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Summary of Country Reports

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Country reports containing the various aspects of bean production were presented by Burundi, Kenya, Malawi, Rwanda, Tanzania, Uganda and Zambia. Each of these reports was of high standard, containing a wealth of information and data on the bean production situation in the respective country. Their authors deserve to be complimented for their effort, time and dedication to this work, which formed the true basis for this workshop.

The seven country reports can be summarized as follows:

Importance of Beans

Beans are an important and cheap source of protein with an amino acid composition complementary to that of maize, the staple food of the region. They are also an important carbohydrate source. In most areas in Eastern Africa, beans are the most important food legume, with an annual production exceeding 1.5 million tons. Yields in the region range from 400 to 700 kg/ha.

Consumption of beans is mostly in the form of dry beans. However, green shelled beans, tender leaves and green immature pods, in that order, are also consumed. To a lesser degree, beans are produced for the canning industry in most countries, while Kenya and Tanzania produce seed for the export market.

Besides direct consumption, beans provide cash income for the producers, who are usually small holder farmers.

Bean Types Produced

The majority of bean production in Eastern Africa is of the determinate or indeterminate bush varieties. The importance of the climbing types increases with the duration of the wet season or with higher altitudes. The latter is usually accompanied by higher precipitation or moisture availability. Climbing beans are particularly important in Malawi, Southern Tanzania, Rwanda, Burundi, and Northern and Western Uganda. A major reason why climbers are not more widely grown is the difficulty of harvesting.

Beans are thought to have been introduced by Spanish and Portuguese traders in the 16th and 17th centuries together with maize. In more recent years germplasm has been introduced in all countries from other areas of the world in attempts to improve local production.

The consumer preference is for large seeded types with small seeded ones least preferred. Red, red mottled, purple mottled or brown to light brown mottled beans are preferred over other colors while white seeded beans are preferred for the canning industry. The Canadian Wonder seed types are most preferred followed by Calima types. Black seeded types have very low acceptance although they are found.

Strength or rigidity of color and size preferences vary from region to region and are less prominent in Burundi, Rwanda and Zambia where beans of a variety of colors are grown and sometimes mixtures are even preferred. There is a strong market incentive for certain colors however higher priced beans are sometimes marketed with less preferred types in order to sell all beans.

Production Environment

Beans are produced under natural rainfall and planted in such time as to mature and ripen at the onset of the dry season. Very little bean production takes place under irrigation. In some areas like Uganda early maturing bean varieties are planted any time soil moisture permits germination.

Production takes place between 700 and 2000 masl concentrated around 1200 to 1500 masl.

Production Systems

Beans are produced mostly in association with other crops. However this varies greatly. In Malawi less than 6% of the total production is in

monoculture while in Eastern Kenya monoculture is practiced in 40% of the region. When beans are grown in association maize is the most common partner while crops such as plantain, cassava, pumpkin, groundnut etc. often share the field with beans. Those for seed production or the canning industry are grown in monoculture.

Planting densities are often below those recommended as optimal by experiment stations. The planting pattern is at random and mostly in the same hill when planted with maize. The planting dates are adjusted to the initiation and termination of the rains which varies with the latitude. Most important regional planting dates are February, March and October, November. Therefore April and December are the best time for visits to commercial bean fields in many areas.

Weed control is considered a major production problem causing severe losses. Weeding is mostly manual and often coincides with other peak labor demands. Labor shortages were frequently mentioned to occur although intermediate technology may provide solutions.

Harvest Most commonly mature beans are pulled by hand, dried in the field and threshed by beating the plants with sticks. The fresh green shelled beans are picked in several rounds.

Trade Production estimates for beans are very difficult to make as only a small percentage of the total production enters the marketing channels. Post harvest price collapse was mentioned to occur.

Reports state that 61% of the total African bean production takes place in five countries: Kenya, Rwanda, Tanzania, Burundi and Uganda. The highest per capita bean consumption in the world occurs in Rwanda and Burundi with up to 50 kg legumes consumed per person each year.

Storage Storage technology is insufficiently developed especially at the farm level although adequate storage facilities are available in some places. Normally simple and inadequate storage structures are used and losses of stored grain caused by insects are reported to be as high as 23%.

Control of storage insects is recommended with 1% lindane or malathion powder while more traditional methods include the use of ash or sand to fill up intergranular spaces or to coat beans with vegetable oils. Tobacco leaves or dust mixed with stored beans were mentioned to reduce bruchid attack.

Consumption Not only are beans grown with maize they are usually consumed together as well. It is common to soak beans to reduce cooking time and thus save fuel. Subsequently the beans are cooked sometimes with various spices added and eaten with or mixed with maize porridge or dough. Also maize and beans are commonly cooked together. Small children were reported to be fed a mixture of beans, groundnut and maize to prevent kwashiorkor. Green shelled beans and tender leaves are eaten cooked.

Factors Limiting Production

The principal limiting factor to bean production is considered to be the susceptibility of beans to diseases and pests while production technology and seed availability are also important constraints to production increases.

