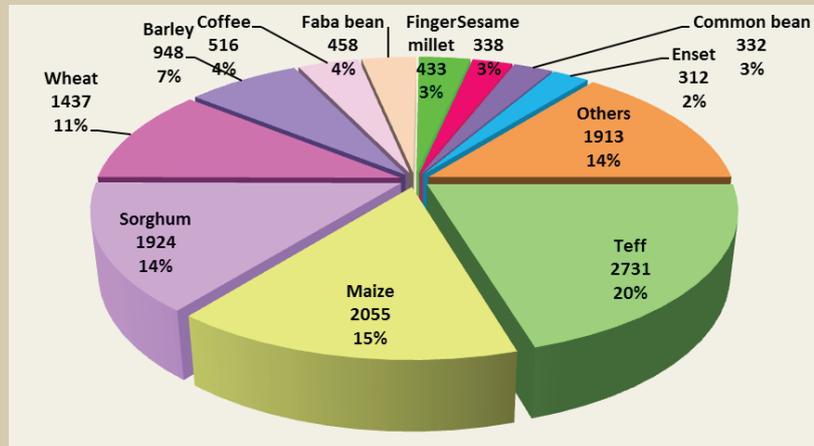


A Quarterly Bulletin of the Drought Tolerant Maize for Africa Project

About the Bulletin

DT Maize is a quarterly publication of the DTMA (Drought Tolerant Maize for Africa) project, funded by the Bill & Melinda Gates Foundation. Its aim is to inform partners and the general public at large about developments related to drought tolerant maize in Sub-Saharan Africa. It publishes short, general articles, relevant news, and events related to DTMA. Articles and news on all aspects of maize in Africa from sister projects and other partners are also welcome. Any feedback from our readers would be appreciated.



Relative importance of major crops grown in Ethiopia; numbers represent 1000 ha and percentages of the total area (source: calculated from CSA data for 2011, www.csa.gov.et)

The Maize Revolution in Ethiopia: What Are the Lessons?

Background

Yes, it is happening in Ethiopia! There is a true green revolution in the making in this country. Maize is grown on more than 2 million ha (ca. 15%) of Ethiopia's 14 million ha cultivated land. It is second to tef (*Eragrostis tef*) in area coverage but first in productivity and total production among all cereals. Approximately 9.3 million smallholder farmers in this country grow maize, mainly for human consumption. It is also an important source of income for these farmers. Other important crops include barley, coffee faba bean, finger millet, sorghum, wheat and more than 40 other species (see front page figure above).

Until the early 2000s maize remained a subsistence crop with the yield levels rarely crossing the 2-metric tons (MT) per ha barrier (Figure 1). Yields fluctuated between 1993 and 2002, with an average annual rate of growth of about 3.8%; the area planted expanded by about 5.2% per annum; and production grew at 8.2% during this period (Figure 2), indicating that production growth came from a combination of yield and area increase though more from expansion in area planted compared to increases in productivity.

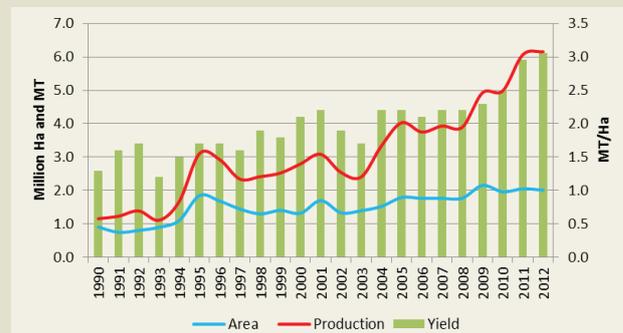


Figure 1: Performance of maize in Ethiopia (source: calculated from CSA, www.csa.gov.et)

In recent years (2003 to 2012), yield gains of 5.3% per annum were achieved while the rate of growth in area planted to maize was about 4.7% per annum, compared to the previous period but overall gains of production were 10.6% per annum (Figure 2). This means that recent increases in production were more due to increases in productivity rather than increases in the area unlike the previous period of 1993-2002. The current yield is upwards of 3 MT per ha, second highest in Sub-Saharan Africa (SSA) after South Africa. Yield has doubled in the 10 years between 2003 and 2012; growths in productivity and production were more rapid and consistent particularly since 2004 (Figure 1).

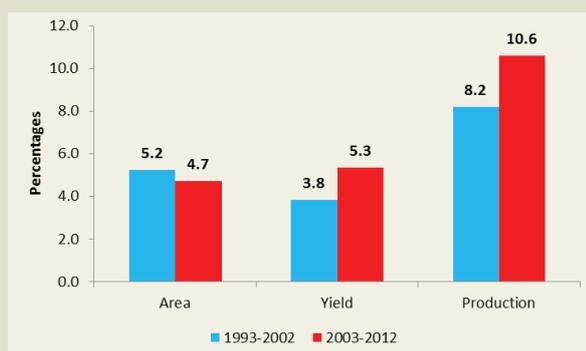


Figure 2: Annual rates of growth for maize area, yield and production in Ethiopia during two periods (source: calculated from CSA, www.csa.gov.et).

In this short article we analyze the drivers behind this spectacular performance of maize and attempt to draw lessons for other countries of SSA.

Major Growing Areas

Maize is widely grown in the mid-altitude (1000-2000 m) areas across the country, consisting of 62 administrative zones and 11 Special *Weredas* (equivalent to counties or districts). According to the 2012 Central Statistical Agency (CSA) data, the top-ten largest maize growing zones of Ethiopia are Arsi, East Shewa, East Welega, Illubabor, Jimma, North Gondar, West Gojjam, West Harerge, West Shewa and West Welega. It should be noted here that Gojjam, Gondar and many other zones in northern and north-central Ethiopia had not been traditional maize producers until the late 1980s. Widespread promotion and production of highland maize in West Shewa and elsewhere in other highlands of the country was carried out in the early 2000s.

