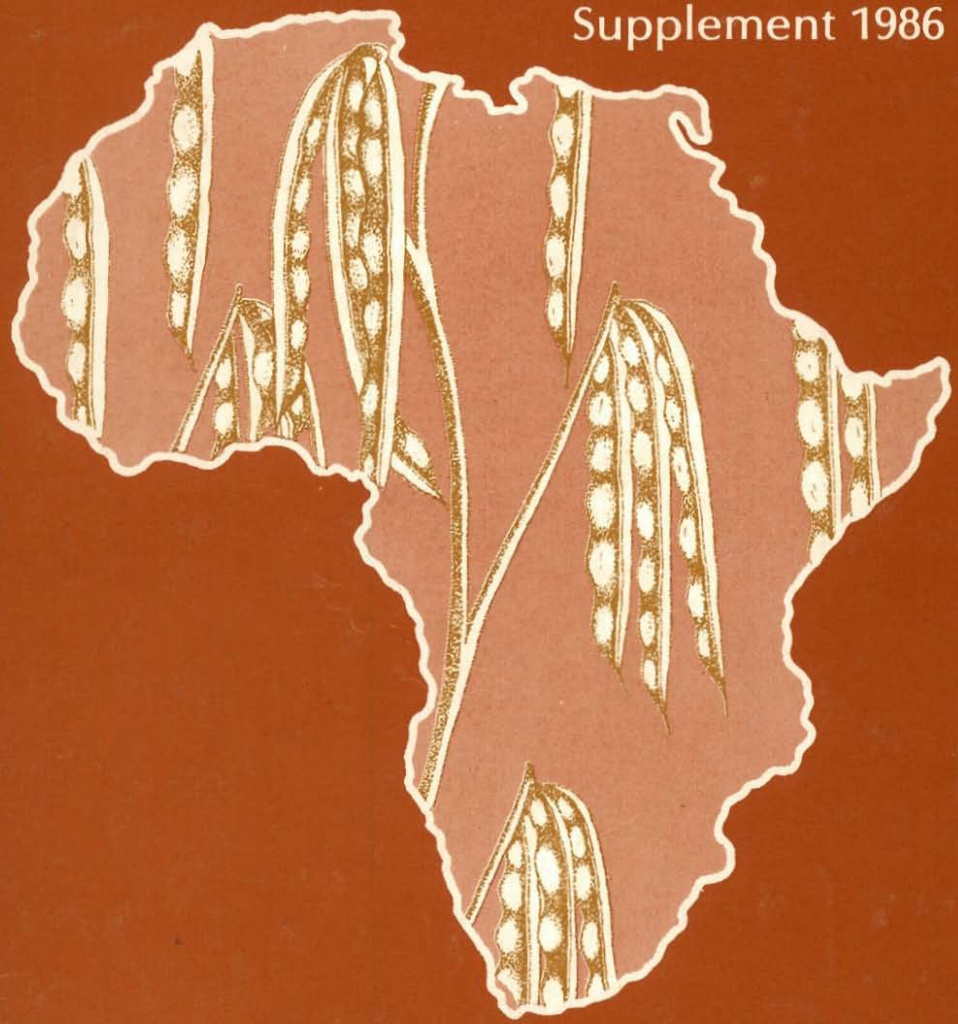


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Bibliography on bean research in Africa

Supplement 1986



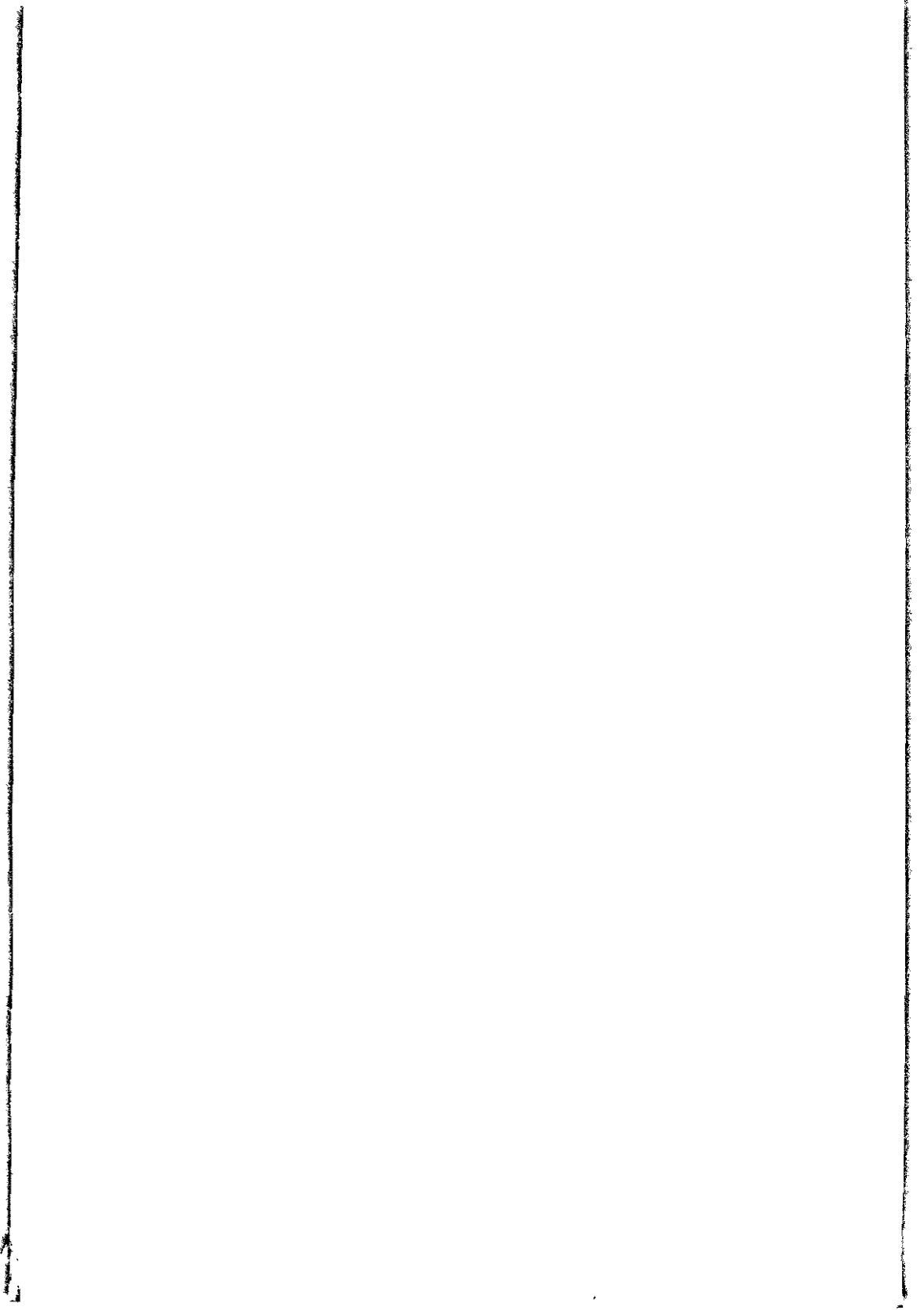
Centro Internacional de Agricultura Tropical

This publication is produced by CIAT's Bean Information Center, under a special project funded jointly by the International Development Research Centre and CIAT's core budget.

CIAT is a nonprofit organization devoted to the agricultural and economic development of the lowland tropics. The government of Colombia provides support as a host country for CIAT and furnishes a 522-hectare site near Cali for CIAT's headquarters. In addition, the Colombian Foundation for Higher Education (FES) makes available to CIAT a 184-hectare substation in Quilichao and a 73-hectare substation near Popayán; the Colombian Rice Federation (FEDEARROZ) also makes available to CIAT a 30-hectare farm—Santa Rosa substation—near Villavicencio. CIAT co-manages with the Colombian Agricultural Institute (ICA) the 22,000-hectare Carimagua Research Center on the Colombian eastern plains and carries out collaborative work on several other ICA experimental stations in Colombia; similar work is done with national agricultural agencies in other Latin American countries.

CIAT is financed by a number of donors, most of which are represented in the Consultative Group on International Agricultural Research (CGIAR). During 1985 these CIAT donors include the governments of Australia, Belgium, Brazil, Canada, France, the Federal Republic of Germany, Italy, Japan, Mexico, the Netherlands, Norway, the People's Republic of China, Spain, Sweden, Switzerland, the United Kingdom, and the United States of America. Organizations that are CIAT donors in 1985 include the European Economic Community (EEC), the Ford Foundation, the Inter-American Development Bank (IDB), the International Bank for Reconstruction and Development (IBRD), the International Development Research Centre (IDRC), the International Fund for Agricultural Development (IFAD), the Rockefeller Foundation; the United Nations Development Programme (UNDP), and the W. K. Kellogg Foundation.

Information and conclusions reported herein do not necessarily reflect the position of any of the aforementioned entities.



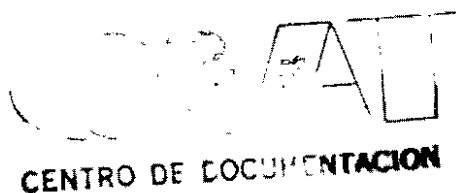
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ISBN-84-89206-52-X

April, 1986

Bibliography on bean research in Africa

Supplement 1986



Centro Internacional de Agricultura Tropical

Centro Internacional de Agricultura Tropical
CIAT
Apartado Aéreo 6713
Cali, Colombia

ISBN 84-89206-52-X
April 1986
1200cc.

Citation:

Bibliography on bean research in Africa. Supplement 1986. Cali,
Colombia, Centro Internacional de Agricultura Tropical. 1986.
190p.

1. Beans - Africa - Bibliography. 2. Bean - Research - Africa -
Bibliography. I. Centro Internacional de Agricultura Tropical.

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INTRODUCTION

With this publication—Bibliography on Bean Research in Africa, Supplement 1986—CIAT's Bean Information Center provides those researchers interested in Phaseolus bean production in Africa, ongoing access to the scientific literature needed in their work with this important legume. This publication, due to its characteristics, will not only strengthen research at the national level but will also facilitate collaboration among the members of the bean research network in Africa.

The Bean Information Center contracted Ms. Anne Warren, who personally interviewed bean researchers in 11 African countries to determine their information needs for research. In addition to first-hand data on bean production and maps for bean-growing regions, she also collected documentation on beans not recorded in the former two volumes of the Bibliography on Bean Research in Africa. Once more we would like to stress the valuable collaboration given by African researchers, who contributed with over 300 new documents for this supplement.

Likewise, a contract between CIAT and the Faculté des Sciences Agronomiques de l'Etat, Gembloux, yielded 200 new references as a result of a documentary search carried out at the main agricultural libraries in Belgium. The present supplement contains 558 new entries.

All contributions are actively solicited, and persons who send articles to be added to the collection may order copies of a corresponding number of articles currently in the collection, free of charge.

Citations have been organized by country to highlight the research on beans carried out at the national level and the research papers written in/on each one of these countries. Citations on Botswana and Tunisia have also been added to this supplement.

Within each country, the citations have been arranged alphabetically by author; and within each author's papers, in descending chronological order. Citations preceded by an asterisk (*) indicate that the complete document is available from the Bean Information Center. Abstracts have been provided for 524 citations. Whenever possible, the author's abstract was used. The source of abstracts is indicated by the following acronyms:

AS - Author's summary
CIAT - CIAT data base

The addresses of the first author of each paper published after 1982 are given after the bibliographic citation, inside brackets.

In addition to the author index, an enriched subject index which records cultivars, varieties, and lines is included to facilitate the use of this bibliography. Care was taken to represent concepts specifically by means of permutation of terms, up to a second level of specificity, i.e.,

Ophiomyia phaseoli

Insect biology 1258 1275 1365
Resistance 1224 1235 1242 1289

When ordering photocopies, the complete reference should be cited or the consecutive number that appears above the reference; this bibliography should be specified as the source. Address requests to: Bean Information Center, Communications and Information Support Unit, CIAT, Apartado Aéreo 6713, Cali, Colombia.

Jorge López S.
Specialized Information Centers
April 1986

GENERAL

1172

- * ANDERSON, G.D. 1973. Potassium responses of various crops in East Africa. In Colloquium of the International Potash Institute, 10th., Abidjan, Ivory Coast, 1973. Proceedings. Ivory Coast. pp.413-437.

The response of various crops, including beans, to K fertilization in East Africa is reviewed and the general nature of the soils and areas known for acute K deficiency is discussed. On many East African soils, including some of the more leached volcanic ones, beans will respond to moderate K applications, provided P, S, and lime are adequate. Poor nodulation, poor N fixation, and the responsiveness to N in beans are often due to inadequate levels of one or more of the above elements, including K. [CIAT]

1173

- * ARRAUDEAU, M. 1961. Note concernant le Phaseolus lunatus. (Note on Phaseolus lunatus). Agronomie Tropicale 16(3):306-312.

In the ecological conditions of Bambey (West Africa), Phaseolus lunatus germinates well; however, its development is poor as of the 1st wk., and 1 mo. after planting nearly all the young plants are dead. The edaphoclimatic conditions of 2 regions in which P. lunatus develops well, California (USA) and Madagascar, are compared. The necessary conditions for P. lunatus are given, depending on whether cultivation is dry, irrigated, or during subsidence of floods: max. diurnal temp. below 27-35°C, hygrometric status superior to 70%, moist soil (whether naturally or by irrigation). The localities where the development of P. lunatus is possible in Senegal or in West Africa are also indicated. [AS]

1174

- * AUTRIQUE, A. 1985. Les ravageurs de la culture du haricot en Afrique Centrale. (Bean pests in Central Africa). Bujumbura, Burundi, Institut des Sciences Agronomiques du Burundi. Department Defense des Vegetaux. 10p. [Institut des Sciences Agronomiques du Burundi, B.P. 795, Bujumbura, Burundi]
Paper presented at Séminaire Régional sur la Production et l'Amélioration du Haricot dans les Pays des Grands Lacs, ler., Bujumbura, Burundi, 1985.

Ophiomyia (Melanagromyza) phaseoli, O. spencerella, and the black aphid Aphis fabae, considered to be the most harmful pests to bean crops in Central Africa, have caused yield losses of more than 50% depending on the season. Factors promoting a rapid and vigorous growth of the plantlets limit the damage caused by the bean fly. Other control measures are under study such as the identification and distribution of tolerant cv., and presowing seed dressing with insecticide. Indigenous parasites of aphids are relatively rare; therefore the introduction of exotic hymenoptera, efficient on other continents, has been planned to improve the natural regulation of aphid populations. Complementary treatments with selective insecticides can be applied once the pest injury threshold is reached, despite natural regulation. Occasional local infestations of phytophagous chrysomelids (Ootheca mutabilis and Luperodes quaternus) or pod borers (Maruca testulalis) also justify insecticide treatments. [AS]

1175

- * AUTRIQUE, A. 1981. Haricot. (Beans). In _____. Principaux ennemis des cultures de la région des Grands Lacs d'Afrique Centrale. Bujumbura, Institut des Sciences Agronomiques du Burundi. pp.108-119.

The damage caused by the main diseases and pests of beans in the Great Lakes region, Africa, and their control are described; color photos are included. Among the pests are Aphis fabae, Melanagromyza (Ophiomyia) phaseoli, and Maruca testulalis. The diseases considered include viroses, Xanthomonas phaseoli, Colletotrichum lindemuthianum, Rhizoctonia microsclerotia, Uromyces phaseoli, Isariopsis griseola, Ascochyta phaseolorum, and Ramularia phaseoli. [CIAT]

1176

- * AUTRIQUE, A. 1981. Principaux ennemis des cultures de la région des Grands Lacs d'Afrique Centrale. (Major crop enemies in the Great Lakes region of Central Africa). Bujumbura, Institut des Sciences Agronomiques du Burundi. 144p.

As an introduction, the causal factors of physiological diseases and of parasite affections of crops, in general, are briefly discussed. Then, the damage caused by the enemies of the major crops, including beans, in the Great Lakes region (Africa) is described. For each one, control measures and color photos are included. [CIAT]

1177

- * CALDERON C., W. 1982. Series estadísticas de frijol y leguminosas en los cinco continentes. (Mundo, Africa, Asia, Europa, Oceanía y América). [Series of bean and legume statistics of the five continents (worldwide, Africa, Asia, Europe, Oceania, and America)]. Cali, Colombia, Centro Internacional de Agricultura Tropical. Economía de Frijol. 45p.

Statistical tables on area, yield, and production of legumes and dry beans at a world level and in the countries of Africa, Asia, Europe, Latin America, North America, and Oceania, are compiled for the periods 1968-70 and 1978-80. Data on the imports and exports of legumes and on country populations are also included. [CIAT]

1178

- * CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL. 1985. Scientific training and network activities. In _____. Bean Program. Annual Report 1984. Cali, Colombia. Working Document no.7. pp.213-299. Also in Spanish.

Scientific training at CIAT continues to support the efforts of researchers particularly with respect to the training of technicians in the evaluation of promising germplasm. For training outside CIAT headquarters, greater emphasis was given to the study of limiting bean production factors at the national and local levels. Lists of in-country courses, professionals and visiting researchers trained at CIAT, as well as major achievements in 1984, are presented. A summary of the network research activities in beans in Central America, the Caribbean, Brazil, Peru, and Eastern Africa is presented. The information provided includes adaptation nurseries, on-farm research, feedback of information to CIAT, and transfer of technology from CIAT to national programs. Regarding the Great Lakes Regional Bean Program, the region is described and project activities, var. development, research on nutrition and quality, and future plans are summarized. [CIAT]

- * CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL. 1984. Vivero Internacional de Roya del Frijol; resultados 1979-1980. (International bean rust nursery; results 1979-80). Cali, Colombia. 36p. [CIAT, Apartado Aéreo 6713, Cali, Colombia]

Results of the evaluation of the International Bean Rust Nursery obtained by collaborators during 1979-80 are presented. The nursery included 98 bean cv. and was sent to 26 collaborators in 28 localities of Latin America, USA, Europe, Africa, and Australia. (The report only registers data received from 22 of these localities.) Standard handling and classification procedures of reaction to the disease caused by Uromyces phaseoli were used. None of the cv. or entries were immune in all the localities where the nursery was evaluated, but some were resistant or intermediate in all of the localities. Introductions Redlands Green Leaf C, Mexico 235, 51051, BAT 261-2C, BAT 445-1C, BAT 66-1C, BAT 6E-1C, BAT 76-1C, and V 3249-13-1C were not susceptible in any of the localities. The current evaluation system in the nursery measures the combined interaction among groups of nursery entries and the population of rust races; this system allows collaborators to observe changes in resistance (expressed by specific entries) and in variability (expressed by the pathogenicity of specific rust populations) by locality and by time. Results show there are specific localities where the population varied over plantings and years; there are different races among and within the localities, from both a qualitative and a quantitative point of view. These contrasts between sites and seasons enables the identification of entries with broad resistance to all rust populations present in the regions of the countries where the entries are evaluated. Detailed results are presented in table form. [CIAT]

- * INSTITUT DE RECHERCHES AGRONOMIQUES TROPICALES ET DES CULTURES VIVRIERES. 1981. Defense des cultures. (Crop protection). In _____, Rapport Annuel 1981. Paris, pp.144-146.

Results are given for different trials carried out in 1981 that evaluated chemical and cultural crop protection treatments in various tropical regions of the world. In Reunion, 2.19 t dry beans/ha were obtained for integrated control treatment, which consisted of 1 soil application of pelleted trichloronate (fenophosphon) at harvest + 3 spray applications of endosulfan at flowering, vs. 1.98 and 1.65 t/ha for traditional and control treatments, resp. At N'Diol Station (Senegal) a previous crop of peanuts gave vegetable crops a better protection (3-4 mo.) against Meloidogyne sp. than sweet potatoes. In the Upper Volta region of western Africa, the application of ethyl-phosphite ammonium (80 g a.i./ha) proved to be effective against Pythium sp. and Macrophomina phaseoli. [CIAT]

- * KAREL, A.K. 1985. Integrated pest management on beans in East Africa. Bean Improvement Cooperative. Annual Report 28:9-10. [Sokoine Univ. of Agriculture, Dept. of Crop Science, P.O. Box 3005, Morogoro, Tanzania]

Integrated pest management (IPM) is an ecological approach to the management of pest populations, which utilizes a var. of compatible techniques in a unified management program that will ensure favorable economic, ecological, and sociological consequences. The components of an IPM program include the use of plants resistant to insect pests, selective and judicious use of insecticides, biological control, and various cultural

control tactics used for the control of bean pests in East Africa. A suggestive schematic model for IPM on beans in East Africa is illustrated. [CIAT]

1182

- * KEYA, S.O. 1985. State of the art on biological nitrogen fixation in Africa. In Ssali, H.; Keya, S.O.; eds. Conference of the African Association for Biological Nitrogen Fixation, 1st., Nairobi, Kenya, 1984. Biological nitrogen fixation in Africa: proceedings. Kenya, Nairobi Rhizobium Microbiological Resources Centre, pp.30-46. [Nairobi Rhizobium Microbiological Resources Centre, Dept. of Soil Science, Univ. of Nairobi, P.O. Box 30197, Nairobi, Kenya]

Developments in biological N fixation (BNF) in way of research, extension, information bases, institutional activities, and limitations are assessed. An attempt is made to explore Africa's future research and promotional aspects necessary to harness BNF technology. Research work has mostly been undertaken by specialized institutions like the Regional MIRCEN Networks in Bamby (Senegal), Cairo (Egypt), and Nairobi (Kenya), specialized institutions like International Institute of Tropical Agriculture (Nigeria) and International Centre for Research in Semi-Arid Tropics (India), and relevant dept. in universities and national research institutions of the resp. countries. Major lines of research have been evaluation, testing, and selection of indigenous and exotic Rhizobium strains, inoculum production, and the factors affecting BNF. Emphasis has been placed on forage and grain legumes such as field beans, soybeans, lucerne, and Scylosanthes. BNF research has been limited by lack of trained personnel, financial and related resources. Greater understanding of Rhizobium-legume symbiosis and factors affecting BNF are indicated. Increased regional cooperation in BNF research so as to disseminate technology and thereby avoid duplication of research efforts is suggested. Current efforts and future prospects for BNF technology in Africa, particularly production of legume inoculants, N-fixing trees, are discussed. [AS (extract)]

1183

- * REGIONAL WORKSHOP IN POTENTIAL FOR FIELD BEANS (PHASEOLUS VULGARIS L.) IN WEST ASIA AND NORTH AFRICA, ALEPPO, SYRIA, 1983. Proceedings, Cali, Colombia, Centro Internacional de Agricultura Tropical, 144p.

Papers presented at a workshop, planned and organized jointly by CIAT (with worldwide responsibility for the collection, preservation, and improvement of bean germplasm at the international level) and the International Center for Agricultural Research in Dry Areas (ICARDA), to study the feasibility of a collaborative regional bean research effort for West Asia and North Africa, are included. The workshop's objectives concentrated on obtaining the views of national research scientists from the region to assure that in the future, all research programs will meet regional requirements. Bean production constraints in these areas were analyzed, and the necessary actions at the national, regional, and international levels to increase bean production through research were discussed. Delegates from the following countries presented reports on the bean production problems, potential, and research in their respective countries: Egypt, Ethiopia, Iran, Jordan, Lebanon, Morocco, Pakistan, Spain, Sudan, Syria, Tunisia, Turkey, and Yemen Arab Republic. The conference was also attended by delegates and observers from national and international research centers and donor agencies. [CIAT]

- * REGIONAL WORKSHOP ON POTENTIAL FOR FIELD BEANS IN EASTERN AFRICA, LILONGWE, MALAWI, 1980. Summary of panel discussions. In _____. Proceedings. Cali, Colombia, Centro Internacional de Agricultura Tropical. pp.207-217.

Panel discussions on bean agronomy, breeding and selection, plant protection, seed production and marketing, training, and extension by the group of researchers participating in the Regional Workshop on Potential for Field Beans in Eastern Africa are summarized. The following research priorities were established in agronomy: regional yield trials, on-farm production systems survey, weed control, plant nutrition, cropping systems, and plant densities. In breeding and selection emphasis was made on developing var. with multiple resistance and other desirable characteristics such as seed color and type, literature dissemination for a full year by CIAT through abstract cards for all the participants, and the possibility of carrying out annual reviews among the researchers. Short-, intermediate-, and long-term priorities include: the identification of weeds, pests, and diseases; studies on pathogen variability; germplasm evaluation; biological and ecological studies of insect pests; regional and international cooperation for the development of bean protection practices. [CIAT]

- * SCHOONHOVEN, A. VAN 1985. Important programs in international agricultural research example: the bean network at CIAT. Entwicklung Ländlicher Raum 19(6):15-17. [CIAT, Apartado Aéreo 6713, Cali, Colombia]

The major steps (including important research findings) in the strategy that evolved at CIAT to increase bean production and productivity levels are described. This strategy, based on the formation of a network and established through training and decentralized research, has already been implemented in Latin America and efforts are now being placed on the formation of a 2nd network for Africa. [AS]

- * SINGH, S.P. 1984. Beans in West Asia and North Africa. In Reunión de Trabajo sobre Ensayos Internacionales de Frijol, la., Cali, Colombia, 1984. Trabajos presentados. Cali, Centro Internacional de Agricultura Tropical. pp.310-316. [CIAT, Apartado Aéreo 6713, Cali, Colombia]

Aspects of bean consumption, cropping systems, production problems, bean types, and research in West Asia (Iran, Iraq, Syria, Turkey) and North Africa (Algeria, Egypt, Morocco, Sudan, Yemen Arab Republic) are briefly described. Beans are of considerable importance in some of these countries; there is also considerable consumption of green beans. The predominant dry bean cv. are of medium and large white-seeded types suitable for monoculture, but some intercropping is also practiced. BCMV, BYMV, root rots, Uromyces phaseoli, Xanthomonas phaseoli, and Pseudomonas phaseolicola are among the main diseases and pathogens limiting production, as well as Empoasca sp. and Bemisia sp. among the insect pests. Drought and photoperiod sensitivity are among the limiting climatic and physiological factors, resp. Beans receive min. research attention; therefore CIAT's role in the region is of major importance in germplasm distribution and training. A brief description of the 1st West Asian and North African Bean Adaptation Nursery (WANABAN) sent by CIAT in 1984 is presented. There is an urgent need for a strong national and regional research network to increase bean production and productivity. [CIAT]

1187

SOUTHGATE, B.J. 1964. Distribution and hosts of certain Bruchidae in Africa. Tropical Stored Products Information 7:277-279.

1188

SOUTHGATE, B.J. 1964. Pulse bruchids of Africa. In Freeman, P., ed. International Congress of Entomology, 12th., London, 1964. Proceedings. p.642.

1189

- * TEMPLE, S. 1984. Nurseries of the international bean network. In Reunión de Trabajo sobre Ensayos Internacionales de Frijol, 1a., Cali, Colombia, 1984. Trabajos presentados. Cali, Centro Internacional de Agricultura Tropical. pp.14-28. [CIAT, Apartado Aéreo 6713, Cali, Colombia]

The objectives, format, distribution, and types of results of the different bean nurseries that currently exist in the international bean network are briefly described. Nurseries are divided into 3 broad categories: (1) germplasm evaluation, including Bean Angular Leaf Spot International Trial, Bean International Drought Adaptation Nursery, Bean International Heat Adaptation Nursery, International Bean Anthracnose Trial, International Bean Flowering and Adaptation Nursery, International Bean Colden Mosaic Virus Nursery, International Bean Inoculation Trial, International Bean Rust Nursery, International Apion Nursery, International Bean Common Blight Nursery, International Web Blight Nursery, and International Empoasca Nursery; (2) var. improvement nurseries which include crossing blocks, segregating populations, EP, IBYAN, adaptation nurseries for Central America, Brazil, Mexico, Argentina, Chile, Peru, West Asia, and North Africa, and VEF; and (3) regional nurseries including preliminary nursery/Central America (VP), national yield nursery/Central America, Central American yield nursery, and the Essai Regional des Grands Lacs. [CIAT]

1190

- * VOYSEST, C. 1984. Evolución de los viveros internacionales de rendimiento y adaptación de frijol, Phaseolus vulgaris (IBYAN) 1976-1984. [Evolution of the International Bean Yield and Adaptation Nursery (IBYAN), 1976-84]. In Reunión de Trabajo sobre Ensayos Internacionales de Frijol, 1a., Cali, Colombia, 1984. Trabajos presentados. Cali, Centro Internacional de Agricultura Tropical. pp.29-50. [CIAT, Apartado Aéreo 6713, Cali, Colombia]

The evolution of IBYAN trials as part of a Latin American research network since their initiation in 1976 up to 1984 is described, including prospects for 1985-87. The original primary objectives of IBYAN trials are to: (1) evaluate yield and adaptation of a set of uniform international trials of a common set of commercial cv., promising germplasm selections, and advanced breeding lines, under a wide range of environmental conditions representative of the main bean production regions, and (2) evaluate at the local level a set of locally adapted var. representative of the best cv. available in the region. The major changes in the characteristics (no. of materials, no. of local checks, growth habit, grain color, origin of the material, trial duration, and exptl. design) of IBYAN trials over these years are detailed. The bean improvement process at CIAT (VEF, EP, and IBYAN) is briefly described. For 1985-87, IBYAN trials could follow 2 alternatives: (1) group the materials based on grain characteristics (color, size), growth habit (bush and climbing), and climatic adaptation with 3 types of nurseries (uniform IBYAN, specialized IBYAN, or mixed

IBYAN) or (2) no special grouping of materials. The data required include yield, plant population at harvest, days to flowering and to maturity, and reaction to 2 of the most common diseases. Summaries by region and by country on trials sent and data reported are presented. [CIAT]

BOTSWANA

1191

- * HORN, N.; NKAMBULF-KANYIMA, B. 1984. Resource guide women in agriculture: Botswana. East Lansing. Bean/Cowpea Collaborative Research Support Program. Michigan State University. 124p.

A description of the Botswana farming systems with emphasis on women's roles, a discussion of the relevance of the available information to the specific objectives of the Bean/Cowpea Collaborative Research Support Program, and information on education are aspects dealt with. Emphasis is made on cowpeas, but some reference is made to Phaseolus acutifolius regarding a survey in which 27% of 126 holdings in southeast District planted beans, and the role of women in selling beans in urban and rural markets. An annotated bibliography is included. [CIAT]

1192

- * AUTRIQUE, A. 1971. Essai de quelques insecticides contre Aphis craccivora Koch, sur haricot au Mosso. (Trials with some insecticides against Aphis craccivora in beans in Mosso). In Institut des Sciences Agronomiques du Burundi. Rapport Annuel 1971. Bujumbura. pp.88-93.

A trial was carried out at Mosso Station, Burundi, to evaluate various organic phosphate insecticides (280 l of emulsifiable concentrates/ha) on bean var. Colorado under irrigated conditions during the dry season. Elementary plots of twenty 9-m lines each were used. Aphid attack was evaluated on a 0-6 scale. Tables included show products evaluated, their way of acting, doses, and properties, and infestation evolution depending on climate and treatment. Phosphamidon, bromophos, oxydemeton-methyl, mevinphos, and dimethoate gave excellent results at low doses (200-250 g a.i./ha). Diazinon was also very effective, but at 600 g a.i./ha. The effect of these insecticides lasted 2-3 wk. The use of these products in the rural media is discussed. [CIAT]

1193

- * BAERT, T.; NZIMENYA, I. 1984. Haricot (Phaseolus vulgaris). (Beans). In Institut des Sciences Agronomiques du Burundi. Rapport des Recherches Agronomiques 1984. pp.28-34.

The results of bean research carried out at Institut des Sciences Agronomiques du Burundi in the Great Lakes region, strengthened by the establishment of CIAT's regional program in Rubona, Rwanda, are presented. The areas covered were the introduction of new materials, var. selection, bean-cassava association, and optimum planting density. Var. Ikinimba showed the best yields in Mosso, Kimeza, and Kisozi (1711, 770, and 1858 kg/ha, resp.). More than 200 bush bean var. were evaluated in Imbo, Mosso, Murungwe, Kisozi, and Kimeza; of these, 41 var. were selected for yield and disease resistance. A screening trial with climbing beans involving 25 introductions from CIAT and a local check was conducted in Kisozi in 1984. Bean yields in the bean-cassava association were 967 and 1240 kg/ha for var. Calima and Doré, resp. No significant differences in yield were obtained in the optimum plant density trial. [CIAT]

1194

- * BAUDELET, P. 1969. La commercialisation des produits vivriers au Mosso. (Commercialization of food products in Mosso). In Institut des Sciences Agronomiques du Burundi. Rapport Annuel 1969. Bujumbura. pp.15,22-23, 26-28,30-31,35-39,41-42,48-49.

Tables are presented on some economic parameters for various food crops grown during 1969 in Mosso, Burundi. Overall, beans represented 20% of the rural income. Min., mean, and max. prices of this crop are presented for 4 regional markets (Bukemba, Muzye, Butare, and Gitanga). Fluctuations and regional differences in prices were attributed to abundance of some crops and lack of transportation means. Other data indicated that min. bean prices were lower in Mosso, where these are sold at retail and there are no regulations on transport prices. The highest max. price was found in Matana. Growing beans represented a high valuation of labor compared with other crops. Regional nutrition tendencies present protein imbalance caused by the almost exclusive consumption of beans. Yields of introduced var. Mixed Mexico, Colorado, Cuarentino, and Wulma are outstanding compared

with those of local var. Factors affecting regional commercialization and their economic equilibrium are analyzed. [CIAT]

1195

- * BERGEN, D. 1983. Flux des produits agricoles et de leurs facteurs influents. Région naturelle du Buyenzi. (Flow of agricultural products and influential factors. Natural region of Buyenzi). In . Contribution a la connaissance des régions naturelles du Burundi. Bujumbura, Burundi, Institut des Sciences Agronomiques du Burundi. Departement de Socio-Economie Rurale. pp.7,12,27,30,32,34-36,44,50-53, 59,70-72,91,100-107,111,115,134.

Tables, maps, and graphs are presented of some agricultural products, among them beans, and the factors influencing their flow, based on a survey done in 20 zones of the natural region of Buyenzi, Burundi, in 1983. Beans gave acceptable yields in 12 communities and in 15 they were considered as one of the most important crops. Most export beans were directed to Ngozi and Kayanza (Buyenzi) and Gisha (Bweru); product importations came from Kirundu and Citeranyi. Bean production was primarily for self-consumption (96.0%). The problems encountered by this crop were the low prices in Kinyonga and the reduced sales in Nyagatobo. [CIAT]

1196

- * BERGEN, D. 1983. Flux des produits agricoles et de leurs facteurs influents. Région naturelle du Bweru. (Flow of agricultural products and influential factors. Natural region of Bweru). In . Contribution a la connaissance des régions naturelles du Burundi. Bujumbura, Burundi, Institut des Sciences Agronomiques du Burundi. Departement de Socio-Economie Rurale. pp.8,10-11,13-15,25,28,31,33, 35-36,39,43,52-53,105-106.

Tables, maps, and graphs of the flow of agricultural products and influential factors in the natural region of Bweru, Burundi, in 1983 are presented. Data on population, importance of diverse agricultural products, commercialization, exports, and prices (dry beans) are included. During the period of high commercialization, an av. of 15 t/day was sold in Muyinga, with a surplus of 810 t; surplus beans were sold in 15 zones. It was found that 51.5% of the farmers sell their bean production with a benefit of 1080 FBu/family exploitation unit, i.e., 60 kg of dry beans, and of 1340 FBu/rugo (1 rugo has an av. of 1.24 households), i.e., 75 kg of dry beans. Beans in the market all came from Bweru. [CIAT]

1197

- * BERGEN, D. 1983. Flux des produits agricoles et de leurs facteurs influents. Région naturelle du Mosso. (Flow of agricultural products and influential factors. Natural region of Mosso). In . Contribution a la connaissance des régions naturelles du Burundi. Bujumbura, Burundi, Institut des Sciences Agronomiques du Burundi. Departement de Socio-Economie Rurale. pp.5,8-9,11,13-15.

Tables and graphs are presented of the flow of agricultural products and influential factors in the region of Mosso, Burundi, in 1983. Fifteen markets surveyed in different communities are located on a map. Beans were sold in all the markets with the exception of the market in Muhwazi. Based on the no. of agricultural products offered, the principal markets were Muzye (31), Giharo (27), Butare, Kayogoro, and Kinyinya (each with 24 products). Based on the no. of salesmen, the principal markets were Muzye (821), Kinyinya (535), and Kayogoro (497). Muzye also offered the greatest

total vol. of agricultural products (24,413 kg), followed by Kayogoro (14,285 kg), and Butare (11,865 kg). All beans in the Mosso market came from the same region. [CIAT]

1198

- * BERGEN, D. 1983. Flux des produits agricoles et de leurs facteurs influents. Région naturelle du Mugamba. (Flow of agricultural products and influential factors. Natural region of Mugamba). In _____, Contribution a la connaissance des régions naturelles du Burundi. Bujumbura, Burundi, Institut des Sciences Agronomiques du Burundi. Departement de Socio-Economie Rurale. pp.10,17-18,20-21,30,41,43,45-46, 48-49,57-58,79,85.

Tables, maps, and graphs are presented of the flow of some agricultural products, among them beans, and factors influencing this flow in the natural region of Mugamba, Burundi, during 1983. Seventeen markets were surveyed in different communities. Most of the products offered came from neighboring regions of Mugamba, especially Kirimiwo and Buyenzi. Surplus beans not consumed locally were directed toward Imbo, where better prices were offered for this product. Most of the production was for self-consumption (81%); furthermore, it was the crop that gave the farmers more satisfactions in terms of yield and marketing. However, storage problems occurred in the northern communities. [CIAT]

1199

- * BERGEN, D. 1982. Aspects de la commercialisation des produits vivriers, des légumes et des fruits au Burundi. Observations sur le Marché Central de Bujumbura. (Aspects of commercialization of food products, legumes, and fruits in Burundi. Observations on the Bujumbura Central Market). Bujumbura, Institut des Sciences Agronomiques du Burundi. Departement de Socio-Economie Rurale. Note Technique no.8. 42p.

Data was collected from May to July, 1982, to acquire better knowledge and understanding of a no. of aspects concerning the marketing of staple crops, vegetables, and fruits at the Central Market of Bujumbura, the most important market in Burundi. A list is given of all the products offered, as well as a qualitative appraisal of their supply and information on prices. The analysis of the origin of most offered products showed the relationship of the different natural regions of Burundi with the capital city, the latter being a deficiency area by definition of agricultural products. Specific marketing procedures were studied for the Central Market and price fixation mechanisms are analyzed in detail. [AS]

1200

- * DEMOL, J. 1980. Recherches sur les légumineuses a graines. (Research on grain legumes). In _____, Rapport de mission au Burundi. Gembloux, Belgique, Faculté des Sciences Agronomiques de l'Etat. pp.22-24.

Information is given on exptl. work with Phaseolus vulgaris in Burundi during 1980. Local and foreign material from Holland, Belgium, France, Colombia, Zaïre, and Rwanda were evaluated. Screening trials were conducted in Mosso and Kisozi, and also definite trials during the 1st season. Performance of var. Calima during the 1st season is highlighted; this var. presents low % of damaged seed and, furthermore, the seed is relatively large. Multilocational trials were conducted in Imbo, Mparambo, Mosso, Murongwe, Gisha (Ngozi), Rutegama (Gitega), Rwira, and Kisozi, with the following var.: Karama var. 1/2, 0762 Mixed Mexico, Bayo 164, 0688 Colorado, ICA (Bunsi), Diacol Calima, and NEP 2 (the last 3 from CIAT). A

list is presented of 14 trials conducted during the 2nd season of 1979-80 on (a) yield and var. adaptation; (b) IBYAN trials (CIAT-Colombia); (c) preliminary trials; and (d) seed collection, purification, and multiplication. [CIAT]

1201

- * DEVOS, P.; KABENGELE, K.; NZIMENYA, I. 1983. Legumineuses: haricot (*Phaseolus vulgaris*). (Legumes: beans). In Institut des Sciences Agronomiques du Burundi. Rapport des activités de recherches 1983. Bujumbura, Burundi. pp.23-29. [Institut des Sciences Agronomiques du Burundi, B.P. 795, Bujumbura, Burundi]

Results are given of a new cycle of bean improvement trials carried out in 1983 and aimed at finding var. with better adaptation to the ecological regions of Burundi. The interactions var. x environment (soil, climate, and alt.) were used to predict yields by a multiple regression formula. The factor soil (mean yield of 10 var. in a multilocational trial) was highly significant. The var. Jaune Pointillé and Aroana were not sensitive to rains and Doré de Kirundu, Bataaf, and Carioca were not affected by alt. The var. Karama 1/2, Calima, Urubonobono, and Kirundu are recommended for different alt. and soil types. At high alt. (1200-1500 m) a mixture of 6 var. showed a marked superiority over pure var. In comparative trials, the best var. from CIAT showed poor adaptation to the ecological conditions of Burundi. [CIAT]

1202

- * DEVOS, P.; KABENGELE, K. 1982. Legumineuses: haricot. (Legumes: beans). In Institut des Sciences Agronomiques du Burundi. Rapport Annuel 1981-1982. Bujumbura, Burundi. pp.40-57. [Institut des Sciences Agronomiques du Burundi, B.P. 795, Bujumbura, Burundi]

Information is given on var. selection of beans in Burundi during 1982. Yields of the 10 best bush var. retained in preliminary trials in Mosso, Murongwe, Ngoma, and Kisozi are presented; these were compared with a var. mixture in 8 localities. Information is included on alt., fertilization, exptl. conditions, best var. in each locality, yields, and % of healthy seed. The origin and performance of the var. mixture (Doré de Kirundu, Bataaf, Diacol Calima, Jaune Pointillé, Aroana, and Carioca) are discussed; the mixture's plasticity under different conditions and alt. is analyzed as well as the influence of the wt. of 100 seeds on the evolution of the mixture and on the allogamy rate. The mixture's actual yield was better than the theoretic yield of the component var., especially with fertilization, thus confirming its productivity. On the other hand, small-seeded var. tended to increase their proportion in mixtures. In other trials, var. Karama var. 1/2 and Diacol Calima outyielded 6 var. from CIAT, obtaining yields of 1832 and 1806 kg/ha, resp. In Mosso, most of the CIAT var. matured later than the control Diacol Calima. [CIAT]

1203

- * DEVOS, P.; KABENGELE, K. 1982. Legumineuses: haricot (*Phaseolus vulgaris*). (Legumes: beans). In Institut des Sciences Agronomiques du Burundi. Rapport Annuel 1982. Bujumbura, Burundi. pp.12-14. [Institut des Sciences Agronomiques du Burundi, B.P. 795, Bujumbura, Burundi]

Information is given on the selection of bean var. adapted to different regions of Burundi (Mosso, Murongwe, Ngoma, and Kisozi) and to cultivation in var. mixtures, during 1982. In preliminary trials, 7 var. were selected: Doré de Kirundu, Bataaf, Jaune Pointillé, Línea 23, BAT 44,

Aroana, and Carioca. In multilocal trials, only Karama var. 1/2 (932 kg/ha) and Diacol Calima (624 kg/ha) adapted to the heat and low humidity conditions of Bubanza. The mixture of 6 var. (Doré de Kirundo, Bataaf, Diacol Calima, Jaune Pointillé, Aroana, and Carioca) yielded 1008 kg/ha, ranking among the 1st places in all the localities. [CIAT]

1204

- * DEVOS, P. 1981. Sélection de la variété de haricot nain Diacol Calima. (Selection of the bush bean variety Diacol Calima). Bujumbura, Institut des Sciences Agronomiques du Burundi. Département de la Production Végétale. Note Technique. 10p.

Information is given on the 1st phase of bush and semiclimbing bean var. selection in Burundi during 1981. Six var. (Karama var. 1/2, 0762 Mixed Mexico, Bayo 164, 0688 Colorado, Bunsu, and Diacol Calima) were compared in various different alt. regions (Mosso, Imbo, Murongwe during 2 seasons; Gisha, Rutagama, Rwira, and Kisozi during 1 season). The parameters observed were time to 1st flowering and to harvest, final stand, no. of pods/plant (20 plants), dry seed wt. of the elementary plot, yield, damaged seed, and wt. of 1000 seeds. There were highly significant differences between var. and treatments, as well as for the var. x locality interaction. Var. Diacol Calima (introduced from CIAT in 1974) outyielded the other var. significantly. Karama var. 1/2, introduced from Rwanda in 1975 and already diffused in the region, occupied 2nd place. Var. Diacol Calima presented 1243 kg/ha, 14.7% damaged seed, 22.3 plants/m², 4.3 pods/plant, and 442 g/1000 seeds. Karama var. 1/2 is recommended for alt. below 1250 m and Diacol Calima for alt. between 1200-2000 m. Var. 0762 Mixed Mexico (bad quality seed, susceptible to anthracnose), Bayo 164 (bad quality seed), and Bunsu were eliminated, even though the latter, together with Diacol Calima, was one of the least susceptible to anthracnose. [CIAT]

1205

- * DEVOS, P. 1980. L'essai multilocal haricot nain (saison 1979-1980 B). [Multilocal trial with bush beans (1979-80 B season)]. In Institut des Sciences Agronomiques du Burundi. Résultats des recherches 1979-1980. Bujumbura. pp.1-5.

Trials were carried out in SEMS Imbo, Mparambo, Mosso, Murongwe, Rutagama, Gisha, Rwira, and Kisozi (Burundi) during the 2nd planting season of 1979-80 to select the highest yielding bean var. No fertilizers or phytosanitary products were applied. Var. used were Karama var. 1/2, 0762 Mixed Mexico, Bayo 164, 0688 Colorado, (ICA) Bunsu (from Colombia), Diacol Calima (from Colombia), and NEP-2; the introduction no., grain color, and origin are included for each one. A table presents data on alt., field conditions, planting date, fertilization, seed origin, and plot size. Trials carried out during the 2nd season of 1979-80 are listed: preliminary var. trials, yield and adaptation trials, and IBVAN. [CIAT]

1206

- * DEVOS, P.; KABENGELE, A. 1978. Le haricot. (Beans). In Institut des Sciences Agronomiques du Burundi. Projet de Programme pour la Campagne 1979-1980. Bujumbura. pp.24-25.

Information is given on projects evaluating the bean var. collection, preliminary and definitive trials, and seed multiplication and purification carried out in Burundi during 1979-80. Only the most vigorous and pest- and disease-tolerant var. in rural environments will compete. Var. from Holland, Belgium, and France will be evaluated for their performance in

Mosso and Kisozi at high alt. and trials will be carried out with CIAT var. to determine their production potential. Depending on the results of the var. trials, the no. of var. will be reduced in about 6 to 8 var., selected for their yield and acceptance. Karama var. 1/2 will be the check var. for low alt. and Colondo for high alt. On-farm evaluations will be done in the localities of Imbo, Mparambo, Mosso (hilly and alluvial soils), Murongwe, Gisha, Rutegama, Rwira, and Kisozi. One or 2 var. will be selected for diffusion. [CIAT]

1207

HERMAN, O. 1983. Etude de la réaction de variétés de Phaseolus vulgaris L. du Burundi a l'égard de Colletotrichum lindemuthianum (Sacc. & Magn.) Bri. & Cav. et de Uromyces phaseoli var. typica Arth. Mém. Trav. Fin d'Et. Gembloux, Fac. Sci. Agron. 97p.

1208

- * INSTITUT DES SCIENCES AGRONOMIQUES DU BURUNDI. 1984. Haricots. (Beans). In _____. Project de multiplication et diffusion des semences selectionnees. Rapport Annual 1984. Bujumbura, Burundi. pp.36-37,48-51.

Results are presented of bean and soybean multiplication trials in some provinces of Burundi during 1984. Highest bean yields were 1146 and 1008 kg/ha with Diacol Calima in Cankuzo and Makamba, resp.; Diacol Calima, Colorado, Urubonobono, and Karama outyielded local var. in all the provinces. In swamp conditions, positive results were obtained using dimethoate in collective treatment against Aphis fabae in bean crops, although some problems were encountered due to deficient application. [CIAT]

1209

- * INSTITUT DES SCIENCES AGRONOMIQUES DU BURUNDI. 1982. Haricots. (Beans). In _____. Ses objectifs-ses realisations 1962-1982. pp.8-9.

The present goals and developments of the bean improvement program at Institut des Sciences Agronomiques du Burundi are briefly stated. Three var., Karama 1/2 (780-1200 m), Diacol Calima (1200-1900 m), and Jaune Pointillé (1900-2200 m) outyielded 0688 Colorado in the main ecological zones and have been used extensively since 1980. Production intensification depends largely on the improvement of crop association (maize-bean). [CIAT]

1210

- * INSTITUT DES SCIENCES AGRONOMIQUES DU BURUNDI. 1981. Groupe des légumineuses. (Legumes). In _____. Rapport Annual 1981. Bujumbura. pp.1-12.

Information is given on bean var. trials in Burundi during 1981, evaluating yield, vegetative cycle, % of damaged seed, density at harvest, no. of pods, and resistance to pests and diseases. Results are presented in tables. That year 21 var. were introduced. All climbing var. from Gembloux were susceptible to mosaic in Kisozi, and were thus eliminated. In definite var. trials at different alt., Karama 1/2 and Diacol Calima (800-1200 and 1200-1900 m.a.s.l., resp.) were the most outstanding; for higher alt. no acceptable var. were found. In Mosso and Kisozi, var. BAT 317 and Ex Rico 23 were the most outstanding. On the other hand, beans grew well in Rwira. Highest av. yields were registered by Doré de Kirundo,

Diacol Calima, and line 17 with 1665, 1521, and 1501 kg/ha, resp. In a multilocational trial with dwarf var. in Mosso, Murongwe, Rwira, and Kisozi, the best var. were Doré de Kirundo and Jaune Pointillé (both local), Bataaf, Aroana, and Calima. In Mosso, harvested beans were of better quality. BAT selections from CIAT presented little adaptation to Burundian conditions. [CIAT]

1211

- * INSTITUT DES SCIENCES AGRONOMIQUES DU BURUNDI. 1977. Groupe des légumineuses. (Legumes). In _____. Rapport Annuel 1977. Bujumbura. pp.38,103-104.

Data for 1977 are presented on bean var. improvement in Kisozi and Mosso, regions in Burundi with high and intermediate alt., resp. Improvement and multiplication of this crop will not be continued in Kisozi. In Mosso, a min. yield of 700 kg/ha was obtained during the dry season; the max. yield during the rainy season was 700 kg/ha. Var. selection must be carried out during the rainy season to determine tolerance to rust. Performance of var. 1/2 (from the Extreme East) and Bayo 164 is highlighted. Bayo 164 yielded 660 and 1040 kg/ha during the rainy and dry seasons, resp. Selected and introduced var. from Colombia were compared in xeroferric soils. Furthermore, an improved var. mixture was obtained: 7 var. of more or less erect growth habit, with an av. yield of 1100 kg/ha. Five tons of seeds were multiplied in black clayey, xeroferric, and plinthonic soils. [CIAT]

1212

- * INSTITUT DES SCIENCES AGRONOMIQUES DU BURUNDI. 1974? Activites de l'I.S.A.B.U. (Activities of I.S.A.B.U.). Bujumbura. lp.

A map of the activities carried out at Institut de Sciences Agronomiques du Burundi during 1974 is presented. The activities on management, planning, coordination, and administration are concentrated in Bujumbura; the pedology and plant pathology lab., rural economics, sociology and rural affairs are also located there. The stations of Kisozi, Luvironza, Mosso, and SEMS/IMBO are pinpointed as well as the Nyakararo, Murongwe, Munanira, and Kinyinya Agricultural Centers. [CIAT]

1213

- * INSTITUT DES SCIENCES AGRONOMIQUES DU BURUNDI. 1974. Les cultures vivrieres. (Food crops). In _____. Rapport Annuel 1974. Bujumbura. pp.110-111,113.

In 1974 a retrospective survey was carried out on income obtained from the sale of food crops (maize, beans, sorghum, peanuts, cassava, banana, and plantain) in 152 rural exploitations in Burundi. Results are presented in tables. Of the total no. of exploitations, 56% sold beans; of the exploitations that harvested beans, 61% sold the product. Beans represented 10% of the financial income for sale of crops and accounted for 5% of the overall agricultural financial income derived per exploitation. The composition of agricultural income in the regions of Mosso, Ngozi, Muyinga, and Cibitoke is compared. The agricultural income in Cibitoke was superior to that of other regions previously studied. [CIAT]

1214

- * INSTITUT DES SCIENCES AGRONOMIQUES DU BURUNDI. 1973. Cultures vivrieres. (Food crops). In _____. Rapport Annuel 1973. Bujumbura. pp.136-137.

Data for 1973 are presented on food crops in Murongwe Station, Burundi, Expt. with intensive rotational crops continued in 7 plots due to fertilization with manure of confined cattle. Bean var. Colorado yielded 961 kg/ha and suffered rust attack, which was controlled by spraying with Cuprexol. In another plot, bean var. 34 SB/44/1 yielded 837 kg/ha. [CIAT]

1215

- * INSTITUT DES SCIENCES AGRONOMIQUES DU BURUNDI. 1972. Les cultures vivrières. (Food crops). In _____. Rapport Annuel 1972. Bujumbura, Station de Mparambo. pp.78-80.

Brief information on food crops in Mparambo, Burundi, in 1972 is presented. Beans (for animal nutrition) yielded 800 kg dry beans/ha. On the other hand, a production potential of 7000 kg/ha was recorded in a bean trial (0.30 ha) using beans for export which included a bush bean var. and the var. Fin de Bagnols. Unfortunately, no market for these beans was found. [CIAT]

1216

- * INSTITUT DES SCIENCES AGRONOMIQUES DU BURUNDI. 1972. Cultures vivrières. (Food crops). In _____. Rapport Annuel 1972. Bujumbura, Station de Murongwe. p.128.

Data on food crops in Murongwe, Burundi, in 1972 are presented. Expt. were conducted in 7 plots using crop rotation. Bean var. Colorado yielded only 694 kg/ha due to a severe rust attack. In another plot, var. 34SB/44/1 yielded 1250 kg bean seed/ha. [CIAT]

1217

- * INSTITUT DES SCIENCES AGRONOMIQUES DU BURUNDI. 1971. Haricots. (Beans). In _____. Rapport Annuel 1971. Bujumbura. 1p.

Results of the evaluation of 30 bean var. in Burundi are briefly described. During the 1st growing season, the outstanding var. were Mulungu 4367, Mulungu 358, Negro 4508, 34 SB 44 and 44/1, and Amarillo 156, and in the 2nd season, Pinto, 34 SB 44, 34 SB 44/1, and M342. The outstanding var. in the multiplication plots were Negro 4508 (814 kg/ha) and Colorado 0688. [CIAT]

1218

- * INSTITUT DES SCIENCES AGRONOMIQUES DU BURUNDI. 1970. Haricots. (Beans). In _____. Rapport Annuel 1969. Bujumbura. 1p.

In 1970 the bean introduction 34 SB 44/1 yielded 1071 kg/ha in the 2nd growing season at Institut des Sciences Agronomiques du Burundi. The genetic materials 2, 3, and 4 yielded more than 1 t/ha. The bean var. Colorado (check) yielded 1319 kg/ha. [CIAT]

1219

- * INSTITUT DES SCIENCES AGRONOMIQUES DU BURUNDI. 1970. Legumineuses alimentaires: haricot. (Food legumes: beans). In _____. Rapport Annuel 1969. Bujumbura, Station du Mosso. p.73.

Data on var., location, planting area, and yield of var. multiplication in Mosso, Burundi, in 1970 are tabulated. The best bean var. was Bayo (1000

kg/ha), followed by Mélange Enrichi, Mixed Mexico, and Wulma which yielded 948, 800, and 800 kg/ha, resp. [CIAT]

1220

- * INSTITUT DES SCIENCES AGRONOMIQUES DU BURUNDI. 1969. Cultures vivrières. (Food crops). In _____. Rapport Annuel 1969. Bujumbura, Station de Murongwe. pp.58-59.

Information is presented on the sequence of food crops grown in rotation in Murongwe, Burundi, in 1969. Bean var. Colorado was 2nd (1 yr) and 4th (1 yr) in the rotation, yielding 1150 and 1000 kg/ha, resp. [CIAT]

1221

- * INSTITUT DES SCIENCES AGRONOMIQUES DU BURUNDI. 1969. Haricots. (Beans). In _____. Rapport Annuel 1969. Bujumbura. lp.

Observation of the collection of 30 bean var. was continued in Burundi during 1969. The yields of 8 bean var. grown in multiplication plots were approx. 1 t/ha. Bean var. Wulma 4508 was superior in the 1st growing season and Colorado 0688 in the 2nd (755 kg/ha). [CIAT]

1222

- * INSTITUT DES SCIENCES AGRONOMIQUES DU BURUNDI. 1968. Cultures vivrières. (Food crops). In _____. Rapport Annuel 1968. Bujumbura, Station de Murongwe. pp.56-57.

A list of the sequence of crops grown in rotation in 1968 in Murongwe, Burundi, is given. Changes for this rotation are suggested. Bean var. Colorado yielded 800 kg/ha during the 1st growing season. [CIAT]

1223

- * INSTITUT DES SCIENCES AGRONOMIQUES DU BURUNDI. 1968. Haricots. (Beans). In _____. Rapport Annuel 1968. Bujumbura, Station de Kisozi. lp.

Data on bean trials carried out in Kisozi, Burundi, in 1968 are presented. From the climatic adaptation point of view, the collection was reduced to 30 var., among which var. Wulma, 34 SB 44/1, Mulungu 358, Colorado, Amarillo, and SB 44 were outstanding. with yields over 800 kg/ha. [CIAT]

1224

- * INSTITUT DES SCIENCES AGRONOMIQUES DU BURUNDI. 1967. Haricots (introductions). (Beans: introductions). In _____. Rapport Annuel 1967. Bujumbura, Station de Kisozi. p.65.

A brief report on the bean collection in Kisozi, Burundi, in 1967 is presented. Fifteen new bean var. were introduced. Var. 48 Bayo 164, 47 Negro 150, 45 Amarillo, SB 44, and SB 44/1 showed resistance to Melanagromyza phaseoli and good performance in marginal regions. The introduction of bean var. better adapted to Kisozi alt. is expected. [CIAT]

1225

- * INSTITUT DES SCIENCES AGRONOMIQUES DU BURUNDI. 1965. Les haricots: (plus de sélection, quelques essais variétaux maintenus). (Beans: no more selection, only varietal trials are maintained). In _____. Rapport Annuel 1965. Bujumbura, Station de Kisozi. p.99.

Information on bean collection (29 var.) and multiplication in Kisozi, Burundi, during 1965 is presented. Screening has been discontinued and only var. trials are maintained. Yields were poor, mainly due to frosts during flowering. Var. Cuarentino 0712 had the highest yield (671 kg/ha during the 2nd season). [CIAT]

1226

- * INSTITUT DES SCIENCES AGRONOMIQUES DU BURUNDI. 1964. Les haricots: (plus de sélection quelques essais variétaux seulement). (Beans: no more selection, only some varietal trials). In _____. Rapport Annuel 1964. Bujumbura, Station de Kisozi. pp.111-112.

Information is presented on the collection of bean var. (32) and some var. trials carried out during 1964 in Kisozi, Burundi. During both seasons, 28 var. from the collection were planted. During the 2nd season, 6 var. were compared using Colorado 0688 as control. The best var., 4508, presented a 114.15% yield in relation to the control (254.5 kg/ha). This var. will undergo multiplication. Climatic conditions were abnormal and a severe aphid attack occurred. Var. Colorado 0688, Mixed Mexico 0762, Cuarentino 0824 and 0712, Long Beige 2209, and Bayo were multiplied. Only Colorado 0688 yielded acceptably (967.50 kg/ha during the 1st season). Yields varied from 45 to 380 and from 29 to 344 kg/ha during the 1st and 2nd seasons, resp., indicating that the Kisozi region is not adequate for this crop. [CIAT]

1227

- * INSTITUT DES SCIENCES AGRONOMIQUES DU BURUNDI. 1963. Les haricots (selection arrêtée). (Beans: verified selection). In _____. Rapport Annuel 1963. Bujumbura. pp.106-108.

Information is given on the var. selection of beans in Kisozi, Burundi, during 1963. Trials were limited to observations of collections and var. trials with introductions. The best introduction was 4505, clearly superior to the control Colorado 0688 ($P = 0.01$). Var. Colorado 0688, Mixed 0538 and 0762, Cuarentino 0712 and 0824, Long Beige 2209, Bayo, and Bayo 0547 were multiplied. Yields were low (34-656 kg/ha), confirming the difficulty to harvest beans at high alt. and the need to use monocrops in highly fertilized soils. [CIAT]

1228

- * INSTITUT DES SCIENCES AGRONOMIQUES DU BURUNDI. 1962. Haricots. (Beans). In _____. Rapport Annuel 1962. Bujumbura, Station de Kisozi. 1p.

Information is presented on expt. carried out with beans in Kisozi, Burundi, during 1962. Abnormal rainy conditions in Nov. affected Oct. plantings. Var. Colorado 0688 yielded 144, 133, and 1600 kg/ha, resp., at the Burundi, Munanira, and Nyakararo stations. [CIAT]

1229

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1962. La diffusion des semences sélectionnées dans le cadre des améliorations en zone d'action rurale de Kisozi. (Diffusion of selected seeds within the breeding program in the target area of Kisozi). Burundi. Documents Techniques. 3p.

The process of diffusing selected seeds in the rural target area of the Institut National pour l'Etude Agronomique du Congo Belge in Kisozi,

Burundi, in 1962 is briefly described. The process consists of 4 stages: (1) primary multiplication at the Station; (2) secondary and local multiplication at a larger scale in Kisozi and Nyakararo; (3) large-scale multiplication in the native environment; and (4) 2nd diffusion of materials from Kisozi and Nyakararo. Subsequently, an advertising and control campaign was carried out, which in the case of beans resulted in the enrichment of local mixtures. Var. recommended for diffusion were Colorado, Bayo, Mixed Mexico, and Long Beige Indigena 2209. [CIAT]

1230

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1962. Haricots. (Beans). In _____, Rapport Annuel 1962. Burundi, Station Experimentale de Kisozi. pp.14-15,37-40.

Information on bean multiplication in 1962 at Kisozi Station, Burundi, is presented. Yields were low due to abnormal rains (544.4 mm in 29 days). However, it was observed that 9 var., among them Colorado, Cuarentino, and Bayo, were resistant to the rains. On the other hand, the var. from Ecuador and Tanganyika were promising. In Nyakararo, var. Colorado yielded 1600 kg/ha, with good soils and adequate cultural practices. [CIAT]

1231

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1961. Haricots. (Beans). In _____, Rapport Annuel 1961. Burundi, Station Experimentale de Kisozi. pp.16-17,41-44,46.

Bean multiplication carried out in 1961 at Kisozi Station, Burundi, is reported. Tables are included on planted area, preceding crop, fertilization, planting and harvesting dates, and yield. The highest yielding var. was 0547 Bayo with 1054 kg/ha. Both drought and rainfall during maturation reduced yields in the local multiplication plots. Several P fertilization trials were carried out. [CIAT]

1232

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1960. Haricots. (Beans). In _____, Rapport Annuel 1960. Burundi, Station Experimentale de Kisozi. p.11.

Data are presented on bean multiplication at Kisozi Station, Burundi, in 1960: cultivated area, preceding crop, fertilization, planting and harvesting dates, and yields. During the 1st planting season yields were 1665 kg/ha for the indigenous var. 2209 L.E.I., 1785 kg/ha for 0688 Colorado, and 1332 kg/ha for 0538 Mixed Mexico. In the 2nd planting season, premature rains decreased yields considerably. [CIAT]

1233

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1959. Experimentation culturale: haricots. (Crop experimentation: beans). In _____, Rapport Annuel 1959. Burundi, Station du Mosso. pp.14-16.

