



**Food  
Legume  
Improvement  
and  
Development**

Proceedings  
of a  
workshop  
held at The  
University  
of Aleppo,  
Syria,  
2-7 May  
1978

Geoffrey C.  
Hawtin  
and  
George J.  
Chancellor,  
Editors

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*Editors:* Geoffrey C. Hawtin and George J. Chancellor

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## **Broad Beans (*Vicia faba*) and Dry Peas (*Pisum sativum*) in Ethiopia**

Asfaw Telaye

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Ethiopia lies entirely within the tropics between latitudes 3° and 18°N and longitudes 33° and 48°E. The climate ranges from permanently humid with hot summers to tropical semidesert and desert, and on this basis the country can be divided into four main zones:

- (1) the "Quola" or hot zone, with altitudes below 1800 m and an average annual temperature greater than 20 °C; the cropping of broad beans and peas is very limited in this area due to the severe and numerous diseases;
- (2) the "Weyna dega" or temperate zone, where the altitude varies from 1800 to 2400 m and average temperatures are between 16 and 20 °C; within this zone the importance of broad bean and pea cropping is considerable and increases with altitude;
- (3) the "Dega" or cool zone, which has altitudes of 2400–3800 m and where average temperatures vary from 10 to 16 °C; the cropping of broad beans in this region extends up to an altitude of about 3000 m; however, above 2900 m chocolate spot (*Botrytis fabae*) and frost severely limit production;
- (4) the mountain zone, with altitudes in excess of 3800 m and an alpine climate; the vegetation here is predominantly alpine and there is no cropping.

In the major broad bean and pea production area, the "Weyna dega," the bulk of the annual precipitation normally falls during the period June to mid-September. Maximum temperatures rarely exceed 27 °C, and although diurnal variations during the dry period may be as great as 22 C°, variations during the period of rainfall are usually of the order of 6 C°. At altitudes greater than 2100 m night frosts may occur between November and the end of January.

Ethiopian soils are generally of a very high clay content and vary from red to red/brown on the mountains, through red/brown on the slopes and brown to dark in the rolling country, to very dark and nearly black in the plain lands.

### **Broad Beans (*Vicia faba*)**

Pulse crops are grown on an estimated 8% of the total Ethiopian arable area, in contrast to the cereals, which occupy over 70%.

Although broad beans are generally considered to be secondary in importance to chick-peas in the agriculture of the country, Ethiopia is one of the leading nations in the world in terms of broad bean production. Approximately 150 000 ha, or 1.5% of the total cultivated area, is annually devoted to the production of broad beans, which exceeds 140 000 metric tonnes (Table 1).

Broad beans can be found growing in every province in Ethiopia, usually in rotation with small grain cereals. The provinces of Shoa, Wello, Tigray, Begumdir, and Gojam (Fig. 1) are the most important production areas.

### **Current Production Practices**

Broad beans are produced almost exclusively by traditional methods. The land is prepared using traditional wooden- and steel-pointed ploughs, which break the soil but do

TABLE 1. Broad bean and dry pea production in Ethiopia 1967-77.

Year	Broad beans			Dry peas		
	Area ('000 ha)	Yield (Q/ha)	Prod. ('000 t)	Area ('000 ha)	Yield (Q/ha)	Prod. ('000 t)
1967	131.4	9.2	120.9	130.0	9.2	119.6
1968	136.0	9.3	125.9	131.8	9.2	121.6
1969	140.2	9.4	137.5	133.5	9.3	123.9
1970	144.0	9.6	137.8	135.0	9.4	126.4
1971	147.3	9.8	144.9	136.2	9.5	129.5
1972	150.0	10.2	152.9	137.1	9.7	132.4
1973	137.0	8.5	118.7	150.0	4.9	73.5
1974	138.0	8.6	294.8	151.4	4.9	74.2
1975	259.0	11.1	304.4	108.0	4.4	47.5
1976				107.0	4.8	65.1
1977				138.4	7.4	51.8



Fig. 1. Provincial divisions of Ethiopia. The provinces of Shoa, Wello, Tigrai, Begumdir, and Gojam are the most important production areas for broad beans.

not turn it; three ploughings are normal prior to broad bean planting, whereas only two are usual for pea production. Broad beans, in common with legumes in general, are frequently grown on poor and sometimes badly eroded soils where cereals are expected to fail. They may also be grown in mixtures with field peas. Planting normally takes place at the beginning of the rainy season in June and the crop is thus harvested in December or January. In some regions, however, namely Wello, and the north of Bale and Sidamo, broad beans are produced off-season during the winter months.