Due to consumer preferences often the best disease resistant or highest yielding variety cannot be grown. Diseases are the principal factor limiting production as a large number of them attack beans and their severity in terms of yield reduction is high for most of them. The following list of disease priorities was summarized from the country reports.

Anthracnose It is considered the most important disease by five of the six countries (excluding Burundi, Table 1) when each country listed their five most important diseases. Anthracnose was mentioned six times (angular leaf spot six times (however it was ranked as the third or fourth most important), rust five times (ranging from second to fifth in importance), BCMV four times, bacterial blight (probably excluding halo blight) three times, halo blight twice (however in Kenya it is considered the most important disease) while Ascochyta leaf spot was mentioned once. However it is believed that BCMV virus may be more important than generally stated. Resistance sources to the above diseases are often available but not in acceptable grain types or in proper combination with other diseases.

Other diseases like bean scab do occur in Africa but are not reported in Latin America.

The bean fly is the most important insect pest. Resistance sources are given in the literature which are based on rapid secondary rooting. Aphids and leaf feeding beetles are causing damage but the extent of it needs more research.

Table 1 Disease priorities¹ given by each country

Country	Anthracnose	Halo blight	BCMV ²	ALS	Rust	CBB	Ascochyta
Kenya	3	1	2	4	5		
Malawi	1	2		5	4	3	
Rwanda	1		3	3	2	3	2
Tanzania	1		4	3	2		
Uganda	1			4	3	2	
Zambia	1		4	3	2		

¹ Frequency = 1 to 5

² BCMV = Bacterial Mosaic; ALS = Angular Leaf Spot; CBB = Common Bacterial Blight

In general the farmer does not control diseases and insects with chemicals. Neither do farmers use disease free seed which contributes to the severity of diseases. However participants from several countries stated that unavailability of certified seed was the main reason for not using it and that farmers would use it if available.

Other production constraints include unreliable rainfall patterns, very low planting densities (possibly for reasons of moisture availability or disease avoidance), suboptimal association patterns with other crops including relative planting dates, inadequate weed control, and insufficient fertilizer use. Drought and the latter two are considered to be the most important production constraints after pests and diseases.

Economic constraints to increased production are very important. Often bean prices fluctuate too much to provide incentives to farmers to use additional inputs. On the other hand, in countries like Kenya with high bean prices, farmers will not use inputs as the risk of bean production is too high. If for instance drought destroys a bean crop, used inputs are lost. Government price controls have often acted as hindrances to increased bean production.

From most reports it was clear that the size and continuity of the bean research programs and their additional responsibilities with other crops limit the development of profitable technology. Usually, and in decreasing order of availability, a research team is composed of a breeder, a pathologist, an agronomist, and an entomologist, this being the minimum size for a program to operate. However, stronger integration within these teams and a better defined responsibility for research between Universities

and Ministries of Agriculture can improve research potential to some degree

Not only was the lack of research scientists mentioned but also the lack of extension officers and the communication gap between them which was considered of great importance and one of the reasons why improved technology has not reached the farmer

Besides the limitations in personnel the level of training the availability and exchange of scientific information were considered inadequate Better access to literature and easier dissemination of information are needed Research support at the experiment station is generally insufficient Existing language barriers in Eastern Africa also limit free exchange of scientific information

Research Achievements

Despite the small size of programs much has been achieved over the past years Production methodologies have been developed to overcome some of the constraints mentioned new varietal introductions individual plant selections or progenies from hybridization programs have been released but have received varying degrees of adoption by farmers Unavailability of seed and commercial unacceptability may have contributed to the lack of adoption Despite such and other achievements much more will be needed to increase bean production in this region

Conclusions

FAO estimates of bean production in Africa indicate that over the last 10 years bean production increased in Africa but this was due only to area increases In most cases this increase in area under production was partially offset by a productivity decrease of over 2% per year in some countries Only in few countries like Tanzania were area increases accompanied by productivity increases Part of the reason for reduced productivity is the replacement of beans by other less risky crops like cassava and plantain — as reported for Uganda — which provide less protein to humans In these cases bean production often was displaced to more marginal areas To insure a growing population with a steady supply of adequate affordable protein rapid solutions must be found to overcome the bean production constraints outlined in this report

Summary of Panel Discussions

Agronomy

The panel discussed the wide area covered by agronomy which includes regional yield trials of promising materials plant density cropping systems research fertilization weed control crop physiology and stress studies irrigation and mechanization of the small producer Out of this wide range of activities the following list of priority research areas was proposed

Regional yield trials To be carried out on a permanent multilocational basis with new releases from breeding programs By deleting poor performers and adding new releases such systematic regional trials should result in recommendations to farmers and to the seed industry of superior new genetic materials Such trials should be conducted under the principal cropping systems and input levels used by the farmers As a result different varieties can be recommended for mono and associated cropping systems and for different ecological zones Cropping practices of small farmers should receive adequate attention

Farm survey The panel assigned high priority to conducting detailed farm surveys to obtain knowledge on major production systems and production constraints The survey should also include storage practices and losses during storage as well as sales of surplus production

Weed control Most bean plantings suffer severe losses from weed competition and weed control costs reduce profitability of bean