Information on crop research in 1959 at Mosso Station, Burundi, is presented. Regarding the study on maize-bean rotation in irrigated alluvial soils, it is indicated that under nonmechanized cropping conditions, without fertilizers, it is more convenient to cultivate maize and beans in association than in monoculture. [CIAT]

1234

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1959. Haricots. (Beans). In _____. Rapport Annuel 1959. Burundi, Station Experimentale de Kisozi. pp.17-18.

Data on bean multiplication during 1959 at Kisozi Station, Burundi, are presented, including area cultivated, preceding crop, fertilization, planting and harvesting dates, and yields. For the Oct. planting of 1958, the highest yields corresponded to the var. 2209 L B I (1527 kg/ha) and 0688 Colorado (1156 kg/ha). For the March planting of 1959, on good quality soils, var. Mixed Mexico, 0688 Colorado, and the indigenous line 2209 yielded 1800, 1513, and 1866 kg/ha, resp. These var. will be promoted among the native bean growers. On the other hand, the introductions from Mulungu were identical to the var. from Kisozi. [CIAT]

1235

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1958. Amelioration des plantes; observations de comportement: haricots (*P. vulgaris*). (Plant breeding: observations on the performance of beans). In _____. Rapport Annuel 1958. Burundi, Station du Mosso. pp.3-4,9-10,14-15.

Some observations are presented on bean performance at Mosso Station, Burundi, in 1958. Var. Mixed Mexico with a yield of 1020 kg/ha was outstanding among lines originating from Kisozi. The sorghum-beans association performed well in nonirrigated Kininiya soils in the 3rd yr after felling. The var. mixture of Bayo, Mixed Mexico, and Colorado yielded 945 and 1655 kg/ha, with and without fertilization, resp., in swamp lands (Lugoma). [CIAT]

1236

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1958. Haricots. (Beans). In _____. Rapport Annuel 1958. Burundi, Station Experimentale de Kisozi. p.18.

Observations made on the bean var. studied at Kisozi Station, Burundi, during 1958 are presented regarding establishment, harvest wt., and resistance to anthracnose and to *Melanogromyza phaseoli*. Best var. were Bayo 0505, Mixed Mexico 0588 and 0762, Colorado 0688 and 0981, and an indigenous line, no. 02209. The low rainfall affected the bean crops. [CIAT]

1237

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1958. Haricots: (*P. vulgaris*). (Beans). In _____. Rapport Annuel 1958. Burundi, Station du Mosso. pp.7,15-17,24,26.

Results corresponding to bean research in 1958 at Mosso Station, Burundi, are presented. The *Phaseolus vulgaris* collection gave a mean yield of 1021 kg dry clean seed/ha. That year an attack of *Uromyces appendiculatus* occurred, reducing yields. The best var. were Cuarentino, Colorado, Mixed Mexico, and Bayo, which will be introduced as a mixture into native crops. During the 1958 dry season, Cuarentino produced 2355 kg/ha; however, this var. had problems with its climbing growth habit under favorable conditions (Mushonga soil). The sorghum-bean association gave good results as the 3rd crop in the rotational cropping scheme. [CIAT]

1238

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1957. Haricots. (Beans). In _____. Rapport Annuel 1957. Burundi, Station Experimentale de Kisozi. p.11.

A table is presented on the comparative bean trials carried out at Kisozi Station, Burundi, in 1957. The best var. was Bayo, which is extensively grown by natives mixed with var. Colorado. [CIAT]

1239

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1957. Haricots: (P. vulgaris). (Beans). In _____. Rapport Annuel 1957. Burundi, Station du Mosso. pp.6,13-18.

The results obtained in crop research in 1957 at Mosso Station, Burundi, are presented. In crop rotation, the sorghum-bean association gave good results as 3rd crop after felling. [CIAT]

1240

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1957. Haricots: (P. vulgaris). (Beans). In _____. Rapport Annuel 1957. Burundi, Station du Mosso. pp.10-12,25,28-31.

Information is presented on the low yields (344 kg/ha) obtained with the bean collection at Mosso Station, Burundi, in 1957. However, in a comparative trial, 5 var. yielded over 1000 kg/ha, the best being Cuarentino and Kabenga (1888 and 1191 kg/ha, resp.). Var. Cuarentino, Kabenga, 21 Aa, and Colorado seem to be more appreciated by the natives and their diffusion will be attempted. An intensive exploitation of the alluvial soils is sought by the use of rotational crops. It has been observed that beans as the preceding crop is very advantageous and so is the cotton-beans-maize rotation. [CIAT]

1241

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1956. Collections: haricots. (Collections: beans). In _____. Rapport Annuel 1956. Burundi, Station du Mosso. pp.4-6,18.

Information is presented on the bean collection and var. multiplication at Mosso Station, Burundi, in 1956. There was a severe drought that affected the 12 var. of the collection, which only reached an av. yield of 509 kg dry seeds/ha, whereas Phaseolus coccineus yielded 1400 kg/ha. P. lunatus confirmed its high productivity (2738 kg/ha), and its diffusion among indigenous groups will be attempted. [CIAT]

1242

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1956. Haricots. (Beans). In _____. Rapport Annuel 1956. Burundi, Station Experimentale de Kisozi. pp.12-14,29-30.

During 1956 the evaluation of bean var. continued at Kisozi Station, Burundi. Var. Bataaf, superior to Bayo on excellent soil, was inferior to the latter on soils of intermediate fertility. Var. Bayo and Colorado, more adaptable, are widely grown by the natives. Seed characteristics and resistance to Melanagromyza phaseoli of 13 bean lines are given in table form. The beneficial effect of earthing up was less noticeable that year

and a marked effect of mineral fertilization on bean var. Bayo was observed when this was applied to a preceding maize or wheat crop. [CIAT]

1243

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1955. Haricots. (Beans). In _____, Rapport Annuel 1955. Burundi, Station Experimentale de Kisozi. pp.15-16.

Data are presented on the collection and var. selection of beans at Kisozi Station, Burundi, in 1955. Var. Bayo and Colorado yielded 1329 and 885 kg/ha, resp., in multiplication plots. On the other hand, beans subjected to earthing up reacted very well after the attack of Melanagromyza phaseoli, by producing new roots above the affected zone; this resulted in higher yields of the var. Colorado (363 vs. 636 kg/ha) and Bayo (509 vs. 1200 kg/ha). [CIAT]

1244

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1955. Productions végétales: haricots. (Crop production: beans). In _____, Rapport Annuel 1955. Burundi, Station du Mosso. pp.14-16.

Production data of Phaseolus vulgaris at Mosso Station, Burundi, in 1955 is presented. That year the yields of the introduced var. improved during the 1st planting season, with an av. of 1197 kg/ha. Var. Mixed Mexico yielded 1669 kg/ha. P. vulgaris performs well on lands felled 2 yr before and also in early planting. P. lunatus gives a good production (1350 kg/ha in av.) as 3rd crop after felling. [CIAT]

1245

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1954. Haricots. (Beans). In _____, Rapport Annuel 1954. Burundi, Station du Mosso. pp.4,7,12,20,22.

Information is given on bean crops, one of the most valued staples in the region, at Kininira Center, Burundi, in 1954. Bean populations are very heterogeneous, mainly those of nonclimbing Phaseolus vulgaris species; climbing P. lunatus is also cultivated on fences and intercropped with cassava. Mixed crops are generally grown since they are appropriate for the short cropping season of the region. The association of beans-sorghum-Cajanus cajan is very common. No success has been obtained with selected var. However, planting of selected var. in swamps with native cropping methods has given good results. [CIAT]

1246

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1954. Haricots. (Beans). In _____, Rapport Annuel 1954. Burundi, Station Experimentale de Kisozi. pp.50-53.

Results of comparative bean var. trials, carried out at Kisozi and Mugahoro Stations and at Ruhunde Center (Burundi) in 1954, are presented. In Kisozi, var. Col. 0652, Col. 0678, Col. 0623, Bayo 0465, and Cuarentino had a similar performance to the check Colorado. In Mugahoro, var. 21 Aa, Cuarentino, and probably Kiba, outyielded Colorado. On the other hand, in Ruhunde var. Kiba, Benrré d'Alger, and Mixed Mexico were outstanding in 2 trials compared with local mixtures. [CIAT]

1247

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1953. Haricots. (Beans). In _____. Rapport Annuel 1953. Burundi, Station du Mosso. p.2.

Information on a severe drought that affected bean crops in 1953 at Mosso Station, Burundi, is presented. The less affected var. were Colorado, Bayo, and Mixed Mexico. [CIAT]

1248

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1953. Haricots. (Beans). In _____. Rapport Annuel 1953. Burundi, Station Experimentale de Kisozi. p.29.

The superiority of the bean lines from Kisozi Station, Burundi, was confirmed during 5 cropping seasons. The results obtained with the mixture of Colorado 0652 and Kiba (Bayo 0465 + 0469) in Rwanda-Burundi territories are presented. In south Ruhengeri, var. Kiba accounted for 75% of the production and in the rest of the territory, 30%. In Astrida, the same mixture accounted for almost 100% of the production and was spreading rapidly in Shangugu. The natives appreciated it for its yields and organoleptic properties. [CIAT]

1249

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1952. Haricots. (Beans). In _____. Rapport Annuel 1952. Burundi, Station Experimentale de Kisozi. pp.45-46.

Information on beans corresponding to 5 planting seasons of 1952 at Kisozi Station, Burundi, is summarized in table form. Kisozi lines Colorado 0652 and Bayo 0465 maintained their superiority and their cultivation has extended among the natives. Among the introductions from Vilmorin Verrieres, no. 3761 and 3754 were outstanding. [CIAT]

1250

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1951. Haricots. (Beans). In _____. Rapport Annuel 1951. Burundi, Station Experimentale de Kisozi. p.49.

The results of expt. carried out at Kisozi Station, Burundi, during 4 planting seasons of 1951 with bean var. introduced from Mulungu, are summarized. The mixture of 2 bean lines from Kisozi, Colorado 0652 and Bayo 0465, used as a check, kept its superiority. The introductions gave good results during the 2 1st seasons but they were inferior to the check afterwards. Rainfall data is included. [CIAT]

1251

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1950. Haricots. (Beans). In _____. Rapport Annuel 1950. Burundi, Station Experimentale de Kisozi. pp.54-58.

Yields are given of the bean lines introduced from Yangambi, in trials with alternate checks carried out at Kisozi Station, Burundi, in 1950. Among the best introductions of the 2 planting seasons were Cuarenteno, 21 Aa, Bayo, and Wulma (black-seeded). Data on flowering, fructification, harvest, and establishment for the introductions made in 1949 are included. [CIAT]

1252

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1949. Haricots. (Beans). In _____. Rapport Annuel 1949. Burundi, Station Experimentale de Kisozi. pp.67-70.

Data are presented on the comparative trials carried out with different bean lines at Kisozi Station, Burundi, in 1949. That year var. Wulma was outstanding but it was not accepted due to the black color of its seed. [CIAT]

1253

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1948. Haricots. (Beans). In _____. Rapport Annuel 1948. Burundi, Station Experimentale de Kisozi. 1p.

Information is presented on the selection of beans in the Kisozi region, Burundi, in 1948. In general, the selected lines outyielded indigenous var. by 150%; therefore, they are very appreciated by the population. These var. form the var. mixture cultivated in the region, with predominance of var. Colorado. In a comparative trial, the mixture Bayo-Colorado-Mixed Mexico yielded 726 kg/ha. [CIAT]

1254

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1947. Activité principale: sélection des plantes vivrières; haricots. (Main activities: selection of food crops; beans). In _____. Rapport Annuel 1947. Burundi, Station Experimentale de Kisozi. 1p.

Data on the selection of beans at Kisozi Station, Burundi, in 1947 are presented. The best plot yielded 1300 kg/ha. The var. cultivated were Colorado, Mixed Mexico, Cuarenteno, and Kis. [CIAT]

1255

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1946. Haricots. (Beans). In _____. Rapport Annuel 1946. Burundi, Station Experimentale de Kisozi. 1p.

Brief information on an expt. with beans in 1946 at Kisozi Station, Burundi, is presented. Lines 0538, 0652, 01002, Kiba, Kiko, and 2856 were superior to the check Blancs Kisozi. [CIAT]

1256

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1945. Haricots. (Beans). In _____. Rapports Annuel 1943, 1944, 1945. Burundi, Station Experimentale de Kisozi. pp.58-69.

Technical and meteorological information is presented of exptl. bean crops at Kisozi Station, Burundi, in 1945. The main exptl. var. were Mixed Mexico, Colorado, Bayo, Cuarentino, Gros Blanc Kisozi, and the lines Kiko, Kiba, and Kime; indigenous lines were also evaluated. On the av., exptl. lines outyielded indigenous lines by 150%; 0538 Mixed Mexico, 0652 Colorado, and Gros Blanc 2826 were notably superior to the rest. Var. Cuarentino gave variable results. [CIAT]

1257

- * LANDA, C. 1983. Essais sur haricot. (Bean trials). In _____. Vingt ans d'essais de fumure sur cultures vivrières au Burundi 1963-1983.

Results of 20 yr (1963-83) of fertilization trials with beans in Burundi are summarized: (1) high alt. trials carried out by the Institut des Sciences Agronomiques du Burundi; (2) multilocational trials in Gitega and Ngozi and results of demonstrations of the FAO fertilization program; and (3) collaborative work between the Institut-FAC to establish the relationship between natural fertility of some soils and the yields obtained. The efficiency of hyper Reno (tricalcic phosphate) for beans was shown. In high alt. soils, rich in humus, the P:K ratio should be at least 2. Increase in yield was greater in anthropic Ferrasols (104-382% of the control) which absorbed K better. It is recommended to use complete formulas such as 20-60-30 and apply K in soluble form in very specific sites to reduce retrogradation risks. [CIAT]

1258

- * LEFEVRE, P.C. 1955. Un important parasite du haricot Melanagromyza (Agromyza) phaseoli Coq. [An important bean pest: Melanagromyza (Agromyza) phaseoli]. Bulletin d'Information de l'INEAC 4(1):43-46.

Data on geographical distribution, biology, damage caused, and control of the bean fly Melanagromyza phaseoli, which attacks beans and other legumes in Mulungu, Burundi, are given. Recommended control measures include (1) identification of the best planting time to allow plant strengthening before pest attack, (2) selection of adequate terrains (light, fresh, rich in OM), (3) soil disturbance before seedling emergence and earthing up, (4) burning of very infested plants and dry leaves, and (5) use of M. phaseoli-resistant var. such as Wulma. [CIAT]

1259

- * LYAMUGENA, L. 1984. La bruche (Acanthoscelides obtectus) du haricot. [Bean bruchids (Acanthoscelides obtectus)]. In Institut des Sciences Agronomiques du Burundi. Rapport des Recherches Agronomiques 1984. pp.120-121.

The results of trials carried out at the Institut des Sciences Agronomiques du Burundi for the control of bean bruchids (Acanthoscelides obtectus) during storage are briefly summarized. In one trial, 4 bean seed lots, 2 kg each, were placed in boxes which were exposed to an identical infestation source and were treated with a formulation of pirimiphos-methyl 1% on clay, calcium carbonate, and laterite. A treatment with laterite alone and a check were also used. All the treatments significantly protected beans during 6 mo. In the treated bean seed lots, 6 mo. after the treatment, bruchid mortality rate 48 h after artificial infestation increased by 20, 35, 60, and 100% for the treatment with pirimiphos-methyl on clay, calcium carbonate, and laterite, and on laterite alone. A complementary trial demonstrated that the laterite dose and granulation do not have significant effects on bruchid control. Laterite did not influence the germinating power of the grain and it was eliminated by washing it before cooking. [CIAT]

1260

- * MATON, P. 1984. Inventaire de l'occupation du sol: Bututsi; note technique. (Inventory of land use: Bututsi; technical note). In . Contribution a la connaissance des régions naturelles du Burundi. Bujumbura, Institut des Sciences Agronomiques du Burundi. Département de

Socio-Economie Rurale. Publication no.54. pp.8-9,13-14. [Institut des Sciences Agronomiques du Burundi, B.P. 795, Bujumbura, Burundi]

An inventory made in 1984 on land use in Bututsi, Burundi, is presented. Information on the evolution of cultivated and noncultivated area, evolution per rugo, per family exploitation unit, and per person is included. [CIAT]

1261

- * MATON, P. 1984. Inventaire de l'occupation du sol: 1. Bugesera. 2. Bweru. 3. Buragane; note technique. (Inventory of land use: 1. Bugesera. 2. Bweru. 3. Buragane; technical note). In _____. Contribution a la connaissance des régions naturelles du Burundi. Bujumbura, Institut des Sciences Agronomiques du Burundi. Departement de Socio-Economie Rurale. Publication no.48. pp.11-12, 17-18,26-29,39,41,45-46. [Institut des Sciences Agronomiques du Burundi, B.P. 795, Bujumbura, Burundi]

An inventory made in 1984 on land use in the natural regions of Bugesera, Bweru, and Buragane (Burundi) is presented. Two hypotheses are included on % of cultivated and noncultivated area and its evolution per rugo, per family exploitation unit, and per person for the years 1973, 1982, and 1987. For Bugesera (210,180 ha), the 1st hypothesis indicates a cultivated area of 27.9, 27.7, and 27.6% for the 3 yr, resp.; the 2nd hypothesis indicates figures of 27.9, 37.9, and 45.0%, resp. For Bweru (242,140 ha), the 1st hypothesis indicates utilization % of 36.0, 35.8, and 35.7%, resp., and the 2nd, 36.0, 44.5, and 44.5% for the 3 yr, resp. With respect to Buragane (116,650 ha), the corresponding % are 21.2, 21.1, and 21.0%, resp. (1st hypothesis) and 21.1, 22.2, and 26.6%, resp. (2nd hypothesis). [CIAT]

1262

- * MATON, P. 1984. Inventaire de l'occupation du sol: 1. Buyogoma. 2. Mosso; note technique. (Inventory of land use: 1. Buyogoma. 2. Mosso; technical note). In _____. Contribution a la connaissance des régions naturelles du Burundi. Bujumbura, Institut des Sciences Agronomiques du Burundi. Departement de Socio-Economie Rurale. Publication no.36. pp.8-9,16-17,23-24,30-31. [Institut des Sciences Agronomiques du Burundi, B.P. 795, Bujumbura, Burundi]

An inventory made in 1984 on land use in the natural regions of Buyogoma and Mosso, Burundi, is presented. Information is included on the % of cultivated and noncultivated area, evolution per rugo, per family exploitation unit, and per person for the years 1973, 1982, and 1987. [CIAT]

1263

- * MATON, P. 1983. Inventaire de l'occupation du sol: Buyenzi. (Inventory of land use: Buyenzi). In _____. Contribution a la connaissance des régions naturelles du Burundi. Bujumbura, Institut des Sciences Agronomiques du Burundi. Departement de Socio-Economie Rurale. Publication no.37. pp.9-10,15-16. [Institut des Sciences Agronomiques du Burundi, B.P. 795, Bujumbura, Burundi]

An inventory made in 1983 on the utilization of Buyenzi soils (207,710 ha), Burundi, is presented in table form. Information on % of cultivated and noncultivated areas in agricultural lands and their evolution per rugo, per family exploitation unit, and per person for the years 1973, 1982, and 1987 is included. [CIAT]

- * MATON, P. 1983. Inventaire de l'occupation du sol: Mugamba. (Inventory of land use: Mugamba). In _____, Contribution a la connaissance des régions naturelles du Burundi. Bujumbura, Institut des Sciences Agronomiques du Burundi, Departement de Socio-Economie Rurale. Publication no.22. pp.10-11,18,20. [Institut des Sciences Agronomiques du Burundi, B.P. 795, Bujumbura, Burundi]

An inventory carried out in 1983 on land use in the Mugamba region, Burundi, is presented. Information on % of cultivated and noncultivated area, their evolution per ruغو, per family exploitation unit, and per person for the years 1973, 1982, and 1987 is included. [CIAT]

- * MATON, P. 1983. Inventaire de l'occupation du sol: 1. Imbo. 2. Mumirwa. (Inventory of land use: 1. Imbo. 2. Mumirwa). In _____, Contribution a la connaissance des régions naturelles du Burundi. Bujumbura, Institut des Sciences Agronomiques du Burundi, Departement de Socio-Economie Rurale. Publication no.15. pp.14-15,22-23,31-32,40-41. [Institut des Sciences Agronomiques du Burundi, B.P. 795, Bujumbura, Burundi]

An inventory conducted in 1983 on the utilization of soils of Imbo and Mumirwa, Burundi, is presented. Two hypotheses are presented on cultivated and noncultivated area, their evolution per ruغو, per family exploitation unit, and per person for the years 1973, 1982, and 1987. According to the 1st hypothesis, of a total of 187,490 ha, the area cultivated in Imbo would be 33.9, 33.9, and 33.8% for the 3 yr mentioned. According to the 2nd hypothesis, the figures would be 33.9, 48.5, and 58.7% for the 3 yr, resp. For Mumirwa, with a total surface area of 257,875 ha, the figures would be 27.5, 27.4, and 27.4% for the 3 yr, resp., for the 1st hypothesis, and 27.5, 37.8, and 46.1% for the 2nd hypothesis. [CIAT]

- * MERTENS, A. 1984. La conservation des vivres dans un ensemble de familles rurales au Burundi: variations dans le temps et dans l'espace. (Food product preservation in a group of rural families in Burundi: variations in time and space). Agronomie Tropicale 39(2):172-185.

The evolution of preservation of 9 food products (peanut, African millet, wheat, bean, maize, pea, rice, soybean, and sorghum) and related socioeconomical parameters (sowing, storage, purchases, sales, and gifts) were studied among 600 rural families divided among 3 natural areas of Burundi. Precise measurements were taken every 2 wk. during 6 cropping seasons. Results are given according to the natural region to which they pertain in order to set the basis of regional agricultural policy adapted to increase stored products to the benefit of a self-supporting rural population. [AS]

- * MERTENS, A.; AUTRIQUE, A. 1977. Contribution a l'étude de la conservation des denrées alimentaires en milieu rural au Burundi. (Contribution to the study on preservation of food products in rural conditions in Burundi). In Institut des Sciences Agronomiques du Burundi. Rapport Annuel 1977. Bujumbura. pp.10-15,21-24,28-29.

Based on surveys, data are presented on the preservation of several food products in rural conditions in Burundi as to drying and form of product,

threshing, amount preserved, and types of preservation. Major phytosanitary problems are also discussed. Beans occupy the 1st place as preferentially preserved product (86%), followed by maize (16%) and sorghum (8%). Major methods of bean drying are (1) in the rugo on the row, (2) in the rugo on the ground, and (3) in the field on the ground. In 49% of the cases observed, podded beans are dried on a high surface, in 43% on the ground, and in 8% they are not dried. Most beans are dried as seed. In the regions of Bweru, Buyenzi, southern Mosso, and Imbo, the products are preferentially dried as seed, and in northern Mosso, Mugamba, and Bututsi, as shoots. The principal forms of bean preservation (clay pots, sacks, long or round hampers, and vertical perches) are analyzed. Regional times of preservation are discussed regarding pest attack; these start in June (+ 2 mo.) and include 1st and 3rd season harvests. Second-season bean preservation starts in Jan. Pest attacks occur in July (+ 3 mo.) and between Feb.-March. An attack of Acanthoscelides obtectus was reported in beans without insecticide treatment after 5 mo. of preservation. [CIAT]

1268

- * SERVICE NATIONAL DES ETUDES ET STATISTIQUES. BURUNDI. 1981. Enquete agricole dans la Province de Gitega 1980-81. (Agricultural survey in the province of Gitega-1980-81). Bujumbura. pp.190,192,210,216,220,224,231, 235,238.

Graphs are presented on intensive crops, associations of 2, 3, 4, and more crops, and area cultivated in the province of Gitega, Burundi, during the 1980-81 Agatasi and Impeshi seasons and under swamp conditions. In the province as well as in Kirimiro and other regions, monocrops and associations of 2 crops occupy the major part of the plots located in the swamp. In Agatasi, this proportion decreases; instead, associations of 3-4 crops and uncultivated areas increase. Beans occupy only 1% of the area dedicated to pure crops in Agatasi, 21% in Impeshi, and 11% in the swamps. In Agatasi and in swamps, associations of 2 crops predominate (39 and 66%, resp.) and in Impeshi, monocrops (54%). Associations of 3, 4, or more crops present greater variation. The main products cultivated, in varying proportions depending on the planting season and the locality, are beans, maize, potato and other tubers, Cajanus cajan, peanuts, and sorghum. [CIAT]

1269

- * SERVICE NATIONAL DES ETUDES ET STATISTIQUES. BURUNDI. 1981. Enquete agricole dans la Province de Ngozi 1980-1981. (Agricultural survey in the province of Ngozi-1980-81). Bujumbura. pp.201-216,222,226,229.

Tables and graphs are presented for the crop associations and planting seasons called Agatasi, Impeshi, and Marais (swamp) in the province of Ngozi, Burundi, during 1980-81. During the Impeshi season, associations of 2 or more crops occupy 53% of the total cultivated area (43,200 ha), 39% corresponding to associations with beans. The importance of beans is particularly evident in pure crop plots, where 50% of the area corresponds to beans and 21% to tuber crops, during the 2nd season. During the 1st season, 78% of the cultivated area corresponds to 9 types of associations, in which tubers and beans also predominate; 65% of the area occupied by dense associations corresponds to beans and this % becomes 70% when considering 3-crop associations. Therefore, beans predominate during the 1st planting season. During the dry season in swamps, the maize-bean association occupies 68% of the cultivated area (2700 ha) and when only one crop is dense, it is generally beans. [CIAT]

- * VAN DURME, J.; NDIHOKUBWAYO, J. 1983. Incidence des affections du haricot et comportement variétal (DV 8201). [Disease incidence in beans and varietal (DV 8201) performance]. In Institut des Sciences Agronomiques du Burundi. Rapport des activités de recherches 1983. Eujumbura, Burundi. pp.88-89.

Trials were established in 1983 with bean var. Colorado (control), Karama 1/2, Doré de Kirundu, Calima, and black speckled Jaune Pontillé (Urubonobono) at Murongwe and Kayanza (Burundi) to determine disease incidence in the presence or absence of phytosanitary control. Phytosanitary protection consisted of seed dressing with ethylmercury chloride (20 g/10 kg) and split applications of dimethoate (20 g a.i./ha), benomyl (500 g a.i./ha), and fentin acetate (400 g a.i./ha). Angular leaf spot (Isariopsis griseola) and floury leaf spot (Ramularia phaseoli) were the most frequently observed diseases, especially during the 1st planting season at Murongwe. The yields of unprotected beans showed decreases of 53.7 and 35.7% during the 1st and 2nd planting seasons, resp. Var. Jaune Pontillé exhibited the lowest sensibility to Isariopsis and Ramularia as well as the lowest yield decrease (35.4%) in unprotected treatments. On the other hand, Doré de Kirundu outyielded all the other var. in the 1st season under unprotected conditions. [CIAT]

CAMEROON

1271

- * EDIMENGO, P.; SALEZ, P. 1985. Synthèse des principaux résultats obtenus sur haricot et niébe en 1984. (Synthesis of the principal results obtained with beans and cowpeas in 1984). Cameroon, Institut de la Recherche Agronomique. Programme Légumineuses. 11p.

A report is presented on the bean and cowpea research program in Cameroon for 1984. In the western region (Dshang, Foubot, and Bangangté), a multi-locational evaluation was carried out with 3 bean var. already diffused (Porrillo 566, 693, and BAT 95) vs. 2 introductions (Canadian Wonder and Negro Huasteco 81). The best var. in relation to yield and disease tolerance was Porrillo 693. Canadian Wonder showed an acceptable production potential and natural nodulation. A fertilization trial was performed in various types of soils with bean BAT 95. Fertilization data, yields, and leaf diagnosis for each soil type are presented in table form. In an associated bean-maize trial, the combination of maize-beans (BAT 95) resulted in greater economical benefits for the farmer. [CIAT]

1272

ABDALLA, M.M.F.; ROUSHI, M.; MORAD, M.M. 1975. Quality of canned beans of different populations and selections of Vicia faba L. Egyptian Journal of Genetics and Cytology 4:473.

1273

- * AL-MENDOUFFI, O.; ASHTON, F.M. 1984. Bentazon influence on selected metabolic processes of isolated bean leaf cells. Journal of Plant Growth Regulation 3(2):121-126. [Dept. of Plant Pathology, Alexandria Univ., Alexandria, Egypt]

Time- and concn.-course studies were conducted to determine the effect of bentazon on photosynthesis, and RNA, protein, and lipid syntheses using enzymatically isolated leaf cells of red kidney bean. Photosynthesis and RNA synthesis were inhibited approx. 75% at 1.0 micromolar bentazon at the 30 min treatment period. This was the lowest concn. and shortest time that significantly inhibited any of these 4 processes. The degree of inhibition of photosynthesis was greater than the degree of inhibition of RNA synthesis at higher concn. and/or longer time periods. At 10.0 micromolar bentazon, protein synthesis and lipid synthesis were also inhibited. Lipid synthesis was stimulated at 0.1 and 1.0 micromolar at 120 min. [AS]

1274

- * ALAA EL-DIN, M.N.; HAMDI, Y.A.; SHALAN, S.N.; HASSAN, M.E. 1985. Activities and achievements in research and production of biofertilizers in Egypt. In Seall, H.; Keya, S.O., eds. Conference of the African Association for Biological Nitrogen Fixation, 1st., Nairobi, Kenya, 1984. Biological nitrogen fixation in Africa: proceedings. Kenya, Nairobi Rhizobium Microbiological Resources Centre, pp.85-110. [Soils & Water Research Inst., Agricultural Research Center, Giza, Egypt]

The activities and achievements of the Agricultural Research Centre (Egypt) in the areas of biological N fixation research and application are discussed. A research program has been adopted that aims at improving soil fertility by providing high quality biofertilizers as legume inoculants, blue-green algae inoculants and Azolla for rice fields, Azospirillum inoculants for cereals, and Mycorrhiza for improving uptake of soil P. Biofertilizers being used in Egypt include (a) preparations containing Rhizobium spp. to be applied as legume inoculants; (b) preparations containing N fixing blue-green algae to be applied in paddies; (c) Azolla plants to be used as green manure for rice and for feed. Associative N-fixing organisms are still under evaluation. [AS]

1275

- * ALI, A.M. 1957. On the bionomics and control on the bean-fly, Agromyza phaseoli Coq. Bulletin de la Societ  Entomologique d'Egypte 41:551-554.

The biology and chemical control trials of Agromyza (Ophiomyia) phaseoli, which causes damage to beans in Egypt, are described. Var. Monte-calm, Swiss Blanc, and Contender were evaluated for resistance and proved to be highly susceptible to attack. To control this pest, it is recommended to import from Australia A. phaseoli-resistant var. In a chemical control trial it was found that chlordane and diazinon may be recommended as long as chlordane is not used for beans consumed fresh because it's a hazard.

Parathion (2% a.i.) also proved to be satisfactory, but is inferior to the 2 previous insecticides. [CIAT]

1276

- * AMER, M.A.; EL-HAMMADY, M.; EL-ABBAS, F.A. 1983. Effect of single and double infection with Myrothecium verrucaria and common bean mosaic virus (CBMV) on dry weight and chemical constituents of bean plants. Acta Phytopathologica Academiae Scientiarum Hungaricae 18(4):225-235. [Faculty of Agriculture, Ain-Shams Univ., Cairo, Egypt]

Single and double infections with Myrothecium verrucaria and BCMV markedly decreased the dry wt. of bean leaves. Single infection with BCMV or double infection decreased total carbohydrate content. M. verrucaria stimulated carbohydrate accumulation as compared with control plants. Virus infection increased total N content of inoculated leaves above healthy ones but fungal infection reduced the total N considerably. Inoculation with the virus resulted in the formation of the conjugated form of phenylalanine, glutamic acid, arginine, and alanine, and fungal inoculation reduced the conjugated form of met., iso-leucine, and tyrosine. [Review of Plant Pathology]

1277

- BADR, H.M.; EL-SHARKAWY, A.M.; KAMMAR, M.E.; HIGAZY, H.H. 1984. Effect of gamma rays on some vegetative growth characters of common bean (Phaseolus vulgaris, L.). Annals of Agricultural Science (Egypt) 20(3):268.

1278

- BADR, H.M.; KHALF-ALLAH, A.M.; EL-SHARKAWY, A.M.; ELNAG, A.Z. 1984. Effect of phosphorus and potassium on growth and yield characteristics of common bean (Phaseolus vulgaris, L.). Annals of Agricultural Science (Egypt) 20(3):271.

1279

- * EL-AFIFI, S.; LANG, F. 1984. Effects of metobromuron and chlorbromuron on photochemical reactions of isolated French bean and pea chloroplasts. Photosynthetica 18(3):317-321. [Dept. of Horticulture, Faculty of Agriculture, Mansoura Univ., Egypt]

The effectiveness of 2 phenylurea herbicides, metobromuron and chlorbromuron, on the photochemical reactions of isolated chloroplasts of French bean and pea was tested. The inhibitory potency of the 2 herbicides was determined by using chlorophyll fluorescence induction and electron transport assays. The primary site of action for metobromuron and chlorbromuron is probably on the reducing site of photosystem 2, between the primary electron acceptor and the plastoquinone pool. The inhibitory effects increased with increasing herbicide concn. Estimation of I_{50} value indicated that chlorbromuron was a more potent inhibitor than metobromuron in both French bean and pea chloroplasts. Isolated pea chloroplasts were relatively more sensitive to chlorbromuron than those of French bean. [AS]

1280

- EI-KADY, M.A.S. 1983. Biological and chemical differentiation between some viruses (of two BYMV isolates) affecting bean (Phaseolus vulgaris L.). Ph.D. Thesis. Cairo, Egypt, Ain-Shams University. 105p.

1281

- * EL-SAID, H.M.; GEWAILY, E.M.; SALEM, S.H.; TOHAMY, M.R. 1982. Biological and chemical control of Pseudomonas aeruginosa, the causal organism of blight disease of bean plants in Egypt. Egyptian Journal of Microbiology 17(1-2):65-80. [Botany Dept., Faculty of Agriculture, Zagazig Univ., Zagazig, Egypt]

The antagonistic effect between the isolated rhizosphere microflora and the causal bacterium of blight disease in bean plants was studied. Different antibiotics and fungicides were evaluated for disease control. Application of antagonistic Streptomyces to the soil had success in combating the bacterial blight disease of bean plants a few days after application; however, the effect faded away rapidly. Antibiotics were found to inhibit the soil-borne bacteria, namely, Pseudomonas aeruginosa and P. phaseolicola. With respect to fungicide application, carbendazim apparently had a phytotoxic effect when applied at the recommended dose. Coprozan inhibited the growth of P. aeruginosa, followed by T.O.C. 158. Fungicide application after 30 days gave satisfactory disease control. [AS]

1282

- * EL SHAMY, M.R.; NASSAR, S.H.; ATTIA, M.S. 1972. Amal (Giza 3) a new variety of snap white seeded bean resistant to common mosaic virus. Agricultural Research Review 50:93-107.

The development of the dual purpose crossbred kidney bean var. Giza 3 is described in detail. Parental var. were Swiss Blanc, used for more than 30 yr in Egypt for dry seed production, and Contender, introduced to this country in 1955 for green bean production and viral resistance. [AS (extract)]

1283

- EL-SHARKAWY, A.M.; KAMER, M.E.; BADR, W.M.; HIGAZY, H.H. 1984. Effect of gamma rays on the earliness and productivity of beans (Phaseolus vulgaris, L.). Annals of Agricultural Science (Egypt) 20(3):274.

1284

- EL-WAFAEI, N.A. 1976. Physiological studies on bean yellow mosaic virus disease. Mag.Sc. Thesis. Egypt, Zagazig University. Faculty of Agriculture.

1285

- * FADL, F.A.M. 1984. Work carried out at Agricultural Research Centre (ARC). 7. Bean rust disease. In El-Fouly, M.M., ed. Grain Legumes Workshop, Mariut, Egypt, 1981. Proceedings. Cairo-Dokki, Egypt, National Research Centre. pp.109-112. [Plant Pathology Inst., Agricultural Research Centre, Giza, Egypt]

Research work carried out on bean rust in Egypt is summarized. Bean var. Vadenal and Astro showed less infection than others; Giza 3 was promising due to its low % of infection. Studies indicated that reducing, nonreducing, and total sugars increased in leaves and stems of inoculated plants compared with uninoculated plants; this increase was more evident in the leaves than in the stems. Quantitative analysis indicated that the content of total amino acids was higher in susceptible var. whereas the levels of phenols were higher in resistant var. Phenol levels increased when plants were inoculated with rust. The highest seed yield was obtained when the disease was controlled with oxycarboxin, triforine, or benomyl. [CIAT]

1286

RADWAN, S.M.A. 1983. Effect of inoculation with phosphate dissolving bacteria (Bacillus megaterium, B. cereus, B. subtilis, B. brevis) on some nutrients uptake from newly cultivated soils. Mag.Sc. Thesis. Cairo, Egypt, Ain-Shams University. 188p.

1287

* SIRRY, A.R.; SALEM, S.H.; GEWALLY, E.M.; TOHAMY, M.R. 1982. Effect of fertilization on the severity of bacterial blight disease of bean plants infected with Pseudomonas aeruginosa in Egypt. 1. Phosphate fertilization. Egyptian Journal of Microbiology 17(1-2):49-63. [Botany Dept., Faculty of Agriculture, Zagazig Univ., Zagazig, Egypt]

The effect of superphosphate fertilization on bean plants (var. Mont Calm and Giza 3), infected with Pseudomonas aeruginosa and showing blight disease, was studied in the greenhouse regarding wt. and total carbohydrate, N, P, and K values. P. aeruginosa had a deleterious effect on plant wt. and chemical constituents. Superphosphate fertilization increased the values resulting in vigorous plants that eventually became resistant to pathogen invasion. The optimum level of superphosphate application was 225 kg/feddan (1 feddan = 0.42 ha), with more vigorous plants and high values of the major chemical constituents. [AS]

1288

SIRRY, A.R.; AMER, M.A.; ELEWA, I.S.; GAMIL, N.A. 1974. Effect of P levels in the root media on the growth and phosphorus content of bean plant with special reference to percentage of infection with leaf spot Myrothecium derrucaria. Annals of Agricultural Science (Egypt) 19:89-97.

ETHIOPIA

1289

- * ABATE, T.; NEGASI, F. 1985. A review of grain legume pest management research in Ethiopia. Nazret, Ethiopia, Institute of Agricultural Research. Nazret Research Station. 18p. [Inst. of Agricultural Research, Nazret Research Station, P.O. Box 103, Nazret, Ethiopia] Paper presented at the Ethiopian Agricultural Research Conference, Addis Abeba, Ethiopia, 1984.

The results of research on grain legume pest control measures conducted in Ethiopia are presented. In the case of beans, Heliothis armigera, Ophiomyia phaseoli, Tetranychus sp., Callosobruchus chinensis, and C. maculatus are considered of major importance. Germplasm resistant to H. armigera and O. phaseoli was identified in both the 1982-83 and 1983-84 nurseries. The parasitoid Opius phaseoli was identified controlling O. phaseoli effectively. Tetradifon 8% (4 l/ha) and dimethoate 30% (1 l/ha) gave satisfactory control of Tetranychus sp. Seed dressings with aldrin and carbofuran (28 g/kg seed) reduced O. phaseoli infestation significantly but phytotoxicity occurred in dry seasons. Cypermethrin (150 g a.i.) gave effective control of H. armigera. Pirimiphos-methyl gave the most effective control of Callosobruchus spp. [CIAT]

1290

- * ABATE, T. 1984. Evaluation of some insecticides for the control of the bean bruchid, Callosobruchus chinensis (L.), on stored haricot bean. Nazret, Ethiopia, Institute of Agricultural Research. Nazret Research Station. 10p. [Inst. of Agricultural Research, Nazret Research Station, P.O. Box 103, Nazret, Ethiopia] Paper presented at the Ethiopian Agricultural Research Conference, Addis Abeba, Ethiopia, 1984.

Varying doses of 3 insecticides were evaluated for the control of the bean bruchid, Callosobruchus chinensis, on stored beans at the Nazret Station of the Institute of Agricultural Research (Ethiopia) between 1981-83. A completely randomized design was used with 3 replications. Results, assessed in terms of % infestation and of the mean no. of living bruchids/0.25 kg seed sample, indicated that significantly ($P = 0.05$) superior control of C. chinensis was obtained with pirimiphos-methyl at all the dosage levels tested (4, 5, and 6 ppm) than with methacrifos and lindane. The highest dosage of methacrifos and lindane also gave results comparable with those of pirimiphos-methyl for about 3 mo. but their efficacy declined thereafter. In general, the degree of control for pirimiphos-methyl was greater than methacrifos, which in turn was greater than or equal to lindane, which in turn was greater than or equal to the untreated check. [AS]

1291

- ABATE, T. 1984. Further note on insect pests of grain legumes in Ethiopia. CEE Newsletter 3(2):4-5.

1292

- ABATE, T. 1984. Progress in and prospects for grain legume pest management research in Ethiopia. [Inst. of Agricultural Research, Nazret Research Station, P.O. Box 103, Nazret, Ethiopia] Paper presented at the Ethiopian Agricultural Research Conference, 2nd., Addis Abeba, Ethiopia, 1984.

1293

ABATE, T. 1981. Spider mites (Tetranychus sp.) on haricot beans. CEE Newsletter 1(1):6-7.

1294

- * AMARE ABEBE; BIRHANU ABEGAZ. 1985. Nitrogen fixation of two Phaseolus vulgaris varieties at different rates of inoculation. In Ssali, H.; Keya, S.O., eds. Conference of the African Association for Biological Nitrogen Fixation, 1st., Nairobi, Kenya, 1984. Biological nitrogen fixation in Africa: proceedings. Kenya, Nairobi Rhizobium Microbiological Resources Centre. pp.313-323. [Inst. of Agricultural Research, P.O. Box 2003, Addis Abeba, Ethiopia]

Phaseolus vulgaris var. Mexican 142 (climbing type) and 73 Vu 945 (bush type) were compared for their effectiveness in N fixation. They were inoculated separately with 2 locally isolated Rhizobium phaseoli strains, S-1 and S-2, at the rates of 1×10^4 , 3×10^4 , and 6×10^4 cells/seed. Pod no./plant, pod length, and seeds/pod were not affected by inoculation, while plant height of Mexican 142 and seed wt. of both var. were significantly influenced. The mean dry wt. of nodules of both var. increased from early vegetative stage to podding stage, when those of Mexican 142 decreased sharply and those of 73 Vu 945 remained constant, since the nodules of the former var. degenerated faster than those of the latter. Uninoculated plants of Mexican 142 and 73 Vu 945 depleted the soil N by 4.60 and 3.13 kg/ha, resp. On the other hand, inoculated plants of the former var. with S-2 at the rate of 6×10^4 cells/seed fixed 17.20 kg N/ha and the latter var., 11.98 kg N/ha. The effect of S-1 was less than that of S-2 in N fixation at all levels of inoculation. Strain S-2 at the rate of 6×10^4 cells/seed increased the seed yield of Mexican 142 by 73% and that of 73 Vu 945 by 43%. The CP % was also improved by inoculation. [AS]

1295

- * AMARE ABEBE. 1984. Haricot bean nursery I 1983/84. Addis Abeba, Ethiopia, Institute of Agricultural Research. 1p.

A brief summary of the haricot bean nursery I, 1983-84, evaluated in Melkassa, Ethiopia, is presented. A total of 138 lines yielded an av. of 672 g/plot (single rows 5-m long); 56 var. yielded over 1000 g/plot and were virus-free and tolerant/resistant to common diseases. [CIAT]

1296

- * AMARE ABEBE. 1984. Haricot bean nursery II - 1983-84. Addis Abeba, Ethiopia, Institute of Agricultural Research. 2p.

The results of the haricot bean nursery II, 1983-84, conducted in Nazret, Bako, Jima, and Awassa (Ethiopia) are briefly presented. Thirty-five entries were evaluated at each site, with av. yields of 2103, 2225, 1712, and 2391 kg/ha, resp. Across locations the highest yielders were 15R-512, M-103 (20252-1), and 13-433 (0139-1) with 2764, 2635, and 2557 kg/ha, resp.; the control Black Dessie yielded 2316 kg/ha. [CIAT]

1297

- * AMARE ABEBE. 1984. Large kidney bean V.T. Addis Abeba, Ethiopia, Institute of Agricultural Research. 1p.

The results of the large kidney bean var. trial, 1983-84, conducted in Nazret, Ethiopia, are briefly presented. Seven entries (No. 31342-1, EPTD

Sample 26, Brown Speckled, 45 Buff, Richmond Wonder, Nazret Selection 21, and FBMD) were evaluated with significant differences between av. yields: 2770, 1800, 1560, 1070, 1030, 780, and 820 kg/ha, resp. [CIAT]

1298

- * AMARE ABEBE. 1984. Medium bean variety trial 1983/84. Addis Abeba, Ethiopia, Institute of Agricultural Research. 2p.

The results of the medium bean var. trial, 1983-84, conducted in Nazret, Bako, Jima, and Awassa (Ethiopia) are briefly presented. Fifteen entries were evaluated at each site, with av. yields of 2037, 2564, 1386, and 2690 kg/ha, resp. Across locations the highest yielders were B-433 (0139-1), Negro Macentrou 64, B-384 (7441-92) and 15R-52 with 2573, 2486, 2475, and 2421 kg/ha, resp.; the control Black Dessie yielded an av. of 2205 kg/ha. [CIAT]

1299

- * BERETON, R.G. 1980. Exports of animal feedingstuffs. Ethiopian Grain Review 6(1):25.

A table is presented on exports of feedstuffs and their values in Ethiopia. These exports reached a total of 5603 t, of which 5439 t corresponded to haricot rejects, worth 1072 Ethiopian Birr. [CIAT]

1300

- * BERETON, R.G. 1980. Total exports of grain products. Ethiopian Grain Review 6(1):25.

A table is presented on total exports of grain products and their values in Ethiopia. These exports reached 88,341 t, of which 25,409 t corresponded to pulses, worth 43,908 Ethiopian Birr. [CIAT]

1301

- * BEYENE, D. 1985. The state of research on biological nitrogen fixation in Ethiopia. In Ssali, H.; Keya, S.O., eds. Conference of the Africa Association for Biological Nitrogen Fixation, 1st., Nairobi, Kenya, 1984. Biological nitrogen fixation in Africa: proceedings. Kenya Nairobi Rhizobium Microbiological Resources Centre. pp.72-84. [Dept. Soil Science, Inst. of Agricultural Research, Addis Abeba, Ethiopia]

The distribution of the major grain legumes (including haricot beans) grown in Ethiopia is briefly discussed. Data regarding av. crop yields and total hectareage under cultivation for the different pulses are also included. Research work on grain legumes in the country has concentrated mainly on improving crop yields through selection, breeding, and the use of improved agronomic practices. Some of the research work conducted on the use of N and P fertilizers is reviewed. Detailed discussion on the findings of inoculation trials at various sites is also presented. Because of the lack of information on the level of N fixation for the various pulses grown in the country, estimates from countries in the tropics have been used to demonstrate the potential for biological N fixation as a means of maximizing crop yields. The need for intensive research on biological N fixation is emphasized. To date, there has been very little research conducted to explore the possible contribution of Rhizobium strains to N fixation. [AS]

* ELLENI TADESSA. 1984. Operation of plant quarantine service for IAR materials. Addis Abeba, Ethiopia, Institute of Agricultural Research. 3p. 1302

A brief report is made of diseases introduced through grain legume germplasm into Ethiopia during 1984 and detected by the quarantine service of the Institute of Agricultural Research. In the case of beans, Phoma sp. and Xanthomonas phaseoli were detected among 98 entries from Colombia and 160 entries from elsewhere in South America. [CIAT]

* HABTU ASSEFA. 1985. Evaluation of diseases in haricot beans. Addis Abeba, Ethiopia, Institute of Agricultural Research. 18p. [Inst. of Agricultural Research, P.O. Box 2003, Addis Abeba, Ethiopia] 1303

The results of disease evaluations in different bean nurseries planted in Ethiopia during 1984 are presented. Phoma sp. was the only important disease observed in the preliminary nursery in Melkassa which included 173 entries; only 2 entries (M-112 and Bac 77-20 VEF 93-93) were rated 1 on a 0-3 scale. In the advanced nursery in Melkassa (36 entries) only Phoma sp. was evaluated; M64 (21274-25.81), M64 (21274-2-81), and W-85 (21305-9) were rated 1.8. Among the 15 entries in the pea bean var. trial, none were observed below 2.4 in a 0-5 scale for Phoma sp. High scores were also observed in the 15 entries included in the medium bean var. trial, scoring below 3. Brown Speckled W-85 (21305-2), M103, and M64 (21274-2) scoring below 3. Brown Speckled var. trial. The 11 entries in the national yield trial were rated an av. of 3.2. In the regional var. trial, Colletotrichum lindemuthianum was also evaluated besides Phoma sp. Less Phoma sp. incidence was observed, but C. lindemuthianum was more severe; 15-R-42 and M103 (20252-1) were among the least infected by the latter. [CIAT]

* HABTU ASSEFA. 1985. General disease survey (GDS) and identification. Addis Abeba, Ethiopia, Institute of Agricultural Research. 6p. [Inst. of Agricultural Research, P.O. Box 2003, Addis Abeba, Ethiopia] 1304

Results are presented of a survey conducted in Ethiopia during 1984 to study the distribution and importance of grain legume diseases, to verify the presence of new or potentially hazardous diseases, to build up a plant disease collection, and to advise farmers. In general, bean disease incidence was low due to climatic conditions. Uromyces appendiculatus was reported to be severe only in Ambo, with a slight incidence in Awassa and Jimma. Phoma sp. was observed in most locations, but was severe in Melkassa, Awassa, and Bako, and slight to moderate in Jimma, Didesa, Cheffa, and Harbu. BCMV was detected at most sites but was severe in Didesa. Colletotrichum lindemuthianum was severe in Ambo, Arsi Negellie, and Didesa. Pseudomonas syringae pv. phaseolicola was observed in Cheffa and Didesa. Uromyces spp. was comparatively higher in Bako and Didesa. Sclerotium sp. and Sclerotium rolfsii were detected in Cheffa. Isariopsis sp. and Ramularia phaseoli were observed in Jimma and Mettu. [CIAT]

* HABTU ASSEFA. 1984. Evaluation of diseases in haricot bean lines. Addis Abeba, Ethiopia, Institute of Agricultural Research. 17p. [Inst. of Agricultural Research, P.O. Box 2003, Addis Abeba, Ethiopia] 1305

The results of bean disease evaluations in Ethiopia during 1983 are presented. All evaluations were conducted in Awassa, Jimma, and Melkassa where visual scores for disease incidence (Phoma sp., Uromyces appendiculatus, Ramularia phaseoli, and Isariopsis griseola) were assigned to entries in different nurseries and trials for haricot, pea, medium and large kidney bean lines and cv. Low ratings and immunity were observed in some materials at all sites for the different pathogens. [CIAT]

1306

- * HABTU ASSEFA. 1984. Preliminary assessment of losses due to Phoma blight in haricot bean. Addis Abeba, Ethiopia, Institute of Agricultural Research. 4p. [Inst. of Agricultural Research, P.O. Box 2003, Addis Abeba, Ethiopia]

The objectives, exptl. design, and other characteristics of the project to evaluate potential bean yield losses caused by Phoma sp. in Ethiopia are briefly presented. The bean cv. to be used will be Black Dessie (susceptible), Mexican 142 (moderately susceptible), and W 85 (21305-9) (moderately resistant). [CIAT]

1307

- * HABTU ASSEFA. 1984. Screening of haricot bean varieties for resistance to rust. Addis Abeba, Ethiopia, Institute of Agricultural Research. 15p. [Inst. of Agricultural Research, P.O. Box 2003, Addis Abeba, Ethiopia]

Three sets of bean nurseries were evaluated in Ethiopia for resistance to Uromyces phaseoli during 1984. Of the 77 entries evaluated in single rows in the screening nursery, 19 were free of infection, including Negro Maccentral, M103 (20252-1), EPID sample 30, Aurora, and some BAT materials, which also gave high yields. Of 100 entries in the advanced screening trial, 39 showed no disease symptoms, among which were ICA Tui, P560, Carioca, some BAT materials, and Bonita 42. In further evaluations conducted with 29 entries, only Mexican 142 (susceptible control) and Black Dessie (resistant control) showed infection levels of 40 and 5%, resp. [CIAT]

1308

- * HABTU ASSEFA. 1983. Occurrence of pulse diseases and their importance in Ethiopia. 1. Haricot bean diseases. Addis Abeba, Ethiopia, Institute of Agricultural Research. 14p. [Inst. of Agricultural Research, P.O. Box 2003, Addis Abeba, Ethiopia]

Bean diseases observed in a field survey in Ethiopia over a 4-yr period (1980-83) included 14 fungal, 2 bacterial, 2 viral, and 1 nematode diseases. The occurrence of these diseases varies depending on the local and climatic conditions. Bean rust and Phoma blight were most severe in Awassa, Ambo, and Jimma; anthracnose in Awassa, Arsi Negelle, and Dide viruses in Melkassa and Awassa. Floury and angular leaf spots restricted to specific regions and were severe in Jimma and Intermediat, Awassa and Bako. Over the last few years there was an outbreak of blight causing severe damage in bean plants. Plant diseases like bean and Phoma blight are present in most bean growing regions; anthracnose prevalent in high rainfall regions while BCMV is restricted to the low drier regions of Ethiopia. [AS]

INSTITU

Pulse
Dp. 32-

Progress
during 197
the 6 cv.
followed by

* HABTU ASSEFA. 1982. Evaluation of di 1309
Abeba, Ethiopia, Agricultural Res. Institute

Xanthomonas phaseoli, BCMV, Uromyces appendiculatus, and Colletotrichum lindemuthianum were observed attacking these cv., with X. phaseoli and C. lindemuthianum severely affecting Mexican 142; the lowest disease incidence was observed in Black Dessie. Ophiomyia phaseoli was the main insect pest observed. Twenty-five cv. were evaluated in the haricot bean var. trial, with Mexican 142 as the control (107 kg/ha). The highest yield was obtained from 15-R-66 (2217 kg/ha), followed by W-95 (1876 kg/ha) and Black Dessie (1876 kg/ha). X. phaseoli and BCMV were the main diseases and O. phaseoli the major insect pest. Cv. Krashodisikaja USSF and Black Dessie showed disease resistance. The control yielded poorly due to rodents. [CIAT]

1316

- * INSTITUTE OF AGRICULTURAL RESEARCH. ETHIOPIA. 1982. Review of experimental results for the 1975 EC (1982). Breeding/Selections. Addis Abeba. 9p.

General research work on Phaseolus vulgaris, P. acutifolius, and other pulses conducted in Ethiopia during 1985 is mentioned and results are given. In the breeding area, haricot bean nursery II showed that accession No. 309747 was the best overall yielder over the standard Black Dessie in warm moist regions; the prevailing diseases were Xanthomonas phaseoli and leaf spots, and some lines were found tolerant/resistant to Ophiomyia phaseoli and Spodoptera sp. Black Dessie was the best overall yielder in multilocational trials. Var. of the series 15-P yielded well in both Harbu and Woldia with av. yields of 1566.4 and 1593.6 kg/ha, resp. The backcrossing program to incorporate white seed color into Black Dessie was initiated. Var. PI-321637 of P. acutifolius was the best yielder at 2 sites. In soil fertility studies, no response of beans was observed to N and P in Nazret but yields increased markedly in Jimma. Pathology studies revealed that Phoma, Phyllosticta, Colletotrichum, Uromyces, Ramularia, Isariopsis, Xanthomonas, and viruses are of major importance in beans, some of them being location-specific. Specific and multiple disease resistance was observed. A summary of grain legume research activities proposed for the 1982-83 cropping season is presented. [CIAT]

1317

- * INSTITUTE OF AGRICULTURAL RESEARCH. ETHIOPIA. 1976. Haricot bean (Phaseolus vulgaris). In _____. IAR/EPID Cooperative Research Programme. Preliminary summary of integrated research on field crops at Kobo, 1973 to 1975. Addis Abeba. pp.24-25.

The results of the bean research program in Kobo, Ethiopia, during 1973-75 are briefly summarized. In the absence of Ophiomyia phaseoli attack in 1975, the best yield was 898.9 kg/ha, while in 1973 and 1974, the resp. yields were 544.8 and 395 kg/ha with heavy damage of O. phaseoli. Cv. Black Dessie and Tengeru 16 have shown good drought resistance. Optimum planting dates are late May to mid-June, if rains occur early, or July if this is not the case. The optimum plant density is 222,222 plants/ha (45 kg seed/ha) at a 45 x 10 cm spacing. O. phaseoli, the striped blister beetle, and Heliothis sp. are the major pests; seed dressings (aldrin 40% W.P.) are recommended as well as 2-3 weedings and early harvesting to avoid losses from shattering. Future research should concentrate on screening

- * INSTITUTE OF AGRICULTURAL RESEARCH, ETHIOPIA. 1976. Seed bean production. In . Progress report for the period April 1974 to March 1975. Addis Abeba, Melka Werer Research Station, pp.98-102.

A 6-ha mechanical planting each of Mexican 142 (canning beans) and No. 68 (seed beans) was conducted in the Middle Awash, Ethiopia, in 1984 to determine if BCMV-free seed beans could be produced in the region, to study insect pest control (especially Aphis sp. and Spodoptera littoralis), to develop and test agronomic and mechanical cultural practices, and to obtain cost data. The schedule of operations and crop events is provided. The results indicated that it is possible to produce disease-free seed beans in the region. The major limiting factor is S. littoralis and farmers are recommended to delay seed bean production until effective control measures are developed. Beans should be planted between Oct. 1-Nov. 1 and after cotton or groundnuts; a reasonable economic return can be expected from yields of 567.5-681.0 kg/ha. [CIAT]

- * INSTITUTE OF AGRICULTURAL RESEARCH, ETHIOPIA. 1973. Haricot bean. In . Progress report for the period April 1972 to March 1973. Addis Abeba, Melka Werer Research Station, pp.127-131.

A progress report on bean research in Ethiopia from mid-1972 to mid-1973 is presented. The trial on var. x planting date indicated that all var. (Ethiopia 10, Tengeru, Mexican 142, and Nazareth small) grew equally well, stand counts at harvest varied considerably, av. yields (1039.7 kg/ha) were high compared with past years, there were no significant differences between mean var. yields, and the best planting date was Dec. 1. In an irrigation interval expt. with Mexican 142, the highest yield (1493.7 kg/ha) was obtained when irrigation was applied at 7-day intervals (10 irrigations/cropping cycle) and decreased progressively (1126.0, 941.6, and 431.3 kg/ha) at longer irrigation intervals (14, 21, and 28 days, resp.). [CIAT]

- * NATIONAL CROP IMPROVEMENT COMMITTEE. 1977. Haricot bean (Phaseolus vulgaris). In . Results of the National Crop Trials and others 1975. Addis Abeba, Ethiopia, Institute of Agricultural Research, pp.178-198.

A progress report is presented on the following trials carried out in Ethiopia: the 1975 haricot bean national yield trial, the haricot bean var. trial, the haricot bean nursery, the seedbed preparation and planting method trial, and the harvesting stage trial. The overall yield for the 19 locations where the 14 cv. of the bean national yield trial were sent was 880.8 kg/ha; however, at Debre Zeit Agricultural Expt. Station, the av. yield was as high as 1679.8 kg/ha. Cv. Black Dessie at this location produced 2433.4 kg/ha, and was considered the highest overall yielder (1253.0 kg/ha) across locations followed by Negro Mecentrau (1166.8 kg/ha) and Mexican 142 (1157.7 kg/ha). Common diseases observed were BCMV and those caused by Xanthomonas phaseoli, Colletotrichum lindemuthianum, and Ramularia sp. The major insect pest was Heliothis sp. In the bean var. trial, W-95 gave the highest yield in Adama (199.8 kg/ha) and Black Dessie in Awassa (1620.8 kg/ha). A total of 104 var. were evaluated in the bean nursery in Adama (av. yield of 1175.9 kg/ha). Black Dessie and Mexican 142 (controls) yielded 1280.3 kg/ha each. Bean harvesting can be carried out earlier than the farmers normally do. No response to N and P applications was observed in Koka and Adama. Early plantings in Adama and Bako gave the highest yields. Tables are included for each trial. [CIAT]

1321

- * NATIONAL CROP IMPROVEMENT COMMITTEE. 1975. National yield trial. Haricot bean (Phaseolus vulgaris). In _____. Results of the National Crop Trials 1973. Addis Abeba, Ethiopia, Institute of Agricultural Research. pp.85-98.

The results of bean trials conducted in Ethiopia during 1973 are summarized. The av. yield over 16 sites for 14 var. evaluated through the national yield trial was 972 kg/ha. The highest yield recorded was from Tengeru 16 (1589 kg/ha) in Debre Zeit. Xanthomonas phaseoli was observed at all sites, with Tengeru 12, Mexican 142, Black Dessie, and Ethiopia 10 showing fairly good resistance. A high incidence of Uromyces appendiculatus was observed only in Bako, affecting Tengeru 16, Mexican 142, and Ethiopia 10. Colletotrichum lindemuthianum and viruses were observed at some specific locations. In a weed control trial, adequate weed control (an early and a late hand weeding or 2 kg fluorodifen/ha + a late hand weeding) increased yields significantly (1135 and 1208 kg/ha, resp.) compared with the unweeded control (613 kg/ha). A high plant population (500,000 plants/ha) appears to compensate for a poor weed control. [CIAT]

1322

- * NATIONAL CROP IMPROVEMENT COMMITTEE. 1974. [Haricot bean]. In _____. Results of the National Crop Trials 1972. Addis Abeba, Ethiopia, Institute of Agricultural Research. pp.61-65.

Tables containing the results of the 1972 national haricot bean var. trial with 8 bean cv. at 11 sites in Ethiopia are presented; sowing date trials were also conducted with cv. Tengeru 16, Mex 12, Ethiopia 10, and Nazareth small at 4 locations as well as 2 weed control trials. The national av. yield was 863 kg/ha for all cv. across all 11 sites; Ethiopia 10 (1099 kg/ha), Tengeru 16 (1071 kg/ha), and Mexican 142 (1062 kg/ha) were the highest yielders across all sites. These same cv. were rated 1 on a 0-5 scale for Uromyces appendiculatus and leaf spot. June-July were the best planting dates at all sites in terms of yields. In the weed control trials in Kulumsa and Melkassa the highest bean yields were obtained with hand weeding (926.2 and 1734.3 kg/ha, resp.) followed by 3 kg a.i. fluorodifen/ha (363.2 and 1598.0 kg/ha, resp.) compared with the unweeded control (131.7 and 803.6 kg/ha, resp.). [CIAT]

1323

- NEGASI, F.; ABATE, T. 1984. Chemical control of bean fly. [Inst. of Agricultural Research, Nazret Research Station, P.O. Box 103, Nazret, Ethiopia]
Paper presented at the National Crop Improvement Conference, 16th., Addis Abeba, Ethiopia, 1984.

1324

- NEGASI, F. 1984. Effect of sowing date on bean fly infestation on haricot bean. Ibis.

1325

- * PETERS, C.W.; HASH, C.T. 1976. The Ethiopian pulse industry, a situation paper. Ethiopia, Ministry of Agriculture and Forestry Development. Extension and Project Implementation Department. Publication no.32. 61p.

An extensive descriptive review of pulse production and marketing in Ethiopia is presented, with special emphasis on beans. The large-scale and peasant production sectors are described based on production practices and regions. Current and projected domestic demand figures and export figures from 1965 to 1979, important export figures for the same period, and important export markets (especially in Europe) are discussed. The internal market structure, marketing practices, price patterns, and government involvement issues are dealt with. The role of the projected Agricultural Marketing Corporation and its importance for the Ethiopian pulse industry are discussed. [CIAT]

1326

SELASSIE, G.H. 1973. Haricot beans in Ethiopia, 1962-1971. Ethiopian Grain Board.

