An overview of chickpea breeding programs in Myanmar

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Abstract: Chickpea is an important legume in Myanmar, not only for local consumption but also for export earnings. Major chickpea-producing area is the central dry zone which contributes 96% of the chickpea production. Kabuli chickpea is mainly grown for export, while desi chickpea is for local consumption. Eight improved varieties of chickpea (5 desi and 3 kabuli) have been released in Myanmar. The adoption of improved varieties and improved crop production practices has led to remarkable increase in chickpea yields and production.

Key words: central dry zone, export, improved varieties, intercropping, varietal improvement

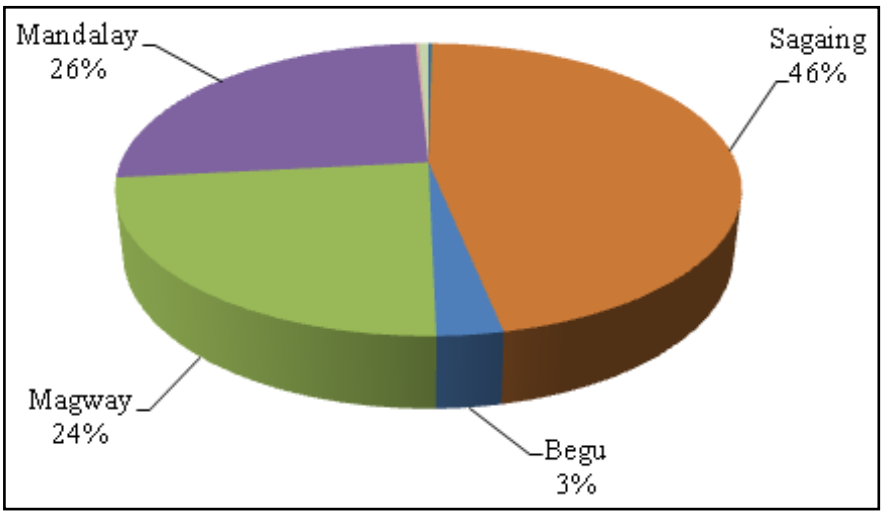

Figure 1. Share of different regions of Myanmar in chickpea production during 2011-2012

Current status of chickpea production

Chickpea is currently grown on 333,195 ha with a total production of 473,020 MT and the average productivity of 1423 kg ha^{-1} (MOAI 2012). The majority of this area is concentrated in the central dry zone which includes Sagaing (46%), Mandalay (26%) and Magway (24%) region. These regions together contribute 96% of the chickpea production (Fig. 1).

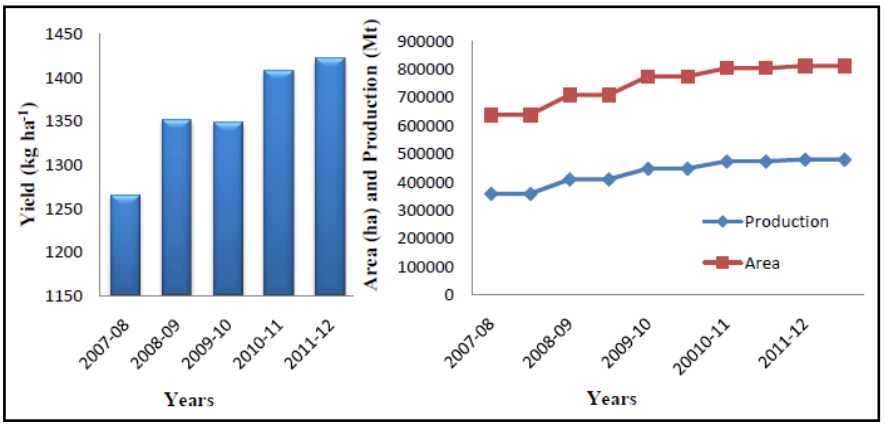

Figure 2. Yield, sown area and production of chickpea in Myanmar during 2007-2008 to 2011-2012

Production and productivity of chickpea has registered an increasing trend from 2007-08 to 2011-12 (Fig. 2). The increase in area is partly due to promotion of export markets and favorable price in the local market and partly due to the research and development efforts of Department of Agricultural Research (DAR). During 2011-2012, Myanmar exported 78,702 MT chickpea (1). There is high demand for chickpea in India, Singapore and Pakistan.

