethiopia, Kenya, Madagascar, Mauritius, Rwanda, Sudan, Tanzania, Uganda and Zaire.

The report consists of separate sections on dissemination and adoption. The discussion in Part 1 covers bean seed distribution as well as efforts to popularize bean production, soil and crop improvement technologies. In Part 2, each country section summarizes research findings on adoption and impact, and plans for future studies.

BEAN SEED PRODUCTION IN EASTERN AFRICA

During the review period, approximately 69 bean varieties were widely available through informal and formal seed channels in eight countries. Notably, however, few of these improved cultivars were available to farmers prior to the late 1980s. At least 23 of the 69 varieties were released or first disseminated to farmers between 1992 and 1996 (Appendix 1). In all countries in the region, the formal seed industry plays at best a limited role in supplying bean seed due to numerous factors which make large-scale multiplication of this self-pollinating crop uneconomical. Formal sector production of bean seed varies considerably in terms of the type of supplier (government vs private) and method of production (small and large scale contract farmers, state farms) (Table 1). The output of certified bean seed is often irregular and, in most cases, is limited to a few varieties with commercial value.

Table 1: Production of bean seed by the formal seed industry in selected East African countries, 1996

	Uganda	Kenya	Tanzania	Ethiopia
Name and type of supplier	Uganda Seed Project (parastatal)	Kenya Seed (parastatal) and other private suppliers	TANSEED (parastatal)	Ethiopian Seed Enterprise (parastatal)
Number of varieties produced	4	3	3	2
Packaging quantity	5&10 kg	2 kg	100 kg	15&100 kg
Mode of seed multiplication	Small-scale contract farmers	Large-scale contract farmers	State-run seed farms	State-run seed farms

PART 1: DISSEMINATION OF NEW BEAN VARIETIES

Given the limited production of bean seed by the organized seed sector, the distribution of newly released bean varieties in the East African Region routinely takes place through two channels: the national extension system and non-governmental organizations (NGOs). Other channels are less widely used (Table 2).

Table 2: Use of diverse seed distribution channels in selected countries

	Rwanda	Zaire	Burundi	Uganda	Tanzania	Ethiopia	Kenya
Extension	H	L	M	H	H	H	M
NGOs/ agricultural projects	H	H	H	L	L	H	M
Sale through formal commercial channels	NA	NA	NA	M	L	L	H
Farmer groups	M	M	M	L	L	L	M

Codes: H = High; M = Moderate; L = Limited

National extension systems

All national agricultural research systems (NARS) in the region rely on the national extension system to disseminate new bean varieties to farmers and most depend on this channel exclusively. Typically, the researcher-extension-farmer delivery approach involves four stages: 1. seed production at high cost at research stations or other multiplication sites, 2. delivery of the seed to district officials, 3. delivery of the seed to extension agents, and 4. selection of farmers for free distribution or demonstrations. Normally, seed is delivered once in a given locality and in some cases (Tanzania), seed exchange schemes are set up. The rationale behind this approach to technology dissemination is the belief that small farmers cannot afford or risk buying seed of new bean varieties. The quantity of seed provided to individual farmers through the extension sytem usually varies between 500 g to 4 kg, although in Tanzania some farmers received up to 12 kg.

Between 1989 and 1993 the Tanzanian National Bean Program achieved great strides in technology dissemination by distributing 4.8 tons of seed of Lyamungu 85 to over 1000 farmers in four regions (Table 3). This program was discontinued due to insufficient funds (Mmbaga, 1996). More recently bean seed has been distributed through the extension system in Babati District. In 1995 the Uganda National Bean Program, with funding from USAID, multiplied and distributed, mainly through the extension system in 22 or the country's 33 districts, 9 tons of 5 newly released bean varieties. The cost of production alone was approximately $30,000. The Bukoba District Rural Development Project is one of the few examples of a government institution which multiplied bean seed (Lyamungu 90) and distributed it outside of the extension system, that is, through agricultural shops and stockists.

Table 3: Distribution of Lyamungu-85 in four regions of Tanzania, by amount of seed (kg) and number of farmers, 1989-1993*

Region	Arusha		Kilimanjaro		Kagera		Tanga		Total	
	Seed (kg)	No. of farmers	Seed (kg)	No. of farmers	Seed (kg)	No. of farmers	Seed (kg)	No. of farmers	Seed (kg)	No. of farmers
1989	100	30	100	30	30	27	100	40	330	127
1990	557	75	200	30	70	43	800	163	1627	311
1991	540	44	500	214	20	12	510	105	1570	375
1992	200	30	200	30	170	75	500	40	1070	175
1993	0	0	10	10	20	13	200	37	230	60
Total	1397	179	1010	314	310	170	2110	385	4827	1048

* Two modes of distribution were used: on-farm varietal trials and direct distribution, with the latter used to distribute the largest quantity.

Source: Mbaga et al., 1996

Non-governmental organizations

Seed distribution through NGOs takes two forms: research institutions collaborate with NGOs in seed delivery (in some cases the seed is produced by the national bean program, as in Rwanda and Uganda) or NGOs on their own initiative buy seed and distribute or sell it to farmers (Ethiopia, Tanzania, Uganda). NGOs involved independently in bean seed distribution include the On-Farm Productivity Enhancement Project (OFPEP, in Kenya and Uganda), Concern (Uganda), ActionAid (Tanzania), FARM Africa (Ethiopia), Freedom from Hunger Campaign-Action for Development (Ethiopia) and SOS-Sahel (Ethiopia). Since monitoring the latter type of activity is difficult, the present discussion is limited to NARS-NGO collaboration.

Few national programs collaborate closely with NGOs and development projects to distribute new varieties. The Agricultural Project of Karama in Rwanda collaborated with the National Bean Program in multiplying (using contract farmers) and distributing large quantities of improved climbing bean seed through agricultural stores and markets (Sperling et al, 1995). In 1994 and 1995 the Mount Elgon Conservation and Development Project in eastern Uganda in collaboration with bean researchers distributed small quantities of three Rwandan climbing bean varieties (Umubano, Gisenyi and Urunyumba) to bean farmers in the mountains of Mbale District (Hoogendijk and David, 1997).