1327

* WALKER, D.J.; BOXALL, R.A. 1974. An annotated list of the insects associated with stored products in Ethiopia, including notes on mites found in Harar Province. East African Agricultural and Forestry Journal 39:330-335.

An annotated list of the insects associated with stored products in Ethiopia is given. Lasioderma serricorne, Stegobium paniceum, Acanthoscelides obtectus, Callosobruchus chinensis, Sitophilus zeamais, S. oryzae, Carpophilus dimidiatus, Ahasverus advena, Gnathocerus cornutus, Tribolium castaneum, T. destructor, and Epehstia cautella are reported for beans. [CIAT]

KENYA

1328

- * BEAN/COWPEA COLLABORATIVE RESEARCH SUPPORT PROGRAM. U.S.A. 1984. Improvement of drought and heat tolerance of disease resistant beans in semiarid regions of Kenya. In _____, 1984 Annual Report. 1. Technical summary. East Lansing, Michigan State University. pp.154-165.

The main objectives of a project to improve drought and heat tolerance of disease-resistant beans in semiarid regions of Kenya for 1984 were: (1) identify parameters of bean growth which contribute to yield reduction due to limited water and high temp. conditions; (2) evaluate effects of varying amounts of water on flower abscission in beans; (3) study growth and development of beans and teparies under natural rainfall conditions; (4) investigate infestation of bean fly at exptl. sites, assess damage, and evaluate control measures; (5) evaluate leaf temp.-air temp. differentials of beans growing at reduced water levels; (6) identify growth characteristics associated with adaptation of beans in semiarid areas growing under differing agronomic conditions; and (7) measure radiant energy conversion in bean cv. Aspects that were also analyzed include constraints to achievement of objectives, progress toward objectives, research and training outputs, institutional resources contributed to the project, and professional and organizational linkages. The proposed plan of work for 1985 is given and articles and presentations on project research during 1984 are listed. [CIAT]

1329

- * EIJNATTEN, C.L.M. VAN; MUNA, S.; HESSELMARK, G. 1974. Report of the mission evaluating the dry bean project. Kenya, University of Nairobi. 36p.

A report on the joint Kenya/Netherlands Dry Bean Project is presented, evaluating the planning procedures that led to its establishment, describing its implementation, defining the policy to be followed in its next development stage, and recommending the staff and financial resources required. Bean production in Kenya is briefly described regarding its importance and problems. Bean research in agronomy and breeding during the 2.5-yr period is analyzed. [CIAT]

1330

- * FLOOR, F. 1983. Investigations on drought-resistance of beans developed by the Grain Legume Project. Phaseolus Beans Newsletter for Eastern Africa no.1;8-9. [Grain Legume Project, National Horticultural Research Station, P.O. Box 220, Thika, Kenya]

A selection of drought-tolerant bean var. has been recently initiated by the Grain Legume Project at the National Dryland Farming Research Station (Kutumani, Kenya). Expt. consisted of yield trials in the semiarid Eastern Province and a trial under sprinkler irrigation in Thika, planted at the end of the rainy season. Some of the var. tested have already been released with GLP-1004 (Mwezi Moja type) being recommended for dry areas. [CIAT]

1331

- * FLOOR, J. 1985. Effect of soil fertility status, moisture, and application of fertilizers and inoculum on nodulation, and growth of dry beans in Kenya. In Ssali, H.; Keya, S.O., eds. Conference of the Africar

Association for Biological Nitrogen Fixation, 1st., Nairobi, Kenya, 1984. Biological nitrogen fixation in Africa: proceedings. Kenya, Nairobi Rhizobium Microbiological Resources Centre. pp.253-261. [National Horticultural Research Station, P.O. Box 220, Thika, Kenya]

Three pot expt. with dry beans were carried out by the Grain Legume Project (Kenya) to study the effect, in different soils, of Rhizobium inoculation and N and P application on nodulation, DM yield, and total N uptake. Results showed no significant effects due to inoculation, but the addition of fertilizers, notably those containing P, had highly significant effects. Initial P availability of the soil was a factor that determined the magnitude of nodulation, and it was found that beans needed more P when they depended on N₂-fixation than when grown with combined N. In another expt., the effect of moisture stress and P fertilizer was studied, and results showed that, besides P application, the availability of moisture also influenced nodulation. The importance of P fertilization in beans is stressed. [AS]

1332

- * FLOOR, J. 1984. Response of dry beans (Phaseolus vulgaris L.) to the application of fertilizers in Kenya. Results of on-farm experiments with fertilizers. Thika, Kenya, National Horticultural Research Station. Grain Legume Project. Technical Bulletin no.5. 25p. [Grain Legume Project, National Horticultural Research Station, P.O. Box 220, Thika, Kenya]

Results of 200 on-farm fertilizer expt., carried out between 1976-84 with monocropped dry beans in several parts of Kenya, are given. Major attention is paid to soil and fertility conditions in these areas (Machakos, Embu, Kisii, Kakamega Districts, and around Thika) and the relationships between yields, response to fertilizers, and soil fertility parameters. Based on these results, new fertilizer recommendations for bean production in Kenya are given. [AS]

1333

- * FLOOR, J. 1978? Some soil fertility constraints to dry bean production in Kenya. Thika, Kenya, National Horticultural Research Station. Grain Legume Project. 6p.

The results of on-farm trials with beans in Kenya show that the av. yield of unfertilized beans depends upon the soil type they are grown in. Av. yield of monocropped beans in West Kenya are about 400-500 kg/ha higher on Nitosols than on Acrisols, because of the Lower soil fertility status of the latter. Fertilizer expt. have shown that the response to N depends on soil OM content (or % organic N). Yield increases ranged from 0 to 10 kg beans/kg N applied. Especially on Ferralsols the response to N increases dramatically when P is also applied. The response to P is somewhat erratic. In areas where N is clearly the most limiting nutrient (e.g., Machakos and Kitui District), responses to P are low and uneconomic. On most Nitosols in Central and Nyanza Provinces good responses were found, and yield increases ranged from 6 to 25 kg beans/kg P applied. In some of the Nitosols, especially those of Western and Central Provinces, and in most Acrisols in Western Province, soil tests indicated K deficiency, possibly affecting the response to P. Responses to P are also low when Al toxicity is present in the soil. [AS (extract)]

1334

- * KHARE, K.B. 1985. Fungi associated with maize and bean grown as a mixture by small scale farmers in Kenya, and their control. Turrialba

35(1):101-103. [Dept. of Crop Science, Univ. of Nairobi, P.O. Box 30197, Nairobi, Kenya]

Seeds from 2 local cv. each of maize (hybrid and Gikuru) and bean (Gituru, and Wairumu) grown as a mixture by small-scale farmers in Kenya were tested for seed-borne fungi. The dominant fungi recovered from bean seed were Fusarium solani sp. phaseoli and Penicillium sp. Penicillium sp. proved to be a wide-spread fungus on the seed lots of both maize and bean cv. tested. Of the 3 fungicides tested, benomyl was the most effective seed treatment, followed by captan and copper oxychloride, in reducing the % of total fungal recovery and increasing the % germination in vitro. [AS]

1335

- * KIBUNJA, N.C. 1985. Agricultural residues as rhizobia carriers in Kenya. In Saali, H.; Keya, S.O., eds. Conference of the African Association for Biological Nitrogen Fixation, 1st., Nairobi, Kenya, 1984. Biological nitrogen fixation in Africa: proceedings. Kenya, Nairobi Rhizobium Microbiological Resources Centre, pp.160-172. [National Agricultural Laboratories, P.O. Box 14733, Nairobi, Kenya]

Fourteen locally available materials in Kenya were evaluated as possible inoculum carriers. Of these, filtermud, bagasse, sawdust, coir dust, and coffee husks were found most promising in terms of availability, OM content, and water-holding capacity. The survival rate of Rhizobium phaseoli using the 5 carriers showed filtermud to be superior to the other 4. Filtermud maintained a viable count of 10^7-10^8 rhizobia/g inoculum throughout a 6-mo. storage period. The quality of the filtermud-based inoculum was determined by the plate count and the plant infection test. Viable counts were in the range of 10^6-10^7 rhizobia/g inoculum and compared favorably with that of a local peat inoculum. The surviving rhizobia effectively nodulated legume seedlings. Storage of inocula at 40°C was detrimental to rhizobia survival but was greatly improved by storage at 4-25°C. The use of adhesives during seed inoculation improved the survival of rhizobia on seeds. Sucrose (10% w.w.) was better than either molasses, Fowler syrup, broth, or water. Gum arabic (40% w.c.) was superior to sucrose while lime pelleting was the overall best treatment. [AS]

1336

- * NUWAMANYA, J.K. 1984. The effect of lime levels on the growth of beans and maize and nodulation of beans in three tropical acid soils. Communications in Soil Science and Plant Analysis 15(9):1017-1027. [Dept. of Soil Science, Univ. of Nairobi, P.O. Box 30197, Nairobi, Kenya]

The effect of lime on DM yield of maize and beans and nodulation of beans grown in 3 tropical acid soils (2 humic Nitosols and 1 humic Andosol) was studied in the greenhouse. The soils ranged between 4.2-5.0 in pH, 1.74-4.56% C, 21.0-32.0 meq/100 g in CEC, 5.10-8.10 meq/100 g in exchange acidity, 0.60-3.20 meq/100 g in exchangeable Al, and 0.13-0.67 meq/100 g in exchangeable Mn. Exchange acidity and exchangeable Al decreased with increasing levels of lime in the 3 soils. Exchangeable Al was reduced to virtually zero at pH 5.5 even in the soils which had appreciable initial amounts. Exchangeable Mn also decreased with increasing levels of lime in the 2 Nitosols. Exceptional results, however, were obtained with the Andosol where exchangeable Mn increased 10-fold with the 1st level of lime and then decreased with subsequent levels. In all the soils, mean DM yield of beans and maize, and mean nodule dry wt. of beans, generally increased significantly with increasing lime levels up to a pH value of 6.0. The DM yield of beans and maize, and nodule wt. of beans, however, decreased

progressively with increasing lime levels beyond pH 6.0 value. A pH range of 5.5-6.0 was considered optimum for the growth of maize and beans, and nodulation of beans in these soils. [AS]

1337

- * SSALI, W.; KEVA, S.O. 1982. Effect of nitrogen fertilizer on yield of beans inoculated with Rhizobium phaseoli. Kenya Journal of Science and Technology 3(2):87-89. [Dept. of Soil Science, Univ. of Nairobi, P.O. Box 30197, Nairobi, Kenya]

The effect of 0, 20, and 100 kg N/ha on the yield of common bean cv. Canadian Wonder (NB 26), Rosecoco (GLP 2), and Mwezi Maja (GLP 10), when seeds were inoculated with Rhizobium phaseoli, was evaluated. Applying 20 kg N/ha had little effect on nodulation, but 100 kg N/ha depressed nodulation in all cv. The application of 20 kg N/ha increased seed yield by 1.0-13.4%, but the dose of 100 kg N/ha did not always result in increased seed yield (range 8.6-21.1%) and, in one case, seed yield decreased by 12.6%. The small but consistent increase in seed yield and the relatively small effect of the low dose of N on nodulation indicates that a starter dose might be beneficial. [CIAT]

1338

- * ZOEHL, D. 1984. Labour requirements in bean production; with special reference to Central Province, Kenya. Thika, Kenya, National Horticultural Research Station, Grain Legume Project. Technical Bulletin no.2. 39p. [Grain Legume Project, National Horticultural Research Station, P.O. Box 220, Thika, Kenya]

Traditional methods of planting, weeding, and harvesting beans in Kenya, especially in the Central Province, are described and analyzed. General conclusions and considerations on crop productivity are presented. Recommended methods for bean planting and fertilization are included. [CIAT]

1339

- * ZOEHL, D. 1984. Trials on bean/maize intercropping, as re-assessed by a farming systems economist. Farming System Newsletter no.18:10-19.

An agronomy trial on plant density of beans when intercropped with maize was reassessed on its economic merits and its applicability for various target groups of Kenyan farmers. The trial recommended the intercropping of 1 or 2 rows of beans in between maize rows based only on yield increase. Economic analysis indicated that it is not significant to increase to 2 rows of beans in between maize rows, in terms of additional costs of required inputs and labor, nor do 2 rows of beans produce a higher benefit of protein balance and of carbohydrates for the family. [CIAT]

1340

- * ZOEHL, D., ed. 1984. 12 years of Kenyan-Dutch technical co-operation 1972-1984. Nairobi-Kenya, Grain Legume Project. 20p. [Grain Legume Project, National Horticultural Research Station, P.O. Box 220, Thika, Kenya]

The activities carried out to improve bean production over a 12-yr period (1972-84) as part of Kenyan-Dutch cooperation are described. Main efforts have been directed toward bean agronomy (planting times, cropping systems, and fertilization), bean crop protection, and breeding. Regarding bean breeding, 6 var. were released during this period: GLP-2, GLP-24, GLP-1004, GLP-X.92, GLP-X.1127 (a), and GLP-585, with av. yields of 1828, 1662, 1437, 1472, 1291, and 1125 kg/ha, resp. [CIAT]

MALAWI

1341

- * ABANI, K.; BARNES-McCONNELL, F. 1983. Social science pilot study in northern Malawi--preliminary findings. East Lansing, Bean/Cowpea Collaborative Research Support Program. Michigan State University. Technical Report no.2. 22p. [Bean/Cowpea Collaborative Research Support Program, 200 Center for International Programs, Michigan State Univ., East Lansing, MI 48824-1035, USA]

The preliminary findings of a survey conducted in northern Malawi among 25 rural families in order to gain knowledge on the socioeconomic importance of beans are reported. All families grew beans at the time of the study. The large red kidney seed type was indicated as outstanding in yield and families preferred this type. Of the families, 88% intercrop beans, especially with maize, 48% use some fertilizer, and 80% produced 2 crops/yr. Bean production is usually a family affair although some hire laborers when needed. The contribution of family members to bean production by activity is given. The role of women in bean production is stressed. Economic aspects of bean production, storage, and preparation are discussed. The favorite beans for consumption were Nyauzembe for their flavor and fast cooking. There is economic advantage in separating seed types since the preferred var. usually bring a better price when sold separately. However, breeders cannot discount the potential importance of maintaining the complex genetic pool that now exists. [CIAT]

1342

- * BEAN/COWPEA COLLABORATIVE RESEARCH SUPPORT PROGRAM. U.S.A. 1984. Genetic, agronomic and socio-cultural analysis of diversity among bean landraces in Malawi. In _____, 1984 Annual Report. 1. Technical summary. East Lansing, Michigan State University. pp.166-177.

The overall (5 yr) objectives of the Malawian/Michigan State U. collaborative program are to (1) discover those genetic, agronomic, and sociocultural forces that account for the persistent pattern of bean landrace diversity in Malawi, (2) attempt to replace traditional landraces by improved cv. or populations, and (3) bring out the integral role of Malawian farm women in cv. (landrace) evaluation, production, utilization, and acceptance. The main thrust of the project has been to quantify the genetic structure of Malawian bean landraces and to explain the origin and maintenance of genetic diversity on genetic, agronomic, and sociocultural grounds. [CIAT]

1343

- DAVIS, P.E. 1982. Legume microbiology research in Malawi. ODA/Gona Technical Report.

1344

- * EDJE, O.T. 1985. Effects of relative distance of beans stands from maize stands on yield. Bean Improvement Cooperative. Annual Report 28:122-124. [Bunda College of Agriculture, P.O. Box 219, Lilongwe, Malawi]

The effects of different maize/bean relative planting distances on yields were studied. Bush bean cv. P402 and climbing cv. Sapeledekwa were used. These were maize alone, maize/bush beans on same stand, 30 or 45 cm apart, and maize/climbing beans on same stand, 30 or 45 cm apart. Bean yields for

the different treatments were 545, 612, and 575 kg/ha, resp. (bush beans), and 507, 691, and 545 kg/ha, resp. (climbing beans). The overall av. bean yield was 579 kg/ha. Reduced competition for light in beans planted at 30 or 45 cm apart from maize could possibly explain increased bean yields. [CIAT]

1345

- * EDJE, O.T.; ADAMS, M.W. 1985. Moisture absorption by *Phaseolus* bean mixtures. Bean Improvement Cooperative. Annual Report 28:119-120. [Bunda College of Agriculture, P.O. Box 219, Lilongwe, Malawi]

Eighteen pure bean lines, 8 synthetic mixtures, 1 natural mixture, 1 F_2 hybrid, and 2 controls (each composed of 50 seeds) were planted in rolled paper towels to which 450 ml of water were applied, and were germinated at 25°C to evaluate the rate of moisture absorption at 6-h intervals. At 24 h the av. moisture absorption for the 18 pure lines was 11.91 ml compared with 3.09 and 9.18 ml for the natural and synthetic mixtures, resp. At 48 h the resp. av. moisture absorption values were 18.78, 9.59, and 17.56 ml. The slow rate of moisture absorption could be due to a survival mechanism. Seed size also had an effect on moisture absorption. [CIAT]

1346

- * EDJE, O.T. 1985. Response of beans to green manure. Bean Improvement Cooperative. Annual Report 28:116-118. [Bunda College of Agriculture, P.O. Box 219, Lilongwe, Malawi]

The effects of 7 levels (0, 5, 10, 15, 20, 25, and 30 t/ha) of green manure (*Desmodium*) and 1 level (300 kg/ha) of 20-8-7 NPK on plant characteristics and yield of bean cv. P402 were investigated in Malawi during 1983-84. Green manure at 10 t/ha had a similar effect on DM increase as 300 kg NPK/ha: 225.0 and 245.8 g/m², resp., compared with the control (137.1 g/m²). The resp. seed yields were 1301 and 1236 kg/ha. Farmers can plant fast growing legumes just before the onset of rains for plowing 2 mo. later under beans. [CIAT]

1347

- * EDJE, O.T.; ADAMS, M.W. 1985. Stability of bean mixtures in association with maize. Bean Improvement Cooperative. Annual Report 28:121-122. [Bunda College of Agriculture, P.O. Box 219, Lilongwe, Malawi]

Sixteen pure bean lines, 9 synthetic mixtures, 1 natural mixture, 1 F_2 line, and 2 controls were planted in association with maize to assess bean mixture stability under this cropping pattern at Bunda College, Dedza, Dowa, Misuku Hills, and Thyolo (Malawi). The av. yields for the resp. sites were 497, 757, 458, 310, and 306 kg/ha; these low yields were attributed to the competitive ability of maize. However, bean mixtures yielded 7% higher than pure lines. [CIAT]

1348

- * EDJE, O.T. 1983. Biological nitrogen fixation research in Malawi. Lilongwe, Malawi, Bunda College of Agriculture. 14p. [Bunda College of Agriculture, P.O. Box 219, Lilongwe, Malawi]
Paper presented at MIRCEN Coordinating Board Meeting, Lilongwe, Malawi, 1983.

An investigation was conducted in 1983 by the Dept. of Agriculture Research of the Ministry of Agriculture, Malawi, to determine the requirements for

efficient Rhizobium inoculation in the establishment of pastures and grain legumes (including beans), involving the identification of problem areas, evaluation of locally occurring and imported Rhizobium strains, examination of pelleting seed with cultured bacteria, and the establishment of a pilot inoculant factory. The procedure involved legume selection, a study of the needs for inoculation, and choice of strain, type, and rate of inoculation. Recommendations are given. [CIAT]

1349

- * EDJE, O.T. 1983. Ecofarming: growing crops and trees in monoculture and in association. Lilongwe, Malawi, Bunda College of Agriculture. 23p. [Bunda College of Agriculture, P.O. Box 219, Lilongwe, Malawi]
Paper presented at Agroforestry Workshop, Lilongwe, Malawi, 1983.

In a trial carried out in Malawi 4 tree species (Acacia albida, Leucaena leucocephala, Gmelina arborea, and Eucalyptus camaldulensis) were planted in monoculture or in association with maize, beans, or groundnuts. In other on-farm observations, maize, groundnuts, tobacco, and beans were planted between tree strips. Two yr after tree establishment, crop yields were significantly affected. Beans were least affected by shade than the other crops. [CIAT]

1350

- * EDJE, O.T.; SEYANI, J.H. 1979. Effect of defoliation on photosynthetic efficiency of different zones of dry beans. Malawi Journal of Science 3:44-48.

The photosynthetic efficiency of different zones of Phaseolus beans on dry bean yield was studied in Lilongwe, Malawi. A Canadian Wonder bean type, cv. 1199, was used with stages of growth and development as the main plot and zonal defoliation as the subplots. The defoliation zones were: A (top third), B (middle third), C (bottom third), A + B, A + C, B + C, A + B + C, and control (no defoliation). Grain yields (kg/ha) differed significantly for the different zones being A, 800.6; B, 962.7; C, 706.3; A + B, 1073.9; A + C, 968.7; B + C, 897.7; A + B + C, 333.1, and control, 1083.9 kg/ha. All zones functioned below their photosynthetic efficiency when other zones were present presumably due to competition between the sinks in the different zones for photosynthate. Zone B was the most efficient and zone C the least. [AS]

1351

- * KELLY, J.D.; MSUKU, W.A.B.; SAETTLER, A.W. 1984. Genetics of resistance to Malawian halo blight isolates. East Lansing, Michigan State University. Crop and Soil Sciences. 2p. [Crop & Soil Sciences, Botany & Plant Pathology, Michigan State Univ., East Lansing, MI 48824, USA]

To study the genetics of resistance to the Malawian isolates of Pseudomonas syringae pv. phaseolicola, bean crosses were made between Montcalm (resistant) and 5 large- to medium-seeded susceptible cv. and also with the resistant line 1212D. Both the parents and F_2 were inoculated in the field with isolate HB (pathotype 2). In crosses with susceptible cv. Nasaka and lines 600-1D and 2610D, the segregation pattern (9:7) indicated that Montcalm carries 2 complementary dominant genes for resistance to this isolate. In crosses with lines 2586D and 2589D, the 3:1 ratio indicates that both lines carry 1 of the complementary genes present in Montcalm. Line 1212D carries recessive resistance. A linkage between white flower color and resistance was found. [CIAT]

1352

- * KHONJE, M.Y. 1983. Response of maize, beans and pumpkins to planting in monoculture and in association. Lilongwe, University of Malawi. 15p.

The response of maize, beans, and pumpkins to planting in monoculture and in association was studied at Bunda College of Agriculture (Malawi) during the 1981-82 growing season. The treatments were maize, beans, and pumpkins in pure stand, and maize and beans, maize and pumpkins, beans and pumpkins, and maize, beans, and pumpkins in association. Each treatment was replicated 4 times. Bean yields in monoculture, in association with maize, pumpkins, or maize and pumpkins were 70, 18, 54, and 31 kg/ha, resp., and intercropping significantly reduced bean yields. The significance of intercropping is discussed. [AS (extract)]

1353

- MALAWI. MINISTRY OF AGRICULTURE AND NATURAL RESOURCES. 1980. Guide to Agricultural Production in Malawi (1980-81). Lilongwe.

1354

- * MARTIN, G.B.; ADAMS, M.W. 1985. Genetic variability in bean landraces of northern Malawi. Bean Improvement Cooperative. Annual Report 28:47-48. [Dept. of Crop & Soil Science, Michigan State Univ., East Lansing, MI 48824, USA]

Some results obtained from a study of the genetic diversity of bean landraces in northern Malawi are presented. Bean landraces were collected from 5 geographical areas in northern Malawi: Chitipa North (sites 1, 2, and 3); Misuku Hills (sites 4, 5, and 6); Livingstonia Hills (sites 7, 8, and 9); South Rukuru Hills (sites 10, 11, and 12); and Mabulabo (sites 13, 14, and 15). Twenty-five lines were randomly selected from each landrace collection of 500-800 seeds, and 3 replicates of each line were grown in randomized complete blocks at Bunda College of Agriculture. During the course of the growing season, 21 quantitative traits were measured on the 375 lines. Significant differences between sites within areas were observed for all characters at the 0.01 probability level. The 1st 2 principal components accounted for 76.15% of the variance and revealed that there can be great homogeneity within areas. This study confirmed that a vast store of genetic variability for both quantitative and qualitative traits is extant in the bean landraces of Malawian subsistence farmers. [CIAT]

1355

- * MARTIN, G.B.; ADAMS, M.W. 1985. The role of outcrossing in the generation of variability in Malawian bean landraces. Bean Improvement Cooperative. Annual Report 28:49-50. [Dept. of Crop & Soil Science, Michigan State Univ., East Lansing, MI 48824, USA]

The results of a study of the role of outcrossing as a variability-generating force in Malawian bean populations are presented. In order to elucidate possible hybridization between individual lines in 15 landraces collected in the northern region of Malawi, a principal component analysis was performed on 25 line means of 21 quantitative traits (5 phenological traits, 11 morphological traits, and 5 agronomic traits) from each of the 15 landraces. The 1st 2 principal components in these analyses accounted for an av. of 52.0% of the variance. Graphs containing the principal component analysis of the correlation matrix calculated from the 25 line means of 21 quantitative characters of landraces #11 and #5 are presented. [CIAT]

- * MARTIN, G.B. 1984. Genetic diversity of bean landraces in northern Malawi. Mag.Sc. Thesis. East Lansing, Michigan State University. 169p.

The extent, underlying patterns, and generation of variability in Phaseolus vulgaris in northern Malawi were studied. The outcrossing rate, estimated by using flower color and hypocotyl pigmentation as dominant gene markers, was found to be 0-2.23%. Considerable variability both within and between landraces was documented for numerous phenological, morphological, agronomical, and qualitative characters. Analysis of principal components revealed a clinal pattern, with the northern and southern areas forming the extremes. Several statistically significant correlations were found between environmental variables and plant character measurements, suggesting that site-specific adaptation is occurring. Separate principal component analyses of each landrace revealed genetic intergradation involving major seed classes in these bean mixtures. It is postulated that a low level of outcrossing exerts a profound impact on the generation and maintenance of variability in the Malawian bean landraces. [AS]

- * MSUKU, W.A.B. 1985. Evaluation of bean germplasm and breeding for resistance against major diseases of beans (Phaseolus vulgaris L.) in Malawi. Lilongwe, Malawi, Bunda College of Agriculture. 5p.

A project to evaluate bean germplasm and to breed for resistance to major diseases in Malawi is briefly described; objectives, overall methods, justification, and breakdown of project expenses are included. The objectives of the project are to (1) identify the pathogenic races of Colletotrichum lindemuthianum, Isariopsis griseola, Xanthomonas phaseoli, and BCMV present in southern, central, and northern Malawi; (2) evaluate the germplasm collection (over 4000 accessions) present at Bunda College of Agriculture; and (3) develop acceptable resistant var. against the above pathogens and Pseudomonas syringae pv. phaseolicola. [CIAT]

- * MSUKU, W.A.B. 1985. Pathogenic variation and virulence of isolates of Pseudomonas syringae pv. phaseolicola in Malawi. Bean Improvement Cooperative. Annual Report 28:125-126. [Bunda College of Agriculture, P.O. Box 219, Lilongwe, Malawi]

The pathogenic variation and virulence of 32 isolates of Pseudomonas syringae pv. phaseolicola collected from different bean growing areas of Malawi were evaluated on bean cv. Red Mexican U13, Red Mexican U134, Great Northern 123, Jubila, and Namajengo. Resistant Montcalm and susceptible Nasaka were included as controls. The 32 isolates were classified into 4 pathotypes. The most virulent isolates were those of pathotype 2 and the least virulent, those of pathotype 1. Colony morphology for pathotype 4 differed from the rest since it was the only one that produced rough colonies. The fact that there is great variation in the pathogenicity of this organism is extremely important to develop widely adapted, halo blight-resistant bean var. for Malawian farmers. [CIAT]

- * MSUKU, W.A.B. 1984. Pathologic variation in Malawian isolates of Pseudomonas syringae pv. phaseolicola (Burk.) Young, Dye, and Wilkie, and implications for breeding disease resistant beans. Ph.D. Thesis. East Lansing, Michigan State University. 99p.

Thirty-two isolates of Pseudomonas syringae pv. phaseolicola obtained from various bean growing areas of Malawi were separated into 4 pathotypes on the basis of their differential pathogenicity (foliage and pod reaction). Five bean cv., Red Mexican UI3 and UI34, Great Northern 123, Jubila, and Namajengo were used; cv. Nasaka and Montcalm were included as susceptible and resistant controls, resp. Standard isolates of race 1 and race 2 were included for comparison. Thirteen Malawian isolates + race 1 isolate were grouped as pathotype 1, 16 Malawian isolates + race 2 isolate as pathotype 2, 2 isolates as pathotype 3, and 1 isolate as pathotype 4. The isolates were also ranked for virulence on the basis of (1) the diameter of water-soaked lesions caused on pods and (2) no. of water-soaked lesions induced on spray-inoculated leaves of the susceptible cv. Nasaka. The most virulent isolates were those of pathotype 2 while isolates belonging to pathotype 1 were least virulent. Virulence was positively correlated to the rate of toxin production by P. syringae pv. phaseolicola isolates. However, studies showed no relationship between virulence and motility. Antisera produced against 7 Malawian P. syringae pv. phaseolicola isolates grouped the Malawian isolates into 5 distinct serotypes. However, all but 1 Malawian isolates serologically shared some antigenic properties. This isolate was the only isolate exhibiting rough colony form. The genetic basis of resistance to pathotype 2 of P. syringae pv. phaseolicola was investigated in crosses between the resistant cv. Montcalm and 8 Malawian cv./lines: Nasaka, 600-1D, 1212D, 2586D, 2589D, 2600D, 2609D, and 2610D. Analysis of F1 and F2 progenies showed that resistance in Montcalm was controlled by 2 dominant complementary genes. In addition, an allelomorphous series of 3 alleles was assumed to control resistance in complementation with either of 2 genes in 1212D. Studies also indicated linkage between resistance and flower color. [AS]

1360

- * MTEGHA, A.D. 1974. Some aspects of the marketing of beans in Malawi. Lilongwe, University of Malawi. Bunda College of Agriculture. 9p.

The results of a bean marketing study for the period 1969-74 in Malawi are presented. Less than 25% of the beans produced are offered for sale; most of the production is consumed at the farm level. Per capita consumption of pulses is estimated to be 6.81 kg/yr. In 1973 the Agricultural Development and Marketing Corporation could only purchase 1.5 thousand t for both the domestic and export markets (4000 and 7000 t, resp.). In 1972 the most important bean export markets were Holland, United Kingdom, Republic of South Africa, and Zambia. Of over 809,400 ha of land in Malawi under pulses, less than 1% was under pure stands. While production increased, the surplus for sale was inadequate to meet the demand. [CIAT]

1361

- * MULINDE, C.E. 1982. A survey of cropping systems in Lilongwe Agricultural Development Division. Lilongwe, University of Malawi. 16p.

A survey was conducted in Unit 33 of the Lilongwe Agricultural Development Division (Malawi) to document the current cropping systems in that Unit and to ascertain the degree to which the farmers in the area were adopting crop husbandry practices recommended by the Ministry of Agriculture. Results showed that the av. size of holding, pooled over credit and noncredit farmers, was 1.86 ha/household. About 55% of the farmers had at least 2 fields and 70% of the fields were between 0-2 km away from the farmstead. The main crops grown in Unit 33 were maize (hybrid and local), groundnuts, and tobacco. These were generally grown in association with other crops such as beans, pumpkins, sweet potatoes, cucumbers, or finger millet. Beans were grown in mixture with maize and groundnuts. [AS]

1362

- * MZUZU AGRICULTURAL DEVELOPMENT DIVISION. 1985. Report on progress 1980-81 to 1984-85. Malawi. 4lp.

Advances in agricultural production in Malawi during 1980-85 are highlighted and related factors presented. Special emphasis is placed on maize, rice, millet, wheat, cassava, groundnuts, beans, tobacco, and cotton. Total bean production figures were 2113, 2051, 3193, and 2276 t for 1980-81, 1981-82, 1982-83, and 1983-84, resp. The fluctuations were due to changes in the area planted. Hygrometer recording forms and farm/household interview formats are annexed. [CIAT]

1363

- * MZUZU AGRICULTURAL DEVELOPMENT DIVISION. 1982. Bean disposal survey 1982. Malawi. Eval. W.P. Misc. 2/82. 16p.

In 1982 a survey was undertaken in the 2 Malawian rural development project areas, Henga-Lower Kasitu and Mzimba-Rukuru, to seek information on cultivated areas, reasons for not growing beans, cultivation systems, problems in growing beans, disposal of beans, reasons for selling to different buyers, and the nature and extent of advise on bean cultivation. [AS (extract)]

1364

- * RAO, Y.P.; EDJE, O.T.; MUGROCHO, L.K.; MSUKU, W.A.B. 1980. Field evaluation of bean (Phaseolus vulgaris) germplasm for disease resistance. Bean Improvement Cooperative. Annual Report 23:72-74.

A total of 1621 indeterminate and 758 determinate bean lines were evaluated for disease resistance under field conditions for a period of 4 seasons in Malawi. The diseases which attained severe proportions were mainly those caused by Pseudomonas phaseolicola, Colletotrichum lindemuthianum, and Sclerotium rolfsii. About 8% of the lines were resistant to P. phaseolicola, especially those of the indeterminate group. About 12% of the lines were rated as resistant to C. lindemuthianum, also among the indeterminate ones. None of the lines were resistant to S. rolfsii; however, a few indeterminate lines showed a moderate degree of resistance. [CIAT]

MAURITIUS

1365

- * MOUTIA, A. 1945. The bean fly, Melanogromyza phaseoli Coq. In Mauritius. Department of Agriculture. Annual Report 1944. Mauritius. pp.16-17.

Expt. were conducted to study the relative susceptibility of several bean var. to Melanogromyza phaseoli. Early results indicate that the local red bean was more resistant to the insect than either dwarf var. Canadian Wonder and Long Tom, or the runner var. Everbearing and Black Local. The life cycle of M. phaseoli was also studied in the lab. [CIAT]

1366

- * PILLAY, A.R.; MAMET, J.R. 1972. Rhizobium. I. Preliminary field studies on groundnuts (Arachis hypogaea), and dwarf beans (Phaseolus vulgaris) in Mauritius. Revue Agricole et Sucriere de l'Ile Maurice 51:242-248.

An expt. was carried out in Réduit, Mauritius, to evaluate the effect of dwarf bean seed inoculated with Rhizobium sp. and of planting distances (5, 10, and 15 cm) on bean yield. Inoculation with a specific Rhizobium had a significant effect on yield with 1159, 1510, and 1617 kg/ha for inoculated seed and 1189, 1324, and 982 kg/ha for uninoculated seed for the resp. planting distances. The interaction treatment x spacing was significant, indicating that inoculated and uninoculated bean respond differently when grown at different planting distances. The yield from inoculated seeds increases consistently with increased spacing. [CIAT]

1367

- * VENCATASAMY, D.R. 1985. The effects of Rhizobium genotype, host genotype, and their interactions on nitrogen fixation in Phaseolus vulgaris. In Ssali, R.; Keya, S.O., eds. Conference of the African Association for Biological Nitrogen Fixation, 1st., Nairobi, Kenya, 1984. Biological nitrogen fixation in Africa: proceedings. Kenya, Nairobi Rhizobium Microbiological Resources Centre. pp.292-297. [School of Agriculture, Univ. of Mauritius, Reduit, Mauritius]

The effect of Rhizobium genotype, host genotype, and their interactions on the N-fixing efficiency of the Phaseolus vulgaris-Rhizobium phaseoli symbiosis was studied. A range of continuous variation was found to exist in the indigenous R. phaseoli populations in their effectiveness to fix N in association with the cv. Long Tom. This suggests that the ability to fix N is controlled by genetic factors in Rhizobium. There were large differences in the N content of plant tops, the most effective strain producing 3 times as much as the least effective. When 6 P. vulgaris cv. were each examined in association with a standard R. phaseoli strain, large differences were noted in the N content of plant tops, demonstrating that genetic factors in the host also influence the establishment of an effective N-fixing symbiosis. When 3 P. vulgaris cv. were grown in all possible combinations with 5 effective R. phaseoli strains, a significant host x strain interaction was found to exist which is responsible for the inconsistent performance of cv. over strains or vice versa. These results emphasize the importance of simultaneously selecting both symbionts for optimum N fixation. [AS]

MOROCCO

1368

- * SAKR, B. 1985. Bean production in Morocco, In Regional Workshop in Potential for Field Beans (Phaseolus vulgaris L.) in West Asia and North Africa, Aleppo, Syria, 1983. Proceedings. Cali, Colombia, Centro Internacional de Agricultura Tropical. pp.59-62. [Food Legumes Breeder, Institut National de la Recherche Agronomique, B.P. 415, Rabat, Morocco]

Beans, with approx. 7000 ha planted, are grown in northern Morocco where rainfall is higher; 80% of this crop is harvested as fresh beans, which are cultivated for either export or local consumption. Limited bean production areas and seasons, disease incidence (mainly BCMV), manpower needs and water supply, low var. adaptation and yield potential, and lack of an applied research program and extension activities limit bean production and reduce export possibilities. The Moroccan bean research program has a collection of 315 entries, all evaluated for their agronomical and phenological characters. The 1st preliminary screening nursery for rust resistance comprised 116 cv. from which promising entries will be tested during several years to determine adaptation and yield potential. Future research plans include improvement of yield potential, var. stability, and agronomic practices, and the development of disease-resistant var. [CIAT]

NIGERIA

1369

- * GILL, L.S.; OLABANJI, G.O.; HUSAINI, S.W.H. 1980. On the nature of stored food material in the seeds of some Nigerian legumes. Legume Research 3(2):66-70.

Seeds of 69 species of Nigerian legumes were examined for the presence of starch, proteins, fats, and oils. Of 40 species of the subfamily Papilionoideae, starch grains were observed only in the seeds of 20 species, among them Phaseolus vulgaris. Fat and oil were also observed in beans. The morphological characters of starch grains are given. [CIAT]

1370

- * NDIOKWERE, C.L. 1982. Determination of crude protein and some mineral content of edible Nigerian legumes using neutron activation analytical technique. Legume Research 5(2):87-90. [Chemistry Dept., Univ. of Benin, Benin City, Nigeria]

The CP and P in some edible Nigerian legumes, among them beans, have been determined by fast neutron activation analysis. Also, the legumes were analyzed for the minerals K, Ca, and Fe by thermal-neutron activation. The concn. ranges of 21.0-31.6, 0.84-3.41, 0.021-0.580, 2.23-5.14, and 2.34-4.86% dry wt. were obtained for CP, Ca, Fe, K, and P, resp. Corrections for the relevant reaction interferences were carried out in the case of protein determination. The precision of measurements for moist concn. was between approx. 4-10%. [AS]

1371

- * OSINUBI, O.A.; EKA, O.E. 1981. Effect of cooking on the nutritive value of koko/kosai—a traditional breakfast meal of the Hausas in northern Nigeria. Food Chemistry 7(3):181-187.

The effect of cooking on the nutritive value of koko (guinea corn pap)/kosai (bean cake) was assessed by chemical analysis. There was significant loss in the proximate composition due to cooking. In addition, losses of some mineral elements and vitamins were observed. K, Fe, Zn, and P losses were 23.0, 6.7, 25.0, and 13.3%, resp., and those of vitamins B₁, B₂, C, and carotene were 20.0, 46.0, 37.0, and 9.6%, resp. The amino acid pattern of koko/kosai was only slightly affected by the traditional method of cooking employed. Some suggestions and recommendations are made on how to retain most of the nutrients during cooking. [AS]

1372

- TAYLOR, T.A. 1977. The handling and storage of grain legume and pulses in Nigeria.

Paper presented to the FAO Expert Consumption on Grain Legume Processing. Central Food Technological Research Institute, Mysore, India Food and Agriculture Organization of the United Nations, Rome.

RWANDA

1373

- * CAMERMAN, A. 1972. L'inoculation des légumineuses alimentaires au Rwanda. (Inoculation of food legumes in Rwanda). Rubona, Institut des Sciences Agronomiques du Rwanda. Note Technique no.6. 6p.

Tables are presented of inoculation trials with food legumes carried out in 1972 by the Institut des Sciences Agronomiques du Rwanda at the centers of Rubona, Karama, and Rwerere. The inoculation techniques were (1) imbibition in liquid inoculum and (2) contact of the seeds with peat substrate or rice pellets with a high bacteria content. Bean var. Wulma, Bataaf, and Mixed Mexico were evaluated. In Rubona bean inoculation did not have significant effects, this being attributed to the activity of local Rhizobium strains. However, inoculation increased protein contents. In another series of trials, degeneration of inoculum sources was observed resulting in deficient bean yields. [CIAT]

1374

- * DELEPIERRE G., M.; TWAGIRUMUGABE, A. 1974. Groupe des plantes vivrières. (Group of food crops). In Institut des Sciences Agronomiques du Rwanda. Rapport Annuel 1974. Rubona. 6p.

Information is given on the collection (1st and 2nd season crops), improvement, and cultural experimentation with food crops in Rwanda during 1974. A large part of the collection was planted on small plots (less than 1 ha). During the 1st season, 22 bean var. were planted and yields/ha varied from 901 kg for Mixed Mexico to 3592 kg for Nyiramahoro. During the 2nd season, 15 var. were planted and yields/ha varied from 178 kg for Mexico 142 to 1057 kg for Nyiramahoro. During 2 seasons a comparative trial was conducted with 16 var. and 6 replications. During the 1st season, var. Nyiramahoro outyielded the control Wulma (2916 and 2742 kg/ha, resp.), these 2 var. being significantly superior to the rest ($P = 0.05$ and $P = 0.01$). During the 2nd season Nyiramahoro also outyielded No. 49, Wulma, and Colorado ($P = 0.05$). Bean and maize monocrops were more productive but the maize/bean association was more profitable. Fertilization in the bean-sorghum rotation did not have significant effects. [CIAT]

1375

- * DELEPIERRE G., M.; TWAGIRUMUGABE, A. 1965. Groupe des plantes vivrières. (Group of food crops). In Institut des Sciences Agronomiques du Rwanda. Rapport Annuel 1965. 10p.

Data is presented on yield and results of comparative var. trials of the legume collection of Rubona Station, Rwanda, during 1965. Among the bean var., the most outstanding were Nyiramahoro, No. 49, and Wulma, especially Nyiramahoro which yielded 3592, 1057, 2916, and 979 kg/ha in various evaluations. In a trial on planting distance for the beans-maize association, it was concluded that monocrops yield more but that total production (analyzed as a whole) of the association, at 40 x 60 cm spacings, is superior to that of pure crops. Var. Bayo and Mixed Mexico obtained acceptable yields (1858 and 1833 kg/ha) in dry lake colluvial soil in Karama. Var. Wulma showed tolerance to drought in the Central Egwesera but its low yields indicate it is necessary to improve the clayey soils of the transition units. Characteristics of var. Bayo, Mixed Mexico, and Wulma are presented. [CIAT]

1376

- * DEMOL, J. 1979. Legumineuses a graines. (Grain legumes). In _____. Rapport de mission au Rwanda. Gembloux, Belgique, Faculté des Sciences Agronomiques de l'Etat. pp.28-31,57-58.

Information is presented on bean research in Rwanda, where the production of this crop reached 170,000 t in 1979. Selection consists in finding species and var. adapted to the different ecological zones of the country and at the same time, accepted by farmers. General data are included on the crop as well as on: selection trials with climbing, semiclimbing, and bush beans and with snap bean var.; comparative trials; selection for disease resistance and for acceptability characteristics; cultural trials (use of props, associated and relay crops, fertilization); multiplication and diffusion of selected seeds and new introductions. Twenty-one bean var. have been introduced (including CIAT's best var.), besides 4, 5, and 11 cv. of Phaseolus coccineus, P. acutifolius, and P. lunatus, resp. As of 1980, the best pedigree lines will undergo a general selection trial. A list of the trials is included. [CIAT]

1377

- * DEMOL, J. 1978. Légumineuses: haricots (Phaseolus vulgaris). (Legumes: beans). In _____. Rapport de mission au Rwanda. Gembloux, Belgique, Faculté des Sciences Agronomiques de l'Etat. pp.12-13.

Information on the selection of bean var. in Rwanda in 1978 is given. In the locality of Karama, var. Un Demi proved to be the most productive in colluvial soils from fertile valleys and shores of Kilimbi Lake. Var. Bataaf confirmed its superiority in Rwerere. On the other hand, it is recommended to introduce the best bean var. from Palmira (Colombia) for the low and intermediate alt. areas, and Phaseolus coccineus var. Floret (Holland) and Hammards (Cambridge, England) for the high alt. areas. [CIAT]

1378

- * DEMOL, J. 1977. Haricot. (Beans). In _____. Rapport de mission au Rwanda. Gembloux, Belgique, Faculté des Sciences Agronomiques de l'Etat. pp.2-3.

Information is presented on the comparative and cultural trials and pedigree selection carried out during 1977 in Rubona, Karama, and Rwerere (Rwanda). The diffusion of 11 bean var. has been proposed; var. 54 is considered to be suitable for the 3 mentioned regions. Thirty-seven var. were selected for the comparative trials. The checks, Saka and Bataaf (bush bean var.) and Wulma (climbing bean var.), were not outyielded. Several stable pedigree selections competed with var. Wulma and 54. The use of stakes resulted in a 150-200% increase in yield; therefore new methods for their adequate utilization will be sought. [CIAT]

1379

- * DURNEZ, C. 1983. Les maladies du haricot commun (Phaseolus vulgaris L.) au Rwanda. (Diseases of common bean in Rwanda). In Institut des Sciences Agronomiques du Rwanda, La culture du haricot au Rwanda. Journées d'études du Département des Productions Végétales, Rubona, 1982. Compte-rendu. Rwanda. pp.60-72.

Various diseases affecting common beans in Rwanda are described, including symptoms and recommended phytosanitary measures. These include (1) diseases caused by soil fungi (Rhizoctonia solani, Pythium sp., Sclerotium rolfsii,

and Sclerotinia sclerotiorum); (2) cryptogamic diseases (anthracnose, angular leaf spot, Ascochyta phaseolorum, rust, floury leaf spot, and various parasites); (3) bacterial diseases caused by Xanthomonas phaseoli and Pseudomonas phaseolicola; (4) viral diseases, especially common mosaic which is found throughout Rwanda. A control strategy, adapted to the present conditions of the country, is proposed. It includes (1) the search for disease-resistant var. or at least very tolerant; (2) multiplication of these var., application of mixed treatments to the crops, and diffusion of disinfected seeds; (3) adoption by the farmers of appropriate cultural practices and of healthy seed of var. mixtures with high germinating power. [CIAT]

1380

- * DURNEZ, C.; DEJAEGHER, Y. 1980. Evaluation des pertes au cours du stockage du haricot et du sorgho sur la colline de Gatovu. (Evaluation of losses during bean and sorghum storage in the Gatovu hills). Rubona, Institut des Sciences Agronomiques du Rwanda. Note Technique no.7. 36p.

Storage losses of beans and sorghum in 1980 in the Gatovu hills, Rwanda, are evaluated to determine the influence of traditional conservation methods and verify if the introduction of special measures are justified. A preliminary survey was carried out with peasants and samples were taken at the storage installations. Seeds were classified as healthy or damaged and then subdivided into 5 damage categories; the relationship between wt. loss and consumption was established. The most common preservative is kaolin. Seeds are preserved for an av. of 4 mo. (at 3 mo. infestation is evident). For short-term storage no modification is recommended. On the other hand, long-term storage should be studied further. [CIAT]

1381

- * GABRIEL, E. 1975. Haricots. (Beans). In _____. Evaluation de la valeur de production de différentes cultures vivrières au Rwanda. Rubona, Institut des Sciences Agronomiques du Rwanda. Note Technique no.4. pp.3-4.

Bean production in Rwanda during 1975 is assessed. The official production cost/ha is 14,200 Fr, which includes 40 kg seed (1000 Fr) and labor (13,200 Fr). The regional cost is 7600 Fr due to the differential cost of labor (6600 Fr). The av. production for the period 1970-72 was 884 kg/ha. If the official buying price is 20 Fr/kg, the clear profit for the farmer is 17,680 Fr, with a net margin of 3480 (17,680 - 14,200) or 10,080 Fr (17,680 - 7600). The producer can cover his costs with a production of 710 kg. With cheaper labor a production of 380 kg is sufficient to cover costs. [CIAT]

1382

- * GATSINZI, F. 1983. Parasites de la culture du haricot. (Bean insects). In Institut des Sciences Agronomiques du Rwanda. La culture du haricot au Rwanda. Journées d'études du Département des Productions Végétales, Rubona, 1982. Compte-rendu. Rwanda. pp.73-84. [Institut des Sciences Agronomiques du Rwanda, B.P. 138, Butare, Rwanda]

Insect pests attacking beans in Rwanda are briefly described. Damage caused, and cultural and chemical control measures are included. [CIAT]

1383

- * GOETEYN, R. 1975. Résultats de quatre années d'essai variétal sur haricot volubile à Kwerere. (Results of four years of varietal trials with

climbing beans in Rwerere). Rubona, Institut des Sciences Agronomiques du Rwanda. Note Technique no.13. 30p.

A series of trials were conducted from 1972 to 1975 in Rwerere, Rwanda, to study the performance of climbing bean var. and to select the best for rural areas. For the screening trials (1 check every 4 plots) and var. trials (10 var. in randomized plots with 5 replications), a planting distance of 40 x 20 cm and 2 seeds/hill were used. Stakes were used in all the trials. Data are presented on country of origin, seed color, and wt. of 1000 seeds in different cropping seasons as well as the results obtained in comparative trials. [CIAT]

1384

- * COETEYN, R.; GARAKWA, F. 1974. Resultats d'un essai comparatif varietal sur haricot a Rwerere. (Results of a comparative varietal trial with beans in Rwerere). In _____ . Resultats d'Essais no.4. pp.9-19.

In Rwerere, Rwanda, 15 bean var. were evaluated in 1974 to try to substitute var. Bataaf, which is well diffused but with irregular production, especially during the 2nd planting season. Characteristics of the var. and results of replications are presented. Under optimum climatic conditions, var. resistant to diseases (Colletotrichum, Isariopsis, and Ascochyta) yield less than susceptible var. but are more regular. Outstanding var. were Wulma, N 5644, and Inyumba; the latter presented acceptable yields under poor and optimum conditions as well as better seed quality (stained gray color; 1000 seed wt., 410 g). This var. was chosen for multiplication for the 1st as well as the 2nd season. Only var. Bataaf will continue to be multiplied during the 1st season. [CIAT]

1385

- * HAKIZIMANA, A.; TRANCHANT, J.P. 1985. Inoculant production in Rwanda. In Seali, H.; Keys, S.O., eds. Conference of the African Association for Biological Nitrogen Fixation. 1st., Nairobi, Kenya, 1984. Biological nitrogen fixation in Africa: proceedings. Kenya, Nairobi Rhizobium Microbiological Resources Centre. pp.173-179. [Institut des Sciences Agronomiques du Rwanda, Rubona, B.P. 138, Butare, Rwanda]

In July 1983 a pilot plant for inoculant production was set up at Institut des Sciences Agronomiques du Rwanda through the collaboration of FAO and Institut de Recherches Agronomiques Tropicales et des Cultures Vivrieres. Production of soybean inoculant was initiated in 1984 together with an extension program on inoculation techniques at the small farm level. Furthermore, the production of field bean inoculant was planned. Therefore a survey on the level of bean spontaneous nodulation was carried out on farmers' fields in order to select efficient native strains. [AS]

1386

- * HAKIZIMANA, A.; TRANCHANT, J.F. 1984. Inoculant production in Rwanda. Rubona, Institut des Sciences Agronomiques du Rwanda. 15p.

Information is given on the situation of inoculum production for legumes in Rwanda, considering historical aspects from 1968 to 1984. Production of inocula for Phaseolus vulgaris is being planned; to this effect a survey is being carried out at the farmer level in 11 communities to select efficient native strains. To identify plants having greater nodulation, 617 plants have been observed so far. Preliminary results indicate that conditions are appropriate to select native Rhizobium phaseoli strains in Rwanda, considering the distribution of nodule vol./plant; some plants presented

nodulation vol. 5-6 times greater than the av. of 0.52 ml/plant (63.7 mg dry wt./plant). Samples have been taken of 29 plants having the greatest nodulation and strains will be isolated. Subsequently selection will be done in the greenhouse and at the field level with different var. to identify optimum strain-plant associations. [CIAT]

1387

- * HAKIZIMANA, A. 1983. Probleme d'inoculation du haricot au Rwanda. (Bean inoculation problems in Rwanda). In Institut des Sciences Agronomiques du Rwanda. La culture du haricot au Rwanda. Journées d'études du Département des Productions Végétales, Rubona, 1982. Compte-rendu. Rwanda, pp.52-59. [Institut des Sciences Agronomiques du Rwanda, B.P. 138, Butare, Rwanda]

Based on expt. carried out at exptl. stations in Rwanda, a revision is made of the problem of obtaining contradictory results with the inoculation of beans in this country. In an orientation trial carried out in Karama and Rubona in 1968-70, differences between the 2 localities were observed in relation to yields obtained with inoculum sources from Gembloux (Belgium) and the var. Mixed Mexico and Wulms; however, results obtained from 1970 to 1972 were contradictory. It is believed that the lack of efficiency of the sources is due to the fact that almost all soils in Rwanda have been cultivated with beans for a long time, which explains the existence of wild inoculum sources in the soil competing with the sources used. It is recommended to select very efficient sources, adapted to local conditions, capable of competing with the already existing soil inocula. [CIAT]

1388

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1985. Enquete diagnostique de la production du haricot en milieus rural. (Diagnostic survey of bean production in rural environments). In _____, Programme Legumineuses. Rapport Annuel 1984. Rubona. pp.27-32.

Surveys were carried out in the Central Plateau (50 families) and in Ruhengeri (150 families), Rwanda, to describe agricultural practices and systems and to determine bean production constraints. Results are presented in table form. Farmers show a strong preference (96%) for var. mixtures (2 or 3 different var.) over pure bean crops. A constant var. selection by farmers and a high degree of experimentation were also found. Yield, yield stability, and earliness were the most important factors influencing acceptability. Most bean crops are grown in association with other crops (banana, maize, and tubers). When climbing beans are grown in association with maize, tutors are used. The production of manure and compost does not cover the farmers' needs. Beans are broadcasted (+ 300,000 plants/ha) with an av. yield of 650 kg/ha. Women play a major role in cultivating staples and an exclusive role in seed selection. Consequently, work in rural areas is centered around women. On the other hand, farmer knowledge about crop diseases is very limited, although they use crop rotation, associations, var. mixtures, and other disease control practices. Insect damages (especially those caused by the bean fly) are better known. [CIAT]

1389

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1985. Essais culturaux. (Cropping trials). In _____. Programme Legumineuses. Rapport Annuel 1984. Rubona. pp.17-20.

Results of cropping trials (plant spacing, use of tutors, planting date), affected by irregular rainfall conditions, are presented. In Cajamarca,

contradictory results were obtained in plant spacing trials during 2 seasons, and no significant differences were found between the use of 100 tutors (hill planting system in rows of Institut des Sciences Agronomiques du Rwanda) and 117, 97, 77, 57, and 37 tutors (traditional farmers' method). [CIAT]

1390

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1985. Essais d'adaptation des nouvelles varietes en milieu rural. (Varietal adaptation trials in rural environments). In _____. Programme Legumineuses. Rapport Annuel 1984. Rubona. pp.14-16.

Results of a multilocational var. adaptation trial in Rwanda (1979-84) are presented. Farmers show increasing interest for this type of trials, and readily accept the new var. tested. To date, Rubona 5 is the highest yielding and most accepted var. On the other hand, low yields and disease and pest incidence have been reported for multilocational trials at Programme National de Amelioration du Pomme de Terre (PNAP)-Ruhengeri, Intensification du Programme du Vivrieres-Ciciye, and Développement Rural Byumba, with 5 high-alt. climbing bean var. However, yields at PNAP-Ruhengeri were satisfactory, Cajamarca yielding 3041 kg/ha. [CIAT]

1391

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1985. Introductions - collections. (Introductions-collections). In _____. Programme Legumineuses. Rapport Annuel 1984. Rubona. pp.2-3.

Information is given on bean introductions and collection at Institut des Sciences Agronomiques du Rwanda in 1984. Approx. 3200 var. have been introduced from CIAT, 481 of them in 1984. Unfortunately, most of CIAT's virus-resistant (I gene) var. have shown sensitivity to local strains of the black root disease. However, the no. of affected var. has decreased since new var. without the I gene are being developed. On the other hand, CIAT's introductions are less sensitive to virosis and anthracnose and more sensitive to *Aescchyta* and *Isariopsis* spp. Recommended disease-resistant var. are A 483, A 484, AB 136, Ecuador 299, V 7920, G 2333, and G 2371 for anthracnose; A 345, A 340, and A 339 for *Isariopsis*; BAT 1386, BAC 122, BAT 1373, IVT 80785, G 8878, and BAT 1387 for viral diseases; BAT 1220, G 790, and Red Kote for halo blight; and BAC 42, BAT 1336, BAC 112, BAC 125, and BAT 1449 for common blight. [CIAT]

1392

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1985. Microbiologie. (Microbiology). In _____. Programme Legumineuses. Rapport Annuel 1984. Rubona. pp.23-27.

A survey of local *Rhizobium* sources was carried out in Butare and Gitarama (Rwanda) in 1984. From a total of 617 plants surveyed, 145 nodules were collected from 29 plants showing the apparently best fixation activity. At Rwerere, a foreign inoculum source and a local one (with or without PK) were compared in climbing bean Cajamarca. N, NPK, and control treatments were also included. The best inoculum source was inoculum B + PK, and the highest yields were obtained by the NPK, N, inoculum B, and inoculum B + PK treatments, in that order. On the other hand, a plastic nonautoclavable bag, produced in the country, was found to be the best packaging for inoculants and was chosen for large-scale inoculum production. [CIAT]

1393

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1985. Pathologie. (Pathology). In _____ . Programme Legumineuses. Rapport Annuel 1984. Rubona. pp.20-22.

Information is given on disease- and pest-resistant bean var. Institut des Sciences Agronomiques du Rwanda in 1984. Some of the most promising var. are listed. The var. with I gene, not possessing other resistance genes, should not be used in Rwanda; also, preliminary results indicate that responses to Isariopsis griseola and BCMV are different from those observed in South America. At present, several exploratory and var. trials are being evaluated in rural environments. The effect of adding the new resistant var. to the local var. mixture, a common practice among peasants, should be further studied. [CIAT]

1394

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1985. Production et diffusion des semences selectionnees de haricot. (Selected bean seed production and dissemination). In _____ . Programme Legumineuses. Rapport Annuel 1984. Rubona. pp.16-17.

A table is presented on basic seed production and dissemination of dwarf, semiclimbing, and climbing bean var. during 1983-84. Recommended var. are Rubona 5, Ikinimba, Tostado, Kilyumukwe, Urunyumba 3, and C 10. [CIAT]

1395

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1985. Programme legumineuses. (Legume program). Rapport Annuel 1984. Rubona. 50p.

Results of the 1984 legume program of the Institut des Sciences Agronomiques du Rwanda are presented. Main topics covered are var. introduction and collection, pedigree and var. selection, new var. adaptation trials in rural environments, seed production and release, cropping trials, pathology, microbiology, surveys of bean production in rural areas and of bean consumption and quality. Major emphasis was placed on the selection of var. with: (1) high and stable yields, (2) resistance to the most important bean diseases in Kwanda, (3) tolerance to the country's climatic conditions, (4) tolerance to poor soil conditions, and (5) good growth in maize-bean associations. In addition, research work highlighted symbiotic fixation, cultural practices, production constraints, and nutritional and culinary characteristics. [CIAT]

1396

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1985. Recherche sur la consommation et qualite de haricot. (Survey on bean consumption and quality). In _____ . Programme Legumineuses. Rapport Annuel 1984. Rubona. pp.32-37.

A survey was carried out in several localities of Ruhengeri (Kwanda) in June 1984 to determine the possibilities that an improved var. had to be well accepted by the local population. A lab. was also set up at Institut des Sciences Agronomiques du Rwanda to evaluate cooking characteristics of bean var. from comparative trials. A total of 109 farmers (mostly women) were interviewed. Cooking methods and acceptability factors were identified. Beans (dry beans, fresh beans, green beans, and leaves, in that order) were the favorite food for 81% of the respondents. Dry beans are cooked for 3 (25%), 4 (25%), and 5 h (21%), with no presoaking period, and then kept for 2 (60%), 3 (30%), or more days (10%). No preferences were

found between pure var. or mixtures, although var. preferences existed for cooking characteristics; 85-72% of the respondents identified several var. for their cooking quality and color (var. Mutiki, Nyirakagano, Urushimandengo). Beans are included in every meal, larger beans being preferred (92%). Data are also given on some eating habits. [CIAT]

1397

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1985. Selection genealogique. (Pedigree selection). In _____. Programme Legumineuses. Rapport Annuel 1984. Rubona. pp.3-4

Pedigree selection activities in beans in 1984 at Institut des Sciences Agronomiques du Rwanda are reported. Hybrid multiplication and individual selection of dwarf and climbing bean var. were continued in Rubona, Karama, and Rwerere, and on-site selection of CIAT's segregating lines was initiated. Screening was based on yield, adaptation, and disease resistance characteristics. Data are also given on interspecific crossings (Phaseolus coccineus x P. vulgaris) and new hybrid production. [CIAT]

1398

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1985. Selection varietale. (Varietal selection). In _____. Programme Legumineuses. Rapport Annuel 1984. Rubona. pp.4-13.

Results are given for var. selection trials with dwarf, semiclimbing, and climbing bean var. in Rubona, Karama, and Rwerere (Rwanda) in 1984. In Rubona screening trials, the best dwarf-semiclimbing var. were A 197, G 12470, Ica Palmar and Umutikili on poor soils, and in Rwerere, var. Ica Palmar, Inyumba, Nsuzumirurushako, Tostado, Kiryumukwe, and var. mixture ISAR 84 under drought conditions. Among the best climbing var. were G 858, G 1398, Cajamarca, Antioquia 123 Plomo, G2333, and Gisenyi 6. In comparative trials, the best var. were Ica Palmar and the var. mixture ISAR 84 (dwarf); IRW 10, Shikashike, and ISAR 84 (semiclimbing); A 442, A 410, BAT 1671, A 439, A 410, A 321, BAT 1453, and Ex Rico 23 (IBYAN); and G 858 ICA Viboral, V 79116, and Gisenyi 6 (climbing). Results are also presented in table form. [CIAT]

1399

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1983. La culture du haricot au Rwanda. (Bean cultivation in Rwanda). Journées d'études du Département des Productions Végétales, Rubona, 1982. Compte-rendu. Rwanda. 174p.

Statistical, botanical, and ecological data are presented on bean cultivation in Rwanda and conclusions of a seminar held in Nov. 1982 in Rubona are given. The importance of beans for human nutrition is pointed out, analyzing chemical concepts and nutritive properties. The problem of bean inoculation in the different zones of Rwanda is examined and the principal bean diseases and pests in this country are mentioned. In addition, the objectives, methods, and criteria which bean breeding must have in Rwanda are discussed and some exptl. results and strategies for future research are given. Other aspects such as associated cropping of beans, prevulgarization trials in the Gatovu hills, and production and dissemination problems of selected seeds are examined. [CIAT]

1400

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1981. Division des plantes vivrières. Légumineuses: haricot (Phaseolus vulgaris L.). (Division of food plants. Legumes: beans). In _____ . Compte rendu des travaux du Département Production Végétale. Rubona. pp.3-10.