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In Myanmar, the climate of the central dry zone is very hot and arid. This region largely has sandy loam or floodplain clayey soils and the annual precipitation varies from 500 mm to 1000 mm (3). During the chickpea crop season the maximum temperature ranges from 25 °C to 38 °C and minimum temperature from 8 °C to 20 °C. Chickpea is grown under residual soil moisture in both low land and upland conditions. In lowland areas, it is grown as a relay or sequential crop after rice, while in upland areas it is grown mostly on fertile soil with a good water holding capacity after sesame, maize, mugbean or fallow. In upland area of Sagaing region, farmers are now keen to grow kabuli chickpea as it fetches a higher market price. Desi type is more dominant in rice-chickpea sequential cropping system. Chickpea is sometimes intercropped with wheat or sunflower without any definite spatial arrangement as a trap crop to reduce pod borer infestation. Chickpea is also grown along the banks of Chindwin and Ayeyarwaddy Rivers after the flood water recedes (4).

Table 1. Sown area, yield and production of chickpea varieties in central Myanmar during 2011-2012

Region/Variety	Sown area (ha)	Yield (kg ha^{-1})	Production (Mt)
Sagaing			
Yezin 3 (ICCV 2)	75065	1585	118953
Yezin 4(ICCV 88202)	3941	1612	6353
Yezin 6 (ICCV 92944)	39797	1622	64555
Yezin 7(ICCV 95311)	2071	1594	3301
Yezin 8(ICCV 97314)	33938	1623	55101
Yezin 9(ICCV 97306)	230	1661	383
ICCV 01309	6	1630	10
Mandalay			
Yezin 3 (ICCV 2)	45303	1219	55208
Yezin 4 (ICCV 88202)	13118	1479	19396
Yezin 5 (ICCV 3)	139	1141	158
Yezin 6 (ICCV 92944)	164	1240	205
Yezin 8 (ICCV 97314)	4	1223	5
Local	27558	804	22147
			Magway
Yezin 3 (ICCV 2)	5594	1416	7920
Yezin 4 (ICCV 88202)	56390	1440	81215
Yezin 5 (ICCV 3)	937	1243	1185
Yezin 6 (ICCV 92944)	6433	1554	9997
Yezin 8 (ICCV 97314)	38	1594	61
ICCV 37	549	1175	645
ICCV 93031	12	1493	18
Local	8859	1318	11672
(Source: Department of Agriculture) (2)			

Key constraints to chickpea production

Poor agronomic management. Chickpea is a cool season crop and normally grown after the harvest of monsoon rice. Soil physical conditions often are not conducive for planting chickpea immediately after rice harvest that eventually extends turnaround time. Planting of chickpea also suffers from occasional late rains that make the land unworkable particularly in heavy textured soils.

Abiotic constraints. Chickpea is grown mainly on the residual soil moisture and a very little rainfall occurs during the winter. Moisture stress occurs at later growth stage of the crop. In late sowing area, chickpea yield is very low due to high temperature stress during flowering time. Thus early maturing, heat and drought tolerant varieties are needed for Myanmar.

Biotic constraints. Pod borer (*Helicoverpa armigera*) infestation occurs every year throughout the growing season. Root diseases include collar rot (*Sclerotium rolfsii*) at seedling stage, fusarium wilt (*Fusarium oxysporum*) at either early or late growth stage, and dry root rot (*Rhizoctonia bataticola*) at late growth stage.

Socioeconomic constraints. Despite the importance of chickpea in Myanmar farming systems, farmers give least preference to applying agricultural inputs, such as fertilizers or plant protection measures. Such inputs are relatively high priced and often limited, and thus reserved for rice or high value crops. Lack of storage knowhow and capability for chickpea grain also result in a low farm gate price at the time of harvest with high seasonal fluctuations. There are no organized marketing channels or Government support prices for chickpea. Low-income farmers bear most of the risks associated with chickpea production.

