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Cubero J.I. (ed.), Saxena M.C. (ed.).

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Zaragoza : CIHEAM

Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 10

1991

pages 153-157

Article available on line / Article disponible en ligne à l'adresse :

<http://om.ciheam.org/article.php?IDPDF=92605149>

To cite this article / Pour citer cet article

Sakr B. **The status of faba bean production in Morocco.** In : Cubero J.I. (ed.), Saxena M.C. (ed.). *Present status and future prospects of faba bean production and improvement in the Mediterranean countries.* Zaragoza : CIHEAM, 1991. p. 153-157 (Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 10)



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The status of faba bean production in Morocco

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FOOD LEGUME PROGRAM

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SUMMARY - Faba bean is the most important food legume crop in Morocco. About 200,000 ha are grown every year, mainly in the Northern part of the country. Annual average production and yield are about 176,170 t and 900 kg/ha respectively. Both yield and production, however, have significantly decreased in the last few years because of drought, *Orobanche*, *Botrytis*, stem nematodes, and insect damages. As a consequence, exportation of faba bean has also decreased substantially. Research areas have been defined but research work is still very limited because of the lack in the number of scientists, facilities and financial resources.

RESUME - "La situation de la culture de la fève au Maroc". La fève est le légume sec le plus important au Maroc. Environ 200.000 ha sont semés chaque année, surtout dans le Nord du pays. La production moyenne annuelle et le rendement sont de 1.761.700 tonnes environ et de 900 kg/ha respectivement. Cependant, aussi bien le rendement que la production ont baissé de façon significative pendant ces dernières années, à cause de la sécheresse, d'*Orobanche*, de *Botrytis*, des nématodes des tiges, et des dégâts causés par les insectes. Comme conséquence, l'exportation de la fève a également diminué de façon accusée. Les objectifs de la recherche ont été définis, mais ces travaux de recherche sont toutefois très limités en raison du nombre insuffisant de scientifiques et d'installations, et du manque de ressources financières.

Introduction

Faba bean (*Vicia faba* L.) is an important grain legume crop in Morocco. It is grown in all the agricultural areas of the country, Taounate, Kenitra, Fez and Taza being the four major zones of faba bean production.

Faba bean plays three major roles in the agriculture of Morocco: (a) Nutritional role: Faba bean constitutes an important source of proteins. It is consumed either as green vegetable or as dry seeds (bissar, soup, etc.). After harvest, straw and seed are also used for livestock feed. (b) Biological role: symbiotic fixation of atmospheric nitrogen. This is very important in maintaining soil fertility and economizing the expensive nitrogen inputs. (c) Economic role: the possible exportation of faba bean seeds contributes to the farmers revenue.

Area, production and yield

Food legumes, with about 468100 ha (average of 17 years) cover 7 to 8% of the total cultivated land in Morocco and come in the second position after cereals (Amin, 1987). Data in Table 1 show that faba bean is the dominant crop with 196,000 ha, followed by chickpea (80,800 ha), pea (77,000 ha) and lentil (48,000 ha). More

than 60% of the faba bean area is located in the northern area, where the annual rainfall is above 400 mm. The other area of faba bean is distributed over 29 other provinces in the country. Table 1 also shows tremendous variation in the evolution of faba bean area over time. For instance, in 1974, the total area was about 278,400 ha, while in 1982 only 111,200 ha were sown to faba bean. Faba bean area generally decreased during the early 80's because of the severe drought which has prevailed from 1981 to 1984. After this period the cultivated area of faba bean started to increase again to reach about 200,000 ha in 1985/86.

Morocco produces an average of 176,170 t of faba bean every year. Most of this production (76%) comes from the four major growing areas of the crop. The production of faba bean is characterised with an important annual fluctuation (Table 1). During the last 17 years, the maximum production of faba bean was about 345,490 t obtained in 1974 and the minimum was about 38,790 t harvested in 1981. During the drought period (1981-84), faba bean production was reduced by about 40%.

In comparison with the world average yield, which is about 1220 kg/ha (Anonymous, 1984), faba bean average yield in Morocco is very low (900 kg/ha) and never exceeded 1200 kg/ha since 1973 (Table 1). As shown on Table 1, there were two phases in the evolution of yield of faba bean. During the first one (from 1970 to 1976), yield was quite high reaching up to 1520 kg/ha; during

Table 1. Area, production, yield, commercialization and exportation of faba bean in Morocco during the period 1970-1986 as compared to chickpea, pea and lentil.