The activities of the Food Crop Division in Rwanda during 1981 are summarized, including selection, breeding, and study of cultural techniques. The bean germplasm bank (524 var.) received 160 var. from the rural environment and 9 from abroad. In screening trials in Rubona, the most outstanding bush var. were N1 555, N1 572, IRW 8, and Ndimirakaguja (outyielding Bataaf during 2 seasons) and for snap beans, var. Prenel, Radio, Valgreen, Juri, Nain Princesse Cordor, Nain Conserva, and Multima (outyielding Saxa during the 1st season). Treatment with mancozeb increased yields in Rwerere by 39-60%. Var. Actoran and Richmond Nandos outyielded the control during the 2 seasons in Rwerere. In Karama, 3 var. (Sornel, Actoran, and Munyu) outyielded var. 1/2 during the 1st season and 1 var. (Raido Grado) during the 2nd. Many semiclimbing bean var., among them Caru 27 and Gikara, outyielded the control Kicaro in Rubona and others such as Rwerere 8, Nsuzumirurushako, and Amarillo 156 outyielded Unyumba in Rwerere. In Rubona, climbing var. Sabre a Rames was the most outstanding, in Rwerere and Karama var. Urunyumba, and in Karama var. 7211. In multilocational comparative trials, var. 11 showed good adaptation, followed by Actoran and Mutiki 2. Best yields were obtained in plantings of 15-20 seeds/m in continuous rows at 0.3 x 0.4 m spacings. The bean/maize association was not productive. A 0.5-m prop is enough to obtain a 40% increase in yields; the 2.5-m prop gave the best results. Phytosanitary data and the most productive var. for seed multiplication are included. [CIAT]

1401

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1980. Cultures associées. (Crop associations). In _____ . Compte rendu Production Végétale 1980. Rubona. pp.123-127.

Tables with yields and pluviometric data of different crop associations established in Karama, Rwanda, a subhumid region with irregular rainfall, are given. Results obtained during the 1st planting season of 1980 showed the advantages of associating 3 crops; the best combination was sweet potato-bush beans-maize yielding 2361, 917, and 489 kg/ha, resp. Yields of the bean-maize association were markedly reduced (564 and 304 kg/ha, resp.). During the 2nd planting season, the monocrops produced less than the associated crops due to rainfall deficit. [CIAT]

1402

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1980. Cultures vivrières. (Food crops). In _____ . Rapport Annuel 1980. Kigali, Rwanda. Ministère de l'Agriculture et de l'Élevage. Projet Semences Sélectionnées. pp.1-8.

Information is given on research results during 1980 of 5 multiplication centers (Mutura, Ruhunde, Muyumbu, Murutu, and Bumbogo) of various crops grown in Rwanda. During the 2nd season, bush bean var. Cajamarca yielded 983 kg/ha in Ruhunde (2300 m.a.s.l.), where drought affected Bataaf. Performance of var. 1/2, Melange Jaune, and Emma and of the bean/maize association, was outstanding in the region of Muyumbu (+ 1400 m.a.s.l.). On the other hand, 4 bean var. (1/2, Bataaf, Melange Jaune, and Mange Tout) yielded an av. of 1150 kg during the 1st season and 365 kg during the 2nd season, when drought problems were present. Bataaf yielded 505 kg/yr in a

granitic soil region (Bumbogo, 1750 m.a.s.l.); Melange Jaune yielded 828 kg in the same locality. During the 1st season, a total of 6603 kg seed was disseminated or sold, and 14,048 kg during the 2nd; this is enough seed to plant 230 ha (90 kg/ha). Overall, legume yields increased very little during 1980. [CIAT]

1403

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1980. Cultures vivrières. (Food crops). In _____. Rapport Annuel 1979. Kigali, Rwanda. Ministère de l'Agriculture et de l'Élevage. Projet Semences Sélectionnées. pp.1-7.

Data are presented on the multiplication and dissemination of food crop seeds in Rwanda during 1978-79. In Ruhunde (2300 m.a.s.l.), climbing bean var. Cajamarca confirmed its superiority in relation to bush var. Bataaf and Inyumba (av. yields of 1420, 500, and 300 kg/ha, resp.). In Mutura (2300 m.a.s.l.), var. Cajamarca also showed an acceptable performance. In Muyumbu (\pm 1400 m.a.s.l.), var. 1/2 yielded 741 kg/ha and intercropped with maize, complemented maize yields. In Mututu (\pm 1400 m.a.s.l.), strong rains affected crops of var. 1/2 and Bataaf (323 and 403 kg/ha, resp.). In Bumbogo (less than 1800 m.a.s.l.), bush var. did not show an acceptable performance. It was necessary to obtain seed again from the best farmers' fields and from the Institut des Sciences Agronomiques du Rwanda (100, 500, and 300 kg of var. Bataaf, 54, and 1/2, resp.). Bean dissemination is good: var. 1/2 (9283 kg seed), Bataaf (4210 kg), Cajamarca (4142 kg), Phaseolus multiflorus (820 kg), and var. 54 (3875 kg). Beans occupy 186 ha (18% of total surface) and the 3rd place among the most important crops, after maize and soybean. [CIAT]

1404

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1979. Cultures associées. (Crop associations). In _____. Compte rendu Production Végétale 1979. Rubona. p.78.

Within the framework of low-input agriculture, a multilocal trial with associated crops was carried out in 1979 in the 1st and 2nd planting seasons in 8 different environments at Rubona Station, Rwanda. The maize-climbing beans association was the dominant crop, yielding more per unit area than pure crops. This association yielded 2611 kg beans and 4394 kg maize/ha. Beans in monocrop yielded 1706 kg/ha. Bush beans were the best in ternary associations (sweet potato-beans-maize). The climbing beans-sweet potato association produced a high protein content/ha. [CIAT]

1405

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1978. Legumineuses: haricot (Phaseolus vulgaris L.). (Legumes: beans). In _____. Compte rendu des travaux du Département Production Végétale. Rubona. pp.1-13.

Partial conclusions are presented on var. screening trials with bush, semiclimbing, and climbing beans in Rubona, Karama, and Rwerere (Rwanda) during 1978. There were 18 new introductions from the rural areas and 8 from the Federal Republic of Germany. The no. of var. in the 3 localities was, resp., 122, 60, and 20 (climbing), 47, 68, and 52 (semiclimbing), and 47, 34, and 28 (bush). In general screening trials, the most outstanding bush var. were Actoran, Nain, Beau Port, and Emma (all outyielding Bataaf). Among the climbing var. the most outstanding were Gisenyi I, Bayo 158, 0688, Colorado, Bayo, and Nsuzumirurushako (var. 54 as control). Among the semiclimbing var., Nsuzumirurushako, N 7093, and Rwerere 11 outyielded the

control Inyumba. Information is given on the presence of bacterial blight. In comparative trials var. Gisenyi 1 and 2 bis (climbing) were the most outstanding. Materials for pedigree selection were of no interest. Results of cultural trials (planting method with var. Saxa and Wulma, comparison of var. in pure and mixed stands, use of props) and of mutation trials (black tegument of var. Wulma) are summarized in table form. Application of fungicides increased seed yields significantly. [CIAT]

1406

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1977. Haricot. (Beans). In _____ . Compte-rendu des travaux du Département Production Vegetale. Rubona. pp.1-15.

Partial conclusions are presented on expt. with beans in Rwanda during 1977. Bean collections in Rubona, Karama, and Rwerere include, resp., in addition to pedigree offspring and mutants, 97, 60, and 29 climbing bean var. and 45, 23, and 28 bush bean var. In Rubona and Rwerere there are, resp., 24 and 52 semiclimbing var. Brief information is given on var. screening trials. The most outstanding climbing var. were Nyirakabuye Jaune, Mushali, Melange Jaune, Gisenyi 2, and some local var. (Caru 6, 8, 11). Among bush beans the most outstanding were Bataaf and Rose Coco and among the semiclimbing var., Angola and Nyiramahoro. Results of comparative trials are summarized in tables. During the 1st season, Bataaf (bush) outyielded Saxa ($P = 0.05$) and during the 2nd season, var. Emma was the best. Climbing var. Gisenyi 2, Gisenyi 1, Bayo 158, and Gikara outyielded the control var. 54. Controls Bataaf and 1/2 maintained their superiority in other trials. In colluvial soils, Bayo 158, 7093, Amarillo 156, and Ibundu were the most outstanding. Information is given on pedigree selection and cultural trials (planting distance, planting method, props). Spacings of 40 x 5 cm and 1 seed/site are recommended for bush var. Treatments with 1 prop/2 plants and 1 prop/4 plants were superior at the 0.05 level. Regarding the tegument mutation of Wulma, none of the lines outyielded the control. In trials with fungicides, none of the treatments outyielded the untreated control. During the 1st season of 1976, var. Cajamarca considerably outyielded var. Gisenyi 2, Gisenyi 3, and Urunyumba 1. [CIAT]

1407

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1976. Phaseolus vulgaris: haricots. (Phaseolus vulgaris beans). In _____ . Rapport de la Mission d'Evaluation du Projet Service des Semences Selectionnees au Rwanda, Mars 1976. Rubona. pp.6-10.

The characteristics of 3 bean growing zones (low and high alt., and central) in Rwanda during 1976 are presented. In the low alt. zone, var. 1/2 was grown with av. yields of 800 kg/ha; problems of seed availability occurred and for 1981 it was expected to have at least 9600 ha planted. In the high alt. zone, var. Bataaf and Cajamarca were grown with av. yields of 800 kg/ha. Only 0.5 t of Bataaf and 4.0 t of Cajamarca were available; therefore, it was recommended to buy seeds from the Netherlands and Peru. Area planted in 1980 was expected to be 10,200 ha. In the central zone, if var. Saxa was not locally accepted, it could be replaced by Melange Rouge or Melange Kabale; the expected diffusion was 60,000 ha. Appraisal trials with Saxa were planned. [CIAT]

1408

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1975. Especies cultivadas. Leguminosas: haricot (Phaseolus vulgaris L.). (Cultivated species. Legumes: beans). In _____ . Rapport Annuel 1975. Rubona. pp.23-34.

Information is given on experimentation with beans in Rwanda during 1975. Eleven var. were introduced and in Rubona 94 var. were maintained. In screening trials with 4 bush var., using Saxa as control, var. Emma was outstanding. In Karama with var. 11 as control, var. Supermetis, Nanus, Richmond Wonder, Nain Mangetout, Raiado Grado, and Bataaf were outstanding. In Rwerere, production was poor and var. Actoran, Richmond Nandos, Munyu, and Sornel were outstanding. Among climbing var., Bayo 158, Gisenyi, Gikara, Melange Kabale, and Far Lang Tou were superior. Results of comparative trials are summarized, the most outstanding var. being Raiado Grado, Melange Jaune I, and 7045, which outyielded the controls Saxa and Wulma. In lake and dry valley colluviums, none of the var. outyielded the controls 1/2 and Bayo 158. Information is given on pedigree selection trials, cultural trials (planting density, fungicides, irrigation), and mutation trials of the black tegument of var. Wulma, carried out with different doses of EMS. [CIAT]

1409

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1974. Activite 1974. (Activities during 1974). Rubona. 5p.

Location and physical-climatological data of the research stations and centers of the Institut des Sciences Agronomiques du Rwanda in Rubona, Karama, and Rwerere are presented, and some photographs related to research on food crops are included, among them one with mutant seeds of var. Wulma, which is of great agronomic interest but rejected because of its black-colored seed. Climbing bean cultivation allows production to be increased by 30%. [CIAT]

1410

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1974. Essais orientatifs (1968-1970). [Experimental trials (1968-70)]. In _____. La symbiose Rhizobium-legumineuses au Rwanda. Rubona. Note Technique no.6 pp.4-8.

Several exptl. trials were carried out in Rubona, Karama, and Rwerere (Rwanda) during 1974 to (1) evaluate Rhizobium sources from Gembloux (Belgium), (2) demonstrate the practical use of inoculation, and (3) choose between a liquid or a solid inoculum. For the 1st, seeds were imbibed in the inoculum and then air-dried or dried under shade; for the 2nd, seeds were placed in the planting hole and peat or rice balls with inoculum were applied before its closure. Data were taken on the no. of nodules at flowering, color of the nodules and leaves, yield, and DM protein content. In Karama, but not in Rubona, inoculation increased seed yields and protein content, attributed to the fact that legumes had not been cultivated before in these tropical black-clayey soils; thus, competition did not exist for the inoculum sources used. [CIAT]

1411

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1973. Legumineuses: haricot (Phaseolus vulgaris L.). (Legumes: beans). In _____. Rapport Annuel 1973. Rubona. pp.44-50.

Information is given on bean expt. in Rwanda during 1973. Eleven var. were introduced to the collection of 150 var. In screening trials with bush beans (controls Saxa, no. 11, and Bataaf), 13 var. were retained in Rubona, 5 and 8 var. (cultivated with and without irrigation, resp.) in Karama, and 15 var. in Rwerere. In Rubona, 4 var. presented acceptable tolerance to anthracnose: Jamapa Incremento la Stanzuella, Nyiramabuye, Sabana Grande, and Avinhado. In comparative trials with and without props, var. SG 44,

6473, Amarillo 156, and var. 54 were the most outstanding. In Rwerere, various var. outyielded Bataaf, among them Wulma, SC 44, and Amarillo 156. Information is given on pedigree selection, use of props, and mutation of the black tegument of var. Wulma. [CIAT]

1412

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1972. Legumineuses: haricots. (Legumes: beans). In _____. Rapport Annuel 1972. Rubona. pp.28-29.

Information is given on comparative trials and on the selection of bean var. introduced into Rubona and Karama (53 and 5 var., resp.), Rwanda, during 1972. Screening trials were subdivided into bush, climbing, and semiclimbing beans. Among the climbing and semiclimbing var. showing good performance over 4 seasons were No. 18 and No. 78 (Colombia), and Kalikabagen (Rwanda); these, together with 8 other var., will undergo comparative trials in Rubona. Compared with the control Bataaf, the following bush var. performed well over 4 seasons in Rwerere: Amarillo 156 (Mexico), Angola (Angola), and Colorado (Guatemala); these, together with 12 other var., will undergo comparative trials. In Rubona, var. No. 86 (Uganda), S.G. 44 (Zaire), and 60-4-60 (Uganda) yielded 1065, 1020, and 993 kg/ha, resp., significantly outyielding the control Wulma (594 kg/ha). Information is given on pedigree selection (F_5 and F_6) and on a mutation test of the black color of var. Wulma. [CIAT]

1413

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1971. Haricots. (Beans). In _____. Rapport Annuel 1971. Rubona. pp.21-36.

Lists and charts are presented on the bean var. evaluated during the 1st and 2nd seasons of 1971 in Rubona, Rwanda. Vegetative cycle, yields/plot, and observations are included. Bean var. Wulma intercropped every 5 plots was used as check. A no. of var., among them no. 37 (1060 kg/ha), outyielded the check which was highly susceptible to viral diseases. [CIAT]

1414

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1970. Karama: 1ere saison. (Karama: first planting season). In _____. Rapport Annuel 1970. Rubona. pp.39-50.

A list is presented of var. planted in a screening trial carried out during the 1st (36 var.) and 2nd (55 var.) planting seasons in Karama, Rwanda, during 1970. Colluvial soil from lake Kilimbi and from the dry valley of Maza was used. Results are included in table form. Parameters evaluated were as follows: av. yield (5 replications), planting, establishment, flowering, pod formation, vigor, aspect, harvest date, and length of growth cycle. The control was Mixed Mexico (0.464 kg/plot) for the 1st season and the most productive var. was no. 78 (1.008 kg/plot). In the 2nd season, Mixed Mexico was inferior to the others, var. Wulma being the most outstanding (1.155 kg/plot). [CIAT]

1415

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1970. Legumineuses. (Legumes). In _____. Rapport Annuel 1970. Rubona. pp.7-8,14-19,20.

During 1970 approx. 60 new bean var. were introduced into Rwanda. The 59 var. evaluated in cultural trials carried out in Rubona are listed,

including their origin, vegetative cycle, and growth habit. Check var. Wulma was intercropped every 5 plots. In Karama, 19 var. native of Zaire were planted on colluvial soils of Lake Kilimbi; information on planting date, establishment, flowering, pod formation, harvest, and vigor is included for these var. Various legumes were evaluated in Rubona, among them Phaseolus coccineus and P. lunatus. [CIAT]

1416

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1970. Rendements des cultures vivrières en kg/ha. (Food crop yields in kg/ha). In _____. Rapport Annuel 1970. Rubona. pp.12,20-22.

Tables are presented on yields of beans in monoculture and in association in Rwanda. Beans were intercropped with maize, banana, maize and banana, cassava, maize and cassava, sorghum, and sorghum and banana; in 1969 the highest yield was obtained in the association with maize (1028 kg/ha) and in 1970 with sorghum (889 kg/ha). Var. Wulma, Mixed Mexico, and Bataaf were planted in monoculture in Rubona, Karama, and Rwerere, resp., and yielded, on the av., 972, 1363, and 668 kg/ha, resp. [CIAT]

1417

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1970. Rwerere: 1ere saison culturale. (Rwerere: first planting season). In _____. Rapport Annuel 1970. Rubona, Centre Expérimental de Rwerere. pp.33-38.

Lists of bean var. and yields are presented for the 1st and 2nd planting seasons of 1970 (46 and 65 var., resp.) in Rwerere, Rwanda. The check for both seasons, Bataaf, yielded up to 4183 kg/plot. Yield graphs are presented. [CIAT]

1418

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1969. Essai de fumure organique et minérale sur haricots Bataaf. (Organic and mineral fertilization trial with bean var. Bataaf). In _____. Rapport Annuel 1969. Rubona. pp.96-98.

Results are presented of an organic and mineral fertilization trial with bean var. Bataaf, conducted for 5 yr (1964-69) in Kalima, Rubona Station, Rwanda. These are presented in table form and include the doses of NPK and OM utilized, and the yields obtained. [CIAT]

1419

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1969. Essai de lutte contre la rouille du haricot (Rubona). (Bean rust control trial - Rubona). In _____. Rapport Annuel 1969. Rubona. p.86.

Trials were carried out at Rubona Station, Rwanda, in 1969 to evaluate the effectiveness of chemical control of bean rust. Treatments with different doses of zineb (4 applications of 2 or 3 kg/ha) did not affect yields in 2 trials. However, bean plants were not damaged by the disease. [CIAT]

1420

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1968. Collections de haricots. (Bean collections). In _____. Rapport Annuel 1968. Rubona. pp.5-6,14-15,20,42.

Information is given on the bean collection (24 var.) and on expt. evaluating the yield and vegetative cycle of this crop in Rubona, Rwanda, in 1968. Highest yields were obtained by Wulma, No. 78, and Nyiramahoro (4192, 3975, and 3942 kg/ha, resp.) which had vegetative cycles lasting 100-118, 100-118, and 100-110 days, resp. In a comparative trial with the 12 best var., Nyiramahoro outyielded ($P = 0.05$) Wulma and these 2 var., in turn, outyielded the rest ($P = 0.01$). During the 2nd season, Nyiramahoro outyielded 12 other var. ($P = 0.01$). Var. 60-4-60, No. 11, Wulma, Frejol Negro, and Colorado had the same statistic yield value. Application of zineb (5 applications at 3 kg/ha) significantly increased yields for var. Wulma. Results of 2 cropping seasons are summarized in a table. [CIAT]

1421

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1968. Haricots. (Beans). In _____, Rapport Annuel 1968. Rubona. pp.16-17.

Comparative var. trials with beans carried out in Rwerere, Rwanda, during 1968 are reported. Var. Bataaf was the most productive (1024 kg/ha) and the only var. showing stable yields over the 5 replications. [CIAT]

1422

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1968. Haricots. (Beans). In _____, Rapport Annuel 1968. Rubona, Station d'Essai de Karama. pp.26-29. Fr.

Information is given on expt. with beans in Karama, Rwanda, during 1968. Data are presented on N-P-K fertilization and on var. performance in different types of soils (colluvial soils of lakes Kilimbi and Gaharva, gravelly colluvial soils, and gravelly soils). Local var. Nkanga was outstanding (1427 kg/ha), outyielding some selections, although not significantly. Var. Mixed Mexico yielded 1900 kg/ha on gravelly colluvial soil, as the 6th crop in a rotational system; its yield was 2580 kg/ha on colluvial soils of Lake Kilimbi (2nd crop in the rotation) and 2015 kg/ha on colluvial soils of Lake Gaharva (1st crop in the rotation). [CIAT]

1423

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1967. Essais de fongicides contre la rouille du haricot. (Trials with fungicides against bean rust). In _____, Rapport Annuel 1967. Rwanda, Station de Recherches Agronomiques de Rubona. pp.F10-F12.

The effect of propineb and maneb on bean var. Wulma and Nyiramahoro was studied during the 2nd planting season of 1967 in Rubona (Rwanda). The following treatments were used (1) 3 applications of propineb at 1-wk. intervals, (2) 4 applications of propineb at 10-day intervals, (3) 4 applications of maneb at 2-day intervals, and (4) control. Doses consisted in 2 kg product/500 l water (1st application) and 3 kg product/750 l water (subsequent applications). A randomized block design was used. It was concluded that there were no differences between treatments (2) and (3), during which yields of 2273 and 2243 kg/ha, resp., were obtained. These 2 treatments were significantly superior to the control ($P < 0.01$). [CIAT]

1424

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1967. Haricots. (Beans). In _____, Rapport Annuel 1967. Rubona, Centre Expérimental de Rwerere. pp.11-12.

Data on the 1967 bean collection in Rwerere, Rwanda, are presented. Var. Bataaf, Cuarentino, Wulma, and Colorado, as well as Phaseolus coccineus (white and violet), were resistant to rainy and drought conditions. Cultivation aspects for the bush bean var. (2 plantings/yr) and for P. coccineus are described. Selection should be made for yield and for large seed size, with good color and taste. Var. with small black seeds, such as Wulma, are not appreciated in rural conditions. [CIAT]

1425

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1967. Haricots. (Beans). In _____. Rapport Annuel 1967. Rubona, Station d'Essai de Karama. p.24.

Data on beans in the 1st and 2nd growing seasons in Karama, Rwanda, in 1967 are summarized in 2 tables. Plantings were made in colluvial soil from the Kilimbi Lake. Highest yields were obtained with var. Mixed Mexico (982 and 888 kg/ha, under rain deficit). Var. Bayo was less affected by drought. [CIAT]

1426

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1966. Collection légumineuses. (Legume collection). In _____. Rapport Annuel 1966. Rubona, Centre Expérimental de Rwerere. p.G.5.

In 1966 the legume collection in Rwerere, Rwanda, was evaluated. Phaseolus vulgaris var. Bataaf, Wulma, Cuarentino, Colorado, and white- and violet-seeded P. coccineus showed good resistance to rainy conditions. Yields of Bataaf were superior to those of the other var.: 1240-1450 kg/ha. [CIAT]

1427

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1966. Essai de fongicides contre la rouille du haricot. (Fungicide trials against bean rust). In _____. Rapport Annuel 1966. Rubona. pp.H8-H9.

The effects of rust on bean yields were studied and the efficiency of propineb and a cupric fungicide (copper oxychloride 50%) were evaluated in Rubona, Rwanda, during 1965-66. Four applications of each product were made at 10-day intervals; the 1st application was made 4 wk. after planting with 2 kg chemical/500 l water/ha, followed by 3 applications of 3 kg chemical/750 l water/ha. The treatment with propineb was significantly superior ($P = 0,01$) to Cu and check treatments (1812.5, 1274.5, and 1187.5 kg/ha, resp.). [CIAT]

1428

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1966. Haricots. (Beans). In _____. Rapport Annuel 1966. Rubona. pp.D30-D31.

A trial was carried out with beans in rotation with other crops in Karama, Rwanda, during 1966. Var. Mixed Mexico yielded 1928 kg/ha in tropical black clayey soils (2nd season). When var. Wulma and Mixed Mexico were planted in the 7th place of the rotation, yields were 1584 and 1808 kg/ha, resp. In the 2nd planting season and occupying the 7th or 8th place in the crop rotation, var. Bayo, Wulma, and Mixed Mexico yielded 1467, 1376, and 2152 kg/ha, resp. It is concluded that after the 6th place in the crop rotation, bean yields are lower. It is recommended to leave the field to lie fallow or apply mineral fertilization. [CIAT]

1429

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1966. Multiplications de haricots. (Bean multiplication). In _____. Rapport Annuel 1966. Rubona. pp.L.7-L.8,L.10,L.15.

Over 20 ha were planted for crop multiplication during the 2 seasons of 1966 in Rubona, Rwanda. Yields of the different crops are tabulated. Bean yields were 1574 and 970 kg dry seed/ha in the 2 seasons, resp. Early drought produced the lower yields during the 2nd season. The yields of various bean var. planted in Oct. 1965 and in March 1966 are included; these ranged between 1162-2411 and 785-1447 kg/ha, resp., and the highest yielding var. were Wulma and Nyiramahoro, resp. Eleven bean var. were evaluated in comparative trials; some of them were introductions from South America, Uganda, and Belgium, with yields that ranged between 1215-1790 kg/ha. The highest yielding var. was Nyiramahoro with 1790 kg/ha. [CIAT]

1430

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1963. Cultures vivrieres: haricot. (Food crops: beans). In _____. Rapport Annuel 1964. Rubona. pp.149-151.

A list is presented on bean introductions, var. collection and multiplication in Rubona, Rwanda, during 1964. Data included are locality, area planted to beans, planting time and spacing, harvest time, wt. of harvested beans, yields, and observations on yellow-seeded and red-seeded bean types, Kicaro types (locally preferred), and var. Wulma, Bataaf, Mixed Mexico, Cuarentino, and Bayo. This last var. is the most widespread in rural areas because of its high yields. [CIAT]

1431

- * INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA. 1963. Haricot. (Beans). In _____. Rapport Annuel 1963. Rubona. pp.19-21.

Information is presented on bean expt. carried out in different types of soils in Karama, Rwanda, during 1963. Drought was very damaging to this crop on C21b and E22 soil types. On soils with a high humus content, drought was less damaging. During the 2nd season, the effect of organic fertilization on B11a soil type was evaluated (849 vs. 373 kg/ha for the check), and var. Bayo yielded 1844 kg/ha. Early planting during the 2nd season is recommended for staggered cultivation of var. Bayo and Mixed Mexico. Var. Wulma is more tolerant to drought and rains than Bayo and Mixed Mexico. [CIAT]

1432

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1962. Cultures vivrieres: haricots. (Food crops: beans). In _____. Rapport Annuel 1962. Bruxelles. pp.1-2.

Seven bean var. were compared in Karama, Rwanda, during 1962. Bean var. Mixed Mexico was significantly superior ($P = 0.01$) to Colorado, Bataaf, Wulma, and Cuarentino. In the joint analysis, var. Cuarentino, Wulma, Caratas, and Colorado were uniformly superior ($P = 0.01$) to Mixed Mexico, Bataaf, and Bayo. Concerning seed multiplication, yields were low (1300-1750 kg/ha) due to excess rain. White and violet *Phaseolus coccineus* seeds were multiplied and will be kept because of their rusticity and high yields (2300 and 1600 kg/ha, resp.). [CIAT]

1433

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1962. Haricots. (Beans). In _____. Rapport Annuel 1962. Rwanda, Station de Recherches Agronomiques de Rubona. pp.2,5-6,17-18,21,28.

Exptl. results are presented for beans grown at Rubona Station, Rwanda, during 1962. Var. Caraotas only subsisted as a component of mixture A (94% of the seeds). Var. Wulma had the highest yield: 1650 kg/ha. Adolphe beans, particularly vigorous, and white and violet Phaseolus multiflorus were studied. In a comparative trial of bean var. mixtures, var. Caraotas predominated not only because of its larger no. of seeds but also due to its larger productivity. Beans yielded 1142 (after 2 harvests) and 691 kg/ha (after 4 harvests) in irrigated plots; in nonirrigated plots, yields were 477 and 411 kg/ha, resp. The other rotational crops also increased their yields under irrigation. The maize-bean association followed by sorghum was studied. [CIAT]

1434

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1961. Haricots. (Beans). In _____. Rapport Annuel 1961. Rwanda, Station de Recherches Agronomiques de Rubona. pp.2,24-28,35-39.

Results of the expt. with beans at Rubona Station, Rwanda, are presented. Var. Caraotas remained only as a component of the var. mixture A (94% of seeds). Var. Wulma showed the highest yields (1650 kg/ha). Information is also given on Adolphe beans and white and violet Phaseolus multiflorus. Beans were mainly planted in var. mixtures although they were also sown in pure stands or in association with other crops (maize, sorghum, banana, and cassava); the resp. yields of the trials conducted in Oct. 1960 and March 1961 are given. In organic fertilization trials, beans presented an av. yield of 1690 kg/ha (fertilized) compared with 978 kg/ha (unfertilized). [CIAT]

1435

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1960. Haricots. (Beans). In _____. Rapport Annuel 1960. Rwanda, Station de Recherches Agronomiques de Rubona. pp.9-11,28-36,77-80.

Information is given on the evolution of bean var. mixtures of Caraotas, Bayo, Mixed Mexico, Colorado, 21 Aa, and 2816 at Rubona Station, Rwanda, in 4 successive plantings during 1960. Black var. Caraotas dominated the rest, varying the composition of the mixture; therefore its dissemination among farmers was not recommended. As an alternative it was suggested to make a mass dissemination of the best var. or a large-scale release of the best var. so as to eliminate the rest. Comparative trials were carried out in irrigated and nonirrigated plots. In organic and mineral fertilization trials, the weak action of K on beans was confirmed. Also, lime from Mosse (Burundi) and from Shangugu (Rwanda) was evaluated in bean crop rotations. [CIAT]

1436

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1959. Haricots. (Beans). In _____. Rapport Annuel 1959. Rwanda, Station de Recherches Agronomiques de Rubona. pp.9-11,26-27,50-51.

The evolution of 6 mixtures of bean var. Caraotas, Bayo, Mixed Mexico, Colorado, 21 Aa, and 2816 was evaluated at Rubona Station, Rwanda, during 2 planting seasons in 1959. The characteristics of these var. are presented.

A net dominance of Caracotas (black-seeded) was observed, followed by 2i Aa (white-seeded). It was concluded that the mixture composition evolved towards the complete predominance of black var., rejected by the inhabitants; however, in an organoleptic trial with these same var., black var. Caracotas obtained the highest score. In an organic fertilization trial in the crop rotation Angola beans-sorghum, a yield of 1603 kg/ha was obtained, with organic manure applied in the 1st season and mineral fertilization in the 2nd. The study of local farm crops continued in Muhero. [CIAT]

1437

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1958. Haricots. (Beans). In _____. Rapport Annuel 1958. Rwanda, Station de Recherches Agronomiques de Rubona. pp.3,26-29,31-32,55.

Data on color, yield, and growth cycles of bean var., obtained in 1958 in Rubona, Rwanda, are given. Black-seeded bean var. were superior to beige- and red-seeded var. In rotational and regeneration trials during 3 planting seasons (1957-58), bean yields were low in the 2nd planting season. A prolonged residuality of organic fertilization was observed in the bean-sorghum rotation, and long-term monitoring was recommended. The study of seasonal indigenous food crop continued in Muhero. [CIAT]

1438

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1957. Haricots. (Beans). In _____. Rapport Annuel 1957. Rwanda, Station de Recherches Agronomiques de Rubona. pp.3-6,24-28,44.

Data is presented on the yields of bean var. evaluated in Rubona, Rwanda, during 1957. Black-seeded var., scarcely liked by the population, performed well. Among the white-seeded var., Cuarentino, Cuarentino 05419, and 2i Aa were most outstanding for stability. In comparative trials the most outstanding var. were Wulma, Black Mexico, Black Turtle Soup, Colorado, Cuarentino, Beurré d'Alger, and M 22. These var. yielded well over 2 seasons. On the other hand, late var. with staggered flowering were more resistant to rains and, furthermore, were resistant to drought. A table summarizing yields of various successive crops during 6 seasons (1955-57) is presented. It was concluded that beans are not a 2nd season crop. Among the natives, the most frequent crop rotation is beans-sorghum. In a trial with these 2 crops, organic fertilization increased yields from 945 to 1656 kg/ha for beans, and from 850 to 1296 kg/ha for sorghum. [CIAT]

1439

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1956. Haricots. (Beans). In _____. Rapport Annuel 1956. Rwanda, Station de Recherches Agronomiques de Rubona. pp.3-5,36-38.

Preliminary results obtained in 1956 on yield and vegetative cycle of beans at Rubona Station, Rwanda, are presented. Among the promising var. of the collection were Cuarentino 05419, 2i Aa, Wulma, and Cuarentino, yielding 2728, 2656, 2572, and 2500 kg/ha, resp. Wulma had a 98-day vegetative cycle and the others, cycles of 108 days. In a trial during the 1st season, Wulma, Black Turtle Soup, and Angola were the most outstanding with 5726, 5037, and 4080 kg/ha, resp. During the 2nd season only Wulma sustained its yield. The use of props when plants had 4 leaves protected them almost entirely against *Melanagromyza* attacks. In local trials the most outstanding cv. were Cuarentino (Mata) and Colorado 11 (Kasuzi). [CIAT]

1440

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1955. Haricots. (Beans). In _____. Rapport Annuel 1955. Rwanda, Station de Recherches Agronomiques de Rubona. pp.2-5.

Data on yields and growth cycle of different bean var. at Rubona Station, Rwanda, in 1955 are presented. Var. M 36 and M 28, with growth cycles of 85-90 days, yielded 1320 and 1314 kg/ha, resp. In multiplication plots, var. 2816 was outstanding due to its yield stability over 2 seasons (1157 and 1153 kg/ha). In comparative trials, all selected var. were superior to the checks, outstanding var. 2816 and Mixed Mexico. [CIAT]

1441

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1952. Autres plantes vivrières. (Other food crops). In _____. Rapport Annuel 1952. Rwanda, Station de Recherches Agronomiques de Rubona. p.30.

The yields of beans obtained in comparative trials conducted in 1952 at Rubona Station, Rwanda, are presented. The highest yields during the 1st planting season corresponded to Colorado (2500 kg/ha) and Black Mexico (2200 kg/ha), and in the 2nd season to Black Turtle Soup (2471 kg/ha) and Black Mexico (2236 kg/ha). [CIAT]

1442

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1951. Essais effectués avec le guano des Monts Homa. (Trials carried out with guano from Mount Homa). In _____. Rapport Annuel 1951. Rwanda, Station de Recherches Agronomiques de Rubona. pp.24,46-47.

The yields of crops fertilized with guano at Rubona Station, Rwanda, in 1951 are presented in table form. Cuarenteno beans, as a 2nd crop, gave its highest yield (2611 kg/ha) with 200 kg of guano and fertilization, compared with 2182 kg/ha for the check. In another trial, var. Beurré d'Alger yielded 2619 and 2416 kg/ha on unfertilized soil previously cultivated with peanuts. [CIAT]

1443

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1950. Nouvelles variétés introduites. (New introduced varieties). In _____. Rapport Annuel 1950. Rwanda, Station de Recherches Agronomiques de Rubona. p.35.

Exptl. data and yields of several bean introductions at Rubona Station, Rwanda, during 1950 are presented. These var. were Cuarentino, Bayo, Black Turtle Soup, Carotas, Black Mexico, Beurré d'Alger, Mixed Mexico, Angola, and Colorado with yields of 2380, 2000, 1648, 1648, 1592, 1570, 1345, 1071, and 1048 kg/ha, resp. [CIAT]

1444

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1946. Essai comparatif haricots. (Comparative bean trial). In _____. Rapport Annuel 1946. Rwanda, Station de Recherches Agronomiques de Rubona. pp.29,31.

Exptl. data and yields obtained in comparative and adaptation trials with Phaseolus spp. at Rubona Station, Rwanda, in 1946 are presented. Among the highest yielding species were speckled P. lunatus (2440 kg/ha), speckled P.

multiflorus (3030 kg/ha), Kiko beans (1844 kg/ha), and Spotter lima beans (2319 kg/ha). [CIAT]

1445

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1945. Quelques rendements obtenus dans les parcelles de petite multiplication. (Yields obtained on small-scale multiplication plots). In _____. Rapport Annuel 1945. Rwanda, Station de Recherches Agronomiques de Rubona. pp.32-33.

Data on planting dates, growth cycle, and yields of beans grown in small-scale multiplication plots during 1945 at Rubona Station, Rwanda, are presented. Regarding Phaseolus species, yields were as follows: white P. multiflorus, 2079 kg/ha; speckled mauve-colored P. multiflorus, 109 kg/ha; round P. lunatus from Ituri, 336 kg/ha; and speckled P. lunatus from Ituri, 1222 kg/ha. Low yields were attributed to the poor soil, although FYM was applied. Regarding P. vulgaris, var. Dark Red Kidney yielded 1196 kg/ha, Angola bean 937 kg/ha, and Giant Stringless 725 kg/ha. [CIAT]

1446

- * JANSSENS, M.J.J.; MPABANZI, A.; NEUMANN, I.F. 1984. Les cultures associees au Rwanda; association de cultures en milieu rural et premiers resultats de la recherche. (Associated cropping in Rwanda: crop associations in rural areas and first research results). Bujumbura, Institut des Sciences Agronomiques du Burundi. 34p. [Institut des Sciences Agronomiques du Burundi, B.P. 795, Bujumbura, Burundi]

The traditional systems of crop association (CA) in Rwanda are reviewed, and research results comparing CA and pure crop (PC) systems yield factors are given. In addition, some results of on-going research are presented and recommendations are given. During the 1st planting season (short rains) CA systems predominate, the contrary being true during the 2nd planting season. The frequency of CA systems tends to increase as the area of cultivated land decreases. Of a total of 11 more frequently found CA, 3 (70%) have beans as the main crop component. In 11 of the 12 agro-ecological zones of the country, maize-bean association predominates (88% in Mayaga). Association frequencies of 75% (1972-73) and 68% (1982) have been found for beans. Among the factors affecting CA are area and productivity of the land, comparative risks of CA and PC, and labor. Emphasis is given to the need of an in-depth study of traditional CA systems before attempting to modify them. [CIAT]

1447

- * KAYITARE, E. 1983. La prevulgarisation du haricot a Gatovu. (Pre-vulgarization of beans in Gatovu). In Institut des Sciences Agronomiques du Rwanda. La culture du haricot au Rwanda. Journées d'études du Département des Productions Végétales, Rubona, 1982. Compte-rendu. Rwanda. pp.148-154. [Institut des Sciences Agronomiques du Rwanda, B.P. 138, Butare, Rwanda]

The work and objectives of the prevulgarization of bean var. in Gatovu, Rwanda, are discussed. Dwarf bean var. Bataaf, Emma, Mélange Jaune, Tostado, Var. 11, Rubona 5, Actoran, and Mutiki 2, and climbing var. C 10, Urunyumba 3, and Wulma, were evaluated at the farm level. Var. Bataaf and Mélange Jaune maintained their productivity, although they showed some susceptibility to diseases and insect pests. Small-seeded var. Wulma (black) and Kicaro showed great plasticity and tolerance to poor Mugugu-type soils; however, they are not accepted because of their characteristics. [CIAT]

- * LAMB, E.M.; HARDMAN, L.L.; CLARKE, S.A.; NYABYENDA, P. 1985. A survey of bean genotypes grown in Rwanda. Bean Improvement Cooperative. Annual Report 28:17-18. [Institut des Sciences Agronomiques du Rwanda, Rubona, B.P. 138, Butare, Rwanda]

Survey areas in Rwanda were chosen on the basis of commune bean production figures for 1979. The 67 top producing communes of 143 in the country were sampled; these were located across all 12 agroclimatic zones of the country. From 5 to 15 farms and 1 market were sampled within each commune. Mixtures sold by farmers or to the National Grain Stores (GRENARWA) were also evaluated. A total of 450 farm samples, 50 market samples, and 60 warehouse samples were evaluated. Each sampled farmer was asked to identify, by local name, the seed types in each mixture, and indicate their important characteristics. All seed types in each mixture were then analyzed and described by color, color pattern, shape, and shininess of seed coat. Data will be analyzed by commune and by region of the country to estimate the importance of each type and farmer preference for each type. Complete results of this study will be published as soon as the data analysis is completed. [CIAT]

- * LE MARCHAND, M.G. 1979. Phaseolus vulgaris. Gembloux, Belgique, Faculté des Sciences Agronomiques de l'Etat. 13p.

General data are presented on Phaseolus spp. in Rwanda, especially P. vulgaris. A list is included of cv. and data on yield and characteristics of some of them. Indeterminate bush types are used more in Kivu (Rwanda) and Burundi. Under very favorable conditions (rich lowlands of Bugoye with volcanic ashes), the growth habit becomes climbing. In the mountains of Gembloux (Belgium) all of the indeterminate forms are climbing. The most outstanding cv. are 271, 272, and 273 from China, CIAT series 555 through 572, and 2 traditional Colombian cv., 618 and 645 (for high alt.). Technical recommendations on the crop are annexed, regarding: (1) multiplication during the period of climate adaptation, (2) soil selection, (3) planting practices, (4) observations on resistance. Detailed information is given on exptl. techniques and their variation factors. [CIAT]

- * LE MARCHAND, M.G. 1969. Annexe 5. Sélection des papilionacées comestibles. (Annex 5. Selection of edible papilionaceous plants: beans). In . Situation alimentaire générale et problèmes particuliers posés par les cultures vivrières au Rwanda. Gembloux, Belgique, Faculté des Sciences Agronomiques de l'Etat. pp.48-50.

Data are presented on breeding of Phaseolus vulgaris in Rwanda during 1963. This is the most cultivated species and occupies the place previously occupied by Vigna unguiculata. It has been established that the best bean selections are closely related to the best known classical cv. Through selection, only new ecotypes are obtained, adapted to specific conditions. It is not necessary, therefore, to evaluate local cv. which are very heterogeneous, but the offspring of the best materials found. Foreign introductions are selected and pedigree selection is done (intraspecific hybrids, selections, and wild materials). Research on interspecific hybridization (P. vulgaris x P. coccineus) continues and good results are expected in spite of the many unuseful F_1 and F_2 progenies. [CIAT]

- * LE MARCHAND, G. 1967. Haricots. (Beans). In _____. Programme de recherche concernant le groupe des plantes vivrières de la station de Rubona. Gembloux, Belgique, Faculté des Sciences Agronomiques de l'Etat. pp.19-33.

Qualitative improvement of bean proteins in Rubona (Rwanda) includes acceptance of new cv., search for materials, hybridization and selection, and definitive trials and diffusion. The collection of materials must include cv. chosen in Rwanda, wild species, and introductions of cultivated and wild species. It is suggested that responsibilities be distributed among the Gembloux Station, the Institut des Sciences Agronomiques du Rwanda, and the Institut National de Recherche Scientifique; the importance of collaboration is emphasized. Hybridizations between Phaseolus vulgaris (female parent) x P. coccineus (male parent) for high alt., and P. vulgaris (female) x P. lunatus (male) for low alt., are discussed. Selection processes are discussed and it is recommended to include in the selection the species and cv. adapted to climatic conditions and the pedigree selections, as well as the evaluation of var. mixtures. It is important to use cv. that can be distinguished among themselves at harvesting. It is recommended to multiply the F_2 vegetatively and some techniques are discussed. [CIAT]

- * MULINDABYUMA, J.M. 1983. Chimie et propriétés nutritionnelles du haricot. (Chemistry and nutritive properties of beans). In Institut des Sciences Agronomiques du Rwanda. La culture du haricot au Rwanda. Journées d'études du Département des Productions Végétales, Rubona, 1982. Compte-rendu. Rwanda. pp.34-51. [Institut des Sciences Agronomiques du Rwanda, B.P. 138, Butare, Rwanda]

Chemical concepts and nutritive properties (proteins and amino acids) of Phaseolus vulgaris and Vigna vexillata are reviewed on the basis of studies carried out at Institut de Sciences Agronomiques du Rwanda. The chemical structure and biological functions of amino acids are included, as well as tables containing quantitative correlations between them. [CIAT]

- * NDAMAGE, G. 1983. Association du haricot avec d'autres cultures. (Association of beans with other crops). In Institut des Sciences Agronomiques du Rwanda. La culture du haricot au Rwanda. Journées d'études du Département des Productions Végétales, Rubona, 1982. Compte-rendu. Rwanda. pp.132-147. [Institut des Sciences Agronomiques du Rwanda, B.P. 138, Butare, Rwanda]

The utilization of crop mixtures in the rural areas of Rwanda is discussed, and results obtained in the field are compared with those obtained at exptl. centers. Diverse crop associations containing beans are briefly described, and data is given on their frequency in Africa and Rwanda, beans-maize being the most frequent (68 and 82%, resp.). Associations with beans are more frequent during the 1st planting season. Maize is considered as the best crop for association with beans. [CIAT]

- * NDOREYAGO, V. 1983. Importance du haricot dans l'alimentation rwandaise. (Nutritional importance of beans in Rwanda). In Institut des Sciences Agronomiques du Rwanda. La culture du haricot au Rwanda. Journées d'études du Département des Productions Végétales, Rubona, 1982.

The importance of beans as a food crop in Rwanda is highlighted. Bean production is concentrated in East Africa. Between 1977-79 this region produced 822,000 t of beans (61.0% of the av. annual production of the continent), of which 13.0% corresponded to Rwanda. The largest part of this production is used for self-consumption (50.6 kg/person/yr). In Rwanda, the area planted to beans has increased from 154,000 ha in 1966, up to 214,939 ha in 1978, but yields have decreased (850 vs. 792 kg/ha, resp.). [CIAT]

1455

- * NYABYENDA, P. 1984. Importance de la culture et du tuteurage des haricots volubiles dans la production du haricot au Rwanda resultats de 10 annees de recherche. (Importance to bean production in Rwanda of cultural practices and the use of props in climbing beans. Results of 10 years of research). Bulletin Agricole du Rwanda 1984:1-14.

Based on 10 yr of research at Institut des Sciences Agronomiques du Rwanda, the possibilities of increasing bean yield and production in Rwanda (300,000 ha planted since 1981) through cultural practices and the use of props in climbing beans are discussed. Data on exptl. var., soils, variables, exptl. designs, and yield are presented. Climbing var. that are resistant to fungal diseases caused by humidity can yield more than 5 t/ha in rich soils and using good props; furthermore, they adapt to all alt. and to warm and humid climates. The use of props has increased yields by 129-200% in Karama with var. Bleu, Vera Cruz 78, and C 15. Best yields are obtained with 1 prop/4 plants (2 sites). Furthermore, yield increases proportionately with the increase in prop length, up to 2 m. On the other hand, the superiority of the monocrop of the 3 best var., C 10, Wulma, and Urunyumba 3, with 2511, 2442, and 2267 kg/ha, resp., has been demonstrated in relation to the local mixture (1841 kg/ha) and the mixture of 4 var. of equivalent yield (1818 kg/ha). Difficulties presented with the use of props are discussed and the possibility of using shrubs for support is suggested. [CIAT]

1456

- * NYABYENDA, P. 1983. La culture du haricot au Rwanda. (Bean cultivation in Rwanda). In Institut des Sciences Agronomiques du Rwanda. La culture du haricot au Rwanda. Journées d'études du Département des Productions Végétales, Rubona, 1982. Compte-rendu. Rwanda. pp.1-13. [Institut des Sciences Agronomiques du Rwanda, B.P. 138, Butare, Rwanda]

Basic information is presented on bean cultivation in Rwanda in 1983: importance as the main source of protein for the population; data on production, yields, and consumption; classification and origin; bean types; edaphic and climatic conditions for cultivation; cropping systems and methods; production and production constraints; utilization; and conservation. [CIAT]

1457

- * NYABYENDA, P. 1983. Quelques connaissances de base sur la plante de haricot. (Basic information on beans). In Institut des Sciences Agronomiques du Rwanda. La culture du haricot au Rwanda. Journées d'études du Département des Productions Végétales, Rubona, 1982. Compte-rendu. Rwanda. pp.19-33. [Institut des Sciences Agronomiques du Rwanda, B.P. 138, Butare, Rwanda]

Information is presented of the botany and ecology of Phaseolus vulgaris; topics covered include growth habits, cropping systems, diseases and pests, origin, taxonomy, and morphology. [CIAT]

1458

- * NYABYENDA, P. 1983. Quelques résultats de recherche sur haricot a l'ISAR et orientation du programme dans l'avenir. (Some results of the research on bean at ISAR and future orientation of the program). In Institut des Sciences Agronomiques du Rwanda. La culture du haricot au Rwanda. Journées d'études du Département des Productions Végétales, Rubona, 1982. Compte-rendu. Rwanda. pp.103-131. [Institut des Sciences Agronomiques du Rwanda, B.P. 138, Butare, Rwanda]

Some results of var. and pedigree selection in beans at Institut des Sciences Agronomiques du Rwanda are presented, as well as the results of the trials on cultural practices (planting densities, cropping systems, inoculation with Rhizobium, and fertilization). The var. and comparative trials conducted in Rubona since 1966 and in Karama and Rwerere since 1973 are summarized. From a total of 192 introductions, 22 have been proposed for multiplication and diffusion. [CIAT]

1459

- * NYABYENDA, P. 1983. Selection et amelioration du haricot: objectifs, methodes et criteres de selection. (Selection and breeding of beans: objectives, methods, and selection criteria). In Institut des Sciences Agronomiques du Rwanda. La culture du haricot au Rwanda. Journées d'études du Département des Productions Végétales, Rubona, 1982. Compte-rendu. Rwanda. pp.85-102. [Institut des Sciences Agronomiques du Rwanda, B.P. 138, Butare, Rwanda]

General objectives of bean selection and the main objectives of the bean breeding and selection program in Rwanda are presented. Information is included on: (1) germplasm collection, maintenance, and evaluation; (2) development of genetically improved germplasm; (3) parental selection and hybridization (crossbreeding methods and techniques); (4) different methods for bean selection, particularly screening for disease resistance; and (5) selection criteria. [CIAT]

1460

- * NYABYENDA, P. 1982. L'amelioration des plants autogames: le haricot. (Breeding of autogamous plants: beans). Rubona, Institut des Sciences Agronomiques du Rwanda. 34p.
Paper presented at Premier Cours National sur la Production et la Diffusion des Semences Améliorées, Kigali, 1982.

Bean breeding and its importance in Africa is discussed, especially in Rwanda, as well as breeding work carried out at Institut des Sciences Agronomiques du Rwanda. Selection goals, production, yields and consumption, growth types, ecology, cropping systems, and diseases and pests are also analyzed. A table is included that summarizes comparative var. trials performed from 1976 to 1979 in Rubona, Karama, Rwerere, and other localities in the northern, central, and eastern regions of the country. [CIAT]

1461

- * NYABYENDA, P.; MPABANZI, A. 1980. Comparaison des meilleures varietes pures de l'ISAR avec leurs melanges et des melanges locaux. (Comparison of the

best pure varieties from ISAR with local mixtures and with ISAR mixtures]. Rubona, Institut des Sciences Agronomiques du Rwanda. Note Technique no.8. 16p.

A comparative trial was carried out in 1979-80 with bush, semiclimbing, and climbing beans to determine if the best pure var. from the Institut des Sciences Agronomiques du Rwanda were more productive in monocrop or grown in mixtures, and if they were superior to the local mixture. A randomized block design with 4 replications was used. Variables and results are presented in tables and figures. Among bush and semiclimbing beans, var. Kicaro and the local mixture amply outyielded (2469 and 2501 kg/ha, resp.) the other var. or mixtures. This was attributed to the semiclimbing characteristics of Kicaro and most of the var. that make up the local mixture. Among climbing beans, var. C₁₀, Wulma, and Urunyamba 3 outyielded, by a wide margin, the local mixture, the mixture of 4 var., and Amarillo 156. [CIAT]

1462

- * RUSUKU, G.; LEPOIVRE, P. 1983. Effets du triphénylphosphite sur l'infection du haricot par Uromyces phaseoli var. typica (Pers.) Wint. (Effect of triphenylphosphite on bean infection by Uromyces phaseoli var. typica). Bulletin des Recherches Agronomiques de Gembloux 18(4):223-230.

Triphenylphosphite at 125 ppm, when sprayed onto bean leaves 2 days before inoculation with Uromyces phaseoli var. typica, prevented the formation of rust pustules. Triphenylphosphite had no effect on the 1st steps of infection but inhibited the formation of haustoria from haustorial mother cells at the interface with mesophyll cells. Alpha amino-oxyacetic acid (an inhibitor of phenylpropanoid synthesis) and cycloheximide (an inhibitor of protein synthesis) prevented the effect of triphenylphosphite when applied to treated leaves 1 day before inoculation. Triphenylphosphite seemed to induce a resistance mechanism in treated bean leaves inoculated with U. phaseoli var. typica. [AS]

1463

- * SCHOONHOVEN, A. VAN; DAVIS, J. 1983. Development of improved bean technology: a collaborative ISAR-CIAT research project. In Chang, J., ed. Agricultural research in Rwanda: assessment and perspectives, Kigali, Rwanda, 1983. Report of a seminar. The Hague, Netherlands, International Service for National Agricultural Research. pp.133-136. [CIAT, Apartado Aéreo 6713, Cali, Colombia]

The objective of the CIAT bean program is to work in close collaboration with national programs to increase production and productivity of the common bean, Phaseolus vulgaris. Because beans are mostly a small farmer's crop, the bean program strategy is to develop scale-neutral technology. The principal thrust of research efforts is to arrive at new var. resistant to diseases and insects, with improved tolerance of infertile soils and drought, and with increased ability to fix N biologically. Since beans are produced under a great diversity of cropping systems, including in many cases complex associations and ecological conditions, a decentralized breeding program is essential. CIAT proposes collaboration in bean research with the Institut des Sciences Agronomiques du Rwanda to secure an efficient selection of new var. and associated technology adapted to production conditions in Rwanda. As a means towards this end, intensive training to build up a decentralized network of bean breeding is suggested. [AS]

- * SEKANABANGA, C. 1983. Problemes de production et de diffusion des semences selectionnee a l'exemple du haricot. (Problems of production and diffusion of selected seeds; beans). In Institut des Sciences Agronomiques du Rwanda. La culture du haricot au Rwanda. Journées d'études du Département des Productions Végétales, Rubona, 1982. Compte-rendu. Rwanda. pp.155-168.

Seed production in Rwanda and the role of several institutions are examined. The situation at the international level is also discussed. A scheme for the production of high-quality seed is presented and categories are established for the organization of seed production. [CIAT]

SENEGAL

1465

- * BOURDOUXHE, L. 1983. Dynamique des populations de quelques ravageurs importants des cultures maraichères du Sénégal. Insectes des papilionacées: haricot (Phaseolus vulgaris). (Population dynamics of some important noxious pests of garden vegetables in Senegal. Insects of papilionaceous plants: beans). *Agronomie Tropicale* 38(2):132-133. [Centre pour le Développement de l'Horticulture, Cambéréne, Dakar, Sénégal]

A brief description of the damage caused by various insect pests (Heliothis armigera, Maruca testulalis, Trichoplusia ni, Liriomyza trifolii, Ophiomyia phaseoli, Caliothrips impurus, and Sericothrips occiplitalis), identified in beans in Senegal, is presented. [CIAT]

SOUTH AFRICA

1466

- * COETZEE, J.; VAN DER MERWE, C.F. 1984. Extraction of substances during glutaraldehyde fixation of plant cells. *Journal of Microscopy* 135(2):147-158. [Electron Microscopy Unit, Univ. of Pretoria, Pretoria, South Africa]

Extraction of Ca, Mg, reducing sugars, amino acids, and protein was monitored during fixation of bean leaves. Fixatives included 0.5-5.0% glutaraldehyde in water at pH 3.4 and 7.2, phosphate, citrate, Na-cacodylate, tris, glycylglycine, collidine, and 4 'Good' buffers, all with 2.5% glutaraldehyde. Least extraction was found in phosphate-buffered glutaraldehyde. The optimal glutaraldehyde concn. is 2.0-3.0%; this causes least extraction of substances. [AS]

1467

- * HOUGH, M.C.; CLARKE, B.; GROBBELAAR, N. 1966. The influence of the hypocotyl and of vitamin B₁₂ on the nitrogen fixation of isolated bean roots. *Phyton* 23(1):15-19.

The presence of a section of hypocotyl attached to an isolated bean root increased more than 4 times the no. of nodules that developed on such a root. The nodulated roots with hypocotyls fixed more than 7 times as much N as nodulated root without hypocotyls. Although the hypocotyl did not cause a statistically significant difference in the efficiency of the nodules in fixing N, the av. rate of N fixation for the nodules on the roots without hypocotyls was only about 60% of that on the roots with hypocotyls. Vitamin B₁₂ did not induce asymbiotic N fixation in isolated bean roots or in whole bean, pea, or maize seedlings when grown in the absence of combined N. [AS]

1468

- * LIEBENBERG, A.J.; VERMEULEN, W.J. 1984. Development, evaluation, and utilization of germplasm in South Africa. In *Reunión de Trabajo sobre Ensayos Internacionales de Frijol*, Ia., Cali, Colombia, 1984. *Trabajos presentados*. Cali, Centro Internacional de Agricultura Tropical. pp.276-285.

Aspects of the breeding, evaluation, and utilization of beans in South Africa are presented. The lack of well adapted cv. with resistance to Uromyces phaseoli and seed-borne diseases, especially in larger seed types, is a major production constraint as well as insufficient disease-free seed (especially of Phaseolus coccineus), weed control, variation in climatic conditions, and the lack of export markets which prevents dry bean expansion. The bean breeding program focusses on identifying well adapted lines with acceptable seed color and size, and suitable for their use as parental materials. Specific breeding objectives besides high yield potential include plant architecture (type II), disease resistance (U. phaseoli, Pseudomonas phaseolicola, BCMV, and Colletotrichum lindemuthianum), flower abscission, shattering resistance, seed quality, wide adaptability, and tolerance to low P, high Al, and low pH. Research results are briefly described for speckled sugar beans, small white canning types, brown haricot, yellow haricot, and other types. Future releases will all have the I-gene resistance to BCMV. [CIAT]

1469

- * MELIS, R.J.M. 1985. Dry bean research in Kwazulu; progress report 1984-85. Pietermaritzburg, South Africa, University of Natal. Department of Crop Science. 29p. [Univ. of Natal, P.O. Box 375, Pietermaritzburg, Natal, South Africa]

The results of bean research conducted in Kwazulu during 1984-85 are summarized, covering agronomic and yield trials, screening trials for disease resistance, evaluation of the CIAT IBYAN and International Bean Rust Nursery, trials on planting dates, N fertilization, and adaptation to acid/low P soils, pathology, seed multiplication, entomology, and on-farm trials. Cv. A40 and Carioca, with resistance to local diseases (Ascochyta phaseolorum), have been released to farmers, but were outyielded by other cv., especially A286 (2307 kg/ha vs. 1358 and 1785 kg/ha, resp.) which possesses higher resistance to lodging, a shorter maturation period (114 vs. 124 days, resp.) and improved seed quality. Diseases recorded were those caused by Eromyces appendiculatus, A. phaseolorum, Xanthomonas phaseoli, and Colletotrichum lindemuthianum. A list of the 25 best performing cv. from the IBYAN is included, as well as the results of the International Bean Rust Nursery. In Ukulinga, cv. Kamberg yielded highest (1330 kg/ha) when fertilized with 70 kg N/ha. Studies are in progress to positively identify the causal agent of the disease apparently caused by A. phaseolorum; initial results indicate that another Ascochyta sp. could be the pathogen or a different genus (Phoma) or a combination of both. The major pest affecting beans is the bean fly of which perhaps 2 strains or species occur in the region. In on-farm trials, A40 and Carioca have been well accepted by farmers. [CIAT]

1470

- MELIS, R.J.M.; LEA, J.D. 1984. Dry bean cultivar studies in Vulindlela. Annual Report, Subsistence Agriculture Study Group, South Africa, University of Natal.

1471

- MELIS, R.J.M.; LEA, J.D.; STEENKAMP, G.; ZONDAGH, I.B. 1983. Dry bean cultivar studies in Kwazulu. Crop Production 12:61-63.

SUDAN

1472

- * AHMED, A.H.; MILLS, P.R. 1985. Identification of peanut stunt virus in the Sudan. *Plant Disease* 69(2):173-174. [Dept. of Crop Protection, Faculty of Agriculture, Shambat, Sudan]

A spherical virus isolated from mottled Medicago sativa was identified by host range, physical properties, electron microscopy, and serology as peanut stunt virus. The virus was also found in naturally infected Phaseolus vulgaris and P. trilobus, Vigna unguiculata, Dolichos lablab, and Clitoria ternatea. This is the 1st report of the peanut stunt virus in Sudan. [AS]

1473

- * HUSSEIN, M.M. 1978. Diseases of French beans (Phaseolus vulgaris). In Ed-Damer, Sudan. Hudeiba Research Station. Annual Report 1977-1978. Ed-Damer. pp.10-11.

Information on symptoms, disease transmission, and bean var. resistance to curly top virus in Sudan is briefly presented. Although the virus is transmitted by Aphis craccivora, this specie is not a pest of French beans in this region. The disease is sporadic and local var. Beladi and RO 2/1 seem to be highly tolerant in comparison with introduced var. Red Kloud and Red Kote. [CIAT]

1474

- * SALIH, S.R.; SALIH, F.A. 1985. Bean production in the Sudan. In Regional Workshop in Potential for Field Beans (Phaseolus vulgaris L.) in West Asia and North Africa, Aleppo, Syria, 1983. Proceedings. Cali, Colombia, Centro Internacional de Agricultura Tropical. pp.87-100. [Hudeiba Research Station, P.O. Box 3], Ed-Damer, Sudan]

Beans are the 2nd most important food legume grown in Sudan. Cropping systems, production, yields, type of seeds used, trade, and production constraints are reported. Research activities on dry beans have been conducted mainly at the Hudeiba Research Station since its establishment in 1960. Currently, research is also conducted at other stations like Shendi and Wad Medani. Research has been concentrated in the following areas: cv. improvement; agronomic research; Na toxicity; control of insects, diseases, and weeds; and seed quality. Data on the above topics are also included. [CIAT]

1475

- YASSIN, T.E. 1973. Analysis of yield stability in field beans (Vicia faba L.) in the Northern Province of Sudan. *Journal of Agricultural Science* 80:119-124.

SWAZILAND

1476

- * LIN, E. 1984. Development, evaluation and utilization of germplasm in Swaziland. In Reunión de Trabajo sobre Ensayos Internacionales de Frijol, Ia., Cali, Colombia, 1984. Trabajos presentados. Cali, Centro Internacional de Agricultura Tropical. pp.286-304.

Aspects of the breeding, evaluation, and utilization of beans in Swaziland are presented. Germplasm evaluation results are summarized for 1983 and 1984 regarding yield, days to flowering and to maturity, and levels of disease incidence for IBYAN trials, crossing blocks, and advanced lines introduced from CIAT. The 1984 season favored the development of diseases caused by Isariopsis griseola and Xanthomonas phaseoli; other diseases observed in the 1984 IBYAN, but to a lesser extent, were those caused by Uromyces phaseoli and BCMV. A list of promising lines with their av. yields and reaction to diseases is presented. It is most likely that Swazi population will prefer speckled sugar beans, some of which are found in CIAT materials; other preferences are white canning beans and brown-colored beans. A small survey indicated that cream and reddish brown beans could also be acceptable. Great potential for intercropping was found in growth habit types III and IV. Seed multiplication and on-farm testing plans are briefly described. (CIAT)

TANZANIA

1477

BAZIRAKE, C.B. 1975. Fungicide efficacy on bean rust (Uromyces appendiculatus). Arusha, Tanzania, Tropical Pesticides Research Institute. Miscellaneous Report no.907.

1478

- * BEAN/COWPEA COLLABORATIVE RESEARCH SUPPORT PROGRAM. U.S.A. 1984. Breeding beans for disease and insect resistance and determination of economic impact on smallholder farm families. In _____, 1984 Annual Report. 1. Technical summary. East Lansing, Michigan State University. pp.223-234.