In 1996, the Tanzanian National Bean Program in collaboration with CIAT received a USAID technology transfer grant to sell seed of three new varieties (Lyamungu 85, Lyamungu 90 and Selian 94) through a seed stockist program initiated by Sasakawa Global 2000, an international NGO operating in Tanzania. This pilot program offers training and credit guarantees to small rural shopkeepers to enable them to purchase agricultural inputs from district-level supply agents. Stockists in Arusha, Kilimanjaro and Tanga Regions received one-kilo packets of bean seed in the first season of 1996 containing an informational leaflet in Kiswahili and a technical bulletin describing the varieties to enable them to promote them. This exercise will be conducted over two seasons as an insurance against involuntary seed loss and to ensure high adoption rate. Sale proceeds will go into a revolving fund that will be administered by the National Bean Program, thereby ensuring sustainability.

Efforts to popularize new seed types

Farmers in most parts of Eastern and Central Africa show strong perferences for relatively specific seed types. Some notable examples of strong market class preferences are Calima types in Uganda and Kenya, Pintos in Kenya, medium purple (Kablanketi) in Uganda and Tanzania, small to medium reds, brown speckled and white pea beans in Ethiopia. For the most part, the preference is for medium to large grain. In cases where unfamiliar or unappreciated seed types are introduced, strategies have been devised to popularize the new cultivars. In Kenya and Uganda, use of non-preferred seed types and new cultivars in bean samozas is being promoted. Also in Uganda, researchers gave small quantities of seed of MCM 5001, an unfamiliar Carioca seed type, to market vendors with the objective of establishing demand for this new variety among urban consumers. All traders sold MCM 5001 for Ush. 500/kg ($U.S.0.50) compared to Ush 700-900/kg ($U.S.0.70-0.90) for popular varieties. They recommended selling new seed types during periods of shortage and immediately after the harvest when bean prices are lowest.

LIMITATIONS OF CURRENT SEED DISTRIBUTION STRATEGIES AND IMPLICATIONS FOR ADOPTION

The involvement of commodity research programs in widespread bean seed multiplication and dissemination, while often necessary, is neither economically feasible nor sustainable. Seed production and delivery efforts should be geared toward widespread, cost-effective dissemination with minimal emphasis on seed quality. The conventional, linear extension-farmer approach to the distribution of bean seed used by NARS is expensive[1] and often fraught with logistical and other difficulties, usually resulting in untimely delivery to a few farmers. Moreover, where farmers find it difficult to retain seed of new cultivars due to adverse agro-environmental conditions (drought, poor storage, etc.) and socio-economic constraints, repeated seed delivery through the extension system is unlikely to be cost-effective. There is also the potential problem of conflict between using the extension system for both varietal testing and diffusion, since in some cases, due to disappointing experiences with test varieties, farmers have shunned improved seed distributed by extension agents (Cromwell, 1990). Free distribution of bean seed by NARS and NGOs creates expectations and dependence on the part of farmers which may have negative implications for adoption. David and colleagues (1996) suggest that the sale and consumption of well regarded test varieties by some Ugandan trial farmers reflects expectations on their part that extension agents would provide them with a regular supply of seed.

While NGOs often provide an excellent channel for seed distribution, there are drawbacks to relying largely on these insitutions as outlets for new bean varieties. The shortage of agriculturally-oriented NGOs in some countries, the absence of NGOs in certain regions of a country and suspicion on the part of some smaller, local NGOs toward new crop varieties are some of the disadvantages worth noting (David et al., 1997).

SEED PRODUCTION BY FARMER ENTERPRISES

Alternatives to formal, centralized bean seed production are needed, in view of the absence or limited input by the formal seed sector and unsustainable seed production efforts by NARS. Since 1994 CIAT's regional social scientist has supported efforts by three farmer groups in Uganda to produce bean seed on a commercial basis (CIAT, 1994; 1995). The objectives of this research are to assess the feasibility of seed production by farmers, develop training materials and appropriate post-harvest equipment for use by farmer seed producers and identify legal restrictions to on-farm seed production. Farmer seed enterprises are intended to form part of a seed production system which integrates local and formal seed systems, whereby small farmers undertake specialized production of bean seed with input of improved varieties from the formal seed sector. Table 4 presents a summary of the amount of seed produced by three farmer seed enterprises.

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[1] For example in Uganda, at an estimated US$1-3 per kg, the cost of seed production under researcher conditions is prohibitive.

Table 4: Bean seed production by farmer seed enterprises over six seasons, 1993B-1996A[1]

Group	Total quantity of seed produced[2] (kg)
Ikulwe Bean Farmers' Association (IBFA)	2493
Makhai Women's Group	387
Budama Women's Group	402
Total	3282

[1] The IBFA has operated for six seasons, multiplying three varieties: MCM 5001 and CAL 96 and K20 (one season only). The other two groups have produced seed of MCM 5001 and CAL 96 during three seasons.
[2] Excludes seed replanted each season.

Nearly all of the seed produced is sold locally[2] within a period of 2-6 months after each havest for Ush 600-1200/kg (US$ 0.66-$1.33), or two to three times the price of grain. Demand for the seed varies between localities, by variety (there is less demand for MCM 5001) and in relation to the producers' marketing efforts. Based on incomplete sales records, as Table 5 shows, most farmers buy small amounts of seed.

The low production of the groups is attributed to the absence of working capital particularly for renting land, inputs (fertilizer) and labor. To expand this approach and provide more technical and financial assistance, a pilot project is currently being developed by World Learning, a U.S.-based NGO operating in Uganda, with assistance from CIAT. This project will support 30 farmer bean seed enterprises in Eastern Uganda with a production capacity of 1 ton or more per season.

Table 5: Distribution of bean seed sales by farmer seed enterprises, 1994-1996 (percent of buyers)

	IBFA	Makhai	Budama
Kilograms purchased			
0.5	50	10	0
1-2	36	34	69
3-5	4	20	23
>6	10	37	8

[2] In 1994 the Ikulwe Bean Farmers' Association sold 700 kg to an NGO.

SEED DISTRIBUTION RESEARCH

Seed distribution research in Eastern and Central Africa has had two foci: understanding local seed systems as a basis for designing improved delivery systems and investigating alternative modes for distributing new bean varieties.

