



**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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Section II

The Present Production and Improvement Situation

Food Legumes in Algeria

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Historical Considerations

With the exception of beans, the cultivation of legume crops in Algeria can be traced back over many thousands of years to the dawn of plant domestication in the region of the Near East and North Africa. The species have, since then, evolved through small-scale cultivation in isolated local populations, and even up to the period between the French occupation and World War I, it has proved almost impossible to define the areas of land devoted to the cultivation of individual crops. Figures available from World War I onward indicate considerable fluctuations in dry legume seed production in the country, as can be seen in the following figures:

Year	Production area (ha)				
	Peas	Broad beans	Chick-peas	Lentils	Dry beans
1929	18127	38014	27630	1329	1152
1952	8000	45000	25000	40000	-
1964	5700	22890	18230	8400	2040

As the legume crops have traditionally been produced locally for local consumption, these variations have tended to reflect variations in population stability, especially the availability of manpower and seed. Furthermore, disturbances on a national scale in the 1950s and early 1960s resulted in a sharp drop in production throughout the country in this period.

The Present Production Situation

With the preoccupation of the country in improving the standard of living of its population that has been evident over the last decade, the cultivation of dry legumes has been encouraged. The use of legumes in rotation with cereals to replace the traditional fallow course has been shown to provide considerable cultural, as well as the more obvious economic advantages, through improvements in soil fertility and workability. In addition to this, legumes have proved valuable in intercropping with grapes and other fruit trees. The western parts of the country, with their high rainfall (400–500 mm) and large percentage of fallow land are particularly suitable areas for this type of intensification.

Despite these proven advantages, the structure of production and commerce and the relatively low consideration given to legume crops in the period prior to 1975 resulted in a steady decline in production up until this time (Table 1). To meet its domestic consumption requirements, the country was thus forced to import considerable quantities of legumes. However, after 1975 increasing encouragement was given to domestic production in the form of price incentives, as illustrated below:

Prices paid to producers in dinars/quintal (1968-1977)			
	1968	1974	1977
Lentils	88	90	250
Chick-peas	80	80	200
Broad beans	55	60	150
Beans	140	150	270
Peas	55	60	150

This has largely served to offset the great increases in the costs of inputs that occurred during this period but has so far failed to put legume production on a viable economic footing.

The Current Status of Production Practices

Food legumes almost invariably follow a cereal crop in the rotation, and in only very few cases are they planted following a fallow. The presowing land preparation consists of deep ploughing, with either a disc or a mouldboard plough, followed by cultivation with a disc harrow to break the clods, and is essentially identical to the preparation for a cereal crop. Prior to planting and after the first rains of the season the land is again disked to control weeds and further refine the seedbed. All the legume crops are row planted, as this facilitates weed control later in the season, lentils being almost entirely planted using a seed drill, whereas chick-peas, dry peas, and broad beans are, in general, hand seeded into previously opened furrows. Between-row spacing varies from 1-4 m, depending upon the size and type of cultural weeding equipment available, and may be fairly haphazard. Lentils and chick-peas are usually spring sown, lentils between mid-January and mid-February, and chick-peas between mid-February and mid-March, although actual dates vary considerably from the low altitude plains where the season is earlier to the later season high plateau areas. In contrast, broad beans and field peas are grown as winter crops and generally planted between late November and late December.

Natural *Rhizobia* have been found to exist in almost all the soils in which legumes are cultivated and for this reason seed inoculation is not carried out in Algeria. Fertilization is common throughout the pulse cropping areas, and phosphate is normally applied at the rate of 90 kg/ha in the fall. Nitrogen fertilization is not widespread, but 30 kg/ha may be applied post-planting or post-emergence. Algerian soils are believed to be rich in available potash and the use of fertilizers containing this macroelement is thus rare.

The bulk of the legume crops in Algeria are hand harvested: pulled from the ground, gathered in small heaps, left to dry, rearranged into larger piles, and threshed by stationary machines. In many cases, crops may be hauled to the farm yard for threshing, thus increasing yield losses that may be as high as 15-20% as a result of these operations. Recently, attempts at direct combining of lentils and chick-peas have met with some success, but such methods are still limited by the incorrect adjustment of the threshers, which results in a high percentage of damaged seed.