The overall (5 yr) objectives of the Tanzanian/Washington State U. collaborative program include (1) the development of high yielding, disease- and insect-resistant bean cv. for the smallholder family; (2) the assessment of the economic impact of new cv. and/or production or storage practices on smallholder farm families, especially on women's roles in the production, consumption, and marketing processes. Progress was achieved in 4 main areas: crop improvement (breeding and selection), crop protection (entomology, plant physiology, and weed control), crop production (agronomy, physiology, and biological N fixation), and socioeconomic studies (production economics, labor, food supply, and women in development). Research outputs during 1984 are presented. [CIAT]

1479

- * BUJULU, J.; LOTASARWAKI, J. 1983. The effect of fungicides and foliar fertilizers on bean rust. Arusha, Tanzania, Tropical Pesticides Research Institute. 11p. [Tropical Pesticides Research Inst., P.O. Box 3024, Arusha, Tanzania]

Thirteen fungicides were tested against bean rust in Tanzania between 1980-82. One additional trial with a mixture of foliar fertilizer and a fungicide was also conducted in 1981 and 1982 in order to improve yields. After 3 seasons, 6 fungicides were found effective against Uromyces appendiculatus and were recommended for use in Tanzania: oxycarboxin, copper hydroxide, mancozeb, benomyl, chlorothalonil, and triforine, the latter at 1.5 kg/ha. Addition of foliar fertilizer to fungicide sprays did not improve yields. [AS (extract)]

1480

- * DUE, J.M.; WHITE, M.; ROCKE, T. 1985. Beans in the farming systems in two regions of Tanzania, 1980-82. Morogoro, Tanzania, Sokoine University of Agriculture. Department of Rural Economy. Technical Report no.4. 68p. [Univ. of Illinois at Urbana-Champaign, 305 Mumford Hall, 1301 West Gregory Drive, Urbana, IL 61801, USA]

The results of research undertaken to provide baseline and farming systems data for 2 regions of Tanzania between 1980-82 are summarized. The general economy of Tanzania during this time period and the importance of beans in farming systems are described. The adequacy of provision of min. recommended levels of calories and protein from home-produced food/family is discussed as well as the development of a linear programming model which would provide these levels while maximizing farm income. [CIAT]

- * DUE, J.M.; MANDAY, E.A; WHITE, M.; ROCKE, T. 1984. Beans in farming systems in Arusha region, Tanzania 1982. In Minjas, A.N.; Salema, M.P., eds. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984. Proceedings. Tanzania, Sokoine University of Agriculture, pp.98-103, (Univ. of Illinois at Urbana-Champaign, 305 Mumford Hall, 1301 West Gregory Drive, Urbana, IL 61801, USA)

The production of beans in the farming systems of the Arusha region (Tanzania) during 1982 was studied by surveying farm families in Hanang and Arumeru districts. Socioeconomic data of farm families surveyed are presented. Regarding farming systems, beans were in 44% of the intercropped acres in Hanang district. Arumeru district had 62% of the total acreage intercropped within 95% of the intercropped mixtures. Of the total cropped acreage, 14% was in beans in monoculture in Hanang but only 6% in Arumeru. The most preferred var. in both districts in terms of yield were red colored and Masai Red (45%) and Canadian Wonder (40%), other var. planted included Selian Wonder, local small mixed-colored and hybrid var., all with small no. of preferences. Data on av. total value of crop production, crop and livestock sales, off-farm income, farm operating costs, family living expenditures, and net cash income are presented. [CIAT]

- * FOSTER, J.; TERRY, P.J. 1969. Field screening trials against various weed species in six arable crops, during the short rains of 1967-1968. 6. The effects on the beans. Arusha, Tanzania, Tropical Pesticides Research Institute. Miscellaneous Report no.665. 13p.

Phaseolus vulgaris beans were sown in 0.91-m strips across herbicide plots. At each site, there were 6 incorporated preplanting herbicides, 13 preemergence surface herbicides, and 4 postemergence herbicides. A split plot design was used, with herbicides as main plots and 3 doses as subplots; an untreated control was adjacent to each main plot. The effects on various parameters of the beans are discussed in the light of the earlier data on weed control. Trifluralin and nitralin could be selective in some situations, but are not suitable on the whole for East Africa weed flora. EPTC might be useful for the control of certain perennials. The erratic behavior of the substituted ureas and triazines was again demonstrated. Chlorbromuron seemed to be the most selective herbicide studied. Fluorodifen and CP-50144 both showed promise of appreciable selectivity, and merit more intensive study. [AS]

- * FOSTER, J.; TERRY, P.J.; MOSHA, C.J. 1969. A preliminary screening trial with seven new soil-applied herbicides against weeds in three legume crops. Arusha, Tanzania, Tropical Pesticides Research Institute. Miscellaneous Report no.670. 12p.

A field screening trial was carried out in a light soil near Arusha, Tanzania, during the long rains of 1968, in which beans, groundnuts, and soybeans were sown in strips across plots. Three substituted triazine herbicides and 4 substituted ureas were applied as preemergence surface treatments. A split plot design was used with herbicides as main plots and 3 doses as subplots; an untreated control was adjacent to each main plot. The responses of the crops and weeds are presented. None of the herbicides was considered suitable for the crops grown in this trial. The 3 triazines gave promising weed control, although terbutylazine was weak against Digitaria velutina. Sebumeton and terbumeton were considered to be worth testing in irrigated sugar cane. The 4 ureas performed weakly against

weeds, being considered unsuitable as preemergence herbicides in tropical crops; however, they will be further tested in small grain cereals at high alt. [AS]

1484

- * GONDWE, B.; NIKOLOV, N.G.; SHOO, J.A.J. 1982. Bean plant protection progress report 1982. Lyamungu, Tanzania, National Bean Research Programme. 8p. [Research Inst. Lyamungu, P.O. Box 3004, Moshi, Tanzania] Paper presented at the Grain Legume Coordinating Committee Meeting, Moshi, Tanzania, 1982.

An expt. was conducted to identify fungicides for disease control in beans in Lyamungu, Tanzania. Five fungicides were tested for their efficacy in controlling major bean diseases. Fentin acetate was the most effective followed by carbendazim, mancozeb, captafol 80, and copper hydroxide. Disease control was accompanied by significant increases in yield of good quality beans. The extent to which the application of a particular fungicide increased yield corresponded to the extent to which it controlled the disease. Best yields were obtained by spraying with fentin acetate, followed by carbendazim, mancozeb, captafol 80, and copper hydroxide in decreasing order of effectiveness. [AS]

1485

- * GREEN, D.H. 1969? Phaseolus beans: the effects of varying the depth of planting and the period of time between sowing and spraying on the performance of three herbicides in dwarf French beans. Arusha, Tanzania, Tropical Pesticides Research Institute. 17p.

Thirty-four plots were sown with dwarf French beans var. Seminole Mottled Wax in 1964 in Arusha, Tanzania, to evaluate the effect of different sowing depths (0.6, 1.3, 2.5, 3.8, and 5.1 cm) and spraying dates on the growth of beans treated with 3 different herbicides: ametryn, desmetryn, and MCPB at max. doses of 2.2, 3.4, and 5.6 kg/ha, resp. Evaluations were carried out on 6 occasions between sprayings and crop maturity. For ametryn, a sowing depth of 3.8 cm was significantly better than 0.6 cm, and plants from seed sown the day before spraying were less affected by the herbicide than plants from seed sown on any earlier day. Sowing at 3.8 cm led to tolerance of significantly higher doses of desmetryn than did sowing at 0.6 or 1.3 cm. A statistical analysis of the means of the max. doses of MCPB tolerated by the various treatments showed no significant advantage of any particular planting depth. [CIAT]

1486

- * HOCKING, D. 1967. A new virulent form of Phaeoisariopsis griseola causing circular leaf spot of French beans. Plant Disease Reporter 51(4): 276-278.

In 1966 a new and virulent form of Phaeoisariopsis griseola caused circular leaf spot of French beans on a farm near Arusha, Tanzania. A comparative study between these new spots and angular leaf spot, very common and widespread in Tanzania, showed that the fungus of circular leaf spot was morphologically indistinguishable from P. griseola from typical angular leaf spot; however, the lesions caused were quite distinct. When detached unwounded bean leaves were inoculated with conidia from both, circular leaf spot was more virulent. A field study of bean farms in the area revealed no diseased plots other than the original outbreak. This plot was completely destroyed by the disease, and was plowed in and not replanted. The next growing season was abnormally dry, and beans that were not

affected by drought remained disease-free. It is suggested that this new virulent form of P. griseola was the result of a single mutation, and that the plowing-in of the affected plot, followed by the dry season, may have eradicated the threat. [CIAT]

1487

- * HUBERT, F.P. 1984. The biology, host plants, and distribution of bean bruchid (Zabrotes subfasciatus) in Tanzania. B.Sc. Thesis. Morogoro, Tanzania, Sokoine University of Agriculture. 83p.

A literature review on the biology, host plants, and distribution of Zabrotes subfasciatus in Tanzania is presented. [CIAT]

1488

- * JAFFER, A.A. 1971. Effect of fungicidal seed-dressing for control of bean rust (Uromyces appendiculatus (Pers) Lev). Arusha, Tanzania, Tropical Pesticides Research Institute. Miscellaneous Report no.768. 4p.

Six seed dressings (Bas 3191 f, Bas 3260 f, carboxin + captan, carboxin + thiram, oxycarboxin, and pyracarbolid) were compared to control Uromyces appendiculatus in bean var. Dutch Princess No. 200. There were no significant differences between the treatments and the control in terms of infection and yield when plants were evaluated 3 wk. after planting (1st symptoms) and at harvest. While the fungicides are systemic, their effect on the fungus does not remain in the plant for a long period; in fact, it disappears before 3 wk. after planting. [CIAT]

1489

- * JAFFER, A.A. 1971. Effect of fungicides on bean rust (Uromyces appendiculatus (Pers.) Lev). Arusha, Tanzania, Tropical Pesticides Research Institute. 8p.

The systemic fungicides oxycarboxin, triforine, triarimol, butrizol, and thiabendazole were compared with the contact fungicides Duter-Extra, Hoe-6084, copper oxide, and Thiovit regarding the control of Uromyces appendiculatus in bean var. Dutch Princess No. 200 (susceptible) planted in 5 x 6 m² plots. A 1st spray was made at 30 days after planting (1st symptoms) and the 2nd spray 10 days later. Oxycarboxin (2.5 kg a.i./ha), triforine (0.1% solution), and butrizol (0.675 kg/ha) provided excellent control, but the latter had some phytotoxic effects. Rust ratings remained low (0-1) for these fungicides. Bean yields were also higher for these chemicals, especially for oxycarboxin (20.1 kg/plot) and triforine (21.5 kg/plot); the control yielded 11.3 kg/plot. The results indicate that the use of contact herbicides to control U. appendiculatus is not completely practicable due to difficulties in spraying the undersides of leaves; thus only systemic fungicides can control the disease effectively. [CIAT]

1490

- * JAKOBSEN, H. 1980. Bean cultivar trials at Uyole Agricultural Centre in 1980. Mbeya, Tanzania, Uyole Agricultural Centre. 4p.

The results of bean cv. trials conducted in 1980 in Uyole and Nkundi, Tanzania, are presented. The yields of 16 cv. for 2 planting seasons in Uyole are given; Kabanima produced significantly higher yields (3400 and 2800 kg/ha for the Feb. and March planting seasons, resp.). PI 155-A-L gave high yields for the early planting (3700 kg/ha) but much lower yields in the late planting (1900 kg/ha). Disease scores for Uromyces

appendiculatus, Isariopsis griseola, and Colletotrichum lindemuthianum are given for 6 cv.; disease incidence was low in 1980. Yields produced by 10 cv. in Nkundi are given; while the results were poor, Kabanima continued as the most outstanding cv. (1500 and 1000 kg for the Feb. and March plantings, resp.). Cv. T 3 should be planted early and only in areas with sufficient rainfall. [CIAT]

1491

- * JAKOBSEN, H. 1980. A bean development programme for the Southern Highlands. Mbeya, Tanzania, Uyole Agricultural Centre. Working paper. 3p.

Bean trials and projects carried out in 1982 at Uyole Agricultural Centre, Tanzania, are briefly reported. Cv. Sabo (Processor) was the best yielder among germplasm for stringless bean pod production. Leaf removal reduced yields by 12%. The band application of 100 kg triple superphosphate/ha or 200 kg broadcasted are recommended. No significant response was obtained from N applications. Cv. T3 and Kabanima were selected from the germplasm collection for release; Kabanima is resistant to Colletotrichum lindemuthianum and tolerant to Isariopsis griseola and the common races of Uromyces appendiculatus in the Southern Highlands, while T3 has been the best yielder over time and resistant to storage insect pests. [CIAT]

1492

- * JAKOBSEN, H. 1980. Selection of bean cultivars for multiple cropping systems. Mbeya, Tanzania, Uyole Agricultural Centre. Working paper no.7. 8p.

A total of 374 bean lines selected from the main bean collection in Uyole, Tanzania, were intercropped with maize planted on the same day in order to select suitable cv. for bean-maize associations. Beans were planted at 150,000 plants/ha in rows spaced 75 cm apart and maize at 20,000 plants/ha. Bean yields ranged between 0-3560 kg/ha (av. 1310 kg/ha, with no effect on maize yields which were 6.1 t/ha). Of 38 accessions yielding over 2100 kg/ha, only 12 had acceptable seed types and only 10 had seeds of a reasonably good quality. The major reason for rejection was the black color. All the highest yielding accessions, except the very vigorous P 532, were uninfected or slightly infected by Isariopsis griseola and Colletotrichum lindemuthianum. The lack of light is a major limiting factor for bean yields, especially for bush type beans. Cv. to be used in multiple cropping systems in the Southern Highlands of Tanzania will have to be high yielding and tolerant to diseases and the prevailing wet conditions. Both protein and income levels were superior in the high-yielding bean-maize associations compared with monocropped maize. Results indicate target levels in a bean-maize improvement program. [CIAT]

1493

- * KAREL, A.K.; MAERERE, A.P. 1985. Evaluation of common bean cultivars for resistance to bean fly (Ophiomyia phaseoli Tryon). Bean Improvement Cooperative. Annual Report 28:15-16. [Sokoine Univ. of Agriculture, Dept. of Crop Science, P.O. Box 3005, Morogoro, Tanzania]

Thirteen bean cv., obtained from within Tanzania and CIAT, were evaluated for resistance to Ophiomyia phaseoli by subjecting them to natural infestation in the field at Sokoine U. of Agriculture (Morogoro, Tanzania) during the 1984 cropping season. A randomized complete block design was used with 4.5-m single-row plots replicated 4 times. The incidence of and damage caused by O. phaseoli were based on ovipuncture counts in plant leaves, larval-pupal counts, and stem damage at weekly intervals from 14 to

42 days after planting by uprooting 5 plants at random from each plot. All data were subjected to analysis of variance. Cv. performance is presented in table form. None of the 13 cv. evaluated was highly or moderately resistant to O. phaseoli attack. Cv. A489, A429, BAT 1570, TMO 118, BAT 1500, A476, and TMO 101 were considered to have low resistance to O. phaseoli attack. Seed yield was generally high for most cv. rated as possessing some resistance. The dry seed yield in these cv. ranged from 6.65 to 11.74 g/plant. [CIAT]

1494

- * KAREL, A.K. 1985. Host-plant resistance in common beans to foliar beetle (Ootheca bennigseni Weise). Bean Improvement Cooperative. Annual Report 28:13-14. [Sokoine Univ. of Agriculture, Dept. of Crop Science, P.O. Box 3005, Morogoro, Tanzania]

Sixty bean var. and accessions obtained locally or from CIAT were tested at Sokoine U. of Agriculture (Morogoro, Tanzania) during the 1983 cropping season for resistance to the foliar beetle, Ootheca bennigseni. A randomized complete block design was used with 4 replications. Foliar damage due to feeding activity of Ootheca beetles was estimated using a visual rating scale of 0-5; 0, no foliar injury; 1, 1-5% foliage consumed; 2, 6-25%; 3, 26-50%; 4, 51-75%; 5, 76-100%. None of the 60 cv. was immune or highly resistant to foliar beetle feeding. However, var. difference in feeding injury was apparent. Cv. A 62, A 63, A 67, A 79, A 83, A 153, A 161, BAT 1265, BAT 1276, Kabanima, T8, UAC 116, and YC-2 were rated as moderately resistant to Ootheca foliar damage. [CIAT]

1495

- * KAREL, A.K.; MGHOGHO, R.M.K. 1984. The effects of insecticide and plant populations on the insect pests and yield of common bean (Phaseolus vulgaris L.). Morogoro, Tanzania, University of Agriculture. 22p. [Sokoine Univ. of Agriculture, Dept. of Crop Science, P.O. Box 3005, Morogoro, Tanzania]

The effects of 4 plant populations (100,000, 200,000, 300,000, and 400,000 plants/ha), with and without lindane application, on the insect pests and yield of common beans were studied at the Faculty of Agriculture, Morogoro, Tanzania. Incidence and damage of the foliar beetle (Ootheca bennigseni) and flower thrips (Taeniothrips sjostedti) were significantly higher in unsprayed plots compared with sprayed plots. Foliar damage was less at 200,000 plants/ha than at other densities. However, thrip counts were not significantly different among the plant populations tested although insect counts increased with increasing plant populations. Flowers and pods were damaged more in unsprayed plots by the pod borers Maruca testulalis and Heliothis armigera. At 200,000 and 300,000 plants/ha, fewer flowers and pods were damaged. Seed yield was significantly higher in lindane-sprayed plots: av. of 1275 kg/ha. The highest seed yield, no. of pods/plant, no. of seeds/pod, and seed size were obtained at 200,000 plants/ha. Possible reasons for decrease in seed yield beyond a plant population of 200,000 plants/ha are discussed. A positive correlation was found between seed yield and no. of pods/plant ($r = 0.56$) no. of seeds/pod ($r = 0.73$), and seed size ($r = 0.25$). A negative correlation coefficient was found between seed yield and flower damage ($r = -0.84$) and pod damage ($r = -0.80$). [AS]

1496

- * KAREL, A.K. 1984. Evaluation and bean accessions for resistance to foliar beetle, Ootheca bennigseni Weise. In Minjas, A.N.; Salema, M.P., eds. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984.

Proceedings. Tanzania, Sokoine University of Agriculture. pp.38-40. [Sokoine Univ. of Agriculture, Dept. of Crop Science, P.O. Box 3005, Morogoro, Tanzania]

An expt. was carried out at Sokoine U. of Agriculture (Morogoro, Tanzania) during the 1983 cropping season to evaluate 60 bean var. (local accessions or from CIAT) for their resistance to the foliar beetle (Ootheca bennigseni). None of the 60 bean cv. was completely or highly resistant to O. bennigseni damage. Cv. A 62, A 63, A 67, A 79, A 83, A 153, A 161, BAT 1265, BAT 12776, Kabanima, T 8, UAC 116, and YC-2 had moderate leaf damage due to O. bennigseni and were rated as moderately resistant. The leaf damage rating of these cv. ranged from 1.59 (A 63) to 1.99 (UAC 116). Cv. A 117 and Selian Wonder were highly susceptible. [CIAT]

1497

- * KAREL, A.K. 1984. Integrated pest control in common beans (Phaseolus vulgaris). In Minjas, A.N.; Salema, M.P., eds. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984. Proceedings. Tanzania, Sokoine University of Agriculture. pp.47-49. [Sokoine Univ. of Agriculture, Dept. of Crop Science, P.O. Box 3005, Morogoro, Tanzania]

An expt. was carried out at Sokoine U. of Agriculture (Morogoro, Tanzania) to evaluate integrated pest control in beans. Bean var. Kabanima, moderately resistant to Ophiomyia phaseoli and to Ootheca bennigseni, was used in a randomized block design with 4 replications and the following treatments: T₁, T₂, and T₃ with 3, 4, and 5 applications of insecticide, resp.; T₄, 2 applications of Bacillus thuringiensis; T₅, 2 applications of insecticide and 2 of B. thuringiensis; T₆, 3 applications of insecticide and 2 of B. thuringiensis; T₇, control. O. phaseoli ovipuncture and larval-pupal counts in various treatments were not significantly different, although counts in T₄ and T₇ were higher. T₃ had the lowest Ootheca count. Seed yield was highest in T₃ (1464 kg/ha). Two applications of B. thuringiensis controlled pod borer larvae. [CIAT]

1498

- * KAREL, A.K. 1984. Resistance to bean fly, Ophiomyia phaseoli Tryon, in common beans. Morogoro, Tanzania, Sokoine University of Agriculture. 5p. [Sokoine Univ. of Agriculture, Dept. of Crop Science, P.O. Box 3005, Morogoro, Tanzania]

Seventy local and introduced bean lines and cv. were evaluated for resistance to Ophiomyia phaseoli at Morogoro, Tanzania, during 1983. Ovipuncture counts, stem damage, and plant vigor were recorded for each cv. Most cv. were either susceptible or highly susceptible to O. phaseoli attack. Resistant cv. grew vigorously compared with susceptible ones and generally gave higher seed yields, except those susceptible to other pests. No cv. was rated resistant; moderately resistant cv. (least stem damage) were A40, A62, A63, A67, A74, A83, A116, A152, A154, A156, A162, A176, BAT 85, BAT 336, BAT 1210, BAT 1236, BAT 1264, BAT 1274, BAT 1275, BAT 1276, BAT 1296, BAT 1297 (all from CIAT), Kablanketi, Sumbawanga, T8, and YC-2. [CIAT]

1499

- * KAREL, A.K.; RWEYEMAMU, C.L. 1984. Resistance to the foliar beetle, Ootheca bennigseni (Coleoptera: Chrysomelidae) in common beans. Morogoro, Tanzania, University of Agriculture. 13p. [Sokoine Univ. of Agriculture, Dept. of Crop Science, P.O. Box 3005, Morogoro, Tanzania]

Twenty-seven common bean cv. were screened in the field (Morogoro, Tanzania) and the glasshouse for resistance to feeding by the foliar beetle Oothea bennigseni. Six var. were resistant, 11 moderately resistant, and 10 susceptible. Resistance partially resulted from nonpreference. Some cv. also appeared to be tolerant to O. bennigseni foliar damage. Dry seed yields of 1400 kg/ha were recorded for resistant cv. T8, Mexican 142, A62, A67, and A83. [AS]

1500

- * KAREL, A.K. 1984. Yield losses from and control of bean pod borers, Maruca testulalis (Lepidoptera: Pyralidae) and Heliothis armigera (Lepidoptera: Noctuidae). Morogoro, Tanzania, University of Agriculture, 18p. [Sokoine Univ. of Agriculture, Dept. of Crop Science, P.O. Box 3005, Morogoro, Tanzania]

The effects of the pod borers Maruca testulalis and Heliothis armigera on dry seed yield of common beans, under various insecticide treatments, were studied at the Sokoine U. of Agriculture, Morogoro, Tanzania. More larvae (52.3%) were found on flowers than on pods (37.8%) and leaves (9.9%). Up to 31.0% of the flowers were damaged by the feeding activity of the larvae of both species. M. testulalis larvae were more abundant and damaged pods to a greater extent than did H. armigera (av. of 31.0 and 13.0%, resp.). Seed damaged by larvae of both species averaged 16.0%. Insecticide applications were effective in controlling the larvae of both species. Larval counts on flowers and pods were reduced in treated plots resulting in increased dry seed yields. The highest dry seed yield (av. of 1442 kg/ha) was recorded in lindane-treated plots. Seed yield losses ranging from 33.0 to 53.0% resulted from M. testulalis and H. armigera damage. [AS (extract)]

1501

- * KAREL, A.K. 1984. Yield losses in field beans following infestation by pod borers. In Minjas, A.N.; Salema, M.P., eds. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984. Proceedings. Tanzania, Sokoine University of Agriculture. pp.41-43. [Sokoine Univ. of Agriculture, Dept. of Crop Science, P.O. Box 3005, Morogoro, Tanzania]

An expt. was carried out at Sokoine U. of Agriculture (Morogoro, Tanzania) to evaluate the effects of 6 insecticides (carbaryl, DDT 25MG, dimethoate, endosulfan, Y-HCH, fenitrothion) on the incidence of Maruca testulalis and Heliothis armigera in beans. Incidence of Maruca larvae was higher than that of Heliothis. Plots treated with endosulfan and Y-HCH had significantly ($P = 0.05$) less Heliothis larvae than other treatments. The % seed damage was generally lower than % pod damage. Seed yield losses of 33-53% were recorded due to damage by the larvae of both species. [CIAT]

1502

- KAREL, A.K.; ODINDO, M.O. 1983. Chemical versus biological control of pests. In Aquatic pollution in relation to protection of living resources. Rome, Food and Agricultural Organization of the United Nations. TF-RAF 112:123-31.

1503

- * KAREL, A.K.; MATARY, R.D.R. 1983. The effect of insecticide application and plant populations on insect pests and yield of intercropped maize and beans. Bean Improvement Cooperative. Annual Report 26:43-45. [Sokoine Univ. of Agriculture, Dept. of Crop Science, P.O. Box 3005, Morogoro, Tanzania]

An expt. was carried out in Morogoro, Tanzania, in 1982 to evaluate the effect of gamma HCN applications at 10, 24, and 48 days after planting and of different plant populations on insect pests and yield of monocropped and intercropped maize and beans. Plant populations were 66,666, 133,333, and 266,666 plants/ha for bean var. Selian Wonder, and 22,222, 44,444, and 88,888 plants/ha for maize var. Ilonga Composite. The damage caused by Oothea bennigseni was higher in intercropped than in monocropped beans, Taeniothrips sjostedti incidence was low in both monocropped and intercropped beans, and Heliothis incidence was higher in monocropped beans. The insecticide applications effectively controlled the insects at all plant populations. A significant seed yield increase was recorded in sprayed plots following insecticide application. [CIAT]

1504

- * KAREL, A.K. 1983. Effect of time of planting on insect pests and yield of common beans. Bean Improvement Cooperative. Annual Report 26:108-110. [Sokoine Univ. of Agriculture, Dept. of Crop Science, P.O. Box 3005, Morogoro, Tanzania]

An expt. was carried out at the Faculty of Agriculture (Morogoro, Tanzania) to study the effect of planting time on insect pests and yield of beans. The planting dates were April, 7, 14, 21, and 28, and May 5 and 12 (1982). Oothea damage to bean leaves was heavier in the 1st planting compared with that of the last planting (2.65 and 0.65, resp.). The infestation by Taeniothrips sjostedti was moderate during the 1st 2 plantings. However, in later planted beans this was high and therefore the damage to flowers was heavier. Pod damage by Heliothis and Maruca was higher in later planted beans (10.81 and 19.86%, resp.) resulting in reduced pod and seed yields. Bean seed yields for the resp. planting dates were 754, 826, 390, 145, 111, and 86 kg/ha. In general, the best time for bean production in Morogoro would be within 15 days from the onset of rains. [CIAT]

1505

- * KAREL, A.K.; RWEYEMAMU, C. 1982. Evaluation of bean varieties for resistance to foliar beetle, Oothea bennigseni Weise. Morogoro, Tanzania, University of Dar es Salaam. 8p.
Paper presented at the Bean Researchers Meeting at the Faculty of Agriculture, Morogoro, Tanzania, 1982.

Twenty-eight common bean var. were screened in the field (Morogoro, Tanzania) for resistance to adult chrysomelid beetles (Oothea bennigseni). Of these, 4 promising var. (Mexican 142, Masonga, Selian Wonder, and T8) were further screened in the glasshouse for foliar damage, on both a visual damage scale of 0-5 and on area meter (% leaf area damaged). In the field evaluation T8 was most resistant to Oothea attack followed by A83, BAT 1252, A62, A67, and Mexican 142. The glasshouse test with selected var. confirmed the resistance in var. T8 and Mexican 142 with artificial infestation of Oothea. Resistant var. recorded high seed yields ranging from over 1400 to 2000 kg/ha. [AS]

1506

- * KASYA, A.K.; SALEMA, M.P. 1984. Effect of lime-pellating of common bean and its symbiosis with Rhizobium. In Minjas, A.N.; Salema, M.P., eds. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984. Proceedings. Tanzania, Sokoine University of Agriculture. pp.26-31. [Sokoine Univ. of Agriculture, Dept. of Soil Science, P.O. Box 3005, Morogoro, Tanzania]

An expt. was carried out in pot culture in the greenhouse using an acid topsoil collected from the Magadu area of the U. Farm (Morogoro, Tanzania) to determine whether lime pelleting of inoculated bean seeds would overcome the harmful effects of soil acidity on beans. Two strains of Rhizobium phaseoli, CIAT 632 and No. 1380, were used. There were N deficiency symptoms and general poor plant growth in treatments where the seeds were neither inoculated nor lime-pelleted, and in treatments where the seeds were both inoculated with strain CIAT 632 and lime-pelleted. Lime pelleting had a significant ($P < 0.05$) effect on nodulation and increased N content of tops significantly ($P < 0.01$). [CIAT]

1507

- * KAWANDAKAMU, H.S.; GILL, B.S.; MISANGU, R.N. 1984. Yield evaluation of some local bean (Phaseolus vulgaris L.) cultivars. In Minjas, A.N.; Salema, M.P., eds. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984. Proceedings. Tanzania, Sokoine University of Agriculture. pp.10-12. [Sokoine Univ. of Agriculture, Dept. of Crop Science, P.O. Box 3005, Morogoro, Tanzania]

An expt. was conducted at Sokoine U. of Agriculture Farm (Morogoro, Tanzania) during the 1984 cropping season to evaluate the yield performance of 15 local cv. and to test some characters which may have a bearing on the ultimate grain yield and which can be used in selection work. Yields for all the cv. were generally good. Most cv. performed better than the check var. (Selian Wonder and Canadian Wonder) in terms of yield. Accession no. TMO 42, TMO 104, TMO 101, and TMO 72 were considered good var. All cv. showed susceptibility to BCMV and angular leaf spot; only 5 showed symptoms of rust. [CIAT]

1508

KILIMO MKOA TANGA. 1979. Maharage. Extension Booklet.

1509

- * KIULA, B.A.; KAREL, A.K. 1985. Effectiveness of vegetable oils in protecting beans against Mexican bean weevil (Zabrotes subfasciatus Bohman). Bean Improvement Cooperative. Annual Report 28:3-5. [Sokoine Univ. of Agriculture, Dept. of Crop Science, P.O. Box 3005, Morogoro, Tanzania]

The effectiveness of 5 vegetable oils in protecting beans against Zabrotes subfasciatus was evaluated at Sokoine U. of Agriculture (Morogoro, Tanzania). A preliminary expt. was set up to determine the effectiveness of manual mixing in comparison with mechanical mixing (tumbler) of oil (coconut). In a following expt. 5 edible oils (coconut, palm, sunflower, cottonseed, and neem kernel) were evaluated for the control of Z. subfasciatus. Results showed a significant difference in effectiveness of oils between tumbler and manual mixing. The % of viable eggs was higher in manual- than in tumbler-treated beans (73 and 16%, resp.). Analysis of variance showed significant differences among the various oil treatments. Of the oils used, neem kernel oil was the most effective in controlling weevils, evidenced by least seed damage. [CIAT]

1510

- * KIULA, B.A.; KAREL, A.K. 1984. Effectiveness of vegetable oils and other plant products in protecting beans against Mexican bean weevil (Zabrotes subfasciatus Bohman). In Minjas, A.N.; Salema, M.P., eds. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984. Proceedings.

Tanzania, Sokoine University of Agriculture. pp.57-59. [Sokoine Univ. of Agriculture, Dept. of Crop Science, P.O. Box 3005, Morogoro, Tanzania]

A preliminary expt. was conducted at Sokoine U. of Agriculture (Morogoro, Tanzania) to determine a method of mixing oil and bean seeds to control Zabrotes subfasciatus. Five types of oils (coconut, palm, sunflower, cotton, and neem kernel) were used, each applied at 4 concn.: 0.5, 1.0, 2.0, and 3.0 ml oil/kg bean seeds. Two mixing methods, hand mixing and tumbler mixing, were used. The parameters recorded and the results obtained are presented in table form. The analysis of variance showed significant differences among the various oil treatments. Neem kernel oil was the most effective in controlling the bruchid at a dose of 3.0 ml oil/kg seeds. Another expt. involved the use of ashes and other dust treatments. The % of seed damage by Z. subfasciatus following the treatments was recorded. All the treatments significantly reduced seed damage at 1 mo. after treatment. [CIAT]

1511

- * KOINANGE, E.M.K.; MARENJE, E.T.; NAHUM, S.; MODESTUS, G. 1984. Bean breeding progress report 1983-84. Lyamungu, Tanzania, National Bean Research Programme. 31p. [Research Inst. Lyamungu, P.O. Box 3004, Moshi, Tanzania]
Paper presented at the Phaseolus Bean Co-ordinating Committee Meeting, Arusha, Tanzania, 1984.

A progress report on bean breeding activities during 1983-84 in Tanzania is presented. The results of the village Phaseolus bean uniform cv. trial, the Tanzania Phaseolus bean uniform cv. trial, the Tanzania Phaseolus bean advanced yield trial, the Tanzania Phaseolus bean preliminary yield trials, the national bean yield trial, the evaluation of breeding materials in single rows, and the CIAT collaborative trials are presented and discussed. [CIAT]

1512

- * KOINANGE, E.M.K.; MARENJE, E.T.; NAHUM, S.; MODESTUS, G. 1984. CIAT collaborative trials. Project no. LY/PB/Br/84/07. In _____, Bean breeding progress report 1983-84. Lyamungu, Tanzania, National Bean Research Programme. pp.22-29. [Research Inst. Lyamungu, P.O. Box 3004, Moshi, Tanzania]
Paper presented at the Phaseolus Bean Co-ordinating Committee Meeting, Arusha, Tanzania, 1984.

The results of the 1983-84 CIAT IBYAN tested in Tanzania are presented. In Lambo, the IBYAN for highland plains (20 entries) produced an av. yield of 1636 kg/ha. A 321 significantly outyielded the rest of the entries (2487 kg/ha) except A 344 (1973 kg/ha); the control Kiburu yielded 1694 kg/ha (av.). The av. yield of the red mottled IBYAN (10 entries) in Lambo was 1257 kg/ha; the highest yielders were BAT 1297 and BAT 1386 (1567 and 1537 kg/ha, resp.). In Maruku, the av. yield of the IBYAN-Carioca nursery (20 entries) was 1172 kg/ha; the control Tibihabwa outyielded all entries with 1811 kg/ha. The av. yield for the large red-seeded IBYAN in Maruku (12 entries) was 1151 kg/ha; the highest yields were obtained with BAT 1253, the control T23, and BAT 1254 (1880, 1751, and 1642 kg/ha, resp.). [CIAT]

1513

- * KOINANGE, E.M.K. 1984. Development, evaluation and utilization of germplasm in Tanzania. In Reunión de Trabajo sobre Ensayos Internacio-

nales de Frijol, la., Cali, Colombia, 1984. Trabajos presentados. Cali, Centro Internacional de Agricultura Tropical. pp.246-265.

Aspects of the breeding, evaluation, and utilization of beans in Tanzania are presented. Major production constraints are the lack of improved var., losses due to diseases (caused by Colletotrichum lindemuthianum, Uromyces phaseoli, Phaeoisariopsis griseola, Xanthomonas phaseoli, and BCMV), insect pests (Ophiomyia phaseoli, Aphis fabae, Oothecha bennigseni, Maruca testulalis, and Heliothis armigera), poor production methods, socio-economic problems, and institutional constraints. In general, germplasm improvement seeks to release superior bean cv. for farmers. The bean breeding scheme, requirements for cv. releases, and results of evaluation of national and international germplasm are summarized. The process of seed multiplication and distribution is briefly described. The collection of bean germplasm in different regions of Tanzania should continue, as well as CIAT's provision of materials. The identification of pathogenic races in the country should receive priority to achieve stable resistance. Resistance to insects should also be incorporated into new var. New var. should be released after screening for intercropping. CIAT's role in providing short courses, study tours, and workshops is stressed. [CIAT]

1514

- * KOINANGE, E.M.K.; MARENCE, E.T.; NAHUM, S.; MODESTUS, G. 1984. Evaluation of breeding materials in single rows. Project no. LY/PB/Br/84/05. In Bean breeding progress report 1983-84, Lyamungu, Tanzania, National Bean Research Programme. p.21. [Research Inst. Lyamungu, P.O. Box 3004, Moshi, Tanzania]
Paper presented at the Phaseolus Bean Co-ordinating Committee Meeting, Arusha, Tanzania, 1984.

A total of 1700 bean lines, 46 CIAT advanced lines, 42 CIAT F₁ lines, and 224 CIAT F₂ lines were evaluated in single rows in Tanzania as a step prior to advanced yield trials. The selection criteria were disease resistance and desirable traits (plant type, flowering and maturity date, yield, and seed size and quality). Halo blight was observed in lines previously rated as resistant. [CIAT]

1515

- * KOINANGE, E.M.K.; MARENCE, E.T.; NAHUM, S.; MODESTUS, G. 1984. The national bean yield trial. Project no. LY/PH/Br/84/0. In Bean breeding progress report 1983-84. Lyamungu, Tanzania, National Bean Research Programme. pp.19-20. [Research Inst. Lyamungu, P.O. Box 3004, Moshi, Tanzania]
Paper presented at the Phaseolus Bean Co-ordinating Committee Meeting, Arusha, Tanzania, 1984.

The results of the 1983-84 national bean yield trial in Lambo, Tanzania, with 16 entries selected in Morogoro and Lyamungu, are presented. The av. yield was 1300 kg/ha. The highest yield was obtained with local cv. Kiburu (1996 kg/ha), followed by Canadian Wonder Selection 19 (1984 kg/ha). Most cv. from Lyamungu produced high yields except T23 (960 kg/ha). [CIAT]

1516

- * KOINANGE, E.M.K. 1984. National Phaseolus Bean Research Progress Report. In Minjas, A.N.; Salema, M.P., eds. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984. Proceedings. Tanzania, Sokoine University of Agriculture. pp.21-24. [Research Inst. Lyamungu, P.O. Box 3004, Moshi, Tanzania]

The results of research carried out by the National Phaseolus Bean Research Program stationed at Lyamungu Research Institute (Moshi, Tanzania) are briefly presented. Screening of exotic germplasm and local collections has taken place since the initiation of the program in 1979. In 1982 advanced yield trials P-285, TB79/467, TB79/509, P-617, and SD-79/381 performed well. After being tested at the advanced yield stage, lines with superior performance are further tested for yield and adaptability at the uniform yield stage. In the uniform cv. trial in Lambo, Arusha, Maruku, and Kasulu in 1982-83, lines T23 and YC-2 gave consistently good yields over seasons and sites. Planting beans at the onset of rains increased seed yield of an indeterminate var., P 311-A-L. For determinate var. Canadian Wonder, however, nonsignificant reductions in seed yields were obtained when grown 3 or 4 wk. after the onset of rains. In trials conducted during 3 seasons in Lambo and Arusha, the use of a 30 x 6 cm spacing, which resulted in a density of 200,000 plants/ha, was found to be suitable. [CIAT]

1517

- * KOINANGE, E.M.K.; MARENCE, E.T.; NAHUM, S.; MODESTUS, G. 1984. Tanzania Phaseolus bean advanced yield trial. Project no. LY/PB/Br/84/03. In . Bean breeding progress report 1983-84. Lyamungu, Tanzania, National Bean Research Programme. pp.13-16. [Research Inst. Lyamungu, P.O. Box 3004, Moshi, Tanzania]
Paper presented at the Phaseolus Bean Co-ordinating Committee Meeting, Arusha, Tanzania, 1984.

The results of the 1983-84 Tanzania bean advanced yield trial with 33 lines in Lambo and Arusha are presented. The performance of lines in Lambo was better than in Arusha, with av. yields of 1477 and 568 kg/ha, resp. The highest yield in Lambo (2167 kg/ha) was obtained with Canadian Wonder Collection 15 followed by RS-63-KK, SD 79/381, Canadian Wonder Collection 36, BAT 317, and MAK 2-3 (1948, 1893, 1843, 1840, and 1827 kg/ha, resp.). Low yields in Arusha were due to drought; no significant differences between yields were observed. [CIAT]

1518

- * KOINANGE, E.M.K.; MARENCE, E.T.; NAHUM, S.; MODESTUS, G. 1984. Tanzania Phaseolus bean preliminary yield trials. Project no. LY/PG/Br/84/04. In . Bean breeding progress report 1983-84. Lyamungu, Tanzania, National Bean Research Programme. pp.17-18. [Research Inst. Lyamungu, P.O. Box 3004, Moshi, Tanzania]
Paper presented at the Phaseolus Bean Co-ordinating Committee Meeting, Arusha, Tanzania, 1984.

The results of the 1983-84 Tanzania bean preliminary yield trials conducted in Lambo, including the 30 best lines, are presented. The av. yield of 1557 kg/ha compares favorably with the av. for the controls Canadian Wonder, Masai Red, and T23 (1393 kg/ha). The highest yield (2046 kg/ha) was obtained with BAT 332 Selection 2. However, the performance of lines included in this trial was not very encouraging, perhaps due to poor climatic conditions. Halo blight was observed and selections were made for this disease. [CIAT]

1519

- * KOINANGE, E.M.K.; MARENCE, E.T.; NAHUM, S.; MODESTUS, G. 1984. Tanzania Phaseolus bean uniform cultivar trial. Project no. LY/PB/Br/84/02. In . Bean breeding progress report 1983-84. Lyamungu, Tanzania, National Bean Research Programme. pp.4-12. [Research Inst. Lyamungu, P.O. Box 3004, Moshi, Tanzania]

Paper presented at the Phaseolus Bean Co-ordinating Committee Meeting, Arusha, Tanzania, 1984.

The results of the 1983-84 Tanzania bean uniform cv. trial conducted in Lambo, Arusha, Selian, Maruku, Iloga, Cairo, and Miwaleni, with 15 cv. and a local control, are presented. Av. yields for the resp. sites were 1133, 630, 1533, 1147, 1341, 801, and 243 kg/ha. In Lambo, the highest yield (1661 kg/ha) was obtained with Canadian Wonder Selection 19, in Arusha with AA/2/5/6 (764 kg/ha), in Selian with Selection 8 (1968 kg/ha), in Maruku with T23 (1593 kg/ha), in Iloga with Canadian Wonder and T3 (1623 kg/ha), in Cairo with P-285 (1120 kg/ha), and in Miwaleni with Supermetis (341 kg/ha). [CIAT]

1520

- * KOINANGE, E.M.K.; MARENAGE, E.T.; NAHUM, S.; MODESTUS, G. 1984. Village Phaseolus bean uniform cultivar trial. Project no. LY/PB/Br/83/01. In . Bean breeding progress report 1983-84. Lyamungu, Tanzania, National Bean Research Programme. pp.1-3. [Research Inst. Lyamungu, P.O. Box 3004, Moshi, Tanzania]
Paper presented at the Phaseolus Bean Co-ordinating Committee Meeting, Arusha, Tanzania, 1984.

The results of the 1983-84 village bean uniform cv. trial conducted in the Kilimanjaro region (Tanzania) in Kifumbu, Kifufu, Marangu, and Nuru KCMC, with 3 lines and 3 controls (Canadian Wonder, Selean Wonder, and local Kiburu), are presented. Plant height, yield, and yield component data were taken. Av. yields for each site were 1062, 1605, 1607, and 1099 kg/ha, resp. Cv. T3 performed better than all entries at all sites with yields of 1773, 1684, 2185, and 1051 kg/ha, resp., with an overall av. yield across sites of 1673 kg/ha followed by Kiburu, IC-2, Canadian Wonder, T23, and Selean Wonder with 1275, 1216, 1129, 826, and 474 kg/ha, resp. [CIAT]

1521

- * KOINANGE, E.M.K.; MMBAGA, M.E.T.; KAMATA, C.; THADEUS, R.S. 1983. Bean agronomy progress report 1982-83. Moshi, Tanzania, National Bean Research Programme. 21p. [Research Inst. Lyamungu, P.O. Box 3004, Moshi, Tanzania]
Paper presented at the Food Crops Co-ordinating Committee Meeting, Arusha, Tanzania, 1983.

Results of bean agronomy research carried out during 1982-83 by the National Bean Research Programme in Tanzania are presented. The topics covered were time of bean planting under rainfed conditions, bean spacing and density trials, screening beans for maize-bean association, optimum bean density in association with maize, planting dates for bean-maize intercropping, and effect of no. of bean plants/hill on grain yield. [CIAT]

1522

- * KOINANGE, E.M.K.; RWIZA, E.J.; NAHUM, S.; MODESTUS, G. 1983. Bean breeding progress report 1982-83. Moshi, Tanzania, National Bean Research Programme. 25p. [Research Inst. Lyamungu, P.O. Box 3004, Moshi, Tanzania]
Paper presented at the Food Crops Co-ordinating Committee Meeting, Arusha, Tanzania, 1983.

Results of bean breeding research carried out during 1982-83 by the National Bean Research Programme in Moshi, Tanzania, are presented. Trials covered uniform bean cv., preliminary and advanced yield, evaluation of

CIAT bean lines for yield and adaptability, breeding material in single rows, breeding for anthracnose resistance and plant type, and International Bean Rust Nursery. [CIAT]

1523

- * KOINANGE, E.M.K.; RWIZA, E.J.; NAHUM, S.; MODESTUS, G. 1983. Breeding for anthracnose resistance and plant type in beans. Project no. LY/PH/83/06. In . Bean breeding progress report 1982-83. Moshi, Tanzania, National Bean Research Programme. p.23. [Research Inst. Lyamungu, P.O. Box 3004, Moshi, Tanzania]
Paper presented at the Food Crops Co-ordinating Committee Meeting, Arusha, Tanzania, 1983.

Work to incorporate bean anthracnose resistance was carried out in Lyamungu (Tanzania). Single rows of selected plants were grown and observed for disease resistance. Yield improvement involving breeding for plant type was also conducted. Lines found promising will be included in preliminary yield trials. [AS]

1524

- * KOINANGE, E.M.K.; MMBAGA, M.E.T.; KAMAFU, C.; THADEUS, R.S. 1983. Effect of number of beans plants per hill on grain yield. Project no. LY/PH/AGRO/83/06. In . Bean agronomy progress report 1982-83. Moshi, Tanzania, National Bean Research Programme. pp.18-19. [Research Inst. Lyamungu, P.O. Box 3004, Moshi, Tanzania]
Paper presented at the Food Crops Co-ordinating Committee Meeting, Arusha, Tanzania, 1983.

Plant intrarow spacings of 10, 20, 30, and 40 cm corresponding to 1, 2, 3, and 4 plants/hole were arranged in a randomized complete block design with 4 replications in Lambo, Tanzania. Two var. with determinate and indeterminate growth habits were used. Data is still undergoing statistical analysis. [AS]

1525

- * KOINANGE, E.M.K.; RWIZA, E.J.; NAHUM, S.; MODESTUS, G. 1983. Evaluation of breeding material in single rows. Project no. LY/PH/Br/83/05. In . Bean breeding progress report 1982-83. Moshi, Tanzania, National Bean Research Programme. p.22. [Research Inst. Lyamungu, P.O. Box 3004, Moshi, Tanzania]
Paper presented at the Food Crops Co-ordinating Committee Meeting, Arusha, Tanzania, 1983.

Bean lines, selected from single rows and single plant selections made during the past season in Lambo, Tanzania, were evaluated for resistance to major diseases and desirable agronomic characteristics. Superior lines will be included in yield trials. [AS]

1526

- * KOINANGE, E.M.K.; RWIZA, E.J.; NAHUM, S.; MODESTUS, G. 1983. Evaluation of CIAT bean lines for yield and adaptability. Project no. LY/PB/Br/83/07. In . Bean breeding progress report 1982-83. Moshi, Tanzania, National Bean Research Programme. pp.17-21. [Research Inst. Lyamungu, P.O. Box 3004, Moshi, Tanzania]
Paper presented at the Food Crops Co-ordinating Committee Meeting, Arusha, Tanzania, 1983.

Three CIAT trials were conducted in Lambo, Tanzania, in 1983. Two IBYAN trials, carioca and large red, included lines which varied in color and large red-colored seeded lines, resp. Lines with yields comparable with the check were identified. The other trial included climbing bean lines which were grown with maize for support. Most of the lines flowered and matured very late, giving very low yields and showing poor adaptability. However, other aspects such as resistance to major diseases should be investigated. Further information is required to evaluate single-row lines. [AS]

1527

- * KOINANGE, E.M.K.; RWIZA, E.J.; NAHUM, S.; MODESTUS, G. 1983. International bean rust nursery. Project no. LY/PB/Br/83/08. In . Bean breeding progress report 1982-83. Moshi, Tanzania, National Bean Research Programme. p.24. [Research Inst. Lyamungu, P.O. Box 3004, Moshi, Tanzania]
Paper presented at the Food Crops Co-ordinating Committee Meeting, Arusha, Tanzania, 1983.

Bean rust differentials together with other promising cv. and breeding lines, in total 100 entries, were evaluated for bean rust in Lambo, Tanzania. Low occurrence of bean rust was observed. It is suggested that future evaluation should be done at Arusha Seed Farm or artificial inoculations should be applied. [AS]

1528

- * KOINANGE, E.M.K.; MMBAGA, M.E.T.; KAMAPA, C.; THADEUS, R.S. 1983. Optimum bean density in association with maize. Project no. LY/PH/AGRO/83/04. In . Bean agronomy progress report 1982-83. Moshi, Tanzania, National Bean Research Programme. pp.11-14. [Research Inst. Lyamungu, P.O. Box 3004, Moshi, Tanzania]
Paper presented at the Food Crops Co-ordinating Committee Meeting, Arusha, Tanzania, 1983.

Two bean var., Canadian Wonder and P311-A-L, were evaluated at 3 densities (102,564, 146,148, and 190,476 plants/ha) associated with maize. A total of 9 treatment combinations were grown at Lambo Estate (Tanzania) in a randomized block design with 4 replications. Significant differences in bean seed yield and other characters were observed between the 2 var. Var. Canadian Wonder at the different densities did not differ significantly in bean seed yield. Intermediate bean seed density for P311-A-L was significantly superior to the low density. From these and previous results, it is evident that Canadian Wonder can be planted at any convenient density and P311-A-L at intermediate density. [AS]

1529

- * KOINANGE, E.M.K.; MMBAGA, M.E.T.; KAMAPA, C.; THADEUS, R.S. 1983. Phaseolus beans spacing and density trial. Project no. LY/PH/AGRO/83/02. In . Bean agronomy progress report 1982-83. Moshi, Tanzania, National Bean Research Programme. pp.4-6. [Research Inst. Lyamungu, P.O. Box 3004, Moshi, Tanzania]
Paper presented at the Food Crops Co-ordinating Committee Meeting, Arusha, Tanzania, 1983.

A combination of 4 densities (200,000, 250,000, 300,000, and 400,000 plants/ha) and 4 different spacings (30, 40, 50, and 60 cm) were arranged in a randomized complete block design with 4 replications, using bean cv. T23, and evaluated at Lambo Estate and Arusha Seed Farm (Tanzania).

Significant seed yield differences between the different treatment combinations were observed at Arusha Seed Farm but not at Lambo Estate. A spacing of 30 x 16 cm, giving a density of 200,000 plants/ha, could be suitable for the bean farmer but further investigation is necessary. [AS]

1530

- * KOINANGE, E.M.K.; MMBAGA, M.E.T.; KAMAFI, C.; THADEUS, R.S. 1983. Relative dates of intercropping bean and maize. Project no. LY/PH/AGRO/83/05. In . Bean agronomy progress report 1982-83. Moshi, Tanzania, National Bean Research Programme. pp.15-17. [Research Inst. Lyamungu, P.O. Box 3004, Moshi, Tanzania]
Paper presented at the Food Crops Co-ordinating Committee Meeting, Arusha, Tanzania, 1983.

A randomized complete block design was used to investigate the effect of relative schedules of intercropping beans and maize in Lambo, Tanzania. Beans were grown 1 and 2 wk. before/after and simultaneously with maize. No significant seed yield differences were observed between intercropping beans 1 and 2 wk. before maize or simultaneously with maize. Results were not reliable mainly because maize stand was extremely poor and the C.V. high. [AS]

1531

- * KOINANGE, E.M.K.; MMBAGA, M.E.T.; KAMAFI, C.; THADEUS, R.S. 1983. Screening bean for maize bean association. Project no. LY/PH/AGRO/83/03. In . Bean agronomy progress report 1982-83. Moshi, Tanzania, National Bean Research Programme. pp.7-10. [Research Inst. Lyamungu, P.O. Box 3004, Moshi, Tanzania]
Paper presented at the Food Crops Co-ordinating Committee Meeting, Arusha, Tanzania, 1983.

Twenty-five treatment combinations were used to evaluate 12 bean cv. in association with maize var. H632 and in monoculture at Lambo Estate, Tanzania, in 1983. A randomized block design with 4 replications was used. Most cv. showed higher yields in monoculture. Maize grain yields did not differ significantly among the treatments. However, a relative advantage of associated cropping was found with all cv., indicating that farmers can still be encouraged to continue with intercropping and that most promising cv. also proved superior under intercropping. [AS]

1532

- * KOINANGE, E.M.K.; RWIZA, E.J.; NAHUM, S.; MOBESTUS, G. 1983. Tanzania Phaseolus bean advanced yield trial. Project no. LY/PH/Br/83/03. In . Bean breeding progress report 1982-83. Moshi, Tanzania, National Bean Research Programme. pp.10-13. [Research Inst. Lyamungu, P.O. Box 3004, Moshi, Tanzania]
Paper presented at the Food Crops Co-ordinating Committee Meeting, Arusha, Tanzania, 1983.

Thirty-two bean lines and 4 checks were evaluated at Lambo Estate and Arusha Seed Farm (Tanzania) in 1983 using a randomized complete block design with 3 replications. P-285, BAT 317, MAK/2-3, and TB 79/467 were the top yielders at Lambo Estate while at Arusha Seed Farm, Co 5621 and SD 79/381 outyielded most var. The lowest yielder at both sites was P-24, a large-seeded trailing type. Lines that performed well the previous season could not maintain their superiority. Also best lines identified at Lambo Estate were not necessarily so at Arusha Seed Farm. For an efficient selection program, an advanced yield trial should be conducted in more than

one location in a single season including most of these lines; however, inferior lines will be discarded. [AS]

1533

- * KOINANGE, E.M.K.; RWIZA, E.J.; NAHUM, S.; MODESTUS, G. 1983. Tanzania Phaseolus bean preliminary yield trial. Project no. LY/PH/Br/83/04. In Bean breeding progress report 1982-83. Moshi, Tanzania, National Bean Research Programme. pp.14-16. [Research Inst. Lyamungu, P.O. Box 3004, Moshi, Tanzania]
Paper presented at the Food Crops Co-ordinating Committee Meeting, Arusha, Tanzania, 1983.

Fifty-eight bean lines and 2 checks (Canadian Wonder and P311-A-L) were evaluated in a preliminary yield trial in Lambo (Tanzania) in 1983. A randomized block design with 2 replications was used. Some best yielders the previous season (FB/GP 246-2, MAK 2-3, FB/BP 262 Lushara BK, and FB/GP 307-2) maintained their superiority. Halo blight screening was made possible by the incidence of this bacterial disease within the season. [AS]

1534

- * KOINANGE, E.M.K.; RWIZA, E.J.; NAHUM, S.; MODESTUS, G. 1983. Tanzania Phaseolus bean uniform cultivar trial. Project no. LY/PB/Br/83/01. In Bean breeding progress report 1982-83. Moshi, Tanzania, National Bean Research Programme. pp.4-9. [Research Inst. Lyamungu, P.O. Box 3004, Moshi, Tanzania]
Paper presented at the Food Crops Co-ordinating Committee Meeting, Arusha, Tanzania, 1983.

Sixteen bean cv. including checks were evaluated for adaptability in a randomized complete block design with 4 replications at Lambo Estate, Arusha Seed Farm, Maruku, and Kasulu (Tanzania). Results from Lambo Estate show that T23 and YC-2 gave the highest seed yields which were significantly superior to those of most cv. evaluated. Arusha Seed Farm results indicate that SD 79/381, P 285, and AA/2/5/6 gave high yields. Very poor yields were obtained from Maruku. [AS]

1535

- * KOINANGE, E.M.K.; MMBAGA, M.E.T.; KAMAPA, C.; THADEUS, R.S. 1983. Time of sowing Phaseolus bean under rainfall conditions. Project no. LY/PH/AGRO/83/01. In Bean agronomy progress report 1982-83. Moshi, Tanzania, National Bean Research Programme. pp.1-3. [Research Inst. Lyamungu, P.O. Box 3004, Moshi, Tanzania]
Paper presented at the Food Crops Co-ordinating Committee Meeting, Arusha, Tanzania, 1983.

Optimum sowing date for 2 bean var., P311-A-L and Canadian Wonder, was determined by sowing at 2-wk.-interval starting with the onset of rains. A randomized complete block design was used at both Lambo Estate and Arusha Seed Farm (Tanzania). Only Lambo Estate data is reported. Sowing P311-A-L, an indeterminate climbing cv., at the onset of rains (1st planting date in late March) significantly increased seed yield. Canadian Wonder sown at the onset of rains up to 6 wk. later (late March and April) significantly (5% level) outyielded later plantings, in agreement with data collected from previous seasons. [AS]

1536

- * KOINANGE, E.M.K.; RWIZA, E.J.; NAHUM, S.; MODESTUS, G. 1983. Village Phaseolus bean uniform cultivar trial. Project no. LY/PB/Br/83/03. In

_____. Bean breeding progress report 1982-83. Moshi, Tanzania, National Bean Research Programme. pp.1-3. [Research Inst. Lyamungu, P.O. Box 3004, Moshi, Tanzania]
Paper presented at the Food Crops Co-ordinating Committee Meeting, Arusha, Tanzania, 1983.

A randomized complete block design with 2 replications was used to evaluate 7 bean cv. for yield and adaptability in Marangu, Tanzania. Low seed yields were obtained from the single-site data. However, comparison with previous season data indicated that Canadian Wonder and Selean Wonder were outyielded or equivalent to T23. P311-1-L, a black-seeded cv., gave the highest yields but cannot be released because of seed color preference. [AS]

1537

- * KOINANGE, E.M.K.; MMBAGA, M.E.T.; KAMAFA, C.; THADEUS, R.S. 1982. Bean agronomy progress report 1981-82. Moshi, Tanzania, National Bean Research Programme. 15p.
Paper presented at the Food Crops Co-ordination Committee Meeting, Ilonga, Tanzania, 1982.

Preliminary results of the research carried out during 1981-82 by the National Bean Research Programme in Tanzania are presented. Trials covered time of planting of beans under rainfed conditions, spacing and density in monoculture and intercropping, bean selection for maize-bean intercropping, relative dates of bean-maize intercropping, and effect of no. of plants/hole on grain yield. [CIAT]

1538

- * KOINANGE, E.M.K.; MMBAGA, M.E.T.; KAMAFA, C.; THADEUS, R.S. 1982. Effect of number of plants per hole on grain yield. Project no. LY/PH/AGRO 82/06. In _____. Bean agronomy progress report 1981-82. Moshi, Tanzania, National Bean Research Programme. pp.15-16.
Paper presented at the Food Crops Co-ordination Committee Meeting, Ilonga, Tanzania, 1982.

Four plant spacings (10, 20, 30, and 40 cm between holes corresponding to 1, 2, 3, and 4 plants/hole, resp.) were arranged in a randomized complete block design and evaluated at Lambo Estate field in 1982. Yield and 100 seed wt. were not significantly different for the 4 plant spacings. However, sowing 2 or 3 bean seeds/hole gave higher 100 seed wt. and yields than the mean and saved time in sowing and weeding compared with sowing 1 seed/hole every 10 cm. [AS]

1539

- * KOINANGE, E.M.K.; MMBAGA, M.E.T.; KAMAFA, C.; THADEUS, R.S. 1982. The optimum bean density in association with maize. Project no. LY/PH/AGRO 82/04. In _____. Bean agronomy progress report 1981-82. Moshi, Tanzania, National Bean Research Programme. pp.10-11.
Paper presented at the Food Crops Co-ordination Committee Meeting, Ilonga, Tanzania, 1982.

Two bean var. (Canadian Wonder and P311-A-L) were evaluated at 3 densities (102,564, 148,148, and 190,476 plants/ha) associated with maize. The 9 treatment combinations were evaluated in a randomized block design with 4 replications. Var. differences in bean seed yield were observed both in monoculture and in association. The 3 bean densities showed no significant seed yield differences. [AS]

1540

- * KOINANGE, E.M.K.; MMBAGA, M.E.T.; KAMAFU, C.; THADEUS, R.S. 1982. Phaseolus bean spacing and density trial. Project no. LY/PH/AGRO 82/02. In _____, Bean agronomy progress report 1981-82. Moshi, Tanzania, National Bean Research Programme. pp.4-6. Paper presented at the Food Crops Co-ordination Committee Meeting, Ilonga, Tanzania, 1982.

Combinations of 4 densities (200,000, 250,000, 333,333, and 400,000 plants/ha) and spacings (30, 40, 50, and 60 cm of beans) were arranged in a randomized complete block design and tested at Lambo Estate and Arusha Seed Farm in Tanzania in 1982. Grain yield was significantly different at Arusha Seed Farm while 100 seed wt. was nonsignificant at both sites. In general the 40-cm row spacing performed better at both sites compared with the other row arrangements; the 60-cm row spacing was the worst at Arusha Seed Farm. [AS]

1541

- * KOINANGE, E.M.K.; MMBAGA, M.E.T.; KAMAFU, C.; THADEUS, R.S. 1982. Relative dates of intercropping beans and maize. Project no. LY/PH/AGRO 82/05. In _____, Bean agronomy progress report 1981-82. Moshi, Tanzania, National Bean Research Programme. pp.12-14. Paper presented at the Food Crops Co-ordination Committee Meeting, Ilonga, Tanzania, 1982.

A randomized block design with 4 replications was used to study the effect of relative schedules of intercropping beans and maize in Lambo, Tanzania. Beans grown 2 wk. before maize showed superiority over other intercropping schedules, due to the minimized competition for nutrients, moisture, and light. [AS]

1542

- * KOINANGE, E.M.K.; MMBAGA, M.E.T.; KAMAFU, C.; THADEUS, R.S. 1982. Screening beans for maize-bean association. Project no. LY/PH/AGRO 82/03. In _____, Bean agronomy progress report 1981-82. Moshi, Tanzania, National Bean Research Programme. pp.7-9. Paper presented at the Food Crops Co-ordination Committee Meeting, Ilonga, Tanzania, 1982.

Twenty-five treatment combinations were used to evaluate 12 bean cv. in association with maize var. H 632 at Lambo, Tanzania. A randomized block design with 4 replications was used. Although lower bean yields were obtained with intercropped beans, a significantly high LER was obtained with most cv., indicating that farmers can still be encouraged to intercrop beans and maize. [AS]

1543

- * KOINANGE, E.M.K.; MMBAGA, M.E.T.; KAMAFU, C.; THADEUS, R.S. 1982. Time of sowing Phaseolus bean under rainfall conditions. Project no. LY/PH/AGRO 82/01. In _____, Bean agronomy progress report 1981-82. Moshi, Tanzania, National Bean Research Programme. pp.2-3. Paper presented at the Food Crops Co-ordination Committee Meeting, Ilonga, Tanzania, 1982.

Optimum planting dates for 2 bean var. (Canadian Wonder and P 311-A-L) were determined by sowing at 2-wk.-intervals starting with the onset of rains. A randomized block design with 4 replications was used in Lambo and the Arusha Seed Farm (Tanzania). The 1st planting of var. P 311-A-L outyielded

all other planting dates at both sites. Canadian Wonder planted in April or early May gave better yields in Lambo and relatively good yields in Arusha. [AS]

1544

- KOINANGE, E.M.K.; MADATA, C.; NAHUM, S.; MODESTUS, G.; RWIZA, E.J. 1981. Bean breeding progress report 1980/81. Paper presented at the Grain Legume Co-ordinating Committee Meeting held at Pamba House DSM No. 3rd-7th, 1981.

1545

- * KOINANGE, E.M.K.; RWIZA, E.J.; NAHUM, S.; MODESTUS, G. 1981. Breeding for anthracnose resistance and plant type in beans. Project no. LY/PB/Br/06. In _____. Bean breeding progress report 1981-82. Moshi, Tanzania, National Bean Research Programme. pp.16-17. Paper presented at the Food Crops Co-ordinating Committee Meeting, Ilonga, Tanzania, 1982.