Local seed systems research

Studies on local seed systems were conducted in the early 1990s in Rwanda, Burundi, Zaire (Sperling et al., 1994) and in Uganda in 1994 (David, 1996a). Studies were underway in Ethiopia in 1996 and were planned for Kenya in 1997. A research protocol has been prepared to facilitate regional comparison.

Studies show that most farmers in the Great Lakes Region and Uganda depend primarily on their own stock for seed (Tables 6 and 7), although the relative importance of this source varies across and within regions of a country and is influenced by season, household characteristics such as wealth, and the intensity of production. Purchased seed (from local markets, shops, other farmers) ranked next in importance to farm-saved seed in the four countries surveyed. A surprisingly large number of farmers in Zaire, Rwanda, Burundi and Uganda (25-59%) obtained bean seed from off-farm sources (through purchase or exchange) in the main bean growning season, although their dependence on this source is irregular. Of the 178 Ugandan farmers who reported buying bean seed, 60% do so rarely (one out of every three or more seasons), nearly a third (29%) buy seed one out of every two seasons and only 10% do so every season (David, 1996a). Evidence from the four countries confirms that, generally, the poor are less seed secure than better-off farmers and rely more on purchased seed (in terms of quantity and sometimes frequency).

Table 6: Percent of farmers growing beans who used a particular seed source during the principal bean growing season 1991-92

	Zaire	Rwanda	Burundi
Seed source			
Own stock	59	63	66
Other farmers	1	10	5
Market	59	32	50
Formal institutions[a]	0	5	3

[a] Formal institutions include development projects, churches, cooperatives, research stations and the state.

Source: Sperling, 1994

Table 7: Percent of farmers using major bean seed sources by the amount of seed obtained in 1993A, Mubende and Mbale Districts, Uganda

Seed source	Amount of seed obtained		
	None	Some	All
Own stock	10	20	69
Markets	85	10	5
Shops	93	4	3
Gifts	91	8	1
Purchased from other farmers	97	3	.4
Borrowed or exchanged	99	1	0

Source: David, 1996a

Seed systems research suggests that while some farmers are more generous in sharing bean seed than others, these farmers may not necessarily share similar characteristics and therefore cannot be easily identified by researchers and extension workers.

Ugandan data show a significant association between diffusion-related behavior and wealth, with "rich" farmers giving more gifts and diffusing seed of local varieties more widely (David, 1996c). Key diffusers in one survey also tended to be older (over 41) than less generous farmers, although this trend was not observed in a second study (David, n.d). Researchers observed varietal differences in diffusion patterns for appreciated introduced varieties (Sperling and Loevinsohn, 1993) and, contrary to expectation, data from a Ugandan survey show that diffusion and the quantity of seed shared was not higher for an appreciated cultivar relative to an unpopular one (David et al., 1996). These findings are largely attributed to the intervening influences of varietal productivity and the favorableness of the environment on the ability of farmers to retain seed.

Action research on seed distribution

Action research conducted in Rwanda and Uganda to devise appropriate seed marketing strategies (packaging quantities, price, etc.) confirmed that farmers in those countries will eagerly buy seed of unknown new bean cultivars at relatively high prices (see Appendix 2). In Rwanda, an undisclosed quantity of bush and climbing bean seed packed in 50-250 g packets were sold through local shops, market vendors, government agricultural stores, nutrition centers, charitable organizations and agricultural training schools (Sperling et al., 1995). Calculations showed that using the distribution approach of small packets and multiple modes, 100,000 farmers can be reached with a mere 5 tons of seed (Sperling et al., 1995: 13). The sale of 279 kg of seed of two bush varieties packed in 250 and 500 gram amounts to over 400 Ugandan farmers through multiple channels (shops, a rural health clinic, women's groups, extension agents selling in markets and an NGO) confirmed the appropriateness of the Rwandan approach for other parts of the region (David et al., 1997).

However, as Table 8 suggests, each delivery channel investigated has advantages and disadvantages, hence the need to use several simultaneously.

Table 8: Evaluation of alternative seed delivery channels in Uganda

	Identification by seed supplier	Country-wide distribution	Cost of delivery to supplier	Frequency of access by farmers	Intra-community equity in access
Shops	D	E	H	E	E
Extension agents selling in markets	E	G	H	G/F	F
NGOs	E	F	L	G	G/F
Women's groups	F/D	G	H	E	E
Clinics	E	G	H/M	F	G

Codes for cost of delivery to supplier: H=high; M=moderate; L=low
Other codes: E=excellent; G=good; F=fair; D=difficult

Source: David et al., 1997

Another issue investigated by seed delivery research is what effect the type of seed delivery channel has on access by different categories of farmers. In Uganda, where beans are mainly grown by women, access through different delivery channels was affected by gender (Table 9) but not by wealth. Multiple factors may account for the patterns observed in Table 9: differences across localities in the extent of male involvement in bean production[3], the greater likelihood that men have cash on hand to use for the unplanned purchase of bean seed from markets/shops, men's greater mobility and involvement in trade in Uganda relative to women and women's more frequent contact with health care institutions and women group members.

Several on-going Network sub-projects focus on seed dissemination strategies. Kassaye (1996) assessed the effects of the quantity of seed received by farmers in the southern Rift Valley of Ethiopia on adoption rates. Deressa (1996) investigated seed retention and adoption among two categories of seed recipients in the central Rift Valley: contact and non-contact farmers. Both studies involved Roba 1 and Awash 1.

[3] In Central Uganda and parts of the East, where the new varieties were distributed through shops, markets, the clinic and World Vision, beans are a woman's crop grown mainly for subsistence. In Mbale District, they are an important cash crop, increasingly grown by men on personal plots.

Table 9: Proportion of bean seed purchases made by men and women, by seed dissemination channels (percent), Uganda

	Sales from shops[1]	Extension agents selling in markets	World Vision	Women's groups	Health clinic
Men	86	66	33	47	42
Women	14	34	67	53	58

[1] Results are from a non-random sample of buyers.

Source: David et al., 1997

Guidelines for bean seed distribution

The following principles and recommendations for the distribution of new bean varieties are derived from years of research experience in the Region (David et al., 1997):

1. Guidelines for NARS and NGOs

1.1 The free distribution of bean seed should be avoided except in emergency relief situations. Bean farmers in Eastern and Southern Africa are clearly willing to buy bean seed, if certain key principles (outlined below) are observed. When farmers purchase bean seed, they value it more and therefore are more likely to plant and retain it.