Important Pests and Diseases

Blight, caused by *Ascochyta rabei*, is without doubt the most important disease of chick-peas in Algeria, appearing on average once every 3 years and causing crop losses as high as 80%. *Ascochyta* species have also been identified as infecting broad bean crops but damage is seldom as serious. Both chick-peas and broad beans are commonly infected with

TABLE 1. Area production and yield of dry legumes in Algeria 1969-76.^a

Year	Lentils			Chick-peas			Broad beans			Peas			Total		
	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield
1969	23670	107000	4.5	28660	113310	4.0	23200	140070	6.0	10880	41900	3.8	86420	402280	4.6
1970	20830	47120	2.7	21850	63510	2.9	25630	99310	3.9	13350	30950	2.3	81660	240890	2.9
1971	15950	47220	3.0	23800	77250	3.2	26970	151980	5.6	13580	44780	3.3	80300	321210	4.0
1972	17980	55990	3.1	21510	70660	3.3	28900	168480	5.8	14690	42380	2.9	83080	345510	4.1
1973	20500	82000	4.0	25000	125000	5.0	28000	217000	7.5	13500	54000	4.0	88000	478000	5.4
1974	13450	22000	1.6	26400	78200	3.0	23800	135400	5.7	9650	34400	3.6	73000	270000	3.7
1975	14300	31700	2.2	26800	115000	4.3	25100	175400	7.0	7800	39400	5.1	74000	361500	4.9
1976	17920	88760	4.9	33250	253790	7.6	36480	344260	9.4	9830	67710	6.8	97480	754570	7.7

^a Area in hectares; production in quintals; yields in quintals/ha.

rusts in the coastal and subcoastal areas, and this may or may not be serious depending on the earliness of the disease outbreak. *Fusarium* species cause important diseases in lentil crops, especially as tolerance is low in local varieties. Root rot and powdery mildew are also fairly common diseases of field peas. In general, the level of disease infections and resulting yield losses is much higher in the moister environment of the coastal areas than in the dry interior where diseases are seldom a problem.

Of the insect pests attacking legumes in Algeria, bruchids, *Bruchus* sp., are of prime importance. Seed damage in lentils, which are much more vigorously attacked than the other pulse crops, may reach as high as 40%; in chick-peas, broad beans, and field peas damage usually ranges between 15 and 30%. Also of importance are aphids, *Aphis* sp., which are common pests of broad beans, lentils, and field peas, and which may become epidemic in some seasons.

At present no methods of control are being implemented for either the diseases or pests outlined above.

Weed infestation is by all standards the most important factor limiting legume production in the country, and different weed species are endemic to the whole range of arable land. Wild mustard, bindweed, pigweed, and lambsquarter are the most important broad leaf weeds, and the grass weeds that pose problems include wild oats, brome grass, and ryegrass. Weed control mainly involves the use of cultivators or disc harrows to eliminate between-row weeds, but weeds growing within the row are not generally controlled. Chemical methods are thus being encouraged as a means of achieving more total control, but at present are only used on a very small scale. The use of Trifluralin as a preplanting control has been included as part of a package of production practices for full mechanization of lentil production, and it is hoped that this will result in about 10% of the food legume production area receiving adequate chemical control by the end of the 1979 cropping season.

Major Problems of Production

The failure of legume production to become a viable economic enterprise in Algerian agriculture has largely stemmed from the fact that farmers have no interest in large-scale production. This is due to the very low productivity under the existing production practices and the rising cost and scarcity of the necessary hand labour, especially at harvest time. Furthermore, the proven success and ease of mechanized cereal production systems has resulted in legume production becoming increasingly less popular with the farmers than the alternative cereal enterprises.

Apart from the labour problems, there are several factors that contribute to the prohibitively low productivity of legume crops in Algeria:

(1) Food legumes are generally grown on marginal land not easily accessible to machinery and unsuited to cereal production.

(2) Lack of chemical weed control and the high population of very competitive weeds necessitate planting the crops in wide rows to facilitate mechanical weeding. Fewer crops can thus be grown per unit area.

(3) Late sowing of lentils and chick-peas, low seed rates, and poor seedbeds frequently result in weak stands. The crops are highly susceptible to moisture stress, particularly when it is severe at flowering and pod filling.

(4) Absence of disease and pest control result in severe crop losses when conditions are favourable.

(5) Stresses, such as late frosts and dry (Sirocco) winds at critical crop growth stages, cause considerable yield reductions.

(6) Excessive postharvest manipulation and mishandling losses may reach as high as 20%.

(7) Lack of mechanization at sowing and harvesting reduces the timeliness of these operations, increases losses, and results in very high labour costs.