Major aims in breeding programs

Chickpea research program of Myanmar is under DAR and it is aimed at development of improved varieties and crop production technologies for different ecosystems. DAR has a strong collaboration with ICRISAT. ICRISAT supplies breeding materials, provides training to researchers and provides technical guidance in the research program and conduct of conduct of farmer-participatory varietal selection trials for identification of suitable chickpea cultivars.

Current research priorities include development/identification of high yielding desi and kabuli varieties with early maturity, grain quality preferred by export market, tolerance to drought and heat stresses, and resistance to root diseases (mainly fusarium wilt, collar rot and dry root rot) and pod borer for upland and rice-based ecosystem. Agronomic research is being carried out on sowing time, spacing (seed rate and plant population), nutrient management and cropping systems. On-farm evaluations of improved varieties and technologies are carried out with participation of farmers and under supervision of researchers, government officials and extension workers.

Figure 3. Intercropping with chickpea and sunflower in upland condition

Salient achievements

Eight improved varieties of chickpea, 5 Desi types (Yezin 1, Yezin 2, Yezin 4, Yezin 6 and Shwenilonegyi) and 3 kabuli types (Yezin 3, Yezin 5 and Yezin 8), have been released in Myanmar through DAR. These varieties have high yield potential, short to medium duration, wide adaptation and export quality grain. All these varieties, except Shwenilonegi, were developed from the breeding materials supplied by ICRISAT. ICRISAT supplied over 4,700 chickpea breeding lines to Myanmar during 1975 to 2012. The varieties developed through DAR-ICRISAT partnerships cover about 88% of the chickpea sown area in the central dry zone. The extra-early kabuli variety Yezin 3 (ICCV 2) is the most popular variety in Sagaing and Mandalay region, while desi variety Yezin 4 (ICCV 88202) is the most popular variety in Magway region (Table 1). The cultivation of heat tolerant variety Yezin 6 (ICCV 92944) and recently released kabuli variety Yezin 8 (ICCV 97314) in now increasing in Sagaing and Magway regions. Shwenilonegyi, the first chickpea variety developed from the hybridization program of DAR, has attractive grains with high recovery of split grains (4) and is becoming popular among farmers.

The adoption of improved varieties and improved production practices has led to remarkable increase in chickpea yields and production in Myanmar. The improved crop production technologies have also been adopted widely. For example, chickpea-sunflower intercropping (Fig. 3) found beneficial in pod borer management and crop diversification is widely adopted by farmers.

Future prospects

There are good prospects of further increasing chickpea production in Myanmar. The additional production can be achieved by (i) increasing productivity through adoption of improved varieties and cultural practices; and (ii) increasing area through utilization of fallow lands and introduction of new cropping patterns. There is need of replacing old varieties with recently released varieties. Several new breeding lines, such as Sinshweni, Yezin 7 (ICCV 95311), Yezin 9 (ICCV 97306), ICCV 01308 and ICCV 01309 are under pre-released stage evaluation (Table 1). These lines produced higher yields compared to the existing varieties at research stations and farmers' fields. Thus, we expect to have more choices of improved varieties to the farmers in the near future. The greatest challenge in adoption of a new variety is the shortage of seed. Thus, seed system needs to be strengthened for improving the availability of quality seeds of improved varieties.

Conclusion

The area, production and yield of chickpea in Myanmar during the past five years (from 2007/2008 to 2011/2012) have increased by 19%, 34% and 12%, respectively. This is mainly because of the adoption of improved cultivars and production technologies by the farmers. Terminal drought and heat stresses, root diseases and pod borer are the major constraints to chickpea production. There is a need to address these constraints by development and adoption of improved cultivars and farmer-friendly management practices. Minimizing losses from these constraints would result in higher and more stable yields. This is important not only for farmers for increasing income, providing food and nutritional security, but also for the country for getting foreign exchange through export. ■

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