1.2 Based on Ugandan and Rwandan experiences, the price of seed of new bean cultivars can be set at twice or more that of local grain, although there is need for flexibility on this issue. The price of familiar seed types can be higher than that of unknown/unappreciated seed types.

1.3 Since small-scale farmers are only willing to pay a small premium for "clean" seed of new bean varieties, seed prices will usually not cover the actual cost of production and delivery.

1.4 Seed of new bean varieties should be distributed through multiple channels in as many localities as possible to maximize the number of households that have access to the new varieties.

1.5 Repeated seed distribution over several seasons in several localities may be necessary before a new variety is fully established within local seed networks and markets.

1.6 Package labels in the local language should indicate the name of the variety (using local names where possible), number of days to maturity, resistance to disease, yield, cooking time relative to popular varieties, and other important characteristics.

1.7 In situations where seed of a new variety is extremely limited, it might be justified to target distribution to specific geographical areas and categories of farmers who can actively participate in diffusion. Relatively large quantities of seed (over 5 kg per household) can initially be distributed to a small number of better-off farmers or, if they can be easily identified, to "key distributor" (i.e. farmers who, on their own accord, widely diffuse seed).

1.8 Diagnostic studies to document local bean seed systems in major bean producing areas should be considered a research priority by national research programs. This information is crucial for improved seed delivery strategies.

2. Guidelines for the formal seed industry

2.1 The feasibility of distributing bean seed through multiple non-conventional and non-market delivery points, such as farmers' associations, clinics and market vendors, should be explored.

2.2 Based on the premise that different categories of seed suppliers have a comparative advantage in specific markets and for particular bean cultivars, stronger linkages and coordinated efforts need to be developed between the formal seed sector and other suppliers of bean seed (e.g. NGOs, farmers involved in specialized bean seed production).

2.3 A parallel varietal naming system, using an institutional or breeder-derived name and a local name, should be adopted by varietal release committees. Although new varieties will invariably be designed by locality-specific names, a local name is useful for labelling of seed packages and identification by researchers and extension staff in monitoring adoption.

3. General principles for seed agencies and supporting institutions

3.1 Bean seed should be packaged in small quantities (50 grams to several kilos). Familiar seed types can be packaged in larger volumes than unknown seed types. Due to their superior yields compared to bush beans, new cultivars of climbing beans can be distributed in very small quantities (e.g. 50 grams) in areas where this technology is being introduced.

3.2 Because planting seasons often vary by locality, if possible bean seed should be multiplied at several sites to supply the major bean producing regions. Otherwise, seed agencies may need to plan one season ahead to ensure timely delivery.

3.3 Support by donor institutions to NARS seed activities which stipulate supplying farmers with free seed should be avoided to prevent undercutting commercial seed production efforts by both the formal seed industry and non-formal seed suppliers.

POPULARIZATION OF BEAN PRODUCTION, CROP AND SOIL IMPROVEMENT TECHNOLOGIES

During the review period, researchers in Rwanda, Burundi, Zaire, Uganda, Kenya and Ethiopia developed an impressive number of technologies to address problems of declining soil productivity and intensify bean production. Those new technologies that have been most widely extended to farmers are listed in Table 10.

Table 10: Bean production, soil improvement and crop protection technologies widely recommended to farmers in ECABREN member countries

Country	Technology	Mode of popularization and dissemination
Rwanda	Climbing beans; *Calliandra calothyrus* for stake production; seed treatment to control bean stem maggot and seed-borne diseases; raised beds, green manures and tolerant bush varieties for root rot management	Extension, Development Projects, NGOs
Burundi	Climbing beans; seed treatment to control bean stem maggot	Extension, Development Projects, NGOs
Zaire	Climbing beans; *Calliandra calothyrus* and banana fibre for staking	Development Projects, farmer groups
Uganda	Climbing beans; cover crops (mucuna, lablab, canavalia, crotalaria) for soil fertility improvement; vetiver grass as a barrier for erosion control; tephrosia to repel moles from fields; inoculation of soybean for improving nitrogen fixation and increasing yields; improved preparation of banana planting material to reduce weevils and nematodes	NGOs, farmer visits, drama
Tanzania	Potassium fertilization	Extension
Kenya	Climbing beans; green manures, raised beds, tolerant bush bean varieties for root rot management	NGOs, farmer groups
Ethiopia	Broadcast seeding at high rate for weed suppression	Extension, NGOs

Six strategies are used to popularize these technologies:

- On-farm trials and demonstrations
- Transfer of technologies to NGOs
- Use of visual aids and promotional materials given to farmers, extension agents and NGOs
- Training of NGO staff and extension agents
- Farmer-to-farmer visits to stimulate diffusion
- Promotional dramas.

Introduction of climbing beans as a new technology

Researchers in several countries initiated work with NGOs and farmer groups to introduce climbing beans. In Rwanda, the Institut des Sciences Agronomiques du Rwanda (ISAR) followed up early successes in transferring new climbing varieties with on-farm trials to introduce farmers to exotic agroforestry species for stake production. Researchers also produced extension booklets and leaflets on climbing bean production.

A Network-sponsored monitoring tour to Rwanda in 1993 subsequently lead to the transfer of this technology from Rwanda to areas of Kenya and Uganda identified as being agroecologically similar (see Wortmann and Allen, 1994). In 1994 researchers from the Kakamega Regional Research Center of the Kenya Agricultural Research Institute (KARI) and the Organic Matter Management Network (an NGO) distributed small amounts of seed of six varieties (Umubano, Gisenyi, Puebla, Flora, Vuningingi and Gwinirare) released in Rwanda to women's groups and individual farmers. Following informal exchange among farmers, an estimated 1000 farmers in Vihiga and Kakamega Districts already grow climbing beans, a technology with the potential to alleviate food security problems in this area of high population density and land shortage. Further distribution and popularization of the technology is in progress by other KARI stations, and has been taken up more recently by Ethiopian and Tanzanian researchers.

Following modest adoption in Kabale, southwestern Uganda, from on-farm trials carried out largely by CARE, in 1996 a breeder from the Uganda National Bean Program organized a field day for 48 farmers from Kabale to visit farmers more familiar with the staking and management of the climbing beans grown traditionally in neigboring Kisoro District. The efforts of the Mount Elgon Conservation and Development Project to promote climbing beans in eastern Uganda were earlier mentioned.