Trials conducted at research stations throughout Ethiopia have established that the optimum plant density for broad bean production may be obtained with a sowing rate of 150–200 kg/ha and a spacing of 5 cm between plants and 40 cm between rows. However, most farmers broadcast their seed at about 150 kg/ha and receive average returns of between 7 and 10 quintals/ha, which is well below the optimum. Applications of 100 kg/ha of phosphate are generally recommended for broad beans.

The crop is normally harvested when most of the leaves have dropped, most of the pods have turned black, and the upper pods are yellowing. The harvesting date varies with altitude but may start as early as late October. Once the crop is cut, it is stacked and left in the field to dry for about 6 weeks before being threshed, using animals (oxen or horses) that trample the crops spread out on a hard piece of ground. Wooden forks and shovels are then used to toss the grain in the air to winnow out the chaff.

### **Diseases and Pests**

Broad beans are susceptible to a large number of fungal diseases that may cause considerable crop losses. The most important of these are rust (*Uromyces fabae*), chocolate spot (*Botrytis fabae*), powdery mildew (*Erysiphe polygoni*), and root rot diseases (*Fusarium* and *Rhizoctonia* spp.). Several viral diseases have also been noted affecting the crop.

The major insect problems are the American bollworm (*Heliothis armigera*), which may be serious in late September and October, aphids (*Aphis fabae*), and thrips (*Teaniothrips sijotedi trybom*), which attack the reproductive organs and interfere with fertilization.

Weeds are also great problems in broad bean crops, resulting in severe yield reductions. Early removal is thus essential and two weedings are recommended.

### **Uses and Marketing**

In many parts of Ethiopia broad beans are a daily part of the diet of the population. They are an important source of dietary protein, especially valuable during the numerous days of fasting that are observed. Broad beans may be consumed green, either raw, roasted, or boiled; as dry seed, having been soaked, roasted, or boiled; in a preparation with a hot sauce called "wot"; ground and mixed with barley, wheat, or teff flour to form "injera" (a kind of pancake-type bread); or used in the preparation of various sauces (e.g., in a mixture with mustard and spices that is fermented for 4–5 days).

The bulk of the broad bean crop is consumed locally, but a certain proportion is exported every year, particularly to the countries of the Arabian peninsula, western Europe, and Southeast Asia. The quantity and value of pulse exports over the past 7 years is shown in Table 2.

### **Field Peas (*Pisum sativum*)**

The field pea is grown predominantly as a dry pulse but can also be harvested immature as a green vegetable. As with the broad bean crop, most of the production is consumed locally, with the exception of a small amount that is exported (Table 2).

In common with broad beans, peas are generally grown in areas between 1800 and 3000 m above sea level, and are normally sown at the beginning of the rains (mid-June to July) for harvesting from mid-October onward. The area devoted to field pea production is in general only slightly less than that for broad beans, but the considerable decline in yields over the past 6 years has meant that present production is very much lower (Table 1).

TABLE 2. Quantity ('000 t) and value (U.S. \$) of pulse exports from Ethiopia 1970-77.

Year	Exportation									
	Chick-peas		Broad beans		Haricot beans		Lentils		Field peas	
	Quant.	Value	Quant.	Value	Quant.	Value	Quant.	Value	Quant.	Value
1970	2.2	235	15.6	225	17.1	396	15.8	312	0.4	257
1971	6.3	283	16.6	268	22.6	447	18.0	314	0.2	265
1972	10.7	279	19.0	299	25.6	402	21.9	322	0.5	284
1973	8.1	444	29.7	295	19.7	633	22.2	564	2.4	643
1974	8.2	682	28.0	489	46.0	1032	30.0	955	10.5	769
1975	10.0	539	22.0	404	41.5	622	37.3	832	-	-
1976	-	600	26.7	434	-	-	17.6	670	-	583
1977	10.0	171.5	26.7	264.6	-	-	17.6	641	-	-

### Current Production Practices

The major production areas are in the north, west, and southwest of the country, and the crop is often grown on poor badly eroded soils where cereal production is not possible. Field peas are generally grown in monoculture but may be produced in a mixture with broad beans and occasionally also with barley. The crop is usually broadcast sown at the rate of 100-150 kg/ha (the latter figure being the recommended rate), and covered using a local plough. This practice, however, frequently results in uneven germination and the loss of young seedlings to both birds and ants.