Breeding work for anthracnose resistance has been initiated in Lyamungu, Tanzania. This involves crossing of line Cornell 49-242 with some potential bean cv. (Mexican 142, Canadian Wonder, T3, T23, YC-2, and Supermatis). These crosses are currently being evaluated. [AS]

1546

- * KOINANGE, E.M.K.; RWIZA, E.J.; NAHUM, S.; MODESTUS, G. 1981. Evaluation of bean material in single rows. Project no. LY/PB/Br/05. In _____. Bean breeding progress report 1981-82. Moshi, Tanzania, National Bean Research Programme. p.15. Paper presented at the Food Crops Co-ordinating Committee Meeting, Ilonga, Tanzania, 1982.

A total of 497 bean lines were screened for adaptability in Tanzania. Although conditions were not favorable to disease infection due to the late planting, information obtained will be useful in subsequent evaluations. Most of the Canadian Wonder single plant selections showed susceptibility to anthracnose, angular leaf spot, and bacterial blight. [AS]

1547

- * KOINANGE, E.M.K.; RWIZA, E.J.; NAHUM, S.; MODESTUS, G. 1981. Tanzania Phaseolus beans advanced yield trial. Project no. LY/PH/Br/03. In _____. Bean breeding progress report 1981-82. Moshi, Tanzania, National Bean Research Programme. pp.10-11. Paper presented at the Food Crops Co-ordinating Committee Meeting, Ilonga, Tanzania, 1982.

Thirty-six bean var./lines were evaluated for their performance in Lambo, Tanzania, in a randomized block design with 3 replications. Most CIAT entries included performed well above the av. seed yield of 3155 kg/ha. The highest seed yield, 4028 kg/ha, was obtained by P-285, a small-seeded line from CIAT. Since data from a single site and season is inconclusive, this expt. will be repeated with several inferior lines being substituted. [AS]

1548

- * KOINANGE, E.M.K.; RWIZA, E.J.; NAHUM, S.; MODESTUS, G. 1981. Tanzania Phaseolus beans preliminary yield trial. Project no. LY/PH/Br/04. In _____. Bean breeding progress report 1981-82. Moshi, Tanzania, National Bean Research Programme. pp.10-11. Paper presented at the Food Crops Co-ordinating Committee Meeting, Ilonga, Tanzania, 1982.

_____. Bean breeding progress report 1981-82. Moshi, Tanzania, National Bean Research Programme. pp.12,14.
Paper presented at the Food Crops Co-ordinating Committee Meeting, Ilonga, Tanzania, 1982.

Fifty bean lines and var., evaluated for yield and adaptability in a randomized block design with 2 replications in Lambo, Tanzania, showed variability in most of the characters measured. The seed yield of 4360 kg/ha obtained by MAK/2-3 was significantly higher than the av. (3200 kg/ha). Lines with superior performance will be useful in the breeding program. [AS]

1549

- * KOINANGE, E.M.K.; RWIZA, E.J.; NAHUM, S.; MODESTUS, G. 1981. Tanzania Phaseolus beans uniform cultivar trial. Project no. LY/PH/Br/01. In _____, Bean breeding progress report 1981-82. Moshi, Tanzania, National Bean Research Programme. pp.2-5,8.
Paper presented at the Food Crops Co-ordinating Committee Meeting, Ilonga, Tanzania, 1982.

Sixteen bean var./lines including a local check (Kiburu) were evaluated for adaptability in a randomized complete block design with 4 replications in Lambo, Arusha, and Gairo (Tanzania). Significant seed yield differences occurred between var. Canadian Wonder and Selean Wonder gave the lowest yield at the 1st 2 sites. However, some of the Canadian Wonder selections proved to be superior to most entries with seed yields above 3000 kg/ha. Data from another season is required to determine which var./line should replace Canadian Wonder and Selean Wonder. [AS]

1550

- * LUHANGA, W.W.; MAKUSI, R.A. 1974. Control of Aphis fabae (Scop.) and Heliothis armigera (Hb.) on seed beans Phaseolus vulgaris with Azodrin 55% E.C. Arusha, Tanzania, Tropical Pesticides Research Institute. Miscellaneous Report no.892. 4p.

Monocrotophos at 0, 0.67, and 0.79 kg a.i./ha was evaluated to control Aphis fabae and Heliothis armigera on beans in Arusha, Tanzania. In the control treatment, A. fabae counts increased from 62 (before spraying) to 104, 141, and 124 plants infested 3, 6, and 9 days after treatment, resp., while no infested plants were observed at all sampling dates for both rates. H. armigera egg and larvae counts showed similar trends; at the high application rate the no. of eggs was reduced from 103 (before treatment) to 31, 16, and 5 at 3, 6, and 9 days after treatment, resp., and at the lower rate from 119 to 47, 31, and 13 eggs, resp. No larvae were observed at the different sampling dates after treatment at both rates. Monocrotophos proved successful in controlling both pests at both application rates. [CIAT]

1551

- * LYIMO, H.F.; TERI, J.M. 1984. Effect of bean cultivar mixtures on disease severity and yield. In Minjas, A.N.; Salema, M.P., eds. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984. Proceedings. Tanzania, Sokoine University of Agriculture. pp.83-87. [Dept. of Crop Science, Faculty of Agriculture, Sokoine Univ. of Agriculture, P.O. Box 3005, Morogoro, Tanzania]

Expt. were conducted in 1984 at Sokoine U. of Agriculture Farm (Morogoro, Tanzania) to reevaluate the effect of bean cv. mixtures on the severity of

angular leaf spot and rust and on yield. The exptl. design was a randomized complete block replicated 4 times. The treatments consisted of cv. Canadian Wonder and Selian Wonder, exptl. line TMO 101, mixtures of Canadian Wonder, Selian Wonder, and TMO 101 in different proportions, and a local landrace. Initially, rust severity was similar in all treatments, but 60 days after planting rust increased more rapidly in pure stands than in mixtures. Angular leaf spot severity was also similar in all treatments, but 46 days after planting it increased more rapidly in pure stands than in mixtures. Yield was significantly different among treatments. The mean yield of mixture components in pure stand was 1389 kg/ha while that of the mixtures was 1607.9 kg/ha, an increase of 13.8% over pure stands. The mean yield of the local landrace was 1553.46 kg/ha, an increase of 10.6% over the mean yield of pure stands. [CIAT]

1552

- * MADATA, C.S.; MKUCHU, M. 1982. Phaseolus beans improvement programme. Progress report (1981-1982). Mbeya, Tanzania, Uyole Agricultural Centre. 10p.

The results of the 1981-82 uniform bean cv. trial, the preliminary yield trial, and the single-row observation trial in Tanzania are given and discussed. The uniform cv. trial evaluated the performance of 16 cv. for yield, disease resistance, and consumer acceptability at 5 locations. The performance of all var. was superior at Uyole Agricultural Centre with an av. yield of 1778 kg/ha compared with the av. in Ndengo (243 kg/ha), Nkundi (544 kg/ha), Mbimba (585 kg/ha), and Ismani (1279 kg/ha). Cv. P-304 significantly outyielded the rest of the cv. at all sites. The results are encouraging in that these are lines comparable with Kabanima and T3. In the preliminary yield trial at Uyole Agricultural Centre with 44 lines and 6 controls, the highest yielders were Kabanima, T8, and line FB/GP 246-3 with 4217, 3530, and 3205 kg/ha, resp. Diseases observed in both trials include those caused by Isariopsis griseola, Uromyces appendiculatus, Ascochyta sp., and Colletotrichum lindemuthianum. Sixty-nine progenies from CIAT and 600 progenies from the Uyole Agricultural Centre germplasm collection were evaluated in Lambo in single-row observation trials. Twenty progenies from CIAT were selected for future preliminary yield trials since they produced higher yields than Kabanima. [CIAT]

1553

- * MAERERE, A.P.; KAREL, A.K. 1984. Evaluation of common bean cultivars for resistance to beanfly (Ophiomyia phaseoli Tryon). In Minjas, A.N.; Salema, M.P., eds. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984. Proceedings. Tanzania, Sokoine University of Agriculture. pp.49-52. [Dept. of Crop Science, Faculty of Agriculture, Sokoine Univ. of Agriculture, P.O. Box 3005, Morogoro, Tanzania]

An expt. was carried out at Sokoine U. of Agriculture (Morogoro, Tanzania) during the 1984 cropping season to evaluate 13 bean cv. for resistance to Ophiomyia phaseoli. The % infestation was not significantly different among the cv. except between Selian Wonder and A 429 (48.5 and 26.6%, resp.). Cv. A 489, A 429, BAT 1570, TMO 118, BAT 1500, A 476, and TMO 101 had low larval/pupal counts ranging from 1.08 to 1.29, and were considered to have low resistance to Ophiomyia phaseoli attack. Plant vigor was lowest in cv. A 489 and BAT 1570 (each with 1.75) and highest in Selian Wonder (2.75). [CIAT]

1554

- * MALLYA, G.A. 1984. Beanfly resistance screening trial. Mbeya, Tanzania, Uyole Agricultural Centre. 3p.

An expt. was conducted to select bean cv. for resistance to Ophiomyia phaseoli in Uyole, Tanzania. Thirty bean cv. were used in a randomized complete block design with 6-m single rows/cv. and 3 replications. Evaluations of wilted plants were carried out 4 wk. after planting and larval/pupal counts at 6 wk. after planting. Plant lodging on a 0-4 scale was assessed at pod maturity. None of the cv. were completely immune to O. phaseoli attacks; however, cv. Masusu had the least % of wilted plants (1.96%), followed by P 189 (8.99%), 19 (WSFS) (9.23%), and T3 (9.49%). Larval-pupal counts/plant for these cv. were 1.37, 3.13, 3.92, and 2.43, resp., and plant lodging scores were 2.33, 2.67, 1.00, and 3.00, resp. Cv. Kablanketi was the most affected with 64.3% wilted plants, larval-pupal counts of 4.80/plant, and with a score of 4 on the plant lodging scale. [CIAT]

1555

- * MANDARI, A.T.G.; MINJAS, A.N. 1984. Critical period for weed competition in beans (Phaseolus vulgaris) intercropped with maize. In Minjas, A.N.; Salema, M.P., eds. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984. Proceedings. Tanzania, Sokoine University of Agriculture. pp.93-98. [Dept. of Crop Science, Faculty of Agriculture, Sokoine Univ. of Agriculture, P.O. Box 3005, Morogoro, Tanzania]

During the 1984 cropping season field trials were carried out at Sokoine U. of Agriculture (Morogoro, Tanzania) to determine the critical period for weed competition in beans (var. Canadian Wonder) intercropped with maize (var. Coastal Composite) at 3 different density levels. The expt. had 2 weeding regimes: some treatments were kept weed-free for a certain period starting from 2 wk. after planting and then left weedy up to the 10th wk.; other treatments were left weedy from planting for a certain period and then kept weed-free up to the 10th wk. Data was collected on weed shoot DM and various yield components of beans. Whether the crop is weeded or not, raising the density of beans in the maize-bean system gives corresponding increases in bean grain yield only when the maize density is low; however, increasing proportions of maize in the mixture resulted in a decrease in bean grain yield. From the observations, it is clear that for optimum bean yield when intercropped with maize the crop must be kept weed-free during the initial 4 wk. of growth. The period at which weeds exerted the greatest competition on the crop coincided with that at which the highest weed DM yield was produced and also the lowest bean yields. [CIAT]

1556

- * MANSUETUS, S.B.A.; KAREL, A.K. 1984. Effect of various neem (Azadiracta indica A. Juss.) extracts on insect pests of common beans. In Minjas, A.N.; Salema, M.P., eds. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984. Proceedings. Tanzania, Sokoine University of Agriculture. pp.52-56. [Dept. of Crop Science, Faculty of Agriculture, Sokoine Univ. of Agriculture, P.O. Box 3005, Morogoro, Tanzania]

An expt. was carried out at Sokoine U. of Agriculture (Morogoro, Tanzania) during 1984 to evaluate the effect of neem (Azadiracta indica) extracts on insect pests of common beans. The neem extracts were as follows: 2 and 4% water extract from neem leaves; 1, 2, and 4% water extracts from neem kernels; 2% neem kernel dust; 1 and 2% alcohol extract from neem kernel; dimethoate in 400 ml water, and control neem extract or synthetic insecticide. There were no significant differences in ovipuncture counts at 28 days after planting. However, at 35 days after planting, plants receiving kernel dust and dimethoate had low ovipuncture counts. Larval/pupal counts increased during 28 and 35 days after planting, then decreased at 42 days after planting. The population of Ootheca bennigseni

decreased between 21-35 days after planting. Neem extracts have potential to protect beans from damage by various insect pests. [CIAT]

1557

- * MBAMBA, H.A.; GILL, B.S.; MISANGU, R.N. 1984. Studies on variability in important characteristics in Phaseolus vulgaris. In Minjas, A.N.; Salema, M.P., eds. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984. Proceedings. Tanzania, Sokoine University of Agriculture. pp.6-10. [Dept. of Crop Science, Faculty of Agriculture, Sokoine Univ. of Agriculture, P.O. Box 3005, Morogoro, Tanzania]

A total of 100 bean lines were tested for their important economic characters at Sokoine U. of Agriculture Farm (Morogoro, Tanzania). A wide range of variation was observed for all the characters studied. The tallest plants had the highest no. of nodes at maturity. Canadian Wonder was the earliest to flower and matured earlier than most of the tested lines. TMO 200 had the highest no. of pods/plant and the lowest 100-seed wt., as well as the longest period to physiological maturity. Most of the tested lines, however, did not show superior yield performance. The origin of lines and their accession no. are presented in table form. [CIAT]

1558

- * MBOWE, A.S.; KESWANI, C.L. 1984. Economic importance of bean rust in Tanzania. In Minjas, A.N.; Salema, M.P., eds. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984. Proceedings. Tanzania, Sokoine University of Agriculture. pp.68-70. [Dept. of Crop Science, Faculty of Agriculture, Sokoine Univ. of Agriculture, P.O. Box 3005, Morogoro, Tanzania]

An investigation was conducted at Sokoine U. of Agriculture Farm (Morogoro, Tanzania) in 1984 to assess the economic importance of bean rust. Two bean var., Canadian Wonder and Selian Wonder, were used in a split plot design. Var. comprised the main plots and fungicide treatments, the subplots. Percentage of disease incidence and of disease severity were recorded at 9, 16, 23, and 30 days after inoculation. Canadian Wonder was more susceptible than Selian Wonder under the same conditions. However, 4 wk. after inoculation, disease incidence was about the same in both var. There was a significant ($P = 0.05$) difference in wt. between sprayed and unsprayed plots. The decrease in yield due to rust infection was 25.56 and 24.45% in Canadian Wonder and Selian Wonder, resp. [CIAT]

1559

- * MBUYA, O.S.; MINJAS, A.N. 1984. Critical period for weed competition in common bean (Phaseolus vulgaris) monoculture. In Minjas, A.N.; Salema, M.P., eds. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984. Proceedings. Tanzania, Sokoine University of Agriculture. pp.87-92. [Dept. of Crop Science, Faculty of Agriculture, Sokoine Univ. of Agriculture, P.O. Box 3005, Morogoro, Tanzania]

The effect of planting density and weeding regimes on grain yield of beans was studied at Sokoine U. of Agriculture (Morogoro, Tanzania) during the 1984 cropping season. Bean cv. Canadian Wonder was sown manually in monoculture. There were 36 treatments arranged in a randomized block design with 3 replications. Three densities (270, 270, 181, 818, and 90, 909 plants/ha) and the following weeding regimes were used: (1) keeping the crop weed-free for different periods followed by weed infestation to maturity and (2) keeping the crop weed-infested for a certain period followed by a weed-free period to maturity. Data were collected on DM

yield of weeds, pod length at harvesting, av. no. of filled pods/plant, no. of seeds/pod, and grain yield/plot. Within a given weeding regime, bean yield generally increased with increasing plant density. At each density, pod length was neither affected by the onset of weed competition nor by the duration of weed competition. Weeding regime did not affect the no. of filled pods/plant at any density level. Initial weed-free period to maturity did not influence the no. of seeds/pod at any of the 3 planting densities. However, the response of the no. of seeds/pod to initial weed infestation was highly dependent upon plant density. [CIAT]

1560

- * MEKETO, N.M.; KESWANI, C.L. 1984. Studies on the economic importance of bean common mosaic virus of common beans (*Phaseolus vulgaris*). In Minjas, A.N.; Salema, M.P., eds. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984. Proceedings. Tanzania, Sokoine University of Agriculture. pp.67-68. [Dept. of Crop Science, Faculty of Agriculture, Sokoine Univ. of Agriculture, P.O. Box 3005, Morogoro, Tanzania]

A study was undertaken in 1984 at Sokoine U. of Agriculture Farm (Morogoro, Tanzania) to assess the economic importance of BCMV. A split plot design with 5 main plots and 2 subplots was used. The main plots were the control and BCMV inoculum applied at 2, 3, 4, and 5 wk. after planting. The subplots were 2 var. (Kabanima and Selian Wonder) planted in 4 rows, 3 m long. Plant spacing was 60 x 10 cm. Of the inoculated plants, 12% developed mosaic symptoms 2 wk. after planting. At flowering, the incidence of BCMV reached 60% in Selian Wonder and 76% in Kabanima (against 4-6% in the control for both var.). There was less yield reduction in Kabanima than in Selian Wonder. [CIAT]

1561

- * MINJAS, A.N.; SALEMA, M.P., eds. 1984. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984. Proceedings. Tanzania, Sokoine University of Agriculture. 107p. [Dept. of Crop Science, Faculty of Agriculture, Sokoine Univ. of Agriculture, P.O. Box 3005, Morogoro, Tanzania]

The annual bean research workshops are aimed at bringing together bean researchers in Tanzania and as well as those from neighboring countries like Kenya, Uganda, Malawi, Rwanda, and Burundi. The proceedings of the 3rd Bean Research Workshop, held at Sokoine U. of Agriculture (Tanzania) between Aug. 27-28, 1984, registers the progress, problems, and prospects of bean research activities in Tanzania. Topics covered include the evaluation of cv. for their resistance to diseases and pests, adaptation trials, N fixation, fertilizers, growth studies, pest and disease control, bean storage, economic importance of diseases (BCMV, rust, angular leaf spot), cv. mixtures, weed competition, and beans in farming systems in Tanzania. [CIAT]

1562

- * MINK, G.I. 1985. 1985 Foreign trip report and experimental results. Prosser, Washington State University. Irrigated Agriculture Research and Extension Center. 28p. [Washington State Univ., Irrigated Agriculture Research & Extension Center, P.O. Box 30, Prosser, WA 99350, USA]

Eight research locations and 24 private farms (mostly in northern Tanzania) were surveyed for bean viral diseases. In Kenya and throughout northern Tanzania no plants were found that exhibited symptoms typical of BCMV.

Only 3 BCMV-infected plants were detected by serological techniques; all 3 plants were found in the Arusha area (Tanzania) and all 3 isolates appeared to belong to serotype A, which has been found mainly in East Africa. The almost complete absence of BCMV in the bean production areas of Kenya and northern Tanzania contrasts with the observations made in Aug. 1984 when numerous BCMV-infected plants were found in the Arusha area. In 1985 observations suggest that the bean seed planted in this region during the rainy season contained little or no seed-borne BCMV. By contrast, seed produced at Sokoine U. in 1984 contained as much as 20% seed-borne infection. This raises the question as to why so little seed-borne infection occurred in the northern areas when so much BCMV was observed there the previous dry season. Both years large no. of BCMV-infected bean plants were found at the Sokoine U. research farm near Morogoro, Tanzania; much of this infection appeared to result from seed-borne infection. Seed lots of some exptl. var. produced on the U. farm in 1984 produced approx. 20% BCMV-infected plants when grown in 1985. Nine of 10 BCMV isolates collected from bean plants on the farm plots were determined to be serotype A, suggesting that most of the BCMV isolates were of local origin. Nine of the 13 BCMV isolates from bean reacted with antisera to cowpea aphid-borne viruses or blackeye cowpea mosaic virus. Twenty-seven color photographs are included. [AS (extract)]

1563

- * MISANGU, R.N.; GILL, B.S. 1984. Bean improvement at Sokoine University of Agriculture. In Minjas, A.N.; Salema, M.P., eds. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984. Proceedings. Tanzania, Sokoine University of Agriculture, pp.5-6. [Dept. of Crop Science, Faculty of Agriculture, Sokoine Univ. of Agriculture, P.O. Box 3005, Morogoro, Tanzania]

The work carried out so far by the bean improvement program of Sokoine U. of Agriculture (Morogoro, Tanzania) is summarized. A total of 275 exotic lines and crosses have been received, of which 107 lines were studied during 1984; 145 local cv. have also been collected among which 111 have been studied. Most of the local cv. are mixed var. and some appear to be outstanding seed yielders while others are tolerant/resistant to BCMV, angular leaf spot, and rust. Forty-three MF 3-8304H, 224 8305-C and 46 MF 3-8409B lines were evaluated in advanced segregating generations; large variations were observed. Better var. in terms of yield or resistance to the bean fly were crossed, in the glasshouse, to Kabanima which possesses resistance to anthracnose, angular leaf spot, and rust. [CIAT]

1564

- MISANGU, R.N. 1983. Yield potential and agronomic characters of some common bean varieties in Tanzania. Mag.Sc. Thesis. Tanzania, University of Dar es Salaam.

1565

- * MITIMINGI, T.M.; NDUNGURU, B.J. 1984. Growth and yield studies of inoculated beans (*Phaseolus vulgaris*). In Minjas, A.N.; Salema, M.P., eds. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984. Proceedings. Tanzania, Sokoine University of Agriculture. pp.31-38. [Dept. of Crop Science, Faculty of Agriculture, Sokoine Univ. of Agriculture, P.O. Box 3005, Morogoro, Tanzania]

A field expt. was conducted at Sokoine U. of Agriculture (Morogoro, Tanzania) during the 1984 cropping season to study the growth and development of 3 bean var. (Canadian Wonder, Selian Wonder, and Kibwebwe)

as affected by rhizobial inoculation (strain No. 1380) and fertilizers (N and P applied at rates of 20 and 60 kg/ha). Fertilizers and inoculation had no effect on seedling emergence, flowering and podding, nor on the duration of the growing period. Var. Kibwebwe had more nodes than the other var. in all treatments. There was a general increase in the no. of nodules in all var. up to flowering followed by a decrease. N fixation activity reached a max. at flowering for Canadian Wonder and Kibwebwe. Kibwebwe had a higher no. of pods/plant (9.05) and more seeds/pod (4.40) in all treatments. Selian Wonder produced the highest av. seed yield (1205 kg/ha). [CIAT]

1566

- * MKUCHU, M. 1982. Agronomy projects from 1981-1982. Progress Report. Mbeya, Tanzania, Uyole Agricultural Centre. 4p.

The results of trials on planting time and spacings for beans in Tanzania are reported. Cv. Canadian Wonder, T3, and Kabanima were planted at biweekly intervals from mid-Feb. to mid-March. For early maturing cv. (Canadian Wonder), the planting date should be mid-March, and for late maturing cv. (Kabanima), mid-Feb. The same cv. were evaluated at 4 different sites (Uyole Agricultural Centre, Nkundi, Isman Mbimba, and Ndengo) at 5 spacings (50 x 10, 60 x 10, 50 x 15, 60 x 15, and 75 x 10 cm). The highest yields for all cv. at all sites were obtained at a 50 x 10 cm spacing. [CIAT]

1567

- * MMBAGA, M.E.T. 1984. Effect of six fungicides on disease severity and yield of beans (*Phaseolus vulgaris* L.) in Tanzania. In Minjas, A.N.; Salema, M.P., eds. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984. Proceedings. Tanzania, Sokoine University of Agriculture. pp.72-75. [Dept. of Botany, Faculty of Science, Univ. of Dar es Salaam, P.O. Box 35060, Dar es Salaam, Tanzania]

Field expt. were carried out during 3 yr (1982-84) at Sokoine U. of Agriculture (Morogoro, Tanzania) to determine the effect of fungicides on disease severity and yield and to identify the fungicide which can control bean rust and not angular leaf spot. A randomized block design with 4 replicates was used. Six fungicides (Diathane M45, benomyl, cupric hydroxide, Perchlor, metiram, and copper oxychloride) were used as well as 2 cv. each year. The effect of the different fungicides on disease severity and yield of bean var. Selian Wonder and Mbanga for each year is presented in table form. [CIAT]

1568

- * MMBAGA, M.E.T. 1984. Studies on the variability of the bean rust pathogen and evaluation of cultivars for resistance to *Uromyces phaseoli*. In Minjas, A.N.; Salema, M.P., eds. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984. Proceedings. Tanzania, Sokoine University of Agriculture. pp.76-83. [Dept. of Botany, Faculty of Science, Univ. of Dar es Salaam, P.O.Box 35060, Dar es Salaam, Tanzania]

A total of 100 local and foreign bean cv. were evaluated at Sokoine U. of Agriculture (Morogoro, Tanzania) in 1983 for their resistance to bean rust. Each cv. was planted in a single 5-m-long row replicated 4 times. At flowering and full pod stages, disease severity was assessed following the CIAT approach which uses pustule size and pustule density scheme. Yield of each cv. was also recorded. Rust and angular leaf spot were the predominant diseases over all growing seasons. The results of the evaluations for all cv. are presented in table form. [CIAT]

1569

- * MMBAGA, M.E.T. 1981. Bean spacing and density trial. In . Bean agronomy progress report 1980-81. Tanzania, Research Institute Lyamungu. 3p.
Paper presented at the Grain Legume Co-ordinating Committee Meeting, Dar es Salaam, Tanzania, 1981.

Bean cv. Canadian Wonder was planted at 16 different spacings corresponding to 4 plant densities (200,000, 250,000, 333,333, and 400,000 plants/ha) in Tanzania to observe the effect on yield, yield components (pods/plant, seeds/pod, 100-seed wt.), and plant characteristics (branches/plant and plant height). Plant height, 100-seed wt., and yields were not significantly different between treatments but the rest of the parameters were significantly different ($P = 0.05$). Yields above av. were obtained at spacings of: 30 x 16 cm at 200,000 plants/ha (1407 kg/ha); 30 x 10 and 40 x 8 cm at 333,333 plants/ha (1395 and 1542 kg/ha, resp.); and 30 x 8, 40 x 6, and 50 x 5 cm at 400,000 plants/ha (1469, 1542, and 1600 kg/ha, resp.). [CIAT]

1570

- * MMBAGA, M.E.T. 1981. The optimum bean density in association with maize. In , Bean agronomy progress report 1980-81. Tanzania, Research Institute Lyamungu. 2p.
Paper presented at the Grain Legume Co-ordinating Committee Meeting, Dar es Salaam, Tanzania, 1981.

Bean cv. Canadian Wonder was intercropped with maize in Lambo, Tanzania, at 102,564 (75 x 13 cm), 148,148 (75 x 9 cm), and 190,476 plants/ha (75 x 7 cm), and sown alone at 200,000 plants/ha (50 x 10 cm), to determine the optimum bean density in association with maize. Yields were significantly reduced from 2125 kg/ha for monocropped beans to 875, 929, and 1178 kg/ha for the resp. plant densities in association, with no significant differences between the latter. Any of these plant densities could be used by farmers in a bean/maize association. [CIAT]

1571

- * MMBAGA, M.E.T. 1981. Relative dates of intercropping beans and maize. In . Bean agronomy progress report 1980-81. Tanzania, Research Institute Lyamungu. 3p.
Paper presented at the Grain Legume Co-ordinating Committee Meeting, Dar es Salaam, Tanzania, 1981.

Bean cv. Canadian Wonder was intercropped with maize in Lambo, Tanzania, to study the effect on yields of relative planting dates of both crops: beans planted 1 or 2 wk. before maize, simultaneously with maize, and 1 or 2 wk. after maize. Bean yields were significantly higher when beans were planted 1 or 2 wk. before maize (1125 and 1250 kg/ha, resp.) due to reduced competition for nutrients, moisture, and light during the early growth stages. Bean yields were significantly reduced when beans were planted on the same date as maize or 1 or 2 wk. later (308, 472, and 105 kg/ha, resp.). [CIAT]

1572

- * MMBAGA, M.E.T. 1981. Screening bean for maize bean association. In . Bean agronomy progress report 1980-81. Tanzania, Research Institute Lyamungu. 4p.
Paper presented at the Grain Legume Co-ordinating Committee Meeting, Dar es Salaam, Tanzania, 1981.

Twelve bean cv. were intercropped with maize in Lambo, Tanzania, to select bean germplasm suitable for bean/maize associations and improve land use efficiency in subsistence farming schemes. Bean yields were significantly different between the intercropped bean cv. (range 633-1017 kg/ha). Cv. P 311-A-L, Canadian Wonder, YC-2, T3, and T23 with 1017, 961, 939, 983, and 967 kg/ha, resp., could be suitable for associated cropping. [CIAT]

1573

- * MMBAGA, M.E.T. 1981. Time of sowing beans under rainfed conditions. In _____ . Bean agronomy progress report 1980-81. Tanzania, Research Institute Lyamungu. 4p.
Paper presented at the Grain Legume Co-ordinating Committee Meeting, Dar es Salaam, Tanzania, 1981.

Bean cv. Canadian Wonder was planted on different dates in Lambo (late March, early and late April, early and late May) and Arusha (late March, early and late April, early May), Tanzania, under rainfed conditions to determine optimum planting date. The av. yield for all planting dates in Lambo was 768 kg/ha, with the best yield obtained from the late March sowing (1677 kg/ha); the rest of the planting dates yielded poorly and were not significantly different. In Arusha, both the late March and early April plantings yielded significantly more than the rest (2147 and 1813 kg/ha, resp.) with an av. yield for all dates of 1467 kg/ha. Yields were reduced significantly as the planting date moved towards early May. [CIAT]

1574

- * MSANGI, R.B.; KAREL, A.K. 1984. Host plant resistance in common beans to beanfly (Ophiomyia phaseoli Tryon). In Minjas, A.N.; Salema, M.P., eds. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984. Proceedings. Tanzania, Sokoine University of Agriculture. pp.60-63. [Dept. of Crop Science, Faculty of Agriculture, Sokoine Univ. of Agriculture, P.O. Box 3005, Morogoro, Tanzania]

Twenty-one bean cv., obtained locally or from CIAT, were tested at Sokoine U. of Agriculture (Morogoro, Tanzania) in 1984 for their resistance to Ophiomyia phaseoli. A randomized complete block design with 4 replications was used. O. phaseoli infestation and damage assessment were based on ovipuncture counts, no. of larvae and pupae, stem damage, % of plant infected, and plant vigor. None of the cv. were completely resistant to O. phaseoli attack; cv. Chipulupulu and CB 137 had the least larval and pupal counts and were considered moderately resistant. There was no significant difference among the cv. in the no. of ovipunctures on leaves. Ovipuncture counts and leaf hairiness were negatively correlated, indicating that high leaf hairiness was associated with low ovipuncture counts. [CIAT]

1575

- * NDAMUGOBA, I. 1984. Performance of Phaseolus vulgaris at Maruku during 1984/1984 season. In Minjas, A.N.; Salema, M.P., eds. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984. Proceedings. Tanzania, Sokoine University of Agriculture. pp.18-20. [Tanzania Agricultural Research Organization, Marikitanda, P.O. Box 8, Amani, Tanga, Tanzania]

The results of the Tanzania Phaseolus bean uniform cultivar trial and the IBYAN-A (Carioca) and IBYAN-B (large red), carried out in Maruku, Tanzania, are briefly presented. In the 1st trial there was a significant difference in yield between var. Var. T23, AA/2/5/6, Tibihawa (local), YC-2, and RS-63-RM gave the best yields (1585, 1518, 1514, 1479, and 1318

kg/ha, resp.). Under IBYAN-A var. Tibihabwa (local check) gave the highest grain yield (1811 kg/ha); under IBYAN-B var. BAT 1254, T23 (local check), and BAT 1253 gave the highest yields, each with 1654 kg/ha. [CIAT]

1576

- * OKIOGA, D.M.; JAFFER, A.A. 1972. Studies on the efficacy of various systemic fungicides against bean rust, (Uromyces appendiculatus (Pers.) Lev.). Arusha, Tanzania, Tropical Pesticides Research Institute. Miscellaneous Report no.805. 13p.

The results of 3 expt. on the use of systemic fungicides against Uromyces appendiculatus affecting bean cv. Dutch Princess No. 200 are reported. In expt. 1, 8 fungicides (WL-24479, thiophanate, thiophanato-methyl, carbendazim, tridemorph, pyracarbolid, S-805, and U-8342) were compared with the standard oxycarboxin and an untreated control. All fungicides were applied approx. 30 days after planting and 10 days later. Pyracarbolid gave excellent control with a slight phytotoxic effect after the treatment, followed by oxycarboxin; the rest did not perform well. However, in terms of yields and postharvest seed germination, there were no significant differences between treated and untreated plots. In expt. 2, oxycarboxin (1.5 kg/ha) and triformine (500 ml/ha) were compared following the same application pattern as expt. 1. Both fungicides were significantly better than the untreated control in controlling the disease, with slightly better results from oxycarboxin. However, no significant differences were observed in terms of yields and seed germination between the treated and untreated plots. In expt. 3, the latter 2 fungicides were compared at double the rate but only 1 application 30 days after planting. The results were similar to those obtained in expt. 2. [CIAT]

1577

- * PALAPALA, D.K.; MISANGU, R.N.; GILL, B.S. 1984. National bean trial. In Minjas, A.N.; Salema, M.P., eds. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984. Proceedings. Tanzania, Sokoine University of Agriculture. pp.12-15. [Dept. of Crop Science, Faculty of Agriculture, Sokoine Univ. of Agriculture, P.O. Box 3005, Morogoro, Tanzania]

An expt. was carried out at Sokoine U. of Agriculture Farm (Morogoro, Tanzania) to evaluate the yield and yield components, growth habit, disease severity (BCMV and angular leaf spot), and seed color of 19 bean entries. Most of the var. outyielded the check var. Selian Wonder. Six var., TMO 223, TMO 214, TMO 197, TMO 124, TMO 101, and TMO 216, yielded 15% more than Selian Wonder. TMO 101 can be regarded as a promising var. as far as yield is concerned and it appears superior to Selian Wonder since it also suffered less from BCMV and angular leaf spot. [CIAT]

1578

- * QUENTIN, M.E. 1984. Investigation of existing storage techniques employed by bean farmers at Mgeta. In Minjas, A.N.; Salema, M.P., eds. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984. Proceedings. Tanzania, Sokoine University of Agriculture. pp.65-66. [Dept. of Crop Science, Faculty of Agriculture, Sokoine Univ. of Agriculture, P.O. Box 3005, Morogoro, Tanzania]

A survey was conducted in Mgeta (Morogoro, Tanzania) to determine the storage techniques utilized by farmers to prevent or reduce postharvest pest damage in dry beans. The 2 major bean var. grown in the area are Kenya and Kibwebwe; 61% of the interviewed farmers preferred growing Kenya

alone. One major reason for not storing bean seed is bruchid (Acanthoscelides obtectus) infestation. Over 80% of the farmers store their beans in gunny bags, which are kept within their houses. On the av. most farmers store 1-2 bags (70-90 kg) after harvest. [CIAT]

1579

- * QUENTIN, M.E. 1984. Progress report on bean research in Mgeta. In Minjas, A.N.; Salema, M.P., eds. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984. Proceedings. Tanzania, Sokoine University of Agriculture. pp.63-64. [Dept. of Crop Science, Faculty of Agriculture, Sokoine Univ. of Agriculture, P.O. Box 3005, Morogoro, Tanzania]

Research conducted in Mgeta (Morogoro, Tanzania) is discussed. This was carried out in 2 phases: problem identification and action or problem solving. During the 1st phase, major insect pests were identified, namely, Ophiomyia phaseoli, Maruca testulalis, Aphis fabae, A. craccivora, and Acanthoscelides obtectus; diseases commonly found were angular leaf spot and bean rust. The 2nd phase involved adaptation studies of local and introduced var. In 1982-83 bean var. Kabanima was introduced in Mgeta and tested for its adaptability to this region. Although it yielded better than the local var. Kibwebwe and Kenya, its cookability and palatability were lower. Additional trials were conducted to assess the effectiveness of ashes, vegetable oils, and insecticides in controlling A. obtectus. The best control was obtained with lindane 0.1% (9% of seed damage) compared with the untreated control (50%). [CIAT]

1580

- * RIYEMBE, S.M.S.; DOTO, A.L. 1984. Variation in seed yield of some common bean varieties in Tanzania and how some selected plant characters are related to seed yield. In Minjas, A.N.; Salema, M.P., eds. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984. Proceedings. Tanzania, Sokoine University of Agriculture. pp.15-18. [Dept. of Crop Science, Faculty of Agriculture, Sokoine Univ. of Agriculture, P.O. Box 3005, Morogoro, Tanzania]

An expt. was carried out in Ngerengere exptl. area of Sokoine U. of Agriculture (Morogoro, Tanzania) during the 1984 cropping season to evaluate the yield performance and the relationship between some selected plant characteristics and yield of 15 exptl. common bean var. The parameters days to 1st flower, no. of branches/plant, days to 50% pod maturity, and no. of pods/plant were negatively correlated to seed yield, while plant height and no. of seeds/pod were positively correlated to seed yield. Two entries, TMO 75 and TMO 35, performed better than others with yields of 1049.9 and 969.2 kg/ha, resp. [CIAT]

1561

- * SALEMA, M.P. 1984. Nodulating capability of bean lines bred for disease and insect resistance. In Minjas, A.N.; Salema, M.P., eds. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984. Proceedings. Tanzania, Sokoine University of Agriculture. pp.25-26. [Dept. of Soil Science, Faculty of Agriculture, Sokoine Univ. of Agriculture, P.O. Box 3005, Morogoro, Tanzania]

Twenty bean lines, considered by breeders as the most promising with respect to disease and pest resistance, were evaluated in the glasshouse for their ability to form nodules (infectiveness) and fix N (effectiveness) using 3 Rhizobium phaseoli strains (M424, 1380, and CIAT 632). All lines

formed nodules with 1, 2, or all 3 rhizobial strains. There was a marked line x strain interaction in both infectiveness and effectiveness. [CIAT]

1582

SEENAPPA, M.; ANANDAJAYASEKARAM, P. 1983. Economic and biological constraints in the production of beans (Phaseolus vulgaris L.) in Morogoro region. Morogoro, Tanzania.

1583

- * SENSENIG, B.; KAREL, A.K. 1984. Trainer's guide to improved cultivation of field beans in Tanzania. Morogoro, Tanzania, Centre for Continuing Education. 83p.

A complete training guide for improved bean production in Tanzania is presented, covering var., soil preparation, production practices, control of diseases (anthracnose, rust, and angular leaf spot) and insect pests (foliar beetle, bean fly, aphids, thrips, spotted borer, bollworm, and bruchids), and farm planning. Indications are given on how lessons should be prepared and followed, their resp. goals and objectives, and classroom and field aids. [CIAT]

1584

- * SENSENIG, B.; KAREL, A.K. 1982. Beans. Morogoro, Tanzania, Sokoine University of Agriculture. 2p.

Recommendations for disease and insect control, weeding, and fertilization in bean crops in Tanzania are briefly described. Also, a list of 5 var. recommended for planting is provided. [CIAT]

1585

- * SHAO, F.M. 1984. Bean pathology 1983-1984. Progress Report. Mbeya, Tanzania, Uyole Agricultural Centre. 15p.

Pathology research in beans in Tanzania during 1983-84 is reported. Colletotrichum lindemuthianum and Isariopsis griseola were not fully controlled by benomyl (0.55 g a.i./l) nor was Uromyces appendiculatus by mancozeb (3 kg a.i./ha) in Uyole and Mbimba, using var. T8, Kablanketi, and T3. In Uyole, significant yield losses (20%) were only caused by C. lindemuthianum in var. T8. In Mbimba, the other 2 diseases caused significant yield losses (18.5 and 25.6%) in Kablanketi and T3, resp. The results of seed selection trials with cv. T8 and Canadian Wonder at the same locations indicated that this practice could be a relatively effective tool to control seed-borne diseases (I. griseola and C. lindemuthianum). Studies on the identification of C. lindemuthianum races in the Southern Highlands indicated that the 14 inoculated pathotypes included races alpha, beta, gamma, delta, and kappa. Studies on planting time for optimum yields and lowest disease pressure indicated that for all cv. (T8, T3, Kablanketi, and Kabanima) the best planting season for highest yields is mid-March. In a trial to evaluate resistance to Pseudomonas phaseoli isolates, all 8 cv. showed symptoms 14 days after inoculation. [CIAT]

1586

SHAO, F.M. 1983. Bean pathology: research trials conducted during 1982/83 season. Mbeya, Tanzania, Uyole Agricultural Centre.

1587

- * SILBERNAGEL, M.J.; WANG, S.; MILLS, L. 1983. New strain of BCMV from Africa and Michigan. Bean Improvement Cooperative. Annual Report 26:10-11. [Washington State Univ., Irrigated Agricultural Research & Extension Center, P.O. Box 30, Prosser, WA 99350, USA]

One of the objectives of the Washington State U.-Tanzanian Bean Collaborative Research Support Program seeks to identify the strains of BCMV present in Eastern Africa in order to evaluate their potential threat to the U.S. bean-related industries and to help develop germplasm, breeding strategies, and control measures. In Nov. 1982, a seed-borne BCMV isolate was found in a Prosser greenhouse increase of a bean accession obtained from Tanzania. Bean breeders and seedsmen are advised to treat all new accessions for whatever source with caution until proven to be virus-free by a greenhouse growout test and a bioassay to a susceptible cv. like Sanilac. A combination serology and differential host assay is being developed to identify the new strain in fresh tissues or seed stocks. A list of susceptible and resistant cv. and breeding lines is being compiled. [CIAT]

1588

- * SWAI, P.E.; KESWANI, C.L. 1984. Economic importance of angular leaf spot of beans in Tanzania. In Minjas, A.N.; Salema, M.P., eds. Workshop on Bean Research in Tanzania, 3rd., Morogoro, Tanzania, 1984. Proceedings. Tanzania, Sokoine University of Agriculture. pp.71-72. [Dept. of Crop Science, Faculty of Agriculture, Sokoine Univ. of Agriculture, P.O. Box 3005, Morogoro, Tanzania]

A study was undertaken at Sokoine U. of Agriculture (Morogoro, Tanzania) to estimate crop losses caused by angular leaf spot of beans. A split plot design with 4 replicates was used, with 2 var. (Kabanima and Selian Wonder) as the main plots and fungicide treatments as subplots. The % of disease incidence and of disease severity were recorded 40, 43, 47, 54, 61, and 68 days after planting for both var., using a 0-10 scale. Also, the effect of the disease on yield and yield components was evaluated. Disease incidence was higher in Selian Wonder than in Kabanima (100 and 98%, resp., 68 days after planting); severity rated 9.4 and 4.9, resp. The disease caused reduction in all parameters studied. On wt. basis, crop losses were 273.5 and 52.2 kg/ha for Selian Wonder and Kabanima, resp. [CIAT]

1589

- TANZANIA. UYOLE AGRICULTURAL CENTRE. 1982. Kilimo bora cha maharagwe. Mbeya. Extension Booklet.

1590

- * TANZANIA. UYOLE AGRICULTURAL CENTRE. 1981. Agro-economic zones of Mbeya region. Mbeya, Tanzania. 52p.

A survey was carried out to provide a basic description and understanding of the present farming systems in the Mbeya region of Tanzania and to identify the major constraints hindering development. The region was divided into near homogeneous agro-economic zones. Each zone is described based on geographical features, climate and soils, crops and livestock, cash sources, land use, labor, extension and development plans, communal activities, agricultural related projects and services, agricultural development problems, and prospects. Beans are grown as an important food staple in 7 of the 8 zones identified. Beans are produced for consumption of both grain and leaves. [CIAT]

1591

- * TANZANIA. UYOLE AGRICULTURAL CENTRE. 1981. Bean breeding. In _____, Phaseolus Bean Research Programme. Progress report 1980-1981. Mbeya, Tanzania. pp.3-7.

Yields and yield component data of 16 cv. included in the 1981 bean uniform cv. trials in Lambo, Arusha, and Ismani (Tanzania) are presented and briefly discussed, as well as information on the crosses made to incorporate resistance to Colletotrichum lindemuthianum from C49242 into promising var. and to improve plant type and yield. The av. yields of the uniform cv. trials for the resp. sites were 2020, 1300, and 1411 kg/ha. [CIAT]

1592

- * URONU, A.B.; BUJULU, J. 1985. Chemical control of bean rust--1982 and 1983 trials. Arusha, Tanzania, Tropical Pesticides Research Institute. 6p. [Tropical Pesticides Research Inst., P.O. Box 3024, Arusha, Tanzania]

Nine and 10 fungicides were field tested in 1982 and 1983, resp., for their efficacy to control bean rust at the Tropical Pesticides Research Institute farm in Arusha, Tanzania. Bitertanol, triforine, oxycarboxin, and mancozeb were excellent in reducing the % of rust-infected leaflets in 1982. The others were, in general, satisfactory. Higher crop yields were obtained in the same year from plots sprayed with bitertanol, chlorothalonil, and oxycarboxin. In 1983, bitertanol, chlorothalonil, triforine, mancozeb, metiram, and a mixture of benalaxyl and mancozeb were the best in controlling bean rust. The best crop yield was obtained from plots sprayed with bitertanol, mancozeb, metiram, and benalaxyl. Mancozeb, metiram, and bitertanol performed as well as the fungicides already recommended for bean rust control. The remaining fungicides, which include Cu oxychloride, a mixture of benalaxyl and mancozeb, and a mixture of benalaxyl and Cu have to undergo further tests before approval. [AS]

1593

- WAIYAKI, J.N. 1972. Control of Aphis fabae (Scop.) and Heliothis armigera (Hb.) on seed beans (Phaseolus vulgaris) with Azodrin/DDT, ULV formulation. Arusha, Tanzania, Tropical Pesticides Research Institute. Miscellaneous Report no.791.

TUNISIA

1594

- * HABIB, M.H.; MOHAMED, B. 1985. Bean production in Tunisia. In Regional Workshop in Potential for Field Beans (Phaseolus vulgaris L.) in West Asia and North Africa, Aleppo, Syria, 1983, Proceedings. Cali, Colombia, Centro Internacional de Agricultura Tropical. pp.112-115. [Institut National de la Recherche Agronomique de Tunisie, 2080 Ariana, Tunisia]

Dry beans are a marginal legume crop in Tunisia, mainly grown for dry seed in the northern part of the country. Local production is far from meeting the needs of the country and imports have to be made to satisfy the demand. Production constraints have not been fully identified; lack of nodulation seems to be one of them. Other constraints such as diseases and pests have been reported. The following ones may be the most prevalent: BCMV, rust (Uromyces phaseoli), mites (Tetranychus spp.), anthracnose (Colletotrichum lindemuthianum), and alfalfa black aphid (Aphis craccivora). The main areas urgently requiring research are agronomic practices, microbiology, and genetic improvement. [CIAT]

UGANDA

1595

AKORO-ADOKO, C.H.T. 1971. Beans in Bunyoro. Bsc. Agric. Special project report. Uganda, Makerere University.

1596

- * BYARUHANGA, E.K.; MAKUMBI, O.H. 1972. Beans. In Uganda. Kawanda Research Station. Annual Report 1971-1972. Uganda. pp.126-131.

Entomology research activities in beans in Uganda in 1972 are summarized. An expt. was established with Banja 2 to assess the effects of the different combinations of insecticide (endosulfan) + fungicide (mancozeb) + fertilizer on bean yields. Treatments that included the insecticide showed a significantly lower no. of thrip nymphs and adults: 9.29 for insecticide alone from 50 flowers at random vs. 14.55 for the control at all sampling dates or 10.62 vs. 13.78, resp., considering all replications. Significantly fewer punctured dry pods were observed in plots treated with endosulfan + mancozeb and endosulfan + fertilizer. Diseased bean seed was lower for treatments with mancozeb: 1.90 vs. 4.19 for the endosulfan treatments. Treated seed appeared to produce higher av. yields than untreated seed (17.32 and 14.39 kg/plot, resp.), [CIAT]

1597

- * FIORES, G. 1972. Screening of various bean varieties for resistance to the different races of anthracnose (Colletotrichum lindemuthianum) (Sacc. & Magn) Scrib. In Uganda. Kawanda Research Station. Annual Report part 2, 1971-1972. Uganda. 2p.

The 1st and 2nd inoculation results of screening 18 bean var. each for resistance to isolates Kawanda 212, Kawanda 77, Long Tom, and Kyenjojo of Colletotrichum lindemuthianum in Uganda are presented in table form. Three replications were carried out per isolate and rated immune, highly resistant, fairly resistant, slightly susceptible, fairly susceptible, and highly susceptible. [CIAT]

1598

- * FOSTER, H.L. 1972. Elephant grass/arable rotation (1971). In Uganda. Kawanda Research Station. Chemistry Section. Annual Report part 2, 1971-1972. Uganda. pp.20-24.

The results of the Pennisetum purpureum-beans-maize rotational cropping cycle for 1971 in Uganda are presented. Bean var. Banja 2 was planted in the field after P. purpureum with 28 kg N/ha applied 3 wk. after planting. Av. yields for beans were 1558 kg/ha, with a significant response to the low N application. The residual P treatment from the P. purpureum field had a significant effect on bean yields. Reduced bean yields were obtained in plots where extractable P was below 10 ppm or extractable K below 18 mg/100 g. Leaf analyses indicated an increased Ca and P uptake by beans as a result of the high N and P residual levels. [CIAT]

1599

- * FOSTER, H.L. 1972. Permanent fertilizer trials (1971-72). In Uganda. Kawanda Research Station. Chemistry Section. Annual Report part 2, 1971-1972. Uganda. pp.1-7.

The results of 3-yr permanent fertilizer trials (1969-71) with beans, soybeans, maize, millet, sorghum, groundnuts, and cotton at 16 departmental stations in Uganda are reported. The most effective treatments on beans at 13 stations in 1971 are reported separately, always showing a positive yield response to NPK applications. In the 1st yr the av. yield across stations for fertilized beans was 1258 vs. 815 kg/ha for unfertilized beans; for the 2nd yr 1347 vs. 960, and for the 3rd yr 1513 vs. 966. In Bushenyi, no response to K was observed except in the 3rd yr (1314 vs. 157 kg/ha for the untreated beans). It is considered that the low response to K in the early years was due to a low level of other bases and hence a higher ratio of K to other bases. Beans are expected to produce higher yields when limed in soils with pH below 5.9. Responses to K are likely to occur in soils where the K:Ca ratio is less than 0.1. [CIAT]

1600

- * KAVUMA, J.B.K. 1972. Fertilizer extension trials on farmers' fields under the fertilizer development scheme. 2. Report of the period April 1971 - March 1972 (1971). In Uganda. Kawanda Research Station, Chemistry Section. Annual Report part 2, 1971-1972. Uganda. pp.25-27,39-42.

The effects of ammonium sulphate and single superphosphate applied to beans in farmer-managed plots in the districts of Ebuganda, Bunyoro, Masakka, and Kigezi (Uganda) are discussed. Fertilizer treatments were 134 and 268 kg N/ha, 134 and 268 kg P/ha, and 134 kg K/ha in all possible NPK combinations. Beans responded to all treatments but in Ebuganda a significant negative N x P interaction was observed. In Kigezi, a positive NPK interaction was significant at the 5% level. The av. yields for the resp. sites were 752 ± 33, 1821 ± 45, 1041 ± 26, and 1228 ± 41 kg/ha. [CIAT]

1601

- * KITUNGULU-ZAKE, J.Y.; NKWIINE, C. 1976. The effect of ash, calcium carbonate, and inoculation on nitrogen fixation and yield of beans (*Phaseolus vulgaris*) variety K₂₀. Kampala, Uganda, Makerere University. Soil Science Department. 13p.

To investigate the response of *Rhizobium*-inoculated beans of var. K₂₀ to 2 different liming materials (CaCO₃ and ash) in terms of nodulation, N fixation, and yield, and to determine whether the high K content of ash is responsible for its improved performance, an expt. was conducted on a deep, highly weathered, and leached Latosol at Makerere U., Uganda. The 5 treatments --T₁ control, T₂ CaCO₃ (3 t/ha), T₃ ash (3 t/ha), T₄ CaCO₃ + K, and T₅ K (268.8 kg/ha)--were arranged in a completely randomized block design with 5 replications. Oven-dried nodules from 20 plants after 44 days weighed 31.16, 16.6, 16.8, 3.62, and 3.84 micrograms for the resp. treatments, indicating that K had the highest depressive effect on this parameter. N contents in tops (20 plants) were 6.8, 6.5, 7.5, 5.1, and 5.2 g, resp., with ash contributing most, but not significantly; ash also produced the highest top dry wt. (200.4 g/20 plants after 44 days) compared with the rest (190.6, 177.8, 144.6, and 145.4 g for T₁, T₂, T₄, and T₅, resp.). Significant differences were also found for seed yield, the highest being for ash (566.6 g) followed by T₁, T₂, T₄, and T₅ (465.0, 438.0, 397.3, and 398.7 g, resp.). Liming these unproductive soils should not necessarily require a change in pH above 5.2. The interaction or balancing of major bases (Ca, Mg, and K) appears more important. The ashes from different sources in Uganda show a high % of K as well as a relatively balanced proportion of the major cations, and thus they are likely to perform better than CaCO₃. [CIAT]

- * LEAKEY, C.L.A. 1963. Bean pathology. In Uganda. Kawanda Research Station. Annual Report part 2, 1962-63. Uganda. pp.1-13.

Pathology research results in beans during 1962-63 in Uganda are summarized. Thirteen introductions were evaluated at 7 stations in the 2nd rains, and for each, a short reference is given on their origin and performance: resistance/susceptibility to Colletotrichum lindemuthianum, Isariopsis griseola, Ramularia deusta, and Ophiomyia phaseoli, plant and agronomic traits. A similar description is given for 22 promising bush bean var. and 27 semiclimbing/climbing bean var. as well as for 18 white-seeded beans possibly suitable for canning. Strains, resistance/susceptibility, and occurrence of C. lindemuthianum, I. griseola, Uromyces appendiculatus, R. deusta, Ascochyta phaseolorum, Erysiphe polygoni, and Xanthomonas phaseoli var. fuscans are discussed. [CIAT]

- * MUKASA, S.K.; MULINDWA, D.N.; SEKABEMBE, E.F. 1974. Bean breeding. In Uganda. Kawanda Research Station. Botany Section. Annual Report part 2, 1973-74 (Progress Report). Uganda. 14p.

The results of breeding research activities in beans in Uganda during 1973-74 are summarized. The bean breeding collection of approx. 400 entries was grown for maintenance; Colletotrichum lindemuthianum and Xanthomonas phaseoli incidence was observed. Yield results for all entries in the 1st, 2nd, and 3rd preliminary yield trials are given. Also summarized are data from the 4th and 5th preliminary yield trials in which promising material was found outyielding cv. K20. The reactions of 20 cv. to diseases caused by C. lindemuthianum, X. phaseoli, Phaeoisariopsis griseola, and Uromyces appendiculatus in a bulk trial are given. The results of district var. trials with 8 selected cv. are included. Cv. K20 has remained stable in both yields and reaction to diseases; however, many lines outyield K20. Bean breeding efforts should concentrate on improving the growth habit of these lines to overcome their main drawback of stained seeds due to diseases or seed rotting. [CIAT]

- * MUKASA, S.K.; MULINDWA, D. 1973. Bean breeding. In Uganda. Kawanda Research Station. Botany Section. Annual Report part 2, 1972/73. Uganda. 6p.

The bean breeding research activities conducted in Uganda in 1972-73 are summarized. Two USA var., resistant to bacterial blight, were introduced to the bean collection. The results of preliminary yield trials 2, 3, 4, 5, and 6 are briefly discussed, indicating improved selections over the controls. The yield results of 13 district var. trials are given; most of the lines outyielded the control K20 at most locations. [CIAT]

- * MUKASA, S.K.; ASEGA, J.J.; SEKABEMBE, E.F. 1972. Bean breeding. In Uganda. Kawanda Research Station. Botany Section. Annual Report part 2, 1971-1972. Uganda. 10p.

Bean breeding activities in Uganda during 1971-72 are summarized. The yields of the 250 accessions in the bean collection are given, with an indication of their maturity period. Lab. inoculation trials showed that var. K25 had good resistance to the alpha, beta, gamma, and zeta races of Colletotrichum lindemuthianum. Av. yield results over 2 seasons of the 1st

preliminary yield trial showed that 10 entries were 10-20% above Banja 2 (1428 kg/ha). In the 2nd preliminary yield trials all entries yielded from 1221 to 1947 kg/ha (70-112% over K19 which yielded 1746 kg/ha). The best yields in the district adaptation trials were obtained with K12, K19, K20, and K18 (1021, 1094, 1113, and 1138 kg/ha, resp.) representing 10% over Banja 2 (937 kg/ha). The haricot bean preliminary trial was affected by C. lindemuthianum and Uromyces appendiculatus; however, 20 entries outyielded the control No. 212 (156 kg/ha), ranging above it from 128 to 351%. [CIAT]

1606

- * MUKASA, S.K. 1966. French beans (Phaseolus vulgaris). Bean agronomy. In Uganda. Kawanda Research Station. Annual Report 1965-1966. Uganda. pp.19-22.

Agronomy research activities regarding French beans in Uganda during 1965-66 are summarized. Spacing trials with Banja 2 and Kawanda 35 were established; a standard population of 17,424 plants/ha and a spacing of 30.5 x 30.5 cm give the highest yield/ha. The yield consistently increased with increasing seeding rates in bush types. The spacings recommended are 61.0 x 7.6 cm for manual plantings and 66.0 x 7.6 cm for mechanical planting. The results of district spacing trials with Banja 2 indicated that av. yields across districts were highest for the 30.5 x 15.2 cm spacing (889.7 kg/ha), followed by the 61.0 x 7.6, 30.5 x 30.5, 61.0 x 15.2, and 61.0 x 2.5 cm spacings (878.4, 847.7, 829.5, and 695.4 kg/ha, resp.). [CIAT]

1607

- * MUKASA, S.K. 1966. French beans (Phaseolus vulgaris). Bean breeding. In Uganda. Kawanda Research Station. Annual Report 1965-1966. Uganda. pp.13-18.

Breeding activities in French beans in Uganda during 1965-66 are summarized. Thirty new introductions were received from the United Kingdom. To improve resistance to Colletotrichum lindemuthianum, crosses were made between the selections Banja 2, Kawanda 35, and Banja-Bukalasa and collection no. 77 and no. 160. In var. trial 1, none of the var. outyielded the control Banja 2 (873.9 kg/ha). In var. trial 2 which included 6 selections of Banja 2 x Bukalasa, a selection from Bukalasa, and Banja 2 (control), the yields of the selection were comparable with that of Banja 2 (752.3, 613.6, and 566.0 kg/ha for the 1st and 2nd season in Kawanda and the 2nd season in Bukalasa, resp.). In var. trial 3 with haricot var., some resistance to C. lindemuthianum was observed; Maruca testulalis was observed causing pod damage. Var. trial 4 included 2 white-seeded and 2 red-seeded selections from Tanganyika Black crosses. The av. yields of var. No. 68, Banja 2, Kawanda 35, No. 47, and No. 212 in district var. trials are given. Av. yields over 3 seasons for the 1st 4 were 702.3, 809.1, 985.2, and 930.7 kg/ha. The av. yield across districts for No. 212 in 1 season was 1094.3 kg/ha. [CIAT]

1608

- * MUKASA, S.K.; LEAKEY, C.L.A. 1965. Notes on grain legumes in Uganda. Uganda, Kawanda Research Station. 6p.
Paper presented at First F.A.O. Technical Meeting on Improvement of Vegetable and Grain Production in Africa, 1965.

General aspects of French bean and groundnut cultivation in Uganda are briefly discussed. Bean var. used vary in maturity from 75 to 90 days, and most beans are intercropped for fresh consumption. Bush types are more

popular but lower yielding and more susceptible to diseases. Climbing types are generally disease resistant with higher yields but only popular in Kigezi district, intercropped with sorghum. Semiclimbing types are intermediate. Breeding work is still in the initial stage. Av. yields fluctuate from 0 to 1122 kg/ha. The most important pathogen is Colletotrichum lindemuthianum, followed by Pseudomonas medicaginis var. phaseolicola, Xanthomonas phaseoli var. fuscans, Phaeoisariopsis griseola, and Uromyces appendiculatus. No major pest has been recorded. Thirty-eight bean cv. that have been evaluated in Uganda are listed, with notes on seed characteristics, use, growth habit, and disease reaction. P. lunatus is also grown in Uganda but to a much lesser extent. [CIAT]

1609

- * MUKASA, S.K. 1963. Phaseolus beans: plant breeding. In Uganda. Kawanda Research Station. Annual Report 1962-1963. Uganda. pp.21-39.

Research results in bean breeding, agronomy, and pathology during 1962-63 in Uganda are summarized. A brief description is given of 4 var. introduced from Australia (Sanilac, California Small White, Redlands Green leaf, and Redlands Beaty), 2 from Holland (Beka and Berna), and 2 from USA (Cornell 49-242 and 59-369), regarding disease resistance/susceptibility. None will be directly useful but some will be of value for future breeding. The Kawanda collection containing local var. now has 211 bean types. A new Colletotrichum lindemuthianum strain was observed in Kawanda. Yield results of trials carried out at Kawanda and Bukalasa during the 1st and 2nd rains are given. Five different spacing/seeding rates were compared in Latin-square trials at Kawanda and Bukalasa. Thirteen introductions were evaluated at 7 stations and for each, a short reference is given on their origin and performance: resistance/susceptibility to C. lindemuthianum, Isariopsis griseola, Ramularia deusta, and Ophiomyia phaseoli, plant and agronomic traits. A similar description is given for 22 promising bush bean var. and 27 semiclimbing/climbing bean var. as well as for 18 white-seeded beans possibly suitable for canning. Strains, resistance/susceptibility, and occurrence of C. lindemuthianum, I. griseola, Uromyces appendiculatus, R. deusta, Ascochyta phaseolorum, Erysiphe polygoni, and Xanthomonas phaseoli var. fuscans are discussed. [CIAT]

1610

- * MUKASA, S.K. 1963. Report on the position of Tanganyika Black Beans in Eastern Region, October 1963. Uganda, Kawanda Research Station. 3p.

Interviews made to agricultural officers, farmers, wholesalers, and consumers on the status of bean var. Tanganyika Black Beans in the Eastern Region (Busoga and Bukedi) of Uganda are reported. Although the var. has many desirable characteristics, it is unacceptable due to its black color. Market limitations should be considered when promoting this bean in areas where farmers accept the var. The work on crosses between this var. and nonblack var. will be continued. [CIAT]

1611

- * MUKASA-KIGGUNDU, A.A. 1975. Soil survey and land use. In Uganda. Kawanda Research Station. Chemistry Section. Annual Report part 2, 1974/75. Uganda. pp.1-3,6-8,15-17.

Soils at the Namulonge Research Station, Uganda, are described regarding morphological features, chemical and physical properties (soil units I, II,

III, IV, V, and VI), and suitability of soil units for crop production. Soil unit I is moderately fertile in which beans would do well. [CIAT]

1612

- * MUKASA-KIGGUNDU, A.A. 1974. Soil survey and land use. In Uganda. Kawanda Research Station. Chemistry Section. Annual Report part 2, 1973-74. Uganda. pp.1-2,20-22.

Soils of the Serere Research Station, Uganda, are described; general data on location, climate, vegetation, soil units, and land use is included. Beans are one of the crops cultivated at this site. [CIAT]

1613

- * MUKASA-KIGGUNDU, A.A. 1973. Permanent fertilizer trials. In Uganda. Kawanda Research Station. Annual Report 1972-1973. Uganda. pp.14-15.