Soil and crop improvement technologies

While similar approaches to technology transfer are often used for new crop varieties and for soil and crop improvement technologies, different approaches are needed given the relatively long gestation period required for some of the latter technologies.

In Rwanda, the Ministry of Agriculture used printed pamphlets in Kinyarwanda and French to popularize seed treatment, a technology for controlling bean stem maggot and seed-borne diseases. Researchers prepared a supporting pictorial bulletin to reduce the risk of accidental poisoning. In Uganda, researchers provided over 15 NGOs and projects with mucuna seed and technical bulletins on the use of cover crops. With funding from a USAID technology transfer project, in 1996 researchers and NGO staff in Rwanda (World Vision, CARE and a GTZ Project) developed posters and brochures on soil fertility improvement technologies for the control of bean root rots. Following training in the use of the technologies, NGO staff and extension agents are conducting demonstrations and organizing farmer visits. Another grant under that project supports work by the Ndere Drama Troupe in Uganda in developing plays to promote new agricultural technologies and training farmer/local drama groups in two districts to develop their own technology promotion messages through the use of drama. The messages emphasized through drama include new crop varieties, the importance of seed quality, cover crops and climbing beans to intensify production.

PART 2: ADOPTION OF NEW BEAN VARIETIES

Approaches to studying adoption and impact

Two types of adoption studies have been conducted in the Region: follow-up studies of seed recipients (i.e., focused adoption or acceptability studies) and conventional adoption studies covering a random sample of farmers in the wider population.

Studies which assess adoption within a select population (i.e., seed recipients) help to determine the need and appropriate timing for conventional adoption studies. They do not, however, attempt to measure impact (by measuring area planted to the new variety, impact on income, etc.). At present, such studies outnumber conventional adoption studies due to limited and relatively recent seed distribution efforts in most countries. Agricultural researchers concur that since farmers move from experimenting with a new crop variety to adopting it after 2-3 seasons (Pachico and Ashby, 1983; Sperling and Loevinsohn, 1993), conventional adoption studies can only realistically take place four or more years after the technology has been disseminated to fairly large numbers of farmers. An even longer follow-up time frame is required for impact assessment where conventional approaches to technology dissemination have been used.

The shortage of economists in all member country NARS (Ethiopia is the exception) and the almost complete absence of sociologists and anthropologists, is a second important constraint to the proliferation of adoption and impact research. In cases where social scientists are employed, they are not assigned to national bean programs (Uganda is the exception) and are responsible for research on several commodities. To address this human resource problem, the Network encourages and supports formal and informal training of biological scientists in survey and FPR methods useful for documenting impact.

RWANDA

Climbing beans are only indigenous to pockets of northwestern Rwanda. The advantages of this technology over bush beans -- higher yields per unit area, better resistance to diseases and ease in drying during heavy rainfall due to staggered harvesting -- allow for intensified production which can alleviate food security problems, especially in areas of high population density and land shortage.

Adoption of Umubano in Projet Kigali-Nord area (Sperling et al., 1992)

In 1990, about six seasons after seed dissemination efforts were initiated by Projet Kigali-Nord, researchers conducted a study on the adoption of an improved climbing bean variety (Umubano). The study found that the adoption rate was similarly high among traditional producers of climbing beans and new users of this technology (72% and 71%, respectively). Mean yields for Umubano were 1350-1600 kg/ha compared to 800-1000 kg/ha for local climbing mixtures.

Adoption of improved climbing beans in all regions of Rwanda (Sperling et al., 1994)

A 1992-3 nation-wide survey of approximately 1100 randomly selected households conducted by the Ministry of Agriculture Statistics Service revealed that 41-43% (480,000-500,000 households) were growing improved climbing beans introduced five years earlier. The study documented the adoption of 20 improved climbing varieties. Adoption was higher in traditional climbing bean areas compared to other areas. On average, adopters planted 1.9 plots measuring 430 m^2 in season B and 370 m^2 in season A. The study estimated that in the early 1990s, 10-20% of the total bean area in Rwanda, or more than 15,5000 hectares, was sown to improved climbers. Based on these findings, it concluded that "the use of improved climbing beans annually brings 31 to 66 thousand additional tons of beans for Rwanda, equivalent to an extra US$ 8 to 15 million in income for Rwandan farmers " (Sperling et al., 1994:8). Users of the new technology cross-cut wealth, farm size and gender categories and were predominant among the more disadvantaged.

The impact of war on the production of improved climbing bean varieties in Rwanda (Sperling, 1996)

Following on from activities by Seeds of Hope and NGOs to guide seed introductions and monitor the impact of seed aid in Rwanda, a survey was conducted in October/November 1995. The results showed that the use of climbing beans had increased overall inspite of the war. Improved climbers were grown by 48% of bean farmers surveyed and accounted for a third of the bean seed sown. However, lower adoption was reported in zones most affected by the war (Butare, Gikongoro and Kibuye). The most important sources of bean seed were markets and own stock, the latter indicating the preservation of local diversity and production stability.

BURUNDI

Adoption of Kaki in Imbo-Nord Projet area (Baert, 1992)

In the early 1990s, 192 randomly selected farmers in the area near Imbo-Nord Projet were surveyed to investigate the adoption of Kaki (A 410). The study reported that 20% of respondents had grown or were growing the introduced variety. Higher adoption rates were recorded near distribution outlets.

ZAIRE

Adoption of climbing beans in South Kivu

A study to investigate the uptake of climbing beans was conducted in 1992 in South Kivu (incomplete information).

Adoption of climbing beans in Kabare and Walungu (Musungayi et al.)

In 1992a, 4 to 10 seasons after on-farm trials started, randomly selected farmers in Kabare (N=994) and Walungu (N=170) were interviewed to document the adoption of several climbing bean varieties. In Kabare, the adoption rate was 5% and 1.5% in Walungu. These

adoption rates, although modest, are remarkable given the high level of poverty in the population and the movement of the seed mainly through farmer-to-farmer diffusion (extension offered little support).

A 1992b study which focussed on 150 adopters of climbing beans found that about a third of the bean area in Kabare and Walungu was planted to this technology (information incomplete).