Year	Area ^a (000 ha)	Production ^a (000 t)	Yield ^a (t/ha)	Commercialisation ^b		Exportation ^b	
				Quantity (000 t)	% of product	Quantity (000 t)	% of product
1970	181.0	188.90	1.040	—	—	—	—
1971	190.0	242.60	1.280	97.55	40.0	75.97	31
1972	259.3	267.17	1.030	151.42	56.6	146.92	55
1973	278.4	188.70	0.680	87.02	46.1	69.99	37
1974	227.3	345.49	1.520	102.30	29.6	66.76	19
1975	220.1	212.68	0.960	54.87	25.8	59.10	27
1976	191.3	230.21	1.200	85.25	37.0	73.63	32
1977	191.1	93.65	0.460	12.43	13.2	34.17	3
1978	221.1	161.42	0.730	50.68	31.4	31.33	19
1979	207.8	147.54	0.710	43.98	29.8	20.50	14
1980	155.8	104.42	0.670	25.49	24.4	17.37	16
1981	130.0	38.79	0.300	6.52	16.8	0	0
1982	111.2	98.68	0.890	14.36	14.5	0	0
1983	170.6	142.24	0.830	29.64	18.9	8.27	6
1984	190.3	12.29	0.640	34.28	28.0	1.85	7
1985	212.3	194.46	0.920	15.47	8.0	0.64	0.3
1986	195.9	214.62	1.100	—	—	—	—
Average							
F. bean	196.0	176.17	0.900	52.75	30.0	38.27	21.7
Chickpea	80.0	55.30	0.680	14.55	26.3	10.01	18.1
Pea	77.0	50.44	0.660	13.79	27.3	8.30	16.4
Lentil	48.0	25.06	0.520	13.98	55.8	8.89	35.5
Others	66.3	35.18	0.540	7.66	21.8	3.95	11.2
Total	468.1	342.15	—	95.75	—	65.87	—
Average	—	—	0.660	—	23.2	—	20.6

^aSource: Amin (1987)

^bSource: Farjan (1987)

the second phase (from 1977 to 1985), yields were highly reduced. The heavy infestation by *Orobanche* and the drought of 1981-84 period were the main causes of this reduction in yield.

Marketing

Commercialization

Faba bean is commercialized in two different ways in Morocco: the free marketing and the official marketing. The latter is controlled by the ONICL (Office National Interprofessionnel des Céréales et des Légumineuses). In addition, a big portion of faba bean production

is used for self-consumption by farmers' families, this amount being very difficult to be estimated.

The amount of faba bean commercialized in the controlled market dominates (55%) the other food legume crops. However, the quantity commercialized annually is still as low as 52,757 t. This quantity represents only about 30% of the total production (Table 1) and it is decreasing substantially from one year to the next.

The price of faba bean in the local market varies essentially with the quality of seeds and the location where the product is sold. The difference between the price at the farmer's field and that paid by the consumer is very big and can sometimes reach 100%. Evolution of food legume prices recorded at farmer's fields since 1972 shows that faba bean price is increasing but not as much

as of chickpea or lentil. It increased from 50 DH in 1972 to 250 DH at the present time.

Exportation

About 38,274 t of faba bean are exported every year, which constitutes 58% of the total food legumes exported (Table 1). However, there was a tremendous decrease in the quantity exported in this crop since 1976. This is mainly due to reductions in the production, most of which was kept to satisfy the domestic demand. EEC is the traditional customer of Moroccan food legumes. It absorbs more than 80%, which demonstrates the high degree of dependence of Morocco on this market.

Current production practices

Crop rotation

Cereal-food legume and cereal-fallow are the two major crop rotations followed in the rainfed areas of Morocco. In the very North, where rainfall is quite high (> 500 mm), cereal-faba bean or cereal-fallow are dominating. In the zones receiving 400 to 500 mm, cereal-faba bean is also frequent but sometimes faba bean is replaced with pea or lentil. In the areas with less than 400 mm rainfall, faba bean is less cultivated and cereal-fallow or cereal-cereal are the most frequent crop rotation. However, in subsistence farming systems, faba bean is grown every year regardless of the location.

Cultivation

Faba bean is rarely cultivated in a fully mechanized farming system. It is commonly cultivated either traditionally or in a mixture of modern and traditional systems. Depending on the degree of mechanization and the size of the farms, soil is generally tilled with a medium plow followed by a superficial cultivator and/or animal drawn plow. Small farmers often plant faba bean directly on unworked soils using animal drawn plows. Usually, soil is prepared from August to November.

Sowing

Planting date of faba bean generally extends from November to December. Sowing rate varies from 80 to 160 kg/ha depending mainly on the desired row spacing. The most common space is 80 cm but 50 cm to 1 m are also found. Mechanized farms tend to use higher plant populations. Wide space is desired in traditional farming

to allow hand weeding or intercultivation using animal drawn intercultivator.

Cultivars

High prices and financial constraints make the use of improved varieties of faba bean very limited. About 88% of farmers use local and untreated seeds, often kept from the previous harvest or bought from the local market. The other 12% using selected seeds grow mainly the cultivars 'Aguadulce' or 'Agrex'.

Fertilization

Although faba bean requires high amounts of phosphorus and potassic fertilizers, fertilization of this crop is very limited as compared to that of cereals. The most frequent fertilizers, if used, are Superphosphate 18%, NPK 14-28-14, NPK 0-30-20 and ASP 19-38-0 applied at the following doses per ha: 14 to 34 of nitrogen, 26 to 68 of P_2O_5 and 14 to 40 of K_2O (Amin and Aldouni, 1987).