Research and Extension Support Available

The only organization engaged in field crops research in Algeria is the Institute for the Development of Field Crops (IDGC). This institute is responsible directly to the Ministry of Agriculture and Agrarian Reform and its work is carried out through two regional centres (East and West) and six experimental stations spread throughout the main agricultural zones of the country. The main work of the two centres involves extrastation experimentation and the coordination of the application and supply of agricultural technology, whereas the experimental stations are mainly engaged in crop improvement practices, which include hybridization on a limited scale, testing of selections, and the initial stages of seed multiplication. Agronomic experiments and variety trials are usually conducted over many locations in the country and are the responsibility of personnel working at the research centres. At present, research in food legumes is hampered by a lack of technical staff at all levels.

The extension of improved technologies is the responsibility of two organizations. First, there is the "Operation Intégrée de Recherche et Développement," whose personnel are part of the IDGC and which operates mainly at the commune level. The organization's work involves conducting demonstration trials and field days to illustrate new techniques and technologies, and working closely with the farmers of the communes, helping them to adjust to the new machinery and the utilization of the new technologies generated by the research efforts. And secondly, there is the "Agrocombina," which is a new organization operating experimentally in only one district as yet. It combines agriculturalists, agronomists, and plant protection and machinery specialists in a group that operates at the farmer's level assisting groups of farmers in the realization of their annual production targets.

The multiplication and distribution of seed of improved varieties is also the responsibility of the IDGC. Breeders' seed and a large proportion of the certified seed is maintained at the research stations. Some certified seed and all registered seed is produced on IDGC selected farms under the supervision of IDGC personnel who issue certificates to the farmers involved. After laboratory analysis, the final certificate is granted and the seed stocks are stored and distributed by the Cooperatives of Cereals and Food Legumes under the supervision of the IDGC.

Current Research

Breeding and Varietal Improvement

International broad bean, chick-pea, and lentil material is tested at two locations, in the east and in the west of the country. The best types are then advanced to replicated trials in three locations across the country where detailed crop growth characteristics and yields are recorded. The lines performing considerably better than the local check varieties are advanced to 2nd and 3rd year replicated trials spread over more locations and the selection pressure is increased. At this stage, or in the 4th year, the best selections are tested in comparative trials on a large scale, under farm conditions in several locations in both the east and west of the country. A few lines are then selected on the basis of performance during the last 3 years and introduced into the seed multiplication cycle.

Agronomic Research

Eight dates of sowing, at 15-day intervals from 15 November, are currently being evaluated for the four crops in four locations. This experiment is designed to yield information on the optimum planting date for each crop in each location, together with details of crop response to environmental stresses, such as frost and drought. It is also hoped that the trial will provide an indication of the feasibility of growing lentils and chick-peas as a winter crop to avoid the severe drought stress often encountered at flowering and thereafter in spring-sown crops.

The world collections of lentils and chick-peas are also being screened in this connection to identify varieties adaptable to winter sowing, and many frost-resistant lines with good vegetative growth have already been identified.

Trials on population studies are also under way to ascertain the optimum and most economic combination of seed rate and plant spacing that will lend itself to total mechanization of the lentil, chick-pea, and field pea crops with the existing available farm machinery.

A study of the interaction between inoculation and fertilization in lentils and chick-peas aims to establish whether inoculation with specific rather than nonspecific *Rhizobia* has any effect on plant stand and grain yield. This study should also give information on the efficacy of nitrogen fertilizers applied early in the period of crop growth both in the presence and absence of *Rhizobia*.

A screening trial of 35 herbicides, to determine their effectiveness in the control of a broad spectrum of weeds and at the same time to evaluate crop tolerance to these chemicals, is also currently under way. The herbicides are being evaluated as applied at several stages: preplanting, preemergence, early postemergence, and late postemergence. Results to date are promising, indicating several chemicals that give 90% control of weeds with no noticeable effect on the crop.

Another trial on sowing methods for lentils is in progress to ascertain the effect of broadcast sowing as opposed to drilling on plant stand, productivity, and ease of combine harvesting. This is particularly important as the expertise of some farmers and the quality of some land makes it impossible to use seed drills well enough to arrive at a good plant stand.

The increasing interest in food legumes in Algeria, illustrated by its expanding research efforts, shows a more comprehensive understanding of the real problems limiting food legume production in the country than has hitherto been the case. A corresponding increase in the cooperation with other research efforts in the region will enable this base of research work to be considerably expanded and strengthened so that the important aim of promoting food legume production into the realms of an economic farm enterprise and thus achieving the desired expansion in production may be realized in the near future.