TANZANIA

Lyamungu 85 and 90 are bush varieties of a seed type (Calima) previously unknown in northern Tanzania. Both varieties have superior yield (3594 kg/ha for Lyamungu 90 and 3452 kg/ha for Lyamungu 85), reach physiological maturity in 70-89 days and are resistant to major bean diseases found at mid-altitude.

Adoption of Lyamungu 85 and 90 among seed recipients in Lushoto District (Ndakidemi and Mushi, n.d)

A 1994 study covering 47 farmers randomly selected from among seed recipients in Lushoto District showed that 2-4 seasons after seed distribution 47% of surveyed farmers were still sowing Lyamungu 90. Adoption of Lyamungu 85 was lower: 35% of farmers surveyed continued to plant the variety 4-6 years after seed distribution. The major reason for disadoption of both varieties was seed loss due to drought (77%), a factor not specifically related to the new variety. Other reasons were: lack of market, stopped farming, seed destroyed by bruchids and ate seed. Despite relatively low recorded adoption rates, two factors suggest high adoption potential in Lushoto District. The varieties are being sold in the market: 16 of the 19 vendors interviewed had sold them, although at the time of the survey only three vendors stocked Lyamungu 85/90 due to their unavailability. The second factor suggesting high adoption potential is the considerable farmer-to-farmer diffusion which has taken place: 45 seed recipients (96% of respondents) shared a total of 249 kg of seed of Lyamungu 90 with other farmers. Due to a high rate of seed loss for both varieties as a result of drought, a more extensive adoption survey was postponed pending renewed seed distribution efforts.

Adoption of Lyamungu 85 and 90 among seed recipients in Bukoba, Muleba and Karagwe Districts (Mafuru et al., 1996)

Three years after initial seed distribution, 71% of the 94 farmers interviewed (31% of seed recipients) in three districts were still growing Lyamungu 90 or 85[4]. Adoption was highest in Karagwe District (96%), next highest in Bukoba District (67%) and lowest in Muleba District (57%). Difference in adoption between districts can be explained by the greater commercialization of beans in Karagwe and the earlier popularity of Lyamungu 85 in that

[4] Although the study focused on Lyamungu 90, the variety distributed by researchers in 1992, it is likely that farmers confused Lyamungu 85 and Lyamungu 90. Some farmers surveyed were probably involved in on-farm trials and retained seed of the earlier variety. Both varieties are Calima seed types which are virtually indistinguishable by sight.

district. Mean amounts planted during the main bean growing season of 1994 ranged from 3 kg and 5 kg per farmer in Muleba and Bukoba respectively, to 22 kg in Karagwe. One hundred and three farmers were given seed of the new varieties by 36 seed recipients, suggesting relatively high diffusion by a few farmers and hence a likely modest to high adoption rate in the wider population. All 19 traders interviewed in 9 markets sold Lyamungu 85/90, suggesting high demand for the new varieties.

Adoption of Lyamungu 85 in Babati and Arumeru Districts (Nkonya, 1995)

A 1995 survey in Babati and Arumeru Districts show that in villages where seed distribution had taken place, 43% of farmers surveyed in Arumeru and 22% in Babati were growing the new variety. However, in villages where no seed had been distributed adoption was lower: 9% of respondents in Arumeru and 7% in Babati. Higher adoption in Arumeru is explained by market demand for the variety from nearby Arusha town.

UGANDA

Adoption of climbing bean varieties by trial farmers in Kabale, Uganda (Grisley et al., 1993)

In 1991-92, twenty nine farmers in Kabale District who hosted climbing bean trials in 1989-90 with five varieties were surveyed. Climbing beans are not indigenous to this area of Uganda. The study found that 66% of surveyed farmers sowed at least one of the new climbing varieties in the 1991a season, 2-5 seasons after trials ended. Of these, 17% planted all five varieties, 21% sowed four, 17% sowed three and 10% sowed two. Eighty five percent of the farmers interviewed gave a total of 109 kg of the new varieties to other farmers in 1991a, while 55% gave a total of 37 kg following the 1991b harvest. The authors suggest that although much of the observed interest in climbing beans is probably of an experimental nature, the findings are a strong indicator of the potential for adoption.

Adoption of three bush bean varieties among trial farmers in Uganda (David et al., 1996)

In 1994, a survey of 60 farmers in seven districts who had hosted bean varietal trials and demonstrations between 1991 and 1993 was conducted to obtain early feedback on varietal adoption potential. Although more than half of the farmers continued to sow test varieties on their own accord, adoption declined steadily over time, with the result that at the time of the survey, no farmer had sown a test variety for more than three seasons after trials. Confirming researchers' predictions, CAL 96 showed the highest adoption and longevity (19% sowed that variety for three seasons compared with 8% who sowed MCM 5001 and 7% who sowed RWR 136 for the same number of seasons). MCM 5001 showed the next highest rate of adoption, particularly in the West and East. RWR 136 was dropped after trials by the largest proportion of farmers, although adoption was highest in the Central and Eastern Regions. No variety was more likely to be grown for more seasons than another. The study concludes that seed retention and adoption behaviour was strongly influenced by many other factors besides varietal characteristics, such as adverse agro-environmental conditions, the temptation to sell or eat bean seed and farmers' perceptions of trials.

The adoption of Rwandan climbing bean varieties in Mbale, Uganda (Hoogendijk and David, 1997)

A 1995-96 study investigated the adoption of three improved climbing bean varieties (Umubano, Gisenyi and Urunyumba) introduced from Rwanda in the early 1990s to Mbale District, a traditional climbing bean area. Two groups of farmers were interviewed: those who received seed of the new varieties from extension agents or from trial farmers, and bean farmers who were systematic selected from the wider population. Three to four years after the new climbing bean varieties were introduced, Umubano was the most widely adopted of the three varieties and was sown in 1995b by 88% of the 59 farmers who had ever grown it. Gisenyi was the next most widely adopted variety (50% of all farmers who sowed it), followed by Urunyumba at 45%. The rates of adoption for Umubano and Gisenyi were higher among farmers who had obtained seed through the informal diffusion process.