Harvest and threshing

Some farmers harvest and thresh faba bean by mechanical means by using a combine. However, in most of the farms, faba bean is harvested by hand and gathered into sheaves along the rows until it is dry enough for threshing. Two major threshing methods are used in Morocco. One way is to gather the harvested plants in one paved place and make animals or a tractor run over them until all seeds come out of the pods. Then seeds are separated from the straw by winnowing using forks on a windy day. The second method involves a stationary combine which is fed with faba bean plants for threshing. It is important to know that hand harvest of faba bean causes considerable seed loss; it is a very time demanding and expensive operation. It becomes in fact a major constraint for expanding area under faba bean.

Production constraints

Genetic material

The genetic material currently used in Morocco consists essentially of local populations, characterised by low productivity, limited adaptation and high susceptibility to the major diseases and insects. The number of improved varieties is limited and therefore cannot satisfy all types of the agroclimatic conditions present in faba bean growing areas. Genetic vulnerability is another characteristic of faba bean production in Morocco. Since

'Aguadulce', an old variety, is the most widely grown in the country, for a long time there has been a tendency to use seeds originating from this variety. This has caused a narrowing of the genetic base of most local populations.

Weeds

Orobanche crenata constitutes at the present time a grave problem in faba bean growing areas. Starting long time ago in the northern areas, *Orobanche* is currently becoming a serious problem even in the southern areas. It attacks also pea, lentil and other legume plants. Although a chemical control technique using glyphosate was developed at INRA (Schluter and Aber, 1980), still its use by farmers is very limited because of the high price of the chemical and the difficulty in its application.

Diseases

A disease survey was recently made in most faba bean growing areas during which three major fungal diseases were identified (Mabsout, 1988). These diseases are:

- Botrytis caused by *Botrytis fabae* is present in most surveyed regions. It may cause up to 90% yield damage (Solh, pers. comm.).
- Rust caused by *Uromyces* spp. was found mainly in the Gharb region. Powdery mildew caused by *Erysiphe* spp. and downy mildew caused by *Peronospora* spp. were less frequent in the surveyed regions, but in some years they cause severe yield losses (mainly in Doukkal areas) which are located in the south.
- Alternaria blight caused by *Alternaria* spp. was relatively less frequent in the North than in the South.
- Nematode diseases caused mainly by *Ditylenchus dipsaci* was reported by Schluter in 1976 as an important disease in the Atlantic coast only. Recently, the distribution of nematode became much wider, and most faba bean areas are now infested (Mabsoute, 1988).

Insects

Aphids, sitona weevils, and bruchus are the most frequent insects found on faba bean at different stages of the plant growth. Damage has not been estimated but can be very high (Sekkat and Lahmar, 1988).

Research program

With the attempt to resolve some of the above mentioned constraints facing faba bean production in Morocco, INRA (Institut National de la Recherche Agronomique) has defined research areas in its 'Plan Directeur' of 1981.

Plant Breeding

- Development of improved varieties for different agroclimatic zones (humid, dry and semi-dry areas, high altitude)
- Identification of sources of resistance to *Orobanche*, *Botrytis*, rust, virus, stem nematodes, aphids, and *Sitona*.
- Collection of local landraces and their evaluation and maintenance.
- Study of the pollination, and flower drop and its relation to pollinator insects.
- Development of a faba bean ideotype considering the potential of the IVS and determinate characters.

Agronomy

- Determination of the appropriate plant populations and planting dates for each faba bean agroclimatic zone.
- Establishment of phosphorus and potassium fertilization recommendations for different agroclimatic zones.
- Mechanization of faba bean cultural practices.
- Study of the symbiotic nitrogen fixation.

Plant parasites

- Chemical control of the major diseases.
- Chemical control of aphids, *Sitona* and stem nematodes.
- Chemical control of *Orobanche* and other weeds.
- Study of the major insects and their importance and biology.

Socio-economy

- Study of the biologic, economic and nutritional significance of faba bean.

- Popularization of faba bean products.
- Improvement of the local commercialization of seeds.

Current research program

At the present time, research on faba bean is very limited if we consider the number of problems requiring research attention. Limitation in the number of scientists, facilities and financial resources are the major factors limiting the development of more research work on faba bean. However, ICARDA is helping considerably in the faba bean research program.

The current situation led INRA to establish research priorities for all the four legume species. Recently more emphasis is put on breeding but only a limited research work is being done on the other aspects.

Feeling the need for more concentrated effort, INRA developed a collaborative regional research project with ICARDA which is expected to strengthen research work, particularly on breeding and pathology, in Morocco and the whole North African region. It is also important to note that other national research institutions such as INAV and ENA are also carrying on some research work through thesis studies especially in pathology and agronomy.

Conclusion and recommendations

Faba bean is the major food legume crop in Morocco. However, yield is very low because the crop is cultivated in a traditional way and most of the cultivars are only

local populations, which are low yielding and susceptible to all the major diseases as well as to *Orobanche*. As a consequence, both faba bean production and exportation have decreased substantially.

Therefore, there is an urgent need for more research work to develop new improved varieties and identify sources of resistance to each of the major diseases and to *Orobanche*.

There is also a need for more cooperative and collaborative research work among national, regional, and international research institutions in order to overcome the insufficiency in technical facilities and financial resources.

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