The results of permanent fertilizer trials with cotton, beans, groundnuts, maize, and soybeans, initiated in the 1st season of 1972 in several regions of Uganda, are presented. The highest bean yield in the 1st season (1252 kg/ha) was obtained with 250 kg single superphosphate + 500 kg calcium ammonium nitrate/ha (13.1% over control-1107 kg/ha). [CIAT]

1614

- * MULINDWA, D. 1974. Seminar on breeding for disease resistance in beans in Uganda, 1974. Uganda, Kawanda Research Station. 5p.

A brief summary of the breeding work for resistance to diseases in beans, especially to Colletotrichum lindemuthianum, in Uganda is presented. Past work on disease resistance has concentrated on the collection of local var. for screening in Kawanda, the selection within existing var. and crosses, the introduction of resistant var., the hybridization to transfer resistance to acceptable var., and the testing of materials under field and lab. conditions. Breeding for resistance to C. lindemuthianum has aimed at identifying and transferring the Are gene of immunity to commercial var.; the formation of disease-resistant bean var. K20 is graphically shown. The reactions of 8 var. to the alpha, beta, gamma, delta, and zeta races of C. lindemuthianum are indicated. Other major diseases in Uganda include Uromyces appendiculatus, Isariopsis griseola, Pseudomonas phaseolicola, Xanthomonas phaseoli var. fuscans, X. phaseoli, Erysiphe polygoni, and viruses. [CIAT]

1615

- * MULINDWA, D. 1965? Breeding for disease resistance in beans in Uganda. Uganda, Kawanda Research Station. 7p.
Paper presented at Annual Technical Conference for Research Workers.

Breeding work on disease resistance in beans in Uganda and results obtained are presented, including a brief description of diseases caused by Colletotrichum lindemuthianum, Pseudomonas phaseolicola, Xanthomonas phaseoli var. fuscans, X. phaseoli, Isariopsis griseola, Uromyces appendiculatus, Ascochyta phaseolorum, Erysiphe polygoni, and Sclerotinia sclerotiorum. Local var. Banja 2, with resistance to all races of C. lindemuthianum except the gamma race, is recommended. Among the germplasm introduced from several countries, Michelite, Red Kidney, Perry Marrow, and Emerson 847 have been widely used to determine anthracnose race distribution in the country. Breeding work has concentrated on resistance to C. lindemuthianum and multiple crosses have been made. Strains alpha,

beta, gamma, delta, zeta, and epsilon have been detected. The methodology used for testing reactions to C. lindemuthianum is briefly discussed; testing conditions need to be standardized in order to obtain more accurate and uniform results. [CIAT]

1616

MUSIKWE, W.; MULINDWA, D.; SENGGOBA, T.; WANYERA, N. 1984. Proposed research project for investigation of the nutritional qualities of beans from Uganda.

1617

- * NGATEGIZE, P.K. 1985. Bean/cowpeas in Uganda: a preliminary subsector report. Final report. East Lansing, Bean/Cowpea Collaborative Research Support Program. Michigan State University. 35p. [Bean/Cowpea Collaborative Research Support Program, Michigan State Univ., East Lansing, MI 48824-1035, USA]

Data on bean and cowpea production in Uganda (cultivated area and production trends) are presented in table form. Crop requirements, agronomic practices, and multiple cropping systems are described for both crops. The major production constraints are discussed, among which are the lack of extension services, poor marketing infrastructure, lack of suitable var., and pest and disease pressure. The role of cooperatives, the private sector, and the national programs is discussed. Bean and cowpea consumption and their nutritional quality are analyzed, and several Phaseolus vulgaris cv. are described. [CIAT]

1618

- * NGATEGIZE, P.K. 1985. Bean research in Uganda: research structure, status and constraints. East Lansing, Bean/Cowpea Collaborative Research Support Program. Michigan State University. Report no.2. 36p. [Bean/Cowpea Collaborative Research Support Program, Michigan State Univ., East Lansing, MI 48824-1035, USA]

The structure of agricultural research in Uganda, the status of the bean research program, and the plans that should be emphasized for revitalizing the bean/cowpea subsector in Uganda are discussed. Detailed information is presented on the distribution of the main insect pests and diseases of beans as well as their control measures. [CIAT]

1619

RITA, L.O. 1984. Background on Uganda: with special reference to bean production. East Lansing, Bean/Cowpea Collaborative Research Support Program. Michigan State University.

1620

RWAKAKAIRE, M. 1972. Beans in Bunyoro. Bsc. Agric. Special project report. Uganda, Makerere University.

1621

- * SENGGOBA, T. 1981. [Bean pathology]. In Uganda. Kawanda Research Station. Annual report for first and second season 1981. Uganda. 6p.

Two bean pathology expt. conducted in 1981 in Kawanda, Uganda, are reported. Expt. 1 was set up with 135 promising lines in microplots under

field conditions to evaluate the incidence and severity of major bean diseases on a 1-5 scale (1 = no infection, 5 = high infection). The av. score for Colletotrichum lindemuthianum in the 1st season was 2.0 with only 13% of the var. infected; Xanthomonas phaseoli and Isariopsis griseola occurred in 95 and 96% of the var., resp., with av. infection scores of 1.4 and 2.2, resp. Ramularia deusta, Uromyces appendiculatus, and viruses occurred in 77, 64, and 13% of the var. with av. scores of 2.0, 1.3, and 2.0, resp. X. phaseoli and I. griseola were again the most prevalent (100 and 98% of the var., resp.) during the 2nd season with av. scores of 1.9 each. In expt. 2, K20 was sprayed with benomyl at different dates. Benomyl controlled I. griseola and R. deusta, but not U. phaseoli. This product is no longer suitable in Kawanda when U. phaseoli incidence is expected; thus, it should be used in combination with other fungicides. [CIAT]

1622

- * SENGGOBA, T. 1979. Bean pathology. In Uganda, Kawanda Research Station. Plant Pathology. Annual Report part 2, 1978-79 (Progress Report). Uganda, 14p.

A series of 4 bean pathology expt. were conducted under lab. conditions to determine optimum germination conditions for Phaeoisariopsis griseola. Of 5 conidial concn. tested (1 million, 500,000, 250,000, 125,000, and 62,000 conidia/ml of suspension), a standard 100,000 conidia/ml concn. was selected for highest germination and use in additional expt. Lactose at 0.5% concn. was selected among other nutrient solutions for showing the highest av. conidial germination (56.7%) after incubation periods of 6, 12, and 18 h; higher or lower lactose concn. reduced germination. Conidial germination in lactose was highest at 20 and 25°C (83.8 and 87.5%, resp.). The highest av. germination was 67.5% after 12 h of incubation. [CIAT]

1623

- * SENGGOBA, T. 1978. Bean pathology. In Uganda, Kawanda Research Station. Plant Pathology. Annual Report part 2, 1977-78 (Progress Report). Uganda, 22p.

Pathology research activities in beans in Uganda during 1977-78 are presented. Morphology, pathogenicity, and control studies of Phaeoisariopsis griseola, as well as observations on Colletotrichum lindemuthianum, were conducted. Leaf samples from bean cv. from areas in Kawanda were collected for the morphology and pathogenicity studies. Mean conidia length and width were 37.9-57.0 microns and 5.7-6.6 microns, resp. The no. of septa/conidia ranged between 0-7, but most (56.5-62.6%) had 3 septa. Coremia length varied between 150-620 microns. The av. no. of conidiophores in the coremia was 22.8, 20.0, and 23.3 from samples collected in Kawanda, Mubuku, and Macwekano, resp. No morphological types could be identified. A specific cv./pathogen relationship is suggested. Variations in pathogenicity of P. griseola were studied for 20 isolates in cv. 78, 79, K20, 68, 25, and 132. Three pathotypes were detected: 1 attacking all cv., 1 attacking all except 78 and 79, and 1 attacking all except 78. Chemical control studies indicated that 4 weekly sprays of benomyl starting 3 wk. after planting is the min. no. of applications required to control P. griseola. C. lindemuthianum incidence was reduced gradually during 1977-78 since it is possible that the continuous planting of clean seed reduces the primary inoculum. [CIAT]

- * SENGOOBA, T. 1977. Bean pathology. In Uganda. Kawanda Research Station. Plant Pathology. Annual Report part 2, 1976-1977 (Progress Report). Uganda. 8p.

Pathology research activities in beans in Uganda during 1976-77 are presented. Soil and straw transmission studies as well as chemical control studies of Phaeoisariopsis griseola are reported. Freshly infected soil transmitted angular leaf spot but naturally infected soil stored for 3 mo. did not. Straw 3-6 mo. old transmitted the disease, while 9-mo.-old straw did not. To identify a suitable fungicide to control the disease, mancozeb, benomyl, and triphenyltin acetate were compared at different rates and application frequencies. Benomyl at the commercial rate and in weekly sprays gave best control, followed by triphenyltin acetate and mancozeb. The severity of the alpha race of Colletotrichum lindemuthianum was greater than that of the gamma race. [CIAT]

- * SENGOOBA, T. 1976. Bean pathology. In Uganda. Kawanda Research Station. Plant Pathology. Annual Report part 2, 1975-76 (Progress Report). Uganda. 10p.

Pathology research activities in beans in Uganda during 1975-76 are presented. Studies on seed transmission, disease incidence and severity, and chemical control of Phaeoisariopsis griseola are reported. A range of 69-72% infected seeds was observed for the group of seeds obtained from under pericarp lesions covering the pod suture; infection was recorded in 15-22% of the seedlings raised from these seeds. The site of seed infection was confirmed to be the hilum. Fifteen bean cv. were planted at 4 different sites to evaluate P. griseola incidence and severity. The disease developed the latest in resistant cv. such as 78 and 79. Mancozeb, benomyl, and triphenyltin acetate were compared as to their efficacy to control P. griseola; however, Uromyces appendiculatus and Sclerotinia sclerotiorum also occurred. Benomyl and triphenyltin acetate at weekly applications maintained P. griseola incidence low, U. appendiculatus was better controlled by mancozeb and triphenyltin acetate, and S. sclerotiorum was equally controlled by all 3 fungicides at weekly or bi-weekly applications. Disease microplots showed all 3 diseases and Xanthomonas phaseoli, the latter being most severe together with P. griseola. Colletotrichum lindemuthianum was recorded on only 13 of the 220 bean cv. tested and rated severe only on cv. No. 116. [CIAT]

- * SENGOOBA, T.; SSALI, C.K. 1974. Bean pathology. In Uganda. Kawanda Research Station. Plant Pathology. Annual Report part 2, 1973-74 (Progress Report). Uganda. 6p.

Pathology research activities in beans in Uganda during 1973-74 are summarized. Disease microplots indicated that Colletotrichum lindemuthianum incidence was low at all locations (Kawanda, Kyembogo, Kakumiro, and Kacwekano); a genotype x pathotype x environment interaction is suggested. The C. lindemuthianum nurseries are briefly described. Spraying foliage alone, without seed dressing, would be sufficient to protect the crop against foliage diseases. [CIAT]

- * SENGOOBA, T.; SSALI, C.K.; LUBOWA, C. 1973. Bean pathology. In Uganda. Kawanda Research Station. Annual Report 1972-1973. Uganda. pp.46-63.

Pathology research activities in beans in Uganda during 1972-73 are summarized. Best cv. from disease microplots, showing no Colletotrichum lindemuthianum infection, are listed. A mixture of alpha, gamma, and zeta races of C. lindemuthianum was detected in cv. Banja 2, K2, K20, and No. 35. Rands 0-5 scale to score disease infections was modified to include a 7th level (01) of infection. A cooler was used to assess infection levels under lab. conditions, maintaining the temp. between 18-23°C and a RH of 100%; results indicated that if K20 was used as the tester plant, level 3 of infection should be allowed for comparison of cv. Three methods for scoring diseases in the field are compared. Fourteen cv. were evaluated for their reaction to the gamma race of C. lindemuthianum in the Banja anthracnose nursery. Dressing bean seeds with a fungicide resulted in better stands, but this was not reflected in the final yields. [CIAT]

1628

- * SENGGOBA, T.N. 1985. The incidence and severity of the major diseases of beans in Uganda. Bean Improvement Cooperative. Annual Report 28:7-8. [Kawanda Research Station, P.O. Box 7065, Kampala, Uganda]

The incidence and severity of the 4 major diseases of beans (anthracnose, rust, bacterial blight, and angular leaf spot) in Uganda were assessed during 2 cropping seasons. Data were collected from 131 bean cv. grown in microplots at 4 locations (Kacwekano, Kyembogo, Kawanda, and Rubare). The analyses were done using the Chi-square test. Results indicated that angular leaf spot and bacterial blight are the most prevalent and severe diseases of beans in Uganda. [CIAT]

1629

- * SENGGOBA, T.N.; MUKIIBI, J. 1980. Studies on the transmission of angular leaf spot of beans caused by Phaeoisariopsis griseola in Uganda. Uganda, Kawanda Research Station. 17p.

The transmission of angular leaf spot (Phaeoisariopsis griseola), a major problem of beans in Eastern Africa, was investigated. The causal fungus was seed-borne in all the cv. tested. The fungus caused seed discoloration but not all infected seeds were discolored. Seed to seedling transmission was low. The fungus survived in infected straw for a max. of 9 and 4-6 mo. under indoor and outside conditions, resp. Under soil, the fungus survived for only 2 mo. Infected off-season crops and volunteer plants were present at the time of planting, being an obvious source of the inoculum. Off-season crops, volunteer plants, and infected seeds were more important sources of infection than the infected bean straw. [AS]

1630

- * SENGGOBA, T.N.K. 1980. Angular leaf spot disease of beans (Phaseolus vulgaris L.) caused by Phaeoisariopsis griseola (Sacc.) Ferr. in Uganda. Mag.Sc. Thesis. Kampala, Uganda, Makerere University. 291p.

A study was undertaken at Kawanda Research Station (Uganda) to investigate the pathogen Phaeoisariopsis griseola, host and environmental factors which affect the development of angular leaf spot disease, and how it can be controlled. The studies revealed that although conidia of P. griseola germinate in water, they germinate faster and more completely in nutrient solutions. The highest germination was recorded when 10^7 conidia/ml were germinated in a 0.5% solution of lactose at 25°C. The fungus grew and sporulated best on PDA and bean agar, resp., under alternating dark and light periods than under either continuous light or darkness. Conidia germinated and entered the host through the stomata. Disease severity was

found to vary with the cv., the age of the crop, and with the environmental conditions. Infected off-season crops and volunteer plants can be a source of the primary inoculum. Benomyl was the most effective fungicide for control as compared with triphenyltin acetate and mancozeb. [AS (extract)]

1631

- * SIMBWA-BUNNYA, M. 1973. Part of a preliminary report on fungicidal trials on beans at Kawanda. In Uganda. Kawanda Research Station. Annual Report 1972-1973. Uganda. pp.1-2.

A randomized block design consisting of 6 blocks with 5 plots each was used to compare various fungicide treatments for their ability to control diseases in bean var. Banja 2. These were control, benomyl 50 WP, thiabendazole 90 W/W, mancozeb M 45, and captafol 80W at commercial rates. Disease scores are presented for Uromyces appendiculatus, Sclerotinia sclerotiorum, and Isariopsis griseola. While the control was rated 4.75, 4.50, and 5.00 (1 = no infection, 5 = severe infection) for the resp. diseases, all beans treated with fungicides were rated below 2.50 to as low as 1.42 (recorded for both S. sclerotiorum and I. griseola). Yields for treated beans were also significantly higher than the control's. [CIAT]

1632

- * SIMBWA-BUNNYA, M.N. 1966. French beans (Phaseolus vulgaris). Bean pathology. In Uganda. Kawanda Research Station. Annual Report 1965-1966. Uganda. pp.23-28.

Pathology research activities in French beans in Uganda during 1965-66 are summarized. The methodology used to identify Colletotrichum lindemuthianum races is described. The reactions of 19 differential var. to the race groups known in Europe and to 4 Uganda isolates (Namulonge 35, Var. Harvester, Ex Kooki, and Kakumiro 35) are indicated as well as the reactions of the Uganda isolates considered on the Schreiber set of differentials (Emerson 847, Perry Marrow, Michelite, Dark Red Kidney), and on the Bannerot Blondet differentials (Immune, Kaboon, Coco a la creme, Widusa, Michelite). Also included are the var. reactions to the different isolates tested in Kawanda. Bush, climbing, and semiclimbing accessions which are immune, tolerant, or only attacked at 1 of 6 stations by C. lindemuthianum and Uromyces appendiculatus are listed. Other diseases observed were those caused by Ramularia deusta and Ascochyta phaseolorum. [CIAT]

1633

- * UGANDA. KAWANDA RESEARCH STATION. 1971. Bean breeding. In _____. Annual Report 1970-71. Uganda. pp.10-12.

Breeding activities in beans in Uganda during 1970-71 are summarized. Over 200 accessions were evaluated for yield during the 1st season. The 10 crosses made during the year and their F₁ grown during the 2nd season are listed. Short notes on origin and performance (disease resistance and yields) of 8 basic parent collections used in hybridization are provided. BYMV-like symptoms were observed in over 1300 single-plant selections from various crosses. In preliminary yield trials in Bukalasa and Kawanda, several selections yielded significantly more than cv. Banja 2. District var. trials have not rendered many high yielding, acceptable bean var. and even these need further improvement. K20 appears promising, with higher yields than Banja 2 and resistant to Colletotrichum lindemuthianum. [CIAT]

- * UGANDA. KAWANDA RESEARCH STATION. 1971. Bean collection yields (kg/ha). In _____ . Annual Report 1970-71. Uganda. pp.13-17.

Av. yields in 1970-71 of 58 accessions in the Uganda bean collection, as well as those of 26 var. in the 1st preliminary var. trial, 18 var. in the 2nd preliminary var. trial in Kawanda and Bukalasa (1st and 2nd season), and 26 var. in the 3rd preliminary var. trial, are given in tables. Tables with av. plant stands and yields of var. trials for districts are also included. [CIAT]

1635

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1961. Haricots. (Beans). In _____. Rapport Annuel 1960-1961. Zaire, Station de M'Vuazi. pp.11-22.

Results are presented of comparative trials with bean var., planting times, and cultural practices carried out during 1960-61. In a comparative trial with 15 var. in recent alluvial M'Vuazi-type soils, all of the var., with the exception of 28/59, were superior to the local control Tuta (349 kg/ha); PV 40 (local Kimpese) was the best with 718 kg/ha. In another comparative trial in old alluvial Bundu rico-type soils all 7 var. outyielded Tuta, but their seeds were very small. It was found that the best planting date was June 6th. The influence of seed size in var. Tuta was studied and it was concluded that mass selection for large grains was better than those for mixed or small grains. Various cultural trials were carried out without any definite results; however, it was observed that planting on the flat was better than planting on ridges. The possibilities of continuous cropping in recent alluvial soils is being studied at the pilot exptl. unit through crop rotation and fertilization. [CIAT]

1636

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1961. Haricots. (Beans). In _____. Rapport Annuel 1961. Zaire, Station de Mulungu. pp.92-104.

Information is given on the collection of Phaseolus vulgaris var., comparative trials with differently colored seeds, multiplication (180 bush var. and 83 climbing var.), pedigree selection, and local trials in Zaire during 1961. Of a total of 226 introductions, 149 came from Rwanda. Among the white-seeded bush var., S.N. 2792 outyielded the control Nain de Kyondo (1640 and 1510 kg/ha, resp.). Among the black-seeded var., Caraota 2784 and Kaiko Ini outyielded the control S.G. 44 (1895, 1880, and 1625 kg/ha, resp.). Various yellow-seeded var. outyielded the control Ibundu (635 kg/ha); among them are Lunage 3548 and Prov. Languy (1470 and 1405 kg/ha, resp.). The red-seeded var. Colorado 3394, Kisola, and Colorado 2783 outyielded Caraota with 1345, 1335, 1315, and 1230 kg/ha, resp. Regardless of seed color, smaller seeds guarantee higher yields. The best climbing bean var. was 295 (C. 49), which yielded 1879 kg/ha. The correlation between yield and seed size was lower for climbing var. Artificial hybrids are being selected with Ibundu as the female parent and S.G. 44, Colorado, and P. coccineus as the male parents. [CIAT]

1637

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1960. Haricots. (Beans). In _____. Rapport Annuel 1960. Zaire, Station de Mulungu. pp.89-96.

Information is presented on collection, var. selection, and comparative bean trials at Mulungu Station, Zaire, during 1960. Fifteen var. from southern Kivu and Rwanda were introduced. Disease resistance is a priority criterion in selection, and stable yields are considered more important than increased av. yield. The most outstanding selections are those presenting higher yields without fungicide application (A), followed by those with higher yields with fungicide application (B). Crosses will be made between A and B selections. In comparative trials, only S.G. 44 (black) showed acceptable performance under unfavorable conditions

(Melanagromyza phaseoli and rust) and was the most outstanding when the fungicide zineb was applied. A total of 185 pedigree lines were kept. Successful interspecific hybridization resulted only when the female parent was Phaseolus vulgaris. The best genetic sources are black var., but these are rejected by consumers. It is recommended to anticipate the selection of sources in the hybridization program to reduce crop areas. [CIAT]

1638

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1960. Phaseolus et legumineuses diverses. (Phaseolus and diverse legumes). In _____ . Rapport Annuel 1960. Zaire, Station de Nioka. pp.14-15.

Data are presented of bean yields during the 1st cropping season for several years (1956-59) at Nioka Station, Zaire. In relation to the check Cuarentino H.6 (theoretical yield of 1670 kg/ha in 1960), var. Mixed Mexico, Kachebeye, PC 78, and Black Mexico were outstanding. The multiplication of navy beans and Phaseolus coccineus continued. [CIAT]

1639

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1959. Annexe haricots: généralités sur les essais en C.E.L. (Annexes on beans: general aspects of trials at C.E.L.). In _____. Rapport Annuel 1959. Zaire, Station de Mulungu. pp.4-18.

Tables are included with yields obtained, yield % in relation to the control, and significative differences for the various bush var. evaluated in Zaire in the localities of Bataillon (1150 m.a.s.l.), Kadjudju (1550), Musienene (1800), Kisuma (1800), Vuhovi (1830), Ikoma (1930), Fendula (2170), and climbing var. evaluated in Musienene (1800) and Luhotu (2200) during 1959. The most outstanding bush var. were Colorado (700 kg/ha), Beurré d'Alger (999 kg/ha), Ibundu (1675 kg/ha), local (1166 kg/ha), Ibundu (1845 kg/ha), Colorado (192 kg/ha), S.G. 44 (1053 kg/ha) in the localities of Bataillon, Kadjudju, Musienene, Kisuma, Vuhovi, Ikoma, and Fendula, resp. The most outstanding climbing var. were Muhuta (2295 kg/ha) and Irumu (3027 kg/ha) in Musienene and Luhotu, resp. Some methodological aspects were evaluated. In relation to the total protection test against thrips and rust, it was verified that the increases in yield and improved quality were due to the use of fungicides, especially 65% zineb. The effect of insecticides was limited. There were no differences among 3 application frequencies of fungicide. Three applications of zineb are recommended at 7-day intervals, 21 days after planting. Zineb efficiently protected the local var. mixture. Data on ecology and intensity of rust attack are presented. [CIAT]

1640

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1959. Haricots. (Beans). In _____. Rapport Annuel 1959. Zaire, Station de Mulungu. pp.84-89.

Data and conclusions are presented on the var. collection and on comparative and local bean trials at Mulungu Station, Zaire, during 1959. Twenty var. were introduced in multiplication trials. Severe damage was caused by rust, Ascochyta, and Phytophthora phaseoli. For the 10 var. evaluated in comparative trials, data are included (in tables) on yield (kg/ha), % yield in relation to the control, significance level at 1 and 5%, grain color, vigor, earliness, and degree of disease damage. Highest yielding var. were black seeded (S.G. 44, Kaiko Ini, and Wulma with yields of 830, 695, and 435 kg/ha, resp.), with the exception of Beurré d'Alger

(221 kg/ha). Planting date and yield of var. included in bush and climbing bean var. trials in different localities and alt. are given. In the comparative var. multiplication trial, the best were Caraota 37, Colorado 29, Bayo 01278, Manteigao Preto, and Bayo 164 (bush) and no. 21 Aa, Rames, Eria Vaganda 65, and Cuarentino 01010 (climbing). Climbing var. were not more productive than bush var. Material from Kisozi Station is promising. The hybrid Ibundu x Phaseolus coccineus was successful. Results of local trials are summarized in tables. Overall, bush selections outyielded local bush var., except for Kisuma. In North Kivu climbing var. Muhuta and Kasali head the selection. [CIAT]

1641

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1959. Haricots. (Beans). In _____. Rapport Annuel 1959. Zaire, Station de M'Vuazi. pp.53-58.

Results and preliminary conclusions of bean expt. are presented for 1959 in the M'Vuazi Station, Zaire. White-seeded var. Cuarentino was the best of the collection of 25 var. planted during the long dry season, yielding 1047 kg/ha. Twenty pedigree lines were selected from the local var. Tuta. The colored-seeded var., not appreciated in the region, outyielded Tuta in a comparative trial. Information is given on rotation expt. with maize, rice, peanuts, and beans. A retroactive effect of the applied fertilizer was observed on bean crops. The possibility of an associated continuous crop on recent alluvial M'Vuazi-type soils was studied, with mulching during the 1st yr and mineral fertilization after the 2nd yr. Beans were planted on the flat and on ridges in a rotational system following maize; the 1st system proved to be better. [CIAT]

1642

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1959. Haricots. (Beans). In _____. Rapport Annuel 1959. Zaire, Station de Ndihira. pp.13-16.

Results are presented on trials carried out at Ndihira Station, Zaire, during 1959. In a preliminary trial with 15 bush bean var., var. Mixed 0330 outyielded the control Mixed Mexico (2152 and 1673 kg/ha, resp.). In comparative trials with 4 black-seeded var., Kaiko Ini produced 3354 kg/ha, outyielding the rest of the var., but in a previous trial this var. was outyielded by Beurré d'Alger (1709 and 1822 kg/ha, resp.). Results of 3 yr are presented for var. Kaiko Ini, Beurré d'Alger, and S.G. 44 (Mulungu). In Capsa de Luhotu, var. Nain de Kiondo and Bayo, with 1986 and 1707 kg/ha, resp., were the most outstanding. Climbing bean hybrids no. 948 and 950 outyielded the control Kasali (2380, 2265, and 1756 kg/ha, resp.). In comparative trials, var. Lubono, Kasali, and Muhuta (2480, 2430, and 2040 kg/ha, resp.) were the most outstanding. Var. Irimu outyielded these 3 var. in Capsa de Luhotu, reaching a yield of 2948 kg/ha. In trials with Phaseolus coccineus, the most outstanding hybrids were Kisozi no. 2 and no. 5, and Luhotu no. 77. Yields of these var. since 1956 are summarized. [CIAT]

1643

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1959. Phaseolus et legumineuses diverses. (Phaseolus and diverse legumes). In _____. Rapport Annuel 1959. Zaire, Station de Nioka. p.13.

The yields of 19 bean var. cultivated in 1959 at Nioka Station, Zaire, are presented in table form. In relation to the check Cuarentino H.6

(theoretical yield of 2862 kg/ha), the best av. corresponded to var. PC 78, Kachebeye, and Mixed Mexico. [CIAT]

1644

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1959. Phaseolus vulgaris. In _____. Rapport Annuel 1959. Zaire, Station du Mont Hawa. pp.19-20.

Results are presented of the comparative yield trials carried out with the 4 best introductions (Rupendo, Wulmer, Wulma, and Prov. Languy) and Caraotas as the check, at Mont Hawa Station, Zaire, during 1959. An av. yield of 700 kg/ha was obtained, Rupendo being the best var. with 830 kg/ha. Good yields are attributed to the adequate planting date (Aug. 7) and to the fertilization of the previous crop. A yield of 1363 kg/ha was obtained in a multiplication plot with H 7. [CIAT]

1645

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1958. Annexe haricots: généralités sur les essais en C.E.L. (Annex on beans: generalities of trials in C.E.L.). In _____. Rapport Annuel 1958. Zaire, Station de Mulungu. pp.7-18.

Results are included of evaluations carried out with beans during 1958 in the localities of Bataillon, Kiemvu, Tshondo, Kadjudju, Kirunbu, Vuhovi, Musienene, Kisuma, Ikoma, Kibabi, Bingi, Luhotu, and Fendula (Zaire) at alt. of 1140, 1200, 1500, 1590, 1700, 1750, 1830, 1850, 1930, 1950, 1990, 2100, and 2170 m.a.s.l., resp. Data on vegetative cycle, yield, and organoleptic qualities of var. evaluated are presented for each locality. The best var. for the resp. localities were Colorado, Ibundu, Ibundu, Ibundu, Local, Kaiko Ini, Kaiko Ini, Nain de Kiondo, Nain de Kiondo, Colorado, Kanyakilo, O,1002, and Local yielding 1342, 832, 3406, 1556, 3306, 935, 824, 1650, 374, 980, 732, 2612, and 253 kg/ha, resp. [CIAT]

1646

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1958. Haricots. (Beans). In _____. Rapport Annuel 1958. Zaire, Station de Gimbi. p.18.

Information on the 1958 bean collection at Gimbi Station, Zaire, is presented. During the April planting carried out in valley forest lands, a satisfactory multiplication of 40 bean var. and other related species was obtained. On the other hand, in July plantings carried out in irrigated lands during the dry season, an excellent development of 49 bean var. was accomplished, with mean yields of 950 kg/ha. [CIAT]

1647

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1958. Haricots. (Beans). In _____. Rapport Annuel 1958. Zaire, Station de Mulungu. pp.68-76.

During 1958, 131 var. were introduced to the Phaseolus vulgaris collection; selection trials, as well as comparative trials, were conducted with bush and climbing var. at Mulungu Station, Zaire. That year a severe rust attack occurred; therefore, selection was directed towards resistance to this disease. Results of a comparative trial indicated that mass selection of Ibundu was not different from the control Ibundu, and was thus eliminated. Var. S.G.44 outyielded the other var. evaluated and its

possible adoption by indigenous populations is suggested in spite of its black color. Use of var. mixtures is recommended. Bush var. no. 31 N'Dihira, 2/46/97/67, 3/11/77/42, Pinto 162, Kawaloka, and no. 17 and climbing var. Gross Blanc, Musale, Nyirakiwate, Rushari, Amabenga, and P. coccineus (Nioka) were retained. Some climbing and semiclimbing var. showed exceptional yields in the multiplication plots. Hybrid selection continued. A synoptic table of local trials is included. [CIAT]

1648

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1958. Haricots. (Beans). In _____, Rapport Annuel 1958. Zaire, Station de M'Vuazi. pp.48-52.

Results obtained with 25 var. during the long dry season of 1957 at M'Vuazi Station, Zaire, are given. Tuta was used as control. Yields of the 10 best var. are presented; the best var., Noir Beurré d'Alger, outyielded the control by 79% (1466 and 820 kg/ha, resp.). During the short dry season of 1958 numerous var. were lost due to extreme drought; during the long dry season of the same year, the best var. were Bayo Mexico, Nayego, Kigari, Funzi, Adranga, Karolina, and Namushibe, with av. yields of 1676, 1485, 1367, 1334, 1313, 1238, and 1175 kg/ha, resp. The control Tuta yielded 922 kg/ha. Thirty-five lines were chosen for mass selection. In the 1st replication (1956-57) of definite comparative trials in M'Vuazi-type soil, 9 var. (6 introductions and 3 local) outyielded the control (459 kg/ha). Control Tuta showed susceptibility to attack by Melanagromyza. In the 2nd replication (1957-58), establishment was irregular and var. Longury, Black Mexico, Kigari, and Usjol (1367, 1366, 1243, and 1007 kg/ha, resp.) outyielded the control (905 kg/ha). [CIAT]

1649

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1958. Haricots. (Beans). In _____, Rapport Annuel 1958. Zaire, Station de Ndihiira. pp.20-25.

Results are presented for preliminary, comparative, and cultural trials with bush and climbing beans, conducted during 1958 in Zaire. Twenty-two var. were observed and 4 natural hybrids were obtained. Trials with beans were rotational (potato-beans-barley) and black-seeded var. underwent separate selection trials. Among the most outstanding var. are Kabala (2248 kg/ha) and Kaiko Inf (2843 kg/ha). To enrich local mixtures, var. Mixed Mexico and Bayo are recommended for their high av. yields (1560 and 1582 kg/ha, resp.). The best climbing bean var. were Kasali and Muhuta, yielding 2304 and 2170 kg/ha, resp. In Luhotu, var. Irimu, Muhuta, and Kasali yielded 3027, 3023, and 3002 kg/ha, resp. In trials with Phaseolus coccineus the most outstanding var. was no. 5 Kisozi, yielding 2733 kg/ha. [CIAT]

1650

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1958. Liste des parasites du haricot (P. vulgaris) cultivé au Congo Belge. (List of bean pests in Zaire). Zaire. Document Technique no.101. 1p.

Diverse pests attacking Phaseolus vulgaris in Zaire are listed; these include bacteria, fungi, and insect pests. [CIAT]

1651

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1958. Phaseolus et legumineuses diverses. (Phaseolus and diverse legumes). In _____ . Rapport Annuel 1958. Zaire, Station de Nioka. pp.18-19.

The yields of 19 bean var. obtained at Nioka Station, Zaire, during the 1st cropping seasons of 1956, 1957, and 1958 are presented in table form. Compared with the check Cuarentino, var. PC 78 and Kachebeye were the most outstanding. [CIAT]

1652

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1958. Phaseolus vulgaris. In _____ . Rapport Annuel 1958. Zaire, Station du Mont Hawa. pp.17-18.

Information is given on the performance of Phaseolus vulgaris in comparative trials carried out at Mont Hawa Station, Zaire, during 1958. Var. H 7, with 299 kg/ha, was used as a check, being exceeded by Prov. Languy, Wulma, H. Wulmer, and Rupendo (369, 364, 347, and 324 kg/ha, resp.). Regarding P. lunatus, var. P.L. 011, 015, and 027 (396, 600, and 970 kg/ha, resp.) were conserved. [CIAT]

1653

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1958. Plantes vivrieres: haricots. (Food crops: beans). In _____ . Rapport Annuel 1958. Zaire, Station de Kondo. p.21.

During the 3rd comparative trial with beans in 1958, at Kondo Station, Zaire, var. Funzi, Tukula, Diki di Susu, H40, Tuta, H39, and H4 gave the following yields: 484, 440, 342, 305, 299, 124, and 105 kg/ha, resp. [CIAT]

1654

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1957. Etude des rotations des plantes vivrieres dans le haut Ituri et specialement aux alentours de la Station de Nioka. (Study of food crop rotations in the Upper Ituri and particularly in the area surrounding the Nioka Station). Zaire, Station de Nioka. Document Technique no.96. pp.1-5,7-12,25-26,28,37.

Various crop rotations, in particular those with maize, beans, Eleusine, and sweet potato, are discussed; land preparation and phytosanitary practices followed by farmers from the Upper Ituri and from areas surrounding the Nioka Station in Zaire are indicated. Burning is favorable to the 1st crop while mulching with OM and tillage with the incorporation of OM favor perennial crops. In a replicated rotation trial (1949-55), it was concluded that: (1) Phaseolus angularis depends more on climatic conditions than on soil conditions, which do not show a marked impoverishment. (2) P. coccineus yields acceptably after cereal crops, and presents resistance to drought, earliness, and better yields during the 1st season. (3) With P. lunatus, the land became notoriously poor and the plants alternately required rains and sun. (4) P. vulgaris yielded well after sweet potato and maize had been grown, and impoverished the soil notoriously. Based on a series of trials it was concluded that mixed cropping gives excellent results, especially in the case of maize-beans-cassava (maize planted 15 days before the other crops). [CIAT]

1655

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1957. Haricots. (Beans). In _____. Rapport Annuel 1957. Zaire, Station de Kondo. pp.1-3.

In a trial planted at Kondo Station, Zaire, in Dec. 1955 and harvested in May 1956, local bean var. Funzi, Tukula, Diki di Susu, and Tuta (922, 894, 718, and 691 kg/ha, resp.) outyielded var. H 39, H 4, and H 40 (600, 475, and 450 kg/ha, resp.). These 7 var., together with PA01, PA05, H 27, Diniania, H 3, Kamanti, H 24, H 1, and Zangi, formed the collection planted in Dec. 1955. A dry season collection was also established to obtain fresh seed for the 1956-57 comparative trials and for the collection. In a 2nd comparative trial, var. Tukula, Diki di Susu, H 39, Tuta, Funzi, H 4, and H 40 yielded 1022, 1003, 989, 936, 932, 881, and 705 kg/ha, resp. [CIAT]

1656

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1957. Haricots. (Beans). In _____. Rapport Annuel 1957. Zaire, Station de Mulungu. pp.53-63.

Information is given on the Phaseolus vulgaris var. collection, screening trials with bush and climbing var. (for yield, earliness, and/or organoleptic characteristics), mass selection, natural and artificial hybrids, and local trials conducted at Mulungu Station, Zaire, during 1957. Mass selection of var. Ibundu gave negative results. Among the most outstanding var. in the various trials were S.C. 44 and Cuarentino. Var. Bayo 164 (from Mexico), having yellow striped seeds, was outstanding for its yield (12.5 g/plant) and earliness in bush bean screening trials where 5 lines and 5 var. were chosen. A severe thrip attack was registered that year. Var. Nyirakirete, Amabenga (to be used as control), and Bushari were chosen among 11 climbing var. from northern Kivu evaluated in screening trials. Local trials were carried out with var. Ibundu, Nain de Kiondo, Colorado, Beurré d'Alger, Languy, and the local var. from southern Kivu and Kisuma. At these sites, var. Ibundu ranked 1st. It was recommended to disseminate a mixture of 4 selected var. which had proved to be clearly superior to local var.: Ibundu, Beurré d'Alger, Nain de Kiondo, and Colorado. [CIAT]

1657

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1957. Haricots. (Beans). In _____. Rapport Annuel 1957. Zaire, Station de M'Vuazi. p.52.

Data on the var. expt. carried out with beans at M'Vuazi Station, Zaire, during 1957, are presented. Yields were poor due to a severe Cercospora canescens attack. Beans planted during the long dry season in cleared soil, enriched with green manure, showed better disease resistance. [CIAT]

1658

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1957. Haricots. (Beans). In _____. Rapport Annuel 1957. Zaire, Station de Ndihira. pp.4,21-25.

Preliminary data are presented on the introduction of bean var. at Ndihira Station, Zaire, during 1956. Small, black-seeded var. are more resistant to diseases, especially white mold which attacks the seed, and to heavy rains. There is no demand for Phaseolus coccineus seed in Utwé due to the need of using props. In preliminary trials with bush beans, the most

outstanding var. were local No. 97, Magabori, and the selection Mixed Mexico (1743, 1742, and 2438 kg/ha, resp.). In comparative trials, Beurré d'Alger obtained a theoretical yield of 2128 kg/ha over 6 seasons in Luhutu. In preliminary trials with climbing var., the most outstanding were Kiregela and Muhuta (1188 and 2163 kg/ha, resp.). In preliminary trials, P. coccineus var. Kisozi No. 5 yielded 4648 kg/ha, attributable to the rich soils and to the prolonged flowering and fructification periods of this species. [CIAT]

1659

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE, 1957. Phaseolus et légumineuses diverses. (Phaseolus and diverse legumes). In _____ Rapport Annuel 1957, Zaire, Station de Nioka. pp.12,14.

The yields of 10 bean var. and 13 introductions in Nioka, Zaire, are presented for the 1st planting seasons of 1956 and 1957. Among the var., Mixed Mexico, Kiba, and Bayo Mexico were outstanding with av. yields of 2102, 2022, and 2006 kg/ha, resp., and among the introductions, PC 78 and Kachebeye with av. yields of 2376 and 2232 kg/ha, resp. The multiplication of white beans, in intensive or mixed cropping, and of Phaseolus coccineus continued. [CIAT]

1660

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE, 1957. Phaseolus vulgaris. In _____. Rapport Annuel 1957, Zaire, Station du Mont Hawa. pp.27,30.

Information is presented on the expt. with beans at Mont Hawa Station, Zaire, in 1957. The introduced var. performed well; H. Wulmer, Prov. Languy, and Wulma were outstanding with yields of 415, 380, and 340 kg/ha, resp. In a comparative trial, under climatic conditions favorable to the crop, var. H 7 Caracotas (615 kg/ha) was superior to 5 other var. (P = 0.01). Regarding Phaseolus lunatus, var. P.L. 011 Spotter/654, P.L. 015 Henderson/652, and P.L. 027 Yangambi were maintained. [CIAT]

1661

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE, 1956. Haricots. (Beans). In _____. Rapport Annuel 1956, Zaire, Station de Mulungu. pp.12-20.

During 1954-55, pedigree selection with beans and var. trials were continued at Mulungu Station, Zaire. Forty-eight var. were introduced. In comparative trials, var. S.G. 10, S.G. 44, and Cuarentino were outstanding. Mass selection of Ibundu (SM Ibundu) showed higher susceptibility to thrip attack than the control Ibundu. In an eliminatory trial with 6 var. and 18 lines, var. Black Mexico and 9 lines were selected. Late application of diazinon (800 l/ha) did not improve the condition of plants attacked by thrips. Historical and technical information and results of the selection of natural and artificial hybrids are presented. Trials carried out in Bataillon, Tshondo, Kadjudju, Bitalé, Kavumu, Walungu, Ikoma, Nya-Kasiba, and Kabaré are summarized. It was concluded that the selected var. yield better than the local mixtures by 143%, and therefore the dissemination of a mixture of the best 4 var. (Ibundu, Beurré d'Alger, Main de Kiondo, and Colorado) is recommended in the native environment of southern Kivu. [CIAT]

1662

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1956. Haricots. (Beans). In _____. Rapport Annuel 1956. Zaire, Station de M'Vuazi. pp.51-53.

Data are presented on var. performance (yield, % damaged seed) and on mass selection of beans during the short and long dry seasons of 1956 at M'Vuazi Station, Zaire. In a competition trial with 16 var., Cercospora canescens attacked leaves and pods; the disease was more severe in land cleared during the preceding long dry season and yields were very low. Black-seeded var. H 12 (Black Mexico) was the most resistant to the disease and the most productive (5.1 kg selected dry seed/area). During the prolonged dry season, in silty clay soil using 3 different exptl. designs, the best black-seeded var. were H 4 (16.5, 11.2, and 14.2 kg/area), H 12 (15.7, 13.0, and 11.6 kg/area), and H 3 (15.2, 9.1, and 14.1 kg/area); the best white-seeded var. was H 40 (15.0, 8.9, and 14.1 kg/area). The best selection criteria were wt. of healthy grains/plant (more than 20 g) and the no. of pods/plant (more than 15 pods). [CIAT]

1663

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1956. Phaseolus et legumineuses diverses. (Phaseolus and diverse legumes). In _____. Rapport Annuel 1956. Zaire, Station de Nioka. pp.5,16,20.

The results of the different stages of legume selection, corresponding to 1956 at Nioka Station, Zaire, are given. Regarding beans, cv. Cuarentino H. 6 (with 1677 kg/ha) and 10 other introductions, yielding between 1217-2395 kg/ha, were outstanding. On the other hand, in crops planted on dry swamp lands, var. Caractas, Bayo Mexico, Campinas, and Mixed Mexico outyielded Cuarentino. Regarding Phaseolus lunatus, cv. Henderson PL. 015 notably outyielded the other var., with yields of 2029 kg/ha. [CIAT]

1664

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1956. Phaseolus vulgaris. In _____. Rapport Annuel 1956. Zaire, Station du Mont Hawa. pp.74-78,80-81,100.

In a comparative trial with beans in 1956 at Mont Hawa Station, Zaire, the av. yield was low (145 kg/ha); the possible climatic causes are discussed by comparing rainfall and temp. data of the years 1954 (when the best yield was obtained), 1955, and 1956. The var. H 7 was outstanding, followed by H 33. Also, diverse land preparation treatments were studied, burning being highlighted. A close relationship was observed between Phaseolus lunatus and P. coccineus production and rainfall. [CIAT]

1665

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1956. Plantes vivrieres diverses: haricots. (Different food crops: beans). In _____. Rapport Annuel 1956. Zaire, Station de Gimbi. p.37.

Bean yields obtained at Gimbi Station, Zaire, during 1956 (1st and 2nd growing season) are presented. Var. H.07 black (691 and 195 kg/ha) and H.07 brown (557 and 139 kg/ha) showed the highest yields during the 2 seasons. [CIAT]

1666

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1955. Haricots. (Beans). In _____. Rapport Annuel 1955. Zaire, Station de Gimbi. pp.100-102.

Information is given on the performance of bean var., and exptl. results corresponding to the period 1954-55 at Gimbi Station, Zaire, are presented. A table with the 9 highest yielding var. is included. During 1954 the most outstanding var. were H39, H07 (black seed), and H21 (1820, 1550, and 1459 kg/ha, resp.). During 1955 yields were considerably lower, the most outstanding var. being H21 (707 kg/ha). Low yields were attributed to late establishment of var. in forest lands which dried up fast. A table showing rainfall data of successive plantings with 3 var. (Tuta, H07, and H35) is presented. It has been concluded that the month of May is optimal for bean planting. Planting in Nov. can also give excellent results, depending on rainfall regularity. [CIAT]

1667

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1955. Haricots. (Beans). In _____. Rapport Annuel 1955. Zaire, Station de Mulungu. pp.1-6.

Information is given on the collection and selection of Phaseolus vulgaris var. during 1955 at Mulungu Station, Zaire. Fifteen var. were added to the collection which was completely revised to avoid repetition of identical var. having different names. During the 2nd season of 1949, 11 var. were compared with the control Varia Vaganda which was intercropped every 2 rows; the best var. were Ibundu, Wulma, and M 29. In Kabara, during a severe attack of Melanagromyza phaseoli, var. Ibundu and Wulma were the most outstanding; however, according to results obtained during the 2nd season of 1950, planting of Ibundu, Wulma, and Varia Vaganda are not recommended in this locality. On the other hand, outstanding var. in Kadjudju were Wulma, Ibundu, and M 29; in Kavuru, var. Wulma; and in Walungu, var. Ibundu and Wulma. Var. Varia Vaganda, Namusinho, and Inkoos will be compared with the 3 var. (Wulma, Ibundu, and M 29) recommended for an alt. of 1700 m. A trial on optimum planting date was begun. [CIAT]

1668

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1955. Haricots. (Beans). In _____. Rapport Annuel 1955. Zaire, Station de Nioka. pp.9-10.

Data are presented on preliminary trials with bush and climbing beans carried out at Ndihira Station, Zaire, during 1955-56. In a trial with 9 bush var., only Kakala outyielded the control (506 vs. 425 kg/ha). Kibongo was used as control for climbing beans. Theoretical yields were 3181, 2650, 2050, 1925, 1793, and 1287 kg/ha for var. Ksali, Muhuta, Awaweza, Kinimba, Kinyamunderere, and Kibongo, resp. A 1st trial is being carried out with 5 Phaseolus coccineus var. [CIAT]

1669

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1955. Phaseolus et legumineuses. (Phaseolus and legumes). In _____. Rapport Annuel 1955. Zaire, Station de Nioka. pp.6-7,17-20,32-33.

Information is given on experimentation with beans and other legumes at Nioka Station, Zaire, in 1955. Bean var. Cuarentino H. 6 (used as control) yielded 1281 kg/ha in the 1st planting season. Its yield in intensive

and in associated cropping was 1133 and 1080 kg/ha, resp. This was the only var. multiplied in local trials in Imbo. On the other hand, yields of Phaseolus coccineus were over 3000 kg/ha during the 1st planting season. This bean performs well as 2nd or 3rd crop in rotation (especially with cereals and tubers) and its yield is better in the 1st season. P. vulgaris is excellent when heading the rotation. [CIAT]

1670

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1955. Phaseolus vulgaris. In _____. Rapport Annuel 1955. Zaire, Station du Mont Hawa. pp.75-76.

Information is presented on the comparative var. trials conducted at Mont Hawa Station, Zaire, during 1955. Rainfall data and av. yield for the introduced var. H 33, H 7, H 6, and Colorado, as well as for the local var. Nioka, are presented. Regarding Phaseolus coccineus, an av. yield of 1317 kg/ha was obtained at the Kraal field. [CIAT]

1671

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1954. Haricots. (Beans). In _____. Rapport Annuel 1954. Zaire, Station de Mulungu. pp.11-20.

A list of bean var. eliminated in 1954 from Mulungu Station, Zaire, is presented; information is given on new introductions (3 natural hybrids of Ndihira and 9 var.) and on intervarietal screening trials. Yield and earliness of 27 var. were evaluated during the 1st half of the rainy season, using Ibundu as control. The late maturing var. Cuarentino (817) occupied 1st place in yield/plot and per plant. H.98 Ruyondo, H.152 Bukini, and H.160 Mwenalize were the earliest-maturing var. During the 2nd half of rainy season 18 var. were evaluated and 9 chosen. Seed % varied from 71 to 78% among selected var. In comparative trials, control Ibundu yielded 2476 kg/ha, being outyielded by Beurré d'Alger with 2679 kg/ha. In another trial, var. Magabori, Bibi, and Cuarentino outyielded the control. Precision (6.3%) of the exptl. method used and its reduction of space and labor were confirmed. Background information on pedigree selection (natural and artificial hybrids) is presented. Mass selection was done only with var. Ibundu. Conclusions on exptl. techniques (modifications in the no. of replications and plot shape and length) are given. It was concluded that soil fertility is the factor most affecting yields in local trials and that the microclimate is more important than the alt. [CIAT]

1672

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1954. Haricots. (Beans). In _____. Rapport Annuel 1954. Zaire, Station de Ndihira. pp.2-3,6.

Brief information is presented on the introduction of bean var. at Ndihira Station, Zaire, during 1954. A total of 164 bean var. were introduced from Luhutu, Mulungu, and Lubero. Preliminary trials were carried out with 106 var. for comparison with the check var. Colorado. Twenty other var. were compared with the check var. Kibongo. The introductions of Phaseolus coccineus showed good yields (2300 kg/ha). [CIAT]

1673

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1954. Legumineuses; Phaseolus vulgaris. (Legumes: Phaseolus vulgaris). In

Information is presented on the expt. with Phaseolus spp. carried out at Nioka Station, Zaire, up to 1954. Due to its good organoleptic properties, bean var. Cuarentino H. 6 was multiplied in Imbo and its zone of influence. P. lunatus was sown only in the 2nd season because it is not appreciated by the natives. White var. PL. 015, 016, and 017, with yields over 2000 kg/ha, were sown in mixtures. P. coccineus performed well in rotation with a cereal as the preceding crop. P. vulgaris performed best as 1st crop in the rotation. The utilization of organic manure was evaluated during the 1945-52 period. [CIAT]

1674

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1954. Phaseolus vulgaris. In _____. Rapport Annuel 1954. Zaire, Station du Mont Hawa. p.51.

An excellent multiplication of beans was attained at Mont Hawa Station, Zaire, during 1954. The best yields corresponded to the introduced var. H 7, H 33, and Colorado (1360, 1275, and 1258 kg dry seed/ha). The noticeable production increase was due to fertilization. [CIAT]

1675

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1953. Haricots. (Beans). In _____. Rapport Annuel 1953. Zaire, Station de Mulungu. pp.1-2,8-12,239.

During 1953 various trials were carried out with food crops, beans included, at Mulungu Station, Zaire. Bean var. selection must be aimed at the formation of new high yielding populations. Comparative trials with the controls H 22 and Ibundu are currently being carried out. On the other hand, trials for yield and resistance to Melanagromyza (Ophiomyia) phaseoli showed that earthing up had a favorable but nonsignificant effect. Goals and methods of pedigree research and of mass selection and exptl. techniques are indicated. In a trial on border effect, using various combinations of Varia Vaganda, Wulma, and Nain de Kiondo, it was concluded that exptl. plots must have at least one border row on each side. Uniformity of blocks could be improved by using 2- to 3-row plots (excluding borders). Var. Ibundu headed the selection and was recommended for multiplication in the native environment. [CIAT]

1676

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1953. Phaseolus divers. (Diverse Phaseolus). In _____. Rapport Annuel 1953. Zaire, Station de Nioka. pp.5-7,19-21,26-29.

Exptl. results obtained with different Phaseolus species in 1953 at Nioka Station, Zaire, are presented. With P. lunatus considerable yields were obtained in the 2nd season of 1951 (var. 018 yielded 3721 kg/ha), attributed to the moderate drought season and to the dry periods that occurred during the rainy season. Different crop rotations were studied. It was observed that (1) P. coccineus performs especially well when it is preceded by a cereal crop, and (2) P. vulgaris has an excellent performance when it occupies the 1st place in the rotation and a good performance when the previous crop is sweet potato. Yields of the different mixed crops used by the natives are presented in table form. [CIAT]

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1953. Phaseolus vulgaris. In _____, Rapport Annuel 1953. Zaire, Station du Mont Hawa. pp.58-60,63,66-67.

The collection and preliminary, var., and multiplication trials of beans at Mont Hawa Station, Zaire, during 1953 are reported. Overall, beans gave a higher production when it occupied the 1st or 2nd place in the rotation cropping scheme and when grown in monoculture than when associated with maize at a high plant density. Var. H 33, H 7, and Colorado Rubona outyielded all the other var. ($P = 0.05$), except the local var. Nioka ($P = 0.01$). When grown with sorghum (2nd crop after tobacco), beans gave a good yield (817 kg/ha), without affecting the sorghum. There was a constant production of Phaseolus lunatus and of P. coccineus. [CIAT]

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1952. Legumineuses: Phaseolus vulgaris. (Legumes: Phaseolus vulgaris). In _____, Rapport Annuel 1952. Zaire, Station de Nioka. pp.17-19,32-38, 42-43.

Results obtained in 1952 with various Phaseolus species at Nioka Station, Zaire, are presented. None of the introductions was superior to H. 6 (Cuarentino), H. 35 (Linhagen), and H. 7 (Caracas). Var. Cuarentino and Linhagen surpassed 1000 kg/ha. P. coccineus grown with prope was the most productive; var. PC 01 yielded 1788 kg/ha. In 1950-51-52, expt. were done with mineral fertilization (Reno hyperphosphate), land preparation, and mixed cropping, according to native practices. Tables are included on crop rotation. Yields of P. coccineus were observed to be greater when following other crops, while P. vulgaris yielded best when heading the rotation and when cultivated during the 1st season. [CIAT]

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1952. Traitant des méthodes de conservation du haricot et évaluant les dégâts occasionnés par les Bruches. (Methods of bean conservation and damage caused by bruchids). Zaire. Document Technique no.99. 6p.

Information is given on some conservation practices of beans and other food products in the different zones of Zaire during 1952. Damage caused by bruchids in beans reached 20%. These insects can be controlled by using ash or sand. In Rwanda, pyrethrum extract and RCH are used. For conservation, beans are usually hulled. A table giving the results obtained with 3 different insecticides is included. [CIAT]

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1951. Introduction en parcelles de collection culture de Phaseolus vulgaris (2eme saison 1951). Culture no.3, 84 variétés originales de Nioka, et locales. (Introduction in collection plots. Phaseolus vulgaris cultivation (second season of 1951). Culture no.3, 84 varieties). In _____, Rapport Annuel 1951. Zaire, Station du Mont Hawa. pp.67-69.

A summary is presented of the performance of 84 local bean var. originated from Nioka, Zaire, corresponding to the 2nd cropping season of 1951. Percentage of seedling emergence at 5-6 days after planting, % of establishment, days to flowering, growth cycle, and disease incidence are indicated. [CIAT]

1681

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1951. Legumineuses. Annexe. (Legumes: annexes). In _____, Rapport Annuel 1951. Zaire, Station de Nioka. pp.36-37,41,43-44,47-49,70-72.

Tables are presented summarizing data obtained from 1949 to 1951 in a crop rotation study at Nioka Station, Zaire. Among the legumes (1st, 2nd, and 3rd crop), Phaseolus coccineus, P. lunatus, and P. vulgaris are included. P. coccineus gave better results if grown towards the end of the rotation. The contrary happened with P. vulgaris which prospered as 1st crop. Successive cultivation of 2 legumes should be avoided. All legumes prospered in swamps, particularly at the beginning of the dry season. Statistical data are summarized and lists of var. in the Phaseolus collection and their origins are presented. [CIAT]

1682

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1950. Legumineuses: Phaseolus vulgaris. (Legumes: Phaseolus vulgaris). In _____, Rapport Annuel 1950. Zaire, Station de Nioka. pp.24-30,54-55,57-63,98,100-101.

Results are presented on bean research at Nioka Station, Zaire, during 1950. In intervarietal comparative trials with bush beans, the most outstanding group was Linhagen H. 35, H. 37, H. 21, and H. 107, Cuarentino H. 6 and Carotas H. 7. Lines H. 36, H. 35, H. 109, and H. 119 did not show a climbing growth habit in 1950, whereas Phaseolus coccineus and P. lunatus rapidly reached a height of 2 or more m on stakes. At Nioka Station, P. coccineus was outstanding in all trials except during the 2nd season. The av. yield, yield over 2 seasons, color, and vegetative cycle of the main var. of the collection are presented. Mineral fertilization trials continued with the use of hyperphosphate and guano from the caves in the Boma Mountains. Tables are presented on cultivation methods, associations, and rotations practiced by the Allurs and Walendus native groups. [CIAT]

1683

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1949. Haricots. (Beans). In _____. Rapport Annuel 1949. Zaire, Station de Mulungu. pp.15-23.

Data are presented on the var. collection and selection of Phaseolus vulgaris and on comparative, cultural, and local trials carried out at Mulungu Station, Zaire, during 1948-49. Of a total of 78 var., 22 underwent comparative trials. Var. Burpree Stringless, Acme Clair, Ibundu, and Wulma were resistant to diseases. Three semiclimbing var. (H 22, M 29, and H 45) matured 3 wk. later than the bush var., but were resistant and productive. According to a comparative trial with 9 var., Ibundu, Mulungu 29, Wulma, Namulinwa, and Namugoroba are climbing in fertile soils and semiclimbing or bushy in poor soils. Fertilization (0, 300, 900, and 1200 kg/ha of guano from Ituri) did not vary the chemical constants of the impoverished soil nor did it improve the uniformity of establishment of bean var. Varia Vaganda. Information is given on local trials in Kavumu Line: (1) trials with the control in association to determine optimal length of rows; (2) seed multiplication. Comparative trials are being carried out in Kabaré and Walungu. [CIAT]

1684

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1949. Legumineuses: haricots (Phaseolus vulgaris). (Legumes: beans). In _____

_____. Rapport Annuel 1949. Zaire, Station de Nioka. pp.13-14,16-18, 27-28,35.

Results are presented of comparative trials with bush and climbing Phaseolus vulgaris, P. lunatus, P. angularis, and P. coccineus at Nioka Station, Zaire, during 1949. Introduced P. vulgaris var. were better than the local controls in various localities. P. lunatus performed better during the 1st planting season, which is very prolonged, than during the 2nd season due to less humidity during the 1st. However, 2nd season plantings allowed massive harvesting, were more economical, and provided a useful ground coverage during the dry period. Results are presented of mineral fertilization trials with Reno hyperphosphate. [CIAT]

1685

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1948. Haricots. (Beans). In _____. Rapport Annuel 1948. Zaire, Station de Mulungu. pp.1-9.

Information on the collection of Phaseolus spp., composed of 110 var. of P. vulgaris and various types of P. lunatus, P. coccineus, and P. angularis, is presented as well as results of preliminary and comparative trials during 1948 in Zaire, in which yield and resistance to anthracnose and to Melanagromyza (Ophiomyia) phaseoli were evaluated. Among the best bean var. was Varia Vaganda which yielded 2.46 kg in comparison with 6 other var. which yielded, on av., 1.30 kg. This var. was also resistant to anthracnose and M. phaseoli (93.1 and 91.2% resistant plants, resp.). Among 15 other var. evaluated (with an av. yield of 809 kg/ha), the most outstanding were Fordhock Favorite, Riversdale Suiker, and Idaho Refugee, all resistant to anthracnose and M. phaseoli. Var. Burpree Stringless, Acme Clair, Ibundu, and Wulma were resistant to mosaic and to rust in very poor soils. The short rains season favored beans because there was less anthracnose incidence. Some var., considered to be bush var., showed a tendency to climb. [CIAT]

1686

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1947. Haricots. (Beans). In _____. Rapport Annuel 1947. Zaire, Station de Nioka. 8p.

Preliminary results obtained in 1947 at Nioka Station, Zaire, with diverse bean lines, especially Mixed Mexico and Adranga, are presented. Data on other legumes is also included. The superiority of var. Carotas (H. 7) was shown in comparative trials and therefore it will be used as control for bush var. In a var. trial, var. Cuarentino 062 was the most outstanding and its use in breeding expt. is mentioned. Yields and vegetative cycles of some var. of the collection are presented. On the other hand, var. Carotas associated with cassava yielded 675 kg/ha, but affected cassava yields. [CIAT]

1687

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1947. Haricots. (Beans). In _____. Rapport Annuel 1947. Zaire, Station de Mulungu. pp.14-15.

Information is given on the collection of Phaseolus species, and on bean multiplication and var. trials carried out at Mulungu Station, Zaire, during 1947. To obtain material for var. selection, 30 bush var. were multiplied. In a preliminary trial in a plot previously planted to sweet

potato, beans established vigorously and an attack of Melanagromyza phaseoli was observed. In another trial with 12 var., the pest attacked almost all var.; likewise, rust invaded all plots. Var. Metis, Itangaza, Acme, and Samba showed apparent viral resistance. [CIAT]

1688

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1946. Haricots. (Beans). In _____. Rapport Annuel 1946, Zaire, Station de Mulungu, pp.108-110.

A list is presented of the Phaseolus vulgaris (203), P. lunatus (38), P. coccineus (12), and P. angularis (2) var. conforming the collection of 245 Phaseolus var. at Mulungu Station, Zaire, in 1946. The list of bush var.--all of them attacked by rust and anthracnose--and the list of climbing var. are included. Plans for 1947 included some cultural trials with bush bean var. at different exptl. centers of Mulungu; these var. were already in seed multiplication plots. [CIAT]

1689

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1946. Haricots (Phaseolus vulgaris). (Beans). In _____. Rapport Annuel 1946. Zaire, Station de Nioka. pp.11-15, 28-29.

Expt. carried out with beans during 1946 at Nioka Station, Zaire, are summarized, especially in relation to Quarantain, Caraotas, Mixed Mexico, Adranga, and Colorado beans. Data on yields are given by region and in relation to the local checks. Lines H 79 and H 83 are recommended for the Dendro region, Caraotas and Fryol for the Libi region, and line H 35 for Libi and Pimbo. The var. Mixed Mexico was the most vigorous and better adapted, and its propagation was recommended. The technique utilized in the trials is presented. [CIAT]

1690

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1945. Haricot (Phaseolus vulgaris). (Beans). In _____. Rapport Annuel 1945. Zaire, Station de Nioka. pp.10-14.

The exptl. results obtained with various bean lines, including Caraotas, at Nioka Station, Zaire, during 1945 are presented. Var. Mixed Mexico exceeded the local check 17 times. On the other hand, line H 79 is recommended for the Dendro region and Caraotas and Fryol Colorado for the Libi region. [CIAT]

1691

- * INSTITUT NATIONAL POUR L'ETUDE AGRONOMIQUE DU CONGO BELGE. 1945. Haricots. (Beans). In _____. Rapport Annuel 1945. Bruxelles. v.63, pp.80-82, 147.