On average, in both seasons of 1995, farmers planted smaller quantities of the high yielding Umubano compared to the most popular local climbing variety (Kanyebwa): 2 kg and 1 kg in Bugitimwa Parish and 2 kg during both seasons in Bubentsye Parish, compared to 9 kg and 5-6 kg of the latter variety. The study concludes that the Rwandan varieties have been adopted by a moderate number of Mbale bean farmers in view of the small quantity of seed distributed and have successfully been incorporated within the existing production system. The major constraints to wider adoption are seed availability and the lack of a reliable market at present, particularly for Umubano.

The adoption of MCM 5001 and CAL 96 in Mbale and Mukono Districts, Uganda (David, 1996b)

The following results on varietal adoption were derived from an impact study still in progress in two selected localities. Between 1995A and 1996A, approximately 660 farmers in 6 communities purchased seed of MCM 5001 and CAL 96. Only a few months after the new varieties were introduced (June 1995), most randomly selected farmers (67% in Mukono and 56% in Mbale) covered by a baseline survey (N=49 in Mukono and N=50 in Mbale) were aware of them. Preliminary estimates of adoption are based on results from an informal survey and sale records. An estimated 211 households in three villages in Mbale District (70% of the population) were growing the new varieties in 1996b, four seasons after introduction. Few farmers who bought seed discontinued growing the new varieties.

In 1996b, the number of adopters in three villages in Lugala Parish, Mukono was much smaller: an estimated 38 households out of a population of 212 households (18%). The high rate of disadoption in Lugala is attributed to the mediocre performance of the new varieties relative to local varieties (confirmed by on-farm varietal trials conducted in 1996) which are highly adapted to the high rainfall conditions and poor soils of this area.

CONCLUSIONS

This review highlights the urgent need for commodity research programs and seed suppliers in each Network country to develop a strategy for seed dissemination which builds upon existing channels of diffusion and knowledge exchange. While research in several countries confirms the feasibility of distributing bean seed through market and non-market channels, it shows that each delivery system has advantages and disadvantages which have to be assessed by seed suppliers within a country-specific context. High priority should also be given to supporting and developing non-formal bean seed production activities in view of the uneconomic nature of formal seed production.

All studies reviewed in Part 2 investigated the adoption of new bean cultivars. No information is yet available on the adoption and impact of crop production, soil and crop improvement technologies due to the more recent nature of research in this area, limited diffusion of these technologies and the need for a relatively long time lag between technology dissemination and follow-up. However, the rapid increase in the use of introduced staking materials for climbing beans suggests that farmers will adopt labor-intensive production technologies when incentives are right. Green manures are also likely to have high adoption potential judging by the 22% of trial farmers in Ikulwe, Uganda who have continued to use various forms of this technology for four or more seasons (Fischler, in preparation).

This review would present an incomplete account of bean technology dissemination and adoption in the Eastern and Central African Region if no mention were made of post-trial uptake of introduced genotypes. Farmers in Uganda, Ethiopia and elsewhere who have adopted a wide range of materials not formally released lend truth to the adage that "a good variety sells itself". This then leads to the question "what motivates adoption?" There is now clear evidence that market demand is a crucial determinant of the adoption of new bean cultivars in Eastern Africa. Many, if not most, farmers want a variety that they can both eat and sell. To respond to market driven demand, plant breeders will have to consider the acceptability of promising genotypes to both farmers and traders. In this connection, one issue of concern in some quarters has been the release of a number of small-seeded varieties to take advantage of their superior yields and better disease resistance. It appears however that market demand for unknown and unappreciated seed types can develop in 3-5 years provided that cultivars have other positive characteristics (e.g. good taste, short cooking time). The challenge to bean researchers thus remains the pursuit of a client-driven research agenda and wide, efficient dissemination of new technologies.

APPENDIX 1

Bean varieties distributed formally or informally, 1992-1996

Burundi: Aroana (1987), Calima (1980), Nsosera (?), A321 (1990), Kaki (1987), H 75 (1982), Karama (1980), Urubonobono (1983), Vyuzuzabigega (1993), Mavutayinka (1993), Muhondo (1993), Flora (1987), Vunikingi (1993), Muhinga-1 (1987).

Ethiopia: Mexican 142 (1970s) Red Wolayta (early 1980s), Awash 1 (1989), Roba 1 (1989).

Kenya: Rose Coco [GLP2] (early 1980s), Canadian Wonder (early 1980s), GLP 24 (early 1980s), GLP X92 (early 1980s), Mwezi Moja (early 1980s), Umubano (NR), Gisenyi (NR) Urunyumba (NR), Flora (NR), Puebla (NR), Gwenirare (NR).

Madagascar: GLP X92 (1995), Roshina G2 (1995), ZAA 64 (1995).

Rwanda: Mukiti 2 (1983), Ikinimba (1983), Urunyumba 3 (1970s), Puebla (1985), Gisenyi-bis 2 (1983), Flora (1990), Umubano (1985), Kilyumukwe (1985), Peveya 8 (1988), Ngwinurare (1991), Rwandarugali (1988), RWK 5 (1992), Decelaya (1990), Urugezi (1990), Urugezi 2 (1991), Vuninkingi (1985).

Tanzania: Uyole 84 (1984), Lyamungu 85 (1985), Lyamungu 90 (1990), Uyole 90 (1990), Selian 94 (1994), SUA 90 (NR), Kabanima (NR), Njano (NR), Ilomba (NR), EP4-4 (NR).

Uganda: CAL 96 [K132] (1994), MCM 5001 [K131] (1994), OBA 1 (1995), MCM 1015 (1995), MCM 2001 (1995).

Zaire: Aliya (1990?), Kihembe (1990?), M'Mafutala (1990?), Kinundo (1980s?), Maharagi Soja (1980s?), Nain de Kyondo (1980s?), Munyu (1980s?), Ntendezi (1980s?), Tuta (1980s?).