Peas are harvested in a similar manner to broad beans, when the upper pods are yellowing and the lower ones are almost dry. Harvesting usually takes place in the early morning or afternoon to reduce losses from pod shattering and the cut plants are then stacked in the field to dry for 4-5 weeks before being threshed and winnowed.

### Diseases and Pests

The diseases causing the most severe crop losses to field peas in Ethiopia are powdery mildew (*Erysiphe polygoni*), wilt (caused mainly by *Fusarium* species), and *Ascochyta* blight.

The most serious pest of field peas is probably the American bollworm (*Heliothis armigera*), but there is very little information available on the other important pests of the crop.

Weeds cause some yield losses, but weed control is rarely practiced and under good growing conditions the tall and viney Ethiopian peas compete fairly effectively with the weed population once complete ground cover has been achieved.

### Highland Pulse Research

The agroecological systems existing within Ethiopia are highly complex in their structure, different ecological conditions being encountered within relatively short distances. As a result of this situation, a large number of trial sites must be used for experimentation to achieve proper representation.

The research and development work on food legumes is coordinated through the National Crop Improvement Committee, which evaluates research proposals prepared by the individual crop coordinators. Despite the importance of broad beans and chick-peas to the agriculture of the country, research on these crops is still in its infancy in Ethiopia.

Germ-plasm collections of both these crops have been built up as a result of collecting expeditions by a number of individuals and organizations. However, most collections to date have been predominantly from market samples and the information on such samples is generally very poor. In spite of this drawback, a considerable range of variation has been found within the collections and this has formed a useful base for improvement efforts. In fact some of the highest yielding lines developed so far have resulted from selections from such germ-plasm collections. In 1977, a systematic collection from the major growing

provinces of Shoa and Gojam yielded more than 300 samples of broad bean and pea material. Further collection and systematic documentation, however, is required for both crops. In addition, broad bean germ plasm has been obtained from both national and international sources; in 1977-78, for example, 817 accessions from ICARDA, 81 from the USA, 50 from the U.K., and 129 from Ethiopia were screened by the program. Promising lines selected from such screenings are promoted into national level yield trials for further evaluation. Some cultivars have performed well in these trials: record yields of 40-50 quintals/ha have been reported, and under certain conditions the best cultivars have shown a two- to fourfold yield improvement over traditionally cultivated varieties.

The varieties and selections of broad beans and peas that have been shown to be superior to the presently cultivated types are for broad beans: Kuse 2.27.33, CS2DK, CS11AK, and CS38BK; for field peas: Prussian blue, CS436, Kulumsa, and Mahandar 4.

Agronomic trials have established that row planting of broad beans gives an increased yield over broadcast seeding over a wide range of seed rates. Studies on plant populations have been carried out both with broad beans and field peas and various seed rates and spacings have been recommended. Investigations have also revealed a significant interaction between date of planting, soil type, and seed yield in field peas, the best results being obtained with mid-June plantings on the red clay soils and early July plantings on the black clay soils.

### **Future Research Priorities**

The average yields of pulse crops grown in Ethiopia's traditional pulse-growing regions tend to be very low (7-10 Q/ha) in comparison to yields obtained under experimental conditions (up to 50 Q/ha). This difference largely results from the continued use of local unimproved varieties grown under traditional agronomic means.

To increase yields at the national level, research on broad beans and field peas in the future must focus on two major thrusts: firstly and most importantly, the development of improved cultivars that combine a high yielding ability with resistance to the major diseases, insect pests, and frost, all of which are severe constraints to production; and secondly, the evolution and introduction of improved agronomic practices, such as proper seedbed preparation, accurate planting, and efficient weed control, which will enable the potential of these new varieties to be more fully expressed. Considerable emphasis will be placed on the development, testing, and distribution of such new cultivars and production practices and it is hoped that this will result in yields under commercial conditions that are more comparable to those at present being achieved on the research stations throughout the country.