A list is presented of the var. of Phaseolus vulgaris (198 species), P. lunatus (40 species), P. coccineus (2 species), and P. angularis (2 species) conforming the Phaseolus spp. collection at Mulungu Station, Zaire, and evaluated during 1945. Resistance to anthracnose and rust, earliness, and growth were observed. Among the bean var., 36 were bush var., of which 9 were early maturing and 1 (Idaho Refugee) resistant to anthracnose; all were susceptible to rust. There were 162 climbing var., out of which 15 were early maturing, 58 resistant to anthracnose, and 20 apparently resistant to rust. [CIAT]

1692

- * INSTITUT NATIONAL POUR L'ETUDE ET LA RECHERCHE AGRONOMIQUES. ZAIRE. 1981. Essai comparatif B/81. (Comparative trial B/81). In _____. Rapport Annuel 1981. Zaire, Station principale de Mulungu. pp.12-17.

Expt. carried out with beans in 1981 at Mulungu Main Station, Zaire, is reported. In comparative trials with 7 var., Bassier, Tunia, and Imperial were outstanding with 1364, 1305, and 1202 kg/ha, resp. Intercropping and sole cropping trials were carried out with beans and maize using different plant densities. Monocropped beans gave the highest yield among all treatments: 1590 kg/ha. The yields of monocropped beans and of the association are presented for the different planting densities and planting dates of maize. [CIAT]

1693

- * INSTITUT NATIONAL POUR L'ETUDE ET LA RECHERCHE AGRONOMIQUES. ZAIRE. 1980. Programme de recherche. (Research program). In _____. Rapport Annuel 1980. Zaire, Station principale de Mulungu. Secteur du Kivu. pp.5-7.

The results of the national and international (CIAT and the International Soybean Program) bean trials and the activities of the Legumes Program (Zaire) on conservation of genetic resources are briefly reported. Climatic and edaphic data are included. In comparative trials with dwarf beans, local var. Mubinga and Munyu were superior to the American var. G.N. 934 and Wyo 166 which showed little adaptability. [CIAT]

1694

- * INSTITUT NATIONAL POUR L'ETUDE ET LA RECHERCHE AGRONOMIQUES. ZAIRE. 1978. Amélioration génétique: haricot. (Genetic improvement of beans). In _____. Rapport Annuel 1978. Zaire, Station principale de Mulungu. pp.74-75.

Results of breeding trials with beans, carried out in 1978 at Mulungu Main Station, Zaire, are presented. Var. Nain de Kyondo (bush type) outyielded the local var. Munyu (check) in 2 cropping seasons, and also showed yield stability. Regarding climbing beans, no var. outyielded the check Cuarentino (3935 kg/ha) in 2 cropping seasons. [CIAT]

1695

- * INSTITUT NATIONAL POUR L'ETUDE ET LA RECHERCHE AGRONOMIQUES. ZAIRE. 1977. Programme légumineuses. (Legume program). In _____. Rapport pour l'exercice 1977. Zaire. pp.83-88.

Information is presented on the var. collection and various trials carried out with beans and other legumes at Mulungu Station, Zaire, in 1977. Bean var. PL 1, PL 2, PL 3, Noir de Gisenyi, Mahagi, No. 134 Glx, among others, as well as Phaseolus angularis and P. coccineus, were totally resistant to Uromyces appendiculatus. In comparative yield trials, bush var. Nain de Kyondo maintained its superiority with a yield of 2031 kg/ha, and climbing var. Namuleke was superior to all the others with 2075 kg/ha. Expt. were carried out with the association of black beans-maize. [CIAT]

1696

- * INSTITUT NATIONAL POUR L'ETUDE ET LA RECHERCHE AGRONOMIQUES. ZAIRE. 1976. Projet légumineuses. (Legume project). In _____. Rapport pour l'exercice 1976. Zaire, Station principale de Mulungu. pp.94-106.

Information on the legume project in 1976 at Mulungu Station, Zaire, is presented. Data on rainfall and on the Phaseolus vulgaris collection are included as well as the results of exptl. trials. Nineteen bean var. from Gandajika and 66 from M'Vuazi were introduced. The var. were classified according to their resistance to rust; var. Nkole Vigna, Azuli no. 38, Azuli no. 20, S.G. 18, and S.G. 30 were totally resistant to the disease. It was observed that the planting date influences rust attack and that the best time is between March 20-April 21. In a comparative trial, var. S.G. 44 (check) was outstanding with a yield of 1647 kg/ha. [CIAT]

1697

- * INSTITUT NATIONAL POUR L'ETUDE ET LA RECHERCHE AGRONOMIQUES. ZAIRE. 1976. Rapport annuel synthétique. (Annual report—synthesis). Zaire, Station principale de Mulungu. 2p.

Information is presented on agronomic expt. with beans at Mulungu Station, Zaire, in 1976. The best var. of the collection yielded an av. of 3000 kg/ha in Tshirumbi. The var. were classified according to their resistance to rust, and 5 var. were found totally resistant. It is indicated that the best planting time is between March 20-April 20 (season B) and between Sept. 1-Oct. 1 (season A). In large-scale comparative multiplication trials, var. Cuarentino was superior to S.G. 44. [CIAT]

1698

- * INSTITUT NATIONAL POUR L'ETUDE ET LA RECHERCHE AGRONOMIQUES. ZAIRE. 1975. Projet haricot. (Bean project). In _____. Rapport pour l'exercice 1975. Zaire, Station de Mulungu. pp.111-112.

Information on expt. carried out with beans in 1975 at Mulungu Main Station, Zaire, is presented. Var. trials were conducted; during the 1st cropping season 18 var. yielded over 1000 kg/ha and during the 2nd season 20 var. yielded over 3000 kg/ha, among them Kanani I (6719 kg/ha), Nain de Kyondo (4766 kg/ha), indigenous white (4297 kg/ha), Mabanyange, S.G. 44, and Ukindo no. 9 (each with 4245 kg/ha), and S.G. 10 (4219 kg/ha). [CIAT]

1699

- * INSTITUT NATIONAL POUR L'ETUDE ET LA RECHERCHE AGRONOMIQUES. ZAIRE. 1973. Haricot. (Beans). In _____. Rapport pour l'exercice 1973. Zaire. pp.143-145,294-295.

Information is presented on bean cultivation in Lower Zaire during 1973; planting was only done during the dry season. A new population was discovered of Ntendezi beans (white tegument, voluminous seed, and erect growth habit, but sensitive to humidity). During the rainy season it can only be cultivated on hills and high places (with hilling). The selection of Ntendezi and var. Tuta was carried out and comparative and multiplication trials of the latter var. were performed. On the other hand, var. with light-colored seed seemed to be more productive than those with dark colored seeds, mixtures, and the multicolored var., in this order, the best being the gray and brown var. (1230 and 1341 kg/ha, resp.). [CIAT]

1700

- * INSTITUT NATIONAL POUR L'ETUDE ET LA RECHERCHE AGRONOMIQUES. ZAIRE. 1972. Haricot. (Beans). In _____. Rapport pour l'exercice 1972. Zaire. pp.108-109,199.

Data on bean cultivation in Zaïre during 1970-72 are presented. A new local bean population called *Tendensi* was found; it has a white tegument and voluminous seeds, these characteristics being appreciated by the natives. Through mass selection of this population, approx. 40 lines were retained for pedigree selection. On the other hand, fertilization and multiplication trials of bean lines, among them 13/23 and Tuta, were conducted. [CIAT]

1701

- * INSTITUT NATIONAL POUR L'ETUDE ET LA RECHERCHE AGRONOMIQUES. ZAIRE. 1971. Plantes vivrières. (Food crops). In _____. Rapport pour l'exercice 1971. Zaïre. pp.7,12-13,170,177.

Expt. carried out with beans in Zaïre during 1970-71 are reported. In the Shaba region, legumes were affected by high rainfall during flowering and fructification. There was drought at Kisanga Station, and a yield increase of line 13/23, which was superior to Tuta (888 vs. 387 kg/ha), was observed in Lower Zaïre. [CIAT]

1702

- * KAYISU, K.; VANBELLE, M.; FOULON, M.; VERVACK, W. 1984. Détermination de la valeur alimentaire de quelques légumineuses cultivées au Zaïre. (Détermination of the nutritive value of several legumes grown in Zaïre). *Revue des Fermentations et des Industries Alimentaires* 39(4):87-94.

Seeds of 4 var. of *Vigna unguiculata*, 5 var. of *Phaseolus vulgaris*, 3 var. of *Psophocarpus tetragonolobus*, and 1 var. of *Mucuna pruriens* were analyzed for their protein, fat, ash, Ca, Fe, Zn, P, and amino acid contents. Results showed that the seeds are composed of 24.64-39.74 g proteins, 1.52-18.55 g fat, 3.34-4.33 g ash, 17.37-164.88 mg Ca, 4.74-11.39 mg Fe, 3.79-6.48 mg Zn, and 395.2-670.2 mg P (on a DM base). All the legumes analyzed were rich in glutamic (3.69-5.77%) and aspartic acids (2.86-4.35%); however, they were poor in met. (0.50-0.61%), cysteine (0.49-1.09%), and histidine (0.44-0.77%). [AS]

1703

- * LE MARCHAND, M.G.; VAN DAELE, E. 1952. Haricots (*Phaseolus* spp.). [Beans (*Phaseolus* spp.)]. In Institut National pour l'Etude Agronomique du Congo Belge. Rapport Annuel 1952. Zaïre, Station de Mulungu. pp.1-3.

Information is given on the collection of *Phaseolus* spp. at Mulungu-Tshibinda Station (Zaïre) and on results of comparative and local trials carried out during 1952. Collection and intermediate multiplication plots included 74 bean var. In a comparative trial with 26 var. and 10 replications (2nd season, 1951), 11 var. outyielded the control *Varia Vaganda* (621 kg/ha), var. *Beurré d'Alger* being the most productive (1365 kg/ha). A table is presented on local trials, each with 6 replications, at 8 sites: Nya-Mukubi, Kadjudju, Tshigoma, Kavumu, Kabare, Walungu, Nya-Ngezi, and Nya-Kazila. Results were very heterogeneous, although var. 5237, Virovsky, Caroline Lea, and M46 were the most productive overall. Based on results obtained since 1949, var. *Wulma* and *Ibundu* (preferred locally) were the highest yielding. Trials are conducted on (1) exptl. design with var. *Wulma*, (2) planting density, and (3) resistance of *Wulma* to *Melanagromyza phaseoli* and possible favorable effect of earthing up. [CIAT]

1704

ANDERSON, G.D. 1971. A preliminary report of the growth of groundnuts and beans on ten widely distributed soils in Zambia. University of Zambia. pp.1-5.

1705

- * ANGUS, D.J. 1962-66. Phaseolus species. In _____. Plant pests and diseases in Zambia. Parts 1-7 and supplement. Zambia, Mount Makulu Research Station. pp.39-48,61.

Fungal, bacterial, viral, and nematode pathogens found attacking Phaseolus spp. in Zambia are listed, indicating symptoms, plant part affected, and cv. in which they have been detected. Nine diseases are recorded for P. acutifolius, 10 for P. lunatus, and 30 for P. vulgaris. A list of 8 insect pests detected in P. vulgaris is also included. [CIAT]

1706

- * GREENBERG, D.C.; MBEWE, M.N.; KANNAIYAN, J.; HACHIWA, H.C.; ROOSE, D.; IRVING, N.S.; SOHATI, P.H. 1984. Development, evaluation and utilization of germplasm in Zambia. In Reunión de Trabajo sobre Ensayos Internacionales de Frijol, 1a., Cali, Colombia, 1984. Trabajos presentados. Cali, Centro Internacional de Agricultura Tropical. pp.266-275.

Aspects of the breeding, evaluation, and utilization of beans in Zambia are presented. Major production problems are insect pests (Ophiomyia spencerella and O. centrosematis, aphids) and diseases (those caused by BCMV, Uromyces phaseoli, Colletotrichum lindemuthianum, Ascochyta sp., and Isariopsis griseola). The breeding strategy, which aims at improving yield, desirable seed type/consumer acceptability, and resistance/tolerance to the major pests and diseases, is briefly described. Bean research activities are discussed regarding their zonation. Evaluation results are summarized for the Advanced Bean Var. Trial 1983/84, the Preliminary Bean Var. Trial 1983/84, the Bean Disease Resistance Nursery 1983/84, the Bean Pest Resistance Nurseries, and the On-Farm Evaluations of New Germplasm. Research on the major diseases and pests as well as materials with resistance to heat and drought are required. CIAT could aid Zambia by incorporating these characteristics into materials for their subsequent supply. [CIAT]

1707

- * IRVING, N.S. 1984. Insects collected from legume crops in Zambia, 1982/84. Chipata, Zambia, Msekera Regional Research Station. 8p. [Msekera Regional Research Station, P.O. Box 510089, Chipata, Zambia]

A list is presented of major and minor insect pests, and in some cases insect pest parasites/predators, found attacking legume crops in Zambia during 1982-84. Notes on order, family, species, common name, host, type of damage, and seasonal occurrence are included. Thirty-one insect pests were recorded on beans. [CIAT]

1708

- * ROOSE, D. 1984. Bean trials. BCMV drought and soil acidity. In Grain Legume Research Committee Meeting, 1984. Bean trials 1983-1984. Chilanga, Zambia, Plant Protection Section, Mount Makulu Research Station. pp.1-13.

The results of the 1983-84 bean trials for cv. performance in terms of yields and resistance to BCMV, drought, and soil acidity in Zambia are presented. A major factor limiting the evaluation of new materials is their differential reaction to BCMV. BCMV strains III, IVa, IVb, Va, Vb, VIa, VIb, and VII were detected. In the disease resistance nursery (Colletotrichum lindemuthianum and Isariopsis griseola) planted at Mount Makulu, Lucheche, and Maekera, only BCMV and Xanthomonas phaseoli occurred at the 1st site; the av. yield and X. phaseoli scores for 36 cv. are given. The av. yields are also given for 36 other cv. including those introduced from CIAT; this trial was also severely affected by BCMV. In insecticide trials against thrips, Bat 331, MSS, Nep 2, and Mex 142 were used to evaluate crop losses by BCMV. Mex 142 germination under field conditions was poor and BAT 331 was equal to or better than MSS in terms of yields whether BCMV occurred or not. The yields of Mex 142 were negligible without prolonged insecticide applications; Nep 2 showed more necrosis than BAT 331. A drought resistance nursery from CIAT (11 entries) yielded poorly in Lusitu and Magoye (range 28-456 kg/ha). The yields of the advanced bean cv. trial at 4 sites are given. Scores for X. phaseoli incidence on 10 cv. at 3 sites are given. Cv. were detected with yields above the av. for soil acidity. BAT 331 was selected for improved performance in the drought nursery, field resistance to BCMV (no seed transmission), yields equal to or better than MSS, low susceptibility to X. phaseoli, and yields slightly above av. on soils with pH 4.18. [CIAT]

1709

- * ROOSE, D. 1984. Proposal for the release of dry bean varieties. In Grain Legume Research Committee Meeting, 1984. Bean trials 1983-1984. Chilanga, Zambia, Plant Protection Section. Mount Makulu Research Station. pp.1-6.

A proposal for the release of the introduced bean cv. Carioca and Bat 331 in Zambia is presented based on their agronomic performance: yield; resistance to diseases (especially BCMV), soil acidity, and drought; plant characteristics; consumer and farmer acceptability; and use. These cv. proved equal to or better than the controls (Misamfu and Nep 2) in terms of yield and resistance to BCMV, root rot, Uromyces appendiculatus, Colletotrichum lindemuthianum, Isariopsis griseola, Ascochyta sp., Pseudomonas phaseolicola, Xanthomonas phaseoli, soil acidity, and drought. The var. proposed are intended for cooking and Bat 331 performs well under drier conditions. [CIAT]

1710

- * ROOSE, D. 1983. Bean (Phaseolus vulgaris) cultivar observations. In Grain Legume Research Meeting, 22nd., 1983. Chilanga, Zambia, Plant Protection Section. Mount Makulu Research Station. pp.1-5.

The results of the 1982-83 bean cv. observation trials in Makulu, Mufulira, and Kabwe, and of a BCMV comparative trial in Zambia, are briefly discussed. In the former, Carioca yielded best across sites (1.47, 1.47, and 0.6 t/ha, resp.) compared with the av. yield/site for the 11 cv. tested: 1.27, 0.98, and 0.56 t/ha. The local BCMV-susceptible cv. Mex 142 and Misamfu Speckled Sugar were compared with the field-resistant cv. Nep and BAT 331 at different levels of BCMV infection obtained through varying levels of aphid vector insecticide control. BAT 331 was the highest yielder (561.2 kg/ha) followed by Nep, Mex 142, and Misamfu (474.4, 327.6, and 327.2 kg/ha, resp.). Plant mortality was highest for Nep (37%), followed by BAT-331, Mex 142, and Misamfu (27, 18, and 15%, resp.). Growing hypersensitive cv. in close association with nonresistant infected cv. is highly unfavorable due to increased plant mortality by BCMV; however, hypersensitive cv. considerably outyielded the local cv. [CIAT]

- * ROOSE, D. 1982. Virology: bean common mosaic virus (BCMV) (38). In Belgian Development Cooperation in the Republic of Zambia. 1982. Project Mount Makulu, Plant Protection Section, Research progress for the period 14.12.1976-13.12.1981. Bruxelles, Belgium. pp.44,51-52,55-56.

BCMV symptoms, its transmission, detection, and bean cv. trials in Zambia are briefly discussed. The hypersensitive reaction that confers field resistance is not present in the Zambian commercial dry bean var. BCMV transmission occurs through sap inoculation, aphids (in a nonpersistent way), seed, and pollen. Aphids are important bean virus vectors in Zambia; therefore, for highest productions, beans should be grown either in a low aphid-activity season or at a low aphid-activity site. The serological microprecipitin test to detect BCMV is briefly described. In 1981, 325 bean lines were grown both in the rainy and dry seasons. Selection for BCMV resistance should receive priority to improve beans. [CIAT]

- SAKALA, M.K. 1985. Field beans (Phaseolus vulgaris L.) response to inoculation in Zambia. In Ssali, H.; Keya, S.O., eds. Conference of the African Association for Biological Nitrogen Fixation, 1st., Nairobi, Kenya, 1984. Biological nitrogen fixation in Africa: proceedings. Kenya, Nairobi Rhizobium Microbiological Resources Centre. p.312. (Abstract). [Mount Makulu Research Station, P/B 7, Chilanga, Zambia]

Field bean response to inoculation was tested using 4 var. (Carioca, Mexican 142, Misamfu Speckled Sugar, and BAT 331) and 6 strains of Rhizobium (Nitragin, MM 106, MM 98, TAL 182, Ph 1, and Ph 2—the last 2 local isolates). A randomized complete block design was used with 14 treatments replicated 4 times for each var. One treatment in each replicate was a complete control with no N applied and no inoculation; another received a dose of 100 kg N/ha split applied after emergence, during growth, and at 50% flowering stage but without inoculation. Six treatments received 20 kg N/ha at emergence + inoculation while the other 6 did not receive N but were inoculated. Nodule no. and mass, plant DM wt., and grain yield were determined. In all cases the presence of inoculum in combination with 20 kg N/ha was found to increase yield. A greater no. of nodules together with increased nodule wt. were found in the absence of applied N. Local strain Ph 1 in combination with 20 kg N/ha had the highest seed yield with all var.: 73.8% higher than control in Carioca, 192.9% in Mexican 142, 50.6% in Misamfu Speckled Sugar, and 29.2% in BAT 331. The latter cv. nodulated very well with all strains. Phaseolus bean responds to inoculation at low N levels. [AS]

- * STOLEN, K.A. 1983. Socio-economic constraints on changes in peasant agriculture in the Northern Province of Zambia. In Svads, H.C., ed. Seminar on Soil Productivity in the High Rainfall Areas of Zambia, Lusaka, 1983. Proceedings. Oslo, International Development Programs. Agricultural University of Norway. Occasional paper no.6. pp.330-354.

A socioeconomic study conducted during 1981-82 in 6 villages (4 districts) in the Northern Province of Zambia is presented. Three main production systems are distinguished: chitemene cultivation, semipermanent/permanent cultivation, and a system based on a combination of the 2. These systems are unequally distributed between households within the same village, as well as between households in different villages and in different regions. Some of the factors (labor, capital, market conditions) producing intravillage, intervillage, and interregional differences with regard to

production systems are discussed. Furthermore, the way these factors influence the decision-making processes at the household level is examined. The possibilities of change in the productive systems, once changes in the different factors are introduced, are considered. Finally, emphasis is placed on the key importance of considering local potentials and priorities when agricultural research and change are planned. [AS]

1714

- * SVADS, H.C. 1983. Existing cultivation systems in the high rainfall areas of Zambia. In _____, ed. Seminar on Soil Productivity in the High Rainfall Areas of Zambia, Lusaka, 1983. Proceedings, Oslo, International Development Programs. Agricultural University of Norway. Occasional paper no.6. pp.249-268. [Soil Productivity Research Programme, Misamfu Regional Research Station, P.O. Box 55, Kasama, Zambia]

The existing cultivation systems, including those with beans, in the high rainfall areas of Zambia are described. They consist mainly of shifting and semipermanent traditional systems. The former types (known as Chitemene) are based on cutting and burning of vegetation and are the most extensive system. The grass mound system, which consists in collecting green grass over which soil is thrown to form a mound, is mainly practiced by the Mambwe tribe in Mbala district. The systems are also been examined regarding the ability of the available vegetation to support them under increasing local population density. Investigations on shifting cultivation systems conducted at Lunzuwa Agricultural Station in Mbala from 1928 to 1958 are also outlined. [AS]

1715

- * ZAMBIA. MINISTRY OF AGRICULTURE AND WATER DEVELOPMENT. 1984. Entomology. In _____. Grain Legume Research. Annual Report 1983/84. Chipata, Msekera Regional Research Station. pp.41-50.

Seven chemicals (cypermethrin, pirimiphos-ethyl, endosulfan, carbofuran, dieldrin, chlorpyrifos, and diazinon) were tested against the bean fly. A completely randomized block design was used with 4 replications. Good insect control was obtained with pirimiphos-ethyl, carbofuran, dieldrin, and endosulfan compared with the untreated control. In addition, the effect of sowing date on other insect pests (Empoasca dolichi and Aphis craccivora, among others) was studied. Another trial involved the evaluation of 20 bean entries for their resistance to the bean fly. None of the entries proved to be free of this pest and pupae were observed in all the stems. However, TMO-110, TMO-78, TMO-101, and G 5478 showed good yields, especially the latter with 1469 kg/ha. [CIAT]

1716

- * ZAMBIA. MINISTRY OF AGRICULTURE AND WATER DEVELOPMENT. 1984. Grain Legume Research. Annual Report 1983/84. Chipata, Msekera Regional Research Station. 73p.

The results of the 1983-84 season field trials carried out in Zambia are summarized. Two major areas were studied: plant breeding, pathology, and entomology. Most of the work was directed toward the confirmation of the results of field trials carried out during the 1982-83 season, especially at sites that showed promising lines of legumes (including beans) with yields and pest and disease tolerance superior to those of the local var. already being grown. Furthermore, the performance of germplasm entries received from overseas was investigated. The majority of the field trials were located at Msekera Regional Research Station and Masumba

substation in the Luangwa Valley. National trials were carried out at Mbala, Misamfu Regional Research Station, and Kaoma substation. [CIAT]

1717

- * ZAMBIA. MINISTRY OF AGRICULTURE AND WATER DEVELOPMENT. 1984. Plant breeding and pathology 1983/84 trials. In . Grain Legume Research. Annual Report 1983/84. Chipata, Msekera Regional Research Station. pp.4-62.

Bean breeding/pathology trials were conducted in Zambia in 1983-84. In general, the trials were successful. In Msekera and Masumba there was a severe drought in the 2nd half of Jan., 1984. This caused very severe aphid infestations which almost destroyed some of the cowpea trials at Msekera. However, in the trials which survived, the aphid infestation led to very severe outbreaks of BCMV in beans and cowpea aphid-borne mosaic virus in cowpeas. This gave excellent opportunities for screening for resistance to these 2 diseases, which are probably the most important of these crops in Zambia. Good bean var. with BCMV resistance/tolerance were found and some cowpea lines with good resistance/tolerance to the cowpea aphid-borne mosaic virus were identified. In a maize-bean intercropping trial, some climbing bean var. giving high yields were observed. In on-farm trials (together with ARPT), a combination of an improved bean var. together with a modest fertilizer application and the use of a seedbed insecticide tripled yields. The bean trials in Mbala unfortunately were not a success due to premature drying out of the trial site. The trials there will be planted 1 mo. earlier next season. [AS]

ZIMBABWE

1718

- * BILLET, R. 1984. Bean with a big yield. Farmer's Weekly, March 1984:30-33.

The rust-, lodging-, and shattering-resistant small white canning dry bean cv. Kamberg, to be released in Zimbabwe, is briefly described. This cv. is expected to produce 20-30% higher yields than var. Nep 2 and Teebus, the 2 var. it may replace. An interview with Mr. Andries Lienenberg (Grain Crops Research Institute) is presented regarding bean cultivation and var. in the region. A short description (agronomic traits and production areas) is presented of cv. Nep 2, Teebus, Nuweveld, Bonus, Yellow Haricot, and SSN 1. [CIAT]

1719

- * GREAT FUTURE for sugar beans? Farmer's Weekly, September 1984. 3p.

The experience of a sugar bean grower (cv. Green Speckled) in Zimbabwe is presented, comparing the potential of the var. with others in terms of plant traits and yields. In the 1st 70-ha trial, Green Speckled overyielded Bonus Red Speckled and Nep 2 (2.5 t vs. 1.1 and 1.5 t/ha, resp.). A complete description of the 2nd 150-ha trial with Green Speckled is given regarding planting time and densities, fertilization, irrigation, and weed control. Under dryland conditions this cv. proved to be drought-tolerant (2.2 t/ha) and under adequate irrigation produced 3.1 t/ha. Compared with its av. yield (2.80 t/ha), Black Speckled and Zebras had a poorer performance (2.70 and 2.65 t/ha, resp.). [CIAT]

1720

- HUTCHISON, G. 1979. Production of common beans (Phaseolus vulgaris) in summer. Zimbabwe, Ministry of Agriculture. Branch Crop Production.

1721

- * MARAMBA, P. 1983. Common diseases of beans. Zimbabwe Agricultural Journal 80(4):163-164.

The economic importance, symptoms, and control measures of BCMV and Uromyces appendiculatus affecting beans in Zimbabwe are briefly described. Control measures for BCMV include the use of virus-free seed and resistant var., roguing out infected plants, and the chemical control of aphids. Control measures for U. appendiculatus include destroying old plant debris, crop rotations, the use of benomyl and mancozeb (only in early infections), and the use of resistant or tolerant var. [CIAT]

1722

- * MARAMBA, P. 1983. Diseases of grain legumes. Zimbabwe Agricultural Journal 80(2):67.

The economic importance, symptoms, and control measures of Colletotrichum lindemuthianum and Ascochyta phaseolorum affecting beans in Zimbabwe are briefly described. Cultural control measures for both pathogens include crop rotations, use of resistant var. and of disease-free seed. Chemicals that control C. lindemuthianum are mancozeb, benomyl, captafol, fentin acetate, maneb, metiram, thiram, and zineb. Benomyl and zineb are recommended to control A. phaseolorum. [CIAT]

- * MARIGA, I.K. 1984. A review of field bean production practices, current and future research and its rationale. Salisbury, Agricultural Research Council of Zimbabwe. Department of Research and Specialist Services. 21p.

Bean production, on-going research, and research needs in Zimbabwe are reviewed. In Zimbabwe bean production is characterized by low yields and instability, due mainly to the use of poor quality seed. May plantings give the highest yields (av. 3 t/ha). Recommendations are given for soil fertilization, seed inoculations with Rhizobium, and planting rates and spacing. Var. grown for consumption include Red Canadian Wonder, Natal Sugar, Contendor, White Processor, Top-Crop, Nep 2, and PC 18-CS. Irrigation recommendations are given for the lowveld areas. Major diseases in Zimbabwe are caused by Colletotrichum lindemuthianum, Pseudomonas phaseolicola, and Xanthomonas phaseoli; Alternaria sp. and X. phaseoli are the most devastating diseases in the highveld. The major pest is the Ophiomyia phaseoli, followed by Heliothis armigera, Spodoptera exigua, and Plusia spp. Tetranychus urticae is the prevalent mite. Current research efforts concentrate on (1) testing new introduced germplasm (speckled sugar types, cream- and brown-colored beans), especially from CIAT, (2) testing introduced beans for canning, and (3) evaluating disease occurrence and resistance. Future research should concentrate on expanding germplasm testing for summer and winter production of both dry and canning beans, N management studies, and agronomic trials. [CIAT]

- * MATIBIRI, E.A. 1983. A study of the adaptation, agronomic and consumer variables of newly introduced varieties of dry beans (Phaseolus vulgaris L.). Mag.Sc. Thesis. Salisbury, University of Zimbabwe. 84p.

Eighteen dry bean genotypes grown in 6 different environments in Zimbabwe were analyzed for genotypic stability of their seed yield. The relatively unpredictable component of the genotype x environment interactions was more important in this material than the relatively predictable component. Var. BAT 56i, A90, and Red Canadian Wonder were identified as being good yielding and stable over the wide range of environments tested. From 2 trials conducted at Gwebi Var. Testing Centre, phenotypic correlation coefficients between all possible pair combinations of 12 agronomic variables were calculated. Yield/plant was positively and significantly correlated with no. of pods/plant, seeds/pod, and shelling %, and was significantly and inversely related to 100 seed wt. and days to actual maturity. In testing the consumer preferences of the genetic material, it was found that large, oblong, plump seed types, either plain red, red with cream mottles, or cream with red mottles, were generally the most preferred although those types with a cream-base color and green/brown lines were well accepted. Taste testing results showed no particular trend and mixed beans were the least preferred in all cases. [AS (extract)]

- * RYDER, M.R. 1985. Current practices in legume inoculant production in Zimbabwe. In Ssali, H.; Keya, S.I., eds. Conference of the African Association for Biological Nitrogen Fixation, 1st., Nairobi, Kenya, 1984. Biological nitrogen fixation in Africa: proceedings. Kenya, Nairobi Rhizobium Microbiological Resources Centre. pp.151-159. [Soil Productivity Research Laboratory, Private Bag 3757, Marondera, Zimbabwe]

Production procedures at the inoculant factory at Grassland Research Station (Marondera, Zimbabwe), where legume inoculant on a bagasillo

solid-base medium has been produced since 1981, are detailed. From 1962 until then the inoculant was made on an agar-based medium because no suitable solid base material had been found in Zimbabwe. About 60,000-80,000 units are produced annually of which about 90% is for soybean. The bagasillo packs are filled, left to stand for 1 day at room temp., and autoclaved at 1.3 bars for 2 h to ensure sterility and to destroy any growth inhibiting factors which apparently may be present in the bagasillo. The inoculum mother cultures are prepared from stock cultures in the Grassland Rhizobium collection. Mother cultures for soybean inoculant must be bulked up to meet the demand. The inoculum broth cultures are incubated at 28°C with aeration until the rhizobia are in the logarithmic phase. After they have passed their purity test, the inoculum cultures are transferred aseptically to the yeast extract/carbohydrate broths, forming the mixture used to inoculate the bagasillo packs. All cultures and inoculum are quality tested for purity and count of rhizobia cells before issue. Problems encountered have been growth of spring organisms in the bagasillo by strains of Rhizobium for soybean and clover, and poor keeping quality of inoculant for Phaseolus bean. [AS]

1726

- * TAYLOR, D. 1979. CMR beetles (Blister beetles or Cantharides). Zimbabwe Rhodesia Agricultural Journal 76(6):233.

Identification, host plants, damage, life cycle, and control aspects of the leaf-eating, flower-destructive Meloidae beetles (Mylabris *oculta* and Decapotoma spp.) affecting beans in Zimbabwe are briefly described. Application of insecticides is not economical; however, carbaryl and malathion are registered for their control, provided that spraying is not carried out during the pollination time of bees. Direct contact with humans should be avoided since these beetles produce a highly toxic poison. [CIAT]

1727

- * WHINCWIRI, E.E. 1984. Development, utilization and evaluation of germplasm in Zimbabwe. In Reunión de Trabajo sobre Ensayos Internacionales de Frijol, I., Cali, Colombia, 1984. Trabajos presentados. Cali, Centro Internacional de Agricultura Tropical. pp.305-309.

Aspects of the breeding, evaluation, and utilization of beans in Zimbabwe are presented. Major production problems include drought, Alternaria sp., root and crown rots, Isariopsis *griseola*, Xanthomonas *phaseoli*, Pseudomonas *phaseolicola*, scab, Ascochyta sp., Coryna spp., Mylabris spp., termites, Bemisia *tabaci*, Ootheca spp., and Heliothis sp., among others. For edible dry beans consumers prefer speckled sugar beans and for canning, white haricot navy beans. CIAT training would be of great help for the unexperienced staff working with beans in the country. [CIAT]

1728

- * ZIMBABWE. DEPARTMENT OF RESEARCH AND SPECIALIST SERVICES. 1985. Bean production in Zimbabwe. Causeway, Harare. 2p.

Data on dry bean production in large- and small-scale commercial farming sectors of Zimbabwe, under dryland and irrigated conditions for the period 1978-82, are given in table form. Data on area planted, crop reaped, and yields of dry beans in the small- and large-scale commercial farming sectors for 1975-82 are also included. [CIAT]

* ZIMBABWE. MINISTRY OF AGRICULTURE. 1964. The seed bean crop in southern Rhodesia. Salisbury, Economics and Markets Branch. 25p.

A detailed study was undertaken in 1964 in southern Zimbabwe to evaluate possibilities of expanding the cultivation of dwarf French beans in the region. Information given covers crop importance, factors governing the selection, actual and potential growing areas, market possibilities, considerations, varieties, and recommendations for growing beans (soil, fertilizers, and agronomic practices). [CIAT]

ABBREVIATIONS AND ACRONYMS

- A
 ABA
 ac
 Afr.
 a.i.
 alt.
 AMV
 approx.
 atm.
 ATP
 av.
 BAP
 BRMV
 BCMV
 BGMV
 BCYMV
 BOD
 BPMV
 BRMV
 BSMV
 BV
 BYMV
 °C
 ca.
 CAMD
 CMV
 CBB
 CBSD
 EC
 R
 Angstrom(s)
 Abscisic acid
 Acre(s)
 Afrikaans
 Active ingredient
 Altitude
 Alfalfa mosaic virus
 Approximate(ly)
 Atmosphere
 Adenosine 5'-triphosphate
 Average
 6-Benzylaminopurine
 Broad bean mosaic virus
 Bean common mosaic virus
 Bean golden mosaic virus
 Bean golden yellow mosaic virus
 Biochemical oxygen demand
 Bean pod mottle virus
 Bean rugose mosaic virus
 Bean southern mosaic virus
 Biological value
 Bean yellow mosaic virus
 Degrees Celsius
 About (circa)
 Cassava African mosaic disease
 Cassava African mosaic virus
 Cassava bacterial blight
 Cassava brown streak disease
 Cation exchange capacity
 CO₂ exchange rate
 Cassava flour
 Crop growth rate
 Cassava leaf meal
 Cassava latent virus
 Cassava meal
 Centimeter(s)
 Chemical oxygen demand
 Concentration
 Crude protein
 Calcium stearyl lactylate
 Cassava starch wastes
 Coefficient of variation
 Ivar(s)
 Dichlorophenoxyacetic
 Nucleic acid
 Soluble concentrate
 Diaminetetraacetic
 kcal
 kg
 kJ
 km
 KNap
 kR
 l
 LAD
 LAI
 lat.
 lb
 LD₅₀
 LER
 European Ec
 For example
 Enzyme-linked Community assays
 Ethyl methane str-bent
 English
 Preliminary Trials
 Experiment(s)
 Experimental
 Degrees Fahrenheit
 French
 Foot candles (10.76 lux)
 Farmyard manure
 Gram(s)
 Giga (10⁹)
 Gibberellic acid
 Gallon(s)
 Gross energy
 German
 Glucose entry rates
 Gas-liquid chromatography
 Hour(s)
 Hectare(s)
 Hydrocyanic acid
 Hydroxypropyl distarch phosphate (modified cassava starch)
 Harvest index
 Horsepower
 Indoleacetic acid
 Indolebutyric acid
 International Bean Yield and Adaptation Nursery, CIAT
 Illustrated
 Inches
 Italian
 International unit
 Joule
 Japanese
 Katal (amount of enzymatic activity that converts 1 mole of substrate/s)
 Kilocalorie(s)
 Kilogram(s)
 Kilojoule
 Kilometer(s)
 Potassium naphthenate
 Kiloröntgen(s)
 Liter(s)
 Leaf area duration
 Leaf area index
 Latitude
 Pound(s)
 Mean lethal dose
 Land efficiency ratio

LPC	Leaf protein concentrate	resp.	Respective(ly)
lx	Lux	Rf	Retardation factor- chromatography
M	Mega	RGR	Relative growth rate
<u>M</u>	Molar	RH	Relative humidity
m	Meter(s)	RNA	Ribonucleic acid
Mal.	Malay	Rom.	Romanian
max.	Maximum	rpm	Revolutions per minute
MC	Moisture content	Russ.	Russian
ME	Metabolizable energy	s	Second
meq	Milliequivalent(s)	SBM	Soybean meal
met.	Methionine	SCN	Thiocyanate
mg	Milligram(s)	SCP	Single cell protein
mho	Reciprocal ohm	SDBS	Sodium dodecyl sulfate
min.	Minimum	Sk.	Slovak
min	Minute(s)	sp.	Species
ml	Milliliter(s)	Span.	Spanish
mm	Millimeter(s)	spp.	Species
mo.	Month	SSL	Sodium stearyl-2-lactylate
mol. wt.	Molecular weight	Sum.	Summary
m.p.	Melting point	t	Ton(s)
NAA	Alpha-naphthalene acetic acid	TDN	Total digestible nutrients
NAD	Nicotinamide adenine dinucleotide	temp.	Temperature
NADH	Nicotinamide adenine dinucleotide, reduced form	TIA	Trypsin inhibitor activity
NAR	Net assimilation rate	TIBA	2,3,5-Triiodobenzoic acid compound with <u>N</u> -methylmetha- namine
NCE	Net CO ₂ exchange	TLC	Thin-layer chromatography
NE	Northeast	TMV	Tobacco mosaic virus
NER	Net energy ratio	TSH	Thyroid-stimulating hormone
nm	Nanometer(s) (10 ⁻⁹ m)	UDPG	Uridine diphosphate glucose
no.	Number(s)	UMS	Unmodified cassava starch
NPFs	Negative production factors	UV	Ultraviolet
NPR	Net protein ratio	var.	Variety(ies), varietal
NPU	Net protein utilization	VEF	Bean Team Nursery, CIAT
NW	Northwest	VFA	Volatile fatty acids
OM	Organic matter	vol.	Volume
oz	Ounce(s)	VPD	Vapor pressure deficit
p.	Page	vpm	Volume per million
P	Probability	vs.	Versus
Pa	Pascal(s)	W	West, watt
PAN	Peroxyacetic nitrate	wk.	Week
PCNB	Pentachloronitrobenzene	WP	Wettable powder
PDA	Potato dextrose agar	wt.	Weight
PER	Protein efficiency ratio	yr	Year(s)
pH	Hydrogen ion concentration	/	Per
pp.	Pages	%	Percent(age)
pphm	Parts per hundred million	>	More than, greater than
PPI	Pre planting incorporation	<	Less than
ppm	Parts per million	≤	Equal to or less than
PSA	Potato sucrose agar	≥	Equal to or greater than
pv.	Pathovar	±	Plus or minus
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1417 1418 1421 1424 1426
1430 1432 1447

Cultivars, varieties, ... (Continued)

Bayo 1219 1226 1227 1229
 1230 1235 1237 1238 1242
 1243 1247 1251 1253 1256
 1375 1405 1425 1428 1430
 1431 1432 1435 1436 1443
 1642 1649
 Bayo Mexico 1648 1659 1663
 Bayo 158 1405 1406 1408
 Bayo 164 1200 1204 1205 1211
 1640 1656
 Bayo 0465 1246 1249 1250
 Bayo 0505 1236
 Bayo 0547 1227
 Bayo 01278 1640
 Beau Port 1405
 Beka 1609
 Beladi 1473
 Berna 1609
 Beurrdé d'Alger 1246 1438 1442
 1443 1639 1640 1642 1656
 1658 1661 1671 1703
 Bibi 1671
 Black Dessie 1296 1298 1306
 1307 1309 1315 1316 1317
 1320 1321
 Black Mexico 1438 1441 1443
 1638 1648 1661
 Black Speckled 1719
 Black Turtle Soup 1438 1439
 1441 1443
 Blancs Kisozi 1255
 Bleu 1455
 Bonita 42 1307
 Bonus 1718
 Bonus Red Speckled 1719
 Brown Speckled 1297 1303
 1315
 Bunsì 1204
 Burpree Stringless 1683 1685
 Bushari 1656
 C 10 1394 1447 1455 1461
 C 15 1455
 C49242 1591
 Cajamarca 1390 1392 1398 1402
 1406 1407
 California Small White 1609
 Calima 1193 1200 1270
 Campinas 1663
 Canadian Wonder 1271 1365 1481
 1507 1516 1518 1519 1520
 1528 1533 1535 1536 1539
 1543 1545 1546 1549 1551
 1555 1557 1558 1559 1565
 1566 1569 1570 1571 1572
 1573 1584
 Canadian Wonder (NB 26) 1337
 Canadian Wonder Collection 15
 1517
 Canadian Wonder Collection 36
 1517

Canadian Wonder Selection 19
 1515 1519
 Caraoata 1636
 Caraoata 37 1640
 Caraoata 2784 1636
 Caraoatas 1432 1433 1434 1435
 1436 1443 1644 1663 1686
 1689 1690
 Caraoatas (H. 7) 1686
 Caraoatas H. 7 1682
 Carioca 1201 1202 1203 1307
 1469 1469 1709 1710 1712
 Caroline Lea 1703
 Caru 6 1406
 Caru 8 1406
 Caru 11 1406
 Caru 27 1400
 CB 137 1574
 Chipulupulu 1574
 CIAT serie 555 1449
 CIAT serie 556 1449
 CIAT serie 557 1449
 CIAT serie 558 1449
 CIAT serie 559 1449
 CIAT serie 560 1449
 CIAT serie 561 1449
 CIAT serie 562 1449
 CIAT serie 563 1449
 CIAT serie 564 1449
 CIAT serie 565 1449
 CIAT serie 566 1449
 CIAT serie 567 1449
 CIAT serie 568 1449
 CIAT serie 569 1449
 CIAT serie 570 1449
 CIAT serie 571 1449
 CIAT serie 572 1449
 Coco a la creme 1632
 Col. 0623 1246
 Col. 0652 1246
 Col. 0678 1246
 Colorado 1192 1194 1208 1214
 1216 1218 1220 1222 1223
 1229 1230 1235 1237 1238
 1240 1242 1243 1246 1247
 1253 1254 1256 1270 1374
 1405 1412 1420 1424 1426
 1432 1435 1436 1438 1441
 1443 1636 1639 1645 1656
 1661 1670 1672 1674 1689
 Colorado 11 1439
 Colorado 29 1640
 Colorado 0652 1248 1249 1250
 Colorado 0688 1217 1221 1226
 1227 1228 1236
 Colorado 0981 1236
 Colorado 2783 1636
 Colorado 3394 1636
 Colorado Rubona 1677
 Contender 1275 1282
 Contendor 1723

Cultivars, varieties, ... (Continued)

Cornell 49-242 1545 1609
 Cornell 59-369 1609
 Cuarenteno 1251 1254 1442
 Cuarentino 1194 1230 1237 1240
 1246 1256 1424 1426 1430
 1432 1438 1439 1443 1641
 1651 1656 1661 1663 1671
 1678 1694 1697
 Cuarentino 052 1686
 Cuarentino 0712 1225 1227
 Cuarentino 0824 1226 1227
 Cuarentino (817) 1671
 Cuarentino 01010 1640
 Cuarentino 05419 1439
 Cuarentino H. 6 1669 1673 1682
 Cuarentino H.6 1638 1643
 Dark Red Kidney 1445 1632
 Diacol Calima 1200 1202 1203
 1204 1205 1208 1209 1210
 Diki di Susu 1653 1655
 Diniania 1655
 Doré 1193
 Doré de Kirundo 1203 1210
 Doré de Kirundo 1201 1202 1270
 Dutch Princess No. 200 1488
 1489 1576
 Ecuador 299 1391
 Emerson 847 1615 1632
 Emma 1402 1405 1406 1408 1447
 EPID Sample 26 1297
 EPID sample 30 1307
 Eria Vaganda 65 1640
 Ethiopia 10 1319 1321 1322
 Ex Kooki 1632
 Ex Rico 23 1210 1398
 Far Lang Tou 1408
 FB/BP 262 Lushara BK 1533
 FB/GP 246-2 1533
 FB/GP 246-3 1552
 FB/GP 307-2 1533
 FBMD 1297
 Fin de Bagnols 1215
 Fordhock Favorita 1685
 Frejol Negro 1420
 Fryol 1689
 Fryol Colorado 1690
 Funzi 1648 1653 1655
 G 790 1391
 G 858 1398
 G 1398 1398
 G 2333 1391
 G 2371 1391
 G 5478 1715
 G 8878 1391
 G 12470 1398
 Giant Stringless 1445
 Gikara 1400 1406 1408
 Gisenyi 1408
 Gisenyi 1 1405
 Gisenyi 1 1405 1406

Gisenyi 2 1406
 Gisenyi 3 1406
 Gisenyi 6 1398
 Gisenyi 2 bis 1405
 Giza 3 1285 1287
 GLP-2 1340
 GLP-24 1340
 GLP-585 1340
 GLP-1004 1340
 GLP-1004 (Muezi Moja type)
 1330
 GLP-K.92 1340
 GLP-K.1127 1340
 G.N. 934 1693
 Go 5621 1532
 Great Northern 123 1358
 1359
 Green Speckled 1719
 Gros Blanc Kisozi 1256
 Gros Blanc 2826 1256
 Grosse Blanc 1647
 G2333 1398
 H 1 1655
 H 3 1655 1662
 H 4 1662
 H 6 1670
 H 7 1644 1652 1664 1670 1674
 1677
 H 7 Caraotas 1660
 H 12 1662
 H 22 1675 1683
 H 24 1655
 H 27 1655
 H 33 1664 1670 1674 1677
 H 35 1689
 H 39 1655
 H 40 1655 1662
 H 45 1683
 H 79 1689 1690
 H 83 1689
 H. 6 1663 1678
 H. 7 1678
 H. 21 1682
 H. 35 1678 1682
 H. 36 1682
 H. 37 1682
 H. 107 1682
 H. 109 1682
 H. 119 1682
 H. Wolmer 1652 1660
 H.07 1665
 H.98 Rupondo 1671
 H.152 Bukini 1671
 H.160 Mwenalize 1671
 Harvester 1632
 H4 1653 1655
 H07 1666
 H21 1666
 H35 1666
 H39 1653 1666
 H40 1653

Cultivars, varieties, ... (Continued)

Ibundu 1406 1636 1639 1645
 1647 1656 1667 1671 1675
 1683 1685 1703
 Ibundu (SM Ibundu) 1661
 IC-2 1520
 ICA (Bunsi) 1200
 (ICA) Bunsi 1205
 Ica Palmar 1398
 ICA Tui 1307
 ICA Viboral 1398
 Idaho Refugee 1685
 Ikinimba 1193 1394
 Immune 1632
 Imperial 1692
 Inkoos 1667
 Inyumba 1384 1398 1403 1405
 Irimu 1642 1649
 Irumu 1639
 IRW 8 1400
 IRW 10 1398
 ISAR 84 1398
 Itangaza 1687
 IVT 80785 1391
 Jamapa Incremento la Stanzuelli
 1411
 Jaune Pointillé 1201 1202 1203
 1209 1210 1270
 Jubila 1358 1359
 Juri 1400
 K2 1627
 K12 1605
 K18 1605
 K19 1605
 K20 1267 1601 1604 1605 1614
 1621 1623 1633
 K25 1605
 Kabala 1649
 Kabanima 1490 1491 1494 1496
 1497 1552 1560 1563 1566
 1579 1584 1588
 Kabenga 1240
 Kablanketi 1498 1554 1584
 Kaboon 1632
 Kachebeye 1638 1643 1651 1659
 Kaiko Ini 1636 1640 1642 1645
 1649
 Kakala 1668
 Kakumiro 35 1632
 Kalikabagen 1412
 Kamanti 1655
 Kamberg 1469 1718
 Kanani I 1698
 Kanyakilo 1645
 Karama 1208
 Karama 1/2 1201 1209 1210 1270
 Karama var. 1/2 1200 1202 1203
 1204 1205 1206
 Karolina 1648
 Kasali 1640 1642 1649
 Kawaloka 1647

Kawanda 35 1606 1607
 Kenya 1578 1579
 Kiba 1246 1255 1256 1659
 Kiba (Bayo 0465 + 0469) 1248
 Kibongo 1668 1672
 Kiburu 1512 1515 1520
 Kibwebwe 1565 1578 1579
 Kicaro 1400 1447 1461
 Kigari 1648
 Kiko 1255 1256
 Kilyumukwe 1394
 Kime 1256
 Kinimba 1668
 Kinyamunderere 1668
 Kiregeia 1658
 Kirundu 1201
 Kiryumukwe 1398
 Kis 1254
 Kisola 1636
 Kisuma 1640
 Krashodisikaja USSR 1315
 Keali 1668
 Languy 1656
 Line 17 1210
 Line 600-ID 1351
 Line 1212D 1351
 Line 2209 1234
 Line 02209 1236
 Line 2586D 1351
 Line 2589D 1351
 Line 2610D 1351
 Linea 23 1203
 Linhagen 1678 1682
 Local 1639 1645
 Long Beige 2209 1226 1227
 Long Beige Indigena 2209 1229
 Long Tom 1365 1367
 Longury 1648
 Lubono 1642
 Lunage 3548 1636
 M 22 1438
 M 28 1440
 M 29 1667 1683
 M 36 1440
 M-103 1296
 M-112 1303
 M46 1703
 M64 (21274-2) 1303
 M64 (21274-2-81) 1303
 M64 (21274-25.81) 1303
 M103 1303
 M103 (20252-1) 1303 1307
 M342 1217
 Mabanyange 1698
 Magabori 1658 1671
 Mahagi 1695
 MAK 2-3 1517 1533 1532 1548
 Mange Tout 1402
 Manteigao Preto 1640
 Masai Red 1481 1518
 Masonga 1505

Cultivars, varieties, ... (Continued)

Masusu	1554				
Melange Enrichi	1219				
Melange Jaune	1402	1406	1447		
Melange Jaune I	1408				
Melange Kabale	1407	1408			
Melange Rouge	1407				
Metis	1687				
Mex 12	1322				
Mex 142	1710				
Mex 152	1708				
Mexican 142	1294	1306	1307		
	1309	1313	1315	1318	1319
	1320	1321	1499	1505	1545
	1712				
Mexican 142-R	1313	1315			
Mexico 142	1374				
Mexico 235	1179				
MF 3-8304H	1563				
Mhanga	1567				
Michelite	1615	1632			
Misamfu	1709				
Misamfu Speckled Sugar	1710	1712			
Mixed 0330	1642				
Mixed 0538	1227				
Mixed 0762	1227				
Mixed Mexico 1194	1219	1229			
	1234	1235	1237	1244	1246
	1247	1253	1254	1256	1373
	1374	1375	1387	1414	1416
	1422	1425	1428	1430	1431
	1432	1435	1436	1440	1443
	1638	1642	1643	1649	1658
	1659	1663	1686	1689	1690
Mixed Mexico 0588	1236				
Mixed Mexico 0762	1226	1236			
Mont Calm	1287				
Montcalm 1351	1358	1359			
Monte-calm	1275				
MSS	1708				
Muhinga	1693				
Muhuta	1639	1640	1642	1649	
	1658	1668			
Multima	1400				
Mulungu 29	1683				
Mulungu 358	1217	1223			
Mulungu 4367	1217				
Munyu	1400	1408	1693	1694	
Musale	1647				
Mushali	1406				
Mutiki	1396				
Mutiki 2	1400	1447			
Mwezi Moja (GLP 10)	1337				
N 5644	1384				
N 7093	1405				
Nain	1405				
Nain Conserva	1400				
Nain de Kiondo	1642	1645	1656		
	1661	1675			
Nain de Kyondo	1636	1694	1695		
	1698				
Nain Mangetout	1408				
Nain Princesse Cordor	1400				
Namajengo	1358	1359			
Namugoroba	1683				
Namuleke	1695				
Namulinwa	1683				
Namulonge 35	1632				
Namushibe	1648				
Namusinho	1667				
Nanus	1408				
Nasaka	1351	1358	1359		
Natal Sugar	1723				
Nayego	1648				
Nazareth small	1319	1322			
Nazret Selection 27	1297				
Nazret Small-03	1309				
Ndimirakaguja	1400				
Negro Huasteco 81	1271				
Negro Mecentral	1307				
Negro Mecentrau	1315	1320			
Negro Mecentrou	64	1298			
Negro 4508	1217				
Nep	1710				
NEP 2	1200				
Nep 2	1708	1709	1718	1719	
	1723				
Ni 555	1400				
Ni 572	1400				
Nioka	1670	1677			
Nkaga	1422				
Nkole Vigna	1696				
No. 11	1411	1420			
No. 17	1647				
No. 18	1412				
No. 31 N'Dihira	1647				
No. 35	1627				
No. 37	1413				
No. 47	1607				
No. 49	1374	1375			
No. 68	1607				
No. 77	1607				
No. 78	1412	1414	1420		
No. 86	1412				
No. 97	1658				
No. 116	1625				
No. 134 GLX	1695				
No. 160	1607				
No. 212	1605	1607			
No. 948	1642				
No. 950	1642				
Noir Beurè d'Alger	1648				
Noir de Gisenyi	1695				
Nauzumirurushako	1398	1400			
	1405				
Ntendezi	1699				
Nuweveld	1718				
Nyauzembe	1341				
Nyirakabuye Jaune	1406				
Nyirakirete	1656				
Nyirakiwete	1647				
Nyiramabuye	1411				

Cultivars, varieties, ... (Continued)

Nyiramahoro 1374 1375 1406

1420 1423 1429

Nyrikagano 1396

P 189 1554

P 285 1534

P 311-A-L 1516 1572

P 532 1492

F-24 1532

P-285 1516 1519 1532 1547

P-304 1552

P-617 1516

P311-A-L 1528 1533 1535 1539

1543

P311-I-L 1536

P402 1344 1346

P560 1307

PA01 1655

PA05 1655

PC 18-C5 1723

PC 78 1638 1643 1651 1659

Perry Marrow 1615 1632

PI 155-A-L 1490

Pinto 1217

Pinto 62 1647

PL 1 1695

PL 2 1695

PL 3 1695

PL. 015 1673

PL. 016 1673

PL. 017 1673

Porrillo 566 1271

Porrillo 693 1271

Prenel 1400

Prov. Languy 1636 1644 1652

1660

PV 40 1635

Quarantain 1689

Radio 1400

Raiado Grade 1408 1400

Rames 1640

Red Canadian Wonder 1723 1724

Red Kidney 1615

Red Kloud 1473

Red Kote 1391 1473

Red Mexican U13 1359

Red Mexican U134 1359

Red Mexican U13 1358

Red Mexican U134 1358

Redlands Beaty 1609

Redlands Green Leaf 1609

Redlands Green Leaf C 1179

Richmond 1400

Richmond Nandos 1408

Richmond Wonder 1297 1408

Riversdale Suiker 1685

RO 2/1 1473

Rose Coco 1406 1406

Rosecoco (GLP 2) 1337

RS-63-RM 1517 1575

Rubona 5 1390 1394 1447

Rupendo 1644 1652

Rushari 1647

Rwerere 8 1400

Rwerere 11 1405

S.G. 10 1661 1698

S.G. 18 1696

S.G. 30 1696

S.G. 44 1412 1636 1637 1639

1640 1642 1647 1656 1661

1696 1697 1698

S.N. 2792 1636

Sabana Grande 1411

Sabo 1491

Sabre a Rames 1400

Samba 1687

Sanilac 1609

Sapeledekwa 1344

Saxa 1378 1400 1405 1406 1407

1408 1411

SB 44 1223 1224

SB 44/1 1224

SD 79/381 1517 1532 1534

SD-79/381 1516

Selean Wonder 1520 1536 1549

Selection 8 1519

Selian Wonder 1481 1496 1503

1505 1507 1551 1553 1558

1560 1565 1567 1588

Seminole Mottled Wax 1485

SG 44 1411

Shikashike 1398

Sornel 1400 1408

SSN 1 1718

Sumbawanga 1498

Supermatis 1545

Supermetis 1408 1519

Swiss Blanc 1275 1282

T 3 1490

T 8 1496

T3 1491 1519 1520 1545 1552

1554 1566 1572 1584

T8 1494 1498 1499 1505 1552

1584

T23 1512 1515 1516 1518 1519

1520 1529 1534 1536 1545

1572 1575

Tanganyika Black Beans 1610

TB 79/467 1516 1532

TB 79/509 1516

Teebus 1718

Tendensi 1700

Tengeru 1319

Tengeru 12 1321

Tengeru 16 1317 1321 1322

Tibihawa 1512 1575

TMO 35 1580

TMO 42 1507

TMO 72 1507

TMO 75 1580

TMO 101 1493 1507 1551 1553

1577

Cultivars, varieties, ... (Continued)	1644	1652	1660	1667	1675
TMO 104	1507				
TMO 118	1493	1553			
TMO 124	1577				
TMO 197	1577				
TMO 200	1557				
TMO 214	1577				
TMO 216	1577				
TMO 223	1577				
TMO-78	1715				
TMO-101	1715				
TMO-110	1715				
Top-Crop	1723				
Tostado	1394	1398	1447		
TukuLa	1653	1655			
Tunia	1692				
Tuta	1635	1641	1648	1653	1655
	1666	1699	1700	1701	
UAC 116	1494	1496			
Ukindo no. 9	1698				
Umutikili	1398				
Un Demi	1377				
Unyumba	1400				
Urubonobono	1201	1208			
Urunyamba 3	1461				
Urunyamba	1400	1406	1447		
Urunyamba 3	1394	1455			
Urushimandengo	1396				
Usjol	1648				
V 3249-13-1C	1179				
V 7920	1391				
V 79116	1398				
Vadenal	1285				
Valgreen	1400				
Var. 1/2	1211	1400	1402	1403	
	1406	1407	1408		
Var. 11	1400	1408	1447		
Var. 54	1378	1403	1405	1406	
	1411				
Var. 7211	1400				
Varia Vaganda	1667	1675	1683		
	1685	1703			
Vera Cruz 78	1455				
Virovsky	1703				
W 85 (21305-9)	1306				
W-85 (21305-2)	1303				
W-85 (21305-9)	1303				
W-95	1315	1320			
W-108-0177-2	1313				
W-117-0150-1	1313				
W-132-20711-1	1313				
White Processor	1723				
Widusa	1632				
Wulma	1194	1219	1223	1251	
	1252	1258	1373	1374	1375
	1378	1384	1387	1405	1406
	1408	1409	1411	1412	1413
	1414	1415	1416	1420	1423
	1424	1426	1428	1429	1430
	1431	1432	1433	1434	1438
	1439	1447	1455	1461	1640
	1683	1685	1703		
Wulma	4508	1221			
Wulmer	1644				
Wyo	166	1693			
W85 (21305-2)	1309				
YC-2	1494	1498	1516	1534	
	1545	1572	1575		
Yellow Haricot	1718				
Zangi	1655				
Zabras	1719				
2/46/97/67	1647				
3/11/77/42	1647				
6R-395-08	1313				
13-433	1296				
13/23	1700	1701			
15-R	1316				
15-R-42	1303				
15-R-66	1315				
15R-52	1298				
15R-512	1296				
19 (WSPS)	1554				
21 Aa	1240	1246	1251	1435	
	1436	1438	1439	1640	
25	1623				
28/59	1635				
34 SB 44	1217				
34 SB 44/1	1217	1218	1223		
34 SB/44/1	1214				
34SB/44/1	1216				
45 Amarillo	1224				
45 Buff	1297				
46 MF 3-8409B	1563				
47 Negro	150	1224			
48 Bayo	164	1224			
60-4-60	1412	1420			
68	1318	1623			
73 Vu	945	1294			
78	1623	1625			
79	1623	1625			
132	1623				
224	8305-G	1563			
271	1449				
272	1449				
273	1449				
295 (G. 49)	1636				
0538	1255				
0538 Mixed Mexico	1232	1256			
0547 Bayo	1231				
600-ID	1359				
618	1449				
645	1449				
0652	1255				
0652 Colorado	1256				
0688	1405				
0688 Colorado	1200	1204	1205		
	1209	1232	1234		
0762 Mixed Mexico	1200	1204			
	1205				
01002	1255				
1199	1350				

Cultivars, varieties, ... (Continued)

1212D 1359
2209 L B I 1234
2209 L.B.I. 1232
2586D 1359
2609D 1359
2610D 1359
2816 1435 1436 1440
3754 1249
3761 1249
4505 1227
4508 1226
5237 1703
6473 1411
7045 1408
7093 1406
31342-1 1297
51051 1179
309747 1316

Cultivation 1582 1729

Cultivation systems 1714

Curly top virus
Disease transmission 1473
Resistance 1473
Symptomatology 1473

Decapotoma

Host plant 1726
Insect biology 1726
Insect control 1726
Insecticides 1726
Plant damage 1726

Defoliation 1350

Disease transmission 1334 1585

Disease, bacterial
(see specific pathogens)

Disease control
(see specific pathogens;
Integrated pest management)

Disease, fungal
(see specific pathogens)

Disease resistance
(see specific pathogens)

Disease transmission
(see specific pathogens)

Disease, viral
(see Viroses; specific
pathogens)

Diseases and pathogens

1457 1460 1650 (see also
specific pathogens)
Disease control 1484 1584 1618
Plant damage 1705
Resistance 1210 1295 1305 1315
1357 1364 1393 1447 1459
1463 1514 1525 1561
Symptomatology 1705

Drought 1186 1231 1241 1247 1398
1402 1429 1701 1717 1727

Resistance 1317 1328 1330 1375
1424 1425 1431 1438 1463
1706 1708 1709 1719

Dry matter 1336 1346

Economics 1212 1339

Empoasca 1186

Empoasca dolichi 1715

Entomology 1469 1478 1596 171
1716

Ephestia cautella 1327

Erysiphe polygoni 1614
Resistance 1602 1609 1615

Eucalyptus camaldulensis
Intercropping 1349

Extension 1311 1508 1589

Farming systems 1191 1480
1561 1590

Fertilizers 1202 1205 123
1234 1242 1257 1271
1301 1316 1320 1331

1338 1340 1346 1371
1418 1422 1435 1471
1469 1479 1561 1571
1635 1641 1644 1671

1700 1712 1717
(see also specific
pathogens)

Nodulation 1172
Yields 1332 1333
1613

Flower abscission 1

Flowering 1204 12
1414 1415 1471

French bean
(see Snap bean)

Aschectium verrucaria 1276

Nematodes 1705
(see also under specific pest names)

Nitrogen 1172 1301 1316 1320
1331 1333 1337 1346 1392
1418 1422 1469 1598 1599
1600 1712

Nitrogen fixation 1172 1182 1274
1294 1301 1331 1348 1367
1392 1463 1467 1478 1561
1581 1601

Modulation 1271 1331 1336 1337
1385 1386 1392 1410 1581
1601 1712

Nutrient absorption 1286 1331

Nutritive value 1178 1371 1395
1399 1452 1454 1616 1617
1702

On-farm research 1178 1184 1206
1333 1349 1469 1717

Pathology 1727

Plant damage 1504

Phaseolus bennigseni 1513 1556

Insect control 1495 1497 1503
1583

Insecticides 1495 1497 1503

Plant damage 1495 1496 1503
1505

Resistance 1494 1496 1499 1505

Phaseolus murabilis 1174

Pathology
Insect control 1439
Resistance 1648

Phaseolus centrosematis 1706

Phaseolus phaseoli 1243 1315 1317
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