Year of release is indicated in parentheses. NR=not officially released

APPENDIX 2

Prices set by different categories of bean seed suppliers in Rwanda and Uganda, 1991-96

Country/delivery channel	Sale price of new varieties	Sale price of local food grain
RWANDA:		US$ 0.40/kg
NGO (1991)[a]	US$ 0.76/125g*	
Shops/market vendors (1991)[a]	US$ 0.80-1.00/kg	
UGANDA:		Ush 200-700/kg (US$ 0.23-$0.76)
Shops (1993)[a]	Ush.400/kg (US$ 0.44)	
Markets, NGO, clinic, women's groups (1994-5)[a]	Ush. 800/kg (US$ 0.87)	
Farmer seed enterprises (1994-95)[b]	Ush. 600-1200/kg (US$ 0.66-$1.33)	
Uganda Seed Project (1994-1996)[b]	Ush. 625/kg (US$ 0.66)	

Sources: Sperling et al., 1995 and David et al., 1997

[a] Seed was produced and distributed as part of an experiment.

[b] Four farmer enterprises, established through a CIAT project, sell commercial bean seed. The Uganda Seed Project sells certified bean seed through marketing agents.

*Climbing bean varieties; all other new varieties were bush types.

APPENDIX 3

Summary of adoption and impact studies in Central Africa, 1990-1996

Country	Type of study, year and timing relative to start of transfer of technology (TOT)	Technology	Geographic coverage of study and sample size	Results
Rwanda	Random sample adoption/impact surveys (Sperling et al., 1992); 1990; 6 seasons after TOT	Umubano	Projet Kigali-Nord (N=36; N=42; N=116)	Adoption by 71-72%
Rwanda	Random sample adoption survey (Sperling et al., 1994); 1992-93; 5 years after TOT	20 improved climbing bean varieties	Nation-wide, N=1191/1045	Adoption by 41-43%
Rwanda	Impact survey on a systematically selected sample (Sperling, 1996); 8 years after TOT	Several improved climbing bean varieties and other crops	Nation-wide, N=883	Adopted by 45%
Burundi	Random sample adoption survey (Baert, 1992); year and timing unknown	Kaki (A 410)	The area near Imbo-Nord Projet, N=192	20% had grown or were growing the variety but higher adoption recorded near distribution outlets
Zaire	Random sample adoption survey (Musungayi et al.); 1992a; 4-10 seasons after on-farm trials started	Climbing bean varieties	Kabare (N=994), Walungu (N=170)	Adoption by 5% in Kabare and 1.5% in Walungu (NOTE: no support in dissemination by extension)

APPENDIX 4

Summary of adoption and impact studies in Tanzania, 1994-1996

Type of study, year and timing in relation to start of TOT	Technology and amount of seed distributed in study locality	Geographic coverage of study and sample size	Results
Focused adoption survey (Ndakidemi and Mushi, n.d); 1994; 2-6 years after TOT	Lyamungu 85 and 90; 2.1 t (Tanga Region)	Manolo and Lushoto Wards; N=93	Adoption of Lyamungu 85 by 35%; adoption of Lyamungu 90 by 47%
Focused and random sample adoption survey (Nkonya, 1995); 6 years after TOT	Lyamungu 85	5 villages in Babati & 6 villages in Arumeru; N=164	Adoption by 32% of seed recipients and 8% of randomly sampled farmers
Focused adoption survey (Mafuru et al., 1996); 1994; 3 years after TOT	Lyamungu 85/90, 120 kg	4 villages in Bukoba, 2 villages each in Muleba and Karagwe; N=94	Adoption by 96% in Karagwe, 67% in Bukoba, 57% in Muleba

APPENDIX 5

Summary of adoption and impact studies in Uganda, 1991-1996

Type of study, year and timing in relation to start of TOT	Technology and amount of seed distributed in study locality	Geographic coverage of study and sample size	Results
Focused adoption survey (Grisley et al., 1993); 1991-92; 1-2.5 years after trials ended	Umubano, G13671, Urunyumba, Gisenyi and Mushingiriro; < 15 kg	Areas of Kabale District; N=29	Adoption of at least 1 variety by 66%
Focused adoption survey (David et al., 1994); 1.5-4 years after trials ended	CAL 96, MCM 5001, RWR 136; < 30 kg	Areas of Iganga, Pallisa, Kamuli, Mubende, Mpigi, Bushenyi and Mbarara Districts; N=60	Post-trial sowing of new varieties by 56-82% but no farmer had sowed test varieties for more than 3 seasons
Focused and random sample adoption survey (Hoogendijk and David, 1997); 1995-96; 3-4 years after TOT	Umubano, Gisenyi and Urunyumba (climbing bean varieties); c 30 kg	Bubentsye and Bugitimwa Parishes; N=44 for seed recipients; N=43 for systematic-ally selected sample	Umubano adopted by 88%; Gisenyi by 50%; Urunyumba by 45%
Longitudinal social impact assessment study (David, 1996); 1995-1998; 2 years after TOT	MCM 5001 and CAL 96 (bush bean varieties); 216 kg	Lugala and Nabongo Parishes, informal village census and sale records	Nabongo: adoption of 1 or both varieties by 70% of village population; Lugala: adoption of 1 or both varieties by 18% of village population

APPENDIX 6

Summary of on-going and planned adoption and impact research in Eastern and Central Africa, 1996-97

Country	Type of study and locality	Technology	Status
Tanzania	Random sample adoption survey; Arusha, Kilimanjaro, Lushoto (Kweka)	Lyamungu 85/90	1996-97
	Random sample impact survey; Lushoto and Arumeru (Mmbaga)	Lyamungu 85/90	1996-97
	Random sample adoption survey; Bukoba and Karagwe (David et al.)	Lyamungu 85/90	1997
	Focused and random sample adoption survey; Mbeya (Mkuchu/Bisanda)	Kabanima, Uyole 84, Uyole 90, Njano	Unknown
Kenya	Focused and random sample adoption survey, impact case studies; Kakamega and Vihiga Districts (Salasya)	Umubano, Gisenyi, Vunikingi, Flora, Gwenirare, Puebla	1996-97
Zaire	Random sample adoption survey; S. Kivu (Mbikayi)	?	1997
Ethiopia	Focused and random sample adoption survey; Sidama and Wolayta (Kassaye)	Roba 1, Awash 1	Partly completed
	Focused and random sample adoption survey; Nazreth area (Deressa)	Roba 1, Awash 1	1996
Uganda	Random sample adoption/impact survey, impact case studies; Mbale (David)	CAL 96, MCM 5001	1997-98
	Impact survey; Matugaa village (Mugisha-Mutetikka)	FPR approach	1997

Source: Meeting Minutes of ECABREN Steering Comittee; personal communications

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