Maize Varieties in Ethiopia

The Ethiopian NARS has released a total of 60 maize varieties between 1973 and September 2013; 38 (63%) of these were hybrids and 22 (37%) were OPVs. The first hybrid (BH140, in the early-to intermediate-maturity group) was released in 1988, followed by a late-maturing hybrid (BH660) in 1993, and BH540 and Jabi (Phb3253) in 1995. The frequency of variety releases was accelerated starting in the early 2000s, with a faster pace attained during the last six years (Figure 3).

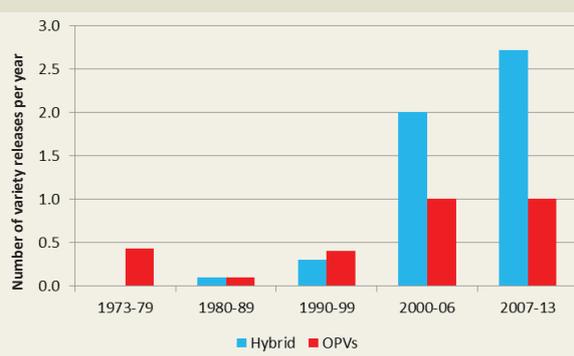


Figure 3: Frequency of maize variety releases in Ethiopia (source: calculated from the National Variety Registry, Ministry of Agriculture).

The bulk of the releases were made by the public sector – mainly through the collaborative work of Ethiopian Institute of Agricultural Research (EIAR), Regional Research Institutes and higher learning institutions, particularly Haramaya and Hawassa universities. The first release by a private seed company, Pioneer Hi-bred Seeds (Ethiopia), was in 1995 (Jabi), and in 2001, where they released two hybrids – Shindi and Tabor. EIAR and several national and international seed companies are now engaged in variety releases. These include Advanta, CP Seeds, EIAR, Pioneer, and SeedCo. DTMA in Ethiopia is working with these and other entities to further speed up the release of more varieties and their diffusion and commercialization.

A total of 11 drought tolerant maize varieties were released under the collaborative work of EIAR and DTMA project between 2007 and 2013 (Table 1). These included six hybrids and five OPVs. They range in maturity from extra-early (90 days) to early (90-120 days) and to intermediate (120-140 days). The majority of these are suited to mid-altitude agro-ecologies. The new varieties have 20-30% yield advantage over the farmers' varieties. In addition to being drought tolerant, they have additional desirable traits such as resistance to major foliar diseases, including gray leaf spot (GLS), maize streak virus (MSV), rust and turicum leaf blight (TLB); three of the varieties are quality protein maize (QPM).

The Maize Seed System in Ethiopia

The Ethiopian Seed Enterprise (ESE), a parastatal, has been the main supplier of maize seed in Ethiopia until recent years. The research system, mainly EIAR research centers at Bako, Melkassa, and Hawassa, has also been producing and supplying mainly breeder and foundation seed. Parastatals under regional governments have also been established in recent years: Amhara Seed Enterprise, Oromia Seed Enterprise, South Seed Enterprise, Somali

Table 1: Drought tolerant maize varieties released under DTMA in Ethiopia (2007 to 2013)

Release name	Year of release	Hybrid/OPV	Maturity range	Suitable agro-ecologies	Grain yield	Additional traits/remarks
Melkasa5	2008	OPV	Early to medium	Dry areas	Low to medium	Resistant to rust and MSV
Melkasa6Q	2008	OPV	Early	Dry areas	Medium	QPM
Melkasa7	2008	OPV	Early	Dry areas	Medium	Resistant to major diseases
Gibe-2	2011	OPV	Early to medium	Dry and wet areas	Medium to high	Resistant to TLB, GLS and rust
BH661	2011	Hybrid	Late	Mid- to transition highlands	High	Resistant to TLB, GLS and rust
MH130	2012	Hybrid	Early	Dry areas	Medium	Resistant to major diseases
MH138Q	2012	Hybrid	Medium	Wet and dry mid-altitude	High	QPM
MH140	2013	Hybrid	Medium	Wet and dry mid-altitude	High	Resistant to rust & MSV
Melkasa1Q	2013	OPV	Extra-early	Moisture stressed marginal maize growing areas	Low to medium	QPM; terminal drought stress escape; resistant to major diseases
BH546	2013	Hybrid	Medium	Mid-altitudes	Medium to high	Resistant to major diseases
BH547	2013	Hybrid	Medium	Mid-altitudes	Medium to high	Resistant to major diseases

Seed Enterprise, and Tigray Seed Enterprise. In Oromia Region alone, there are seven national private seed companies and 18 community-based organizations (CBOs) currently producing maize seed. Pioneer Hybrid Seed has been in the business of seed production in Ethiopia for more than 15 years now. Advanta, CP Seeds and SeedCo are recent comers.

The DTMA team in Ethiopia works with a good number of these entities and assisted in the production of 1,544 MT of drought tolerant maize seed in 2012, as per the seed roadmap prepared in the DTMA project strategy. It is projected that Ethiopia would increase production of drought tolerant maize seed to 3,490 MT by 2016. This will plant about 140,000 ha under DT varieties and may benefit about 280,000 farm households in drought prone areas. With better varieties, the expansion potential is much greater than this and seed companies will need to explore the growing market.

Drivers of Success

There are several factors that have contributed to the success of maize (and other commodities, such as chickpea, common bean and wheat) in Ethiopia. The key ones are enumerated here:

First, Ethiopia has a well-organized, nationally coordinated, agricultural research and development (AR&D) system with clearly defined mandates and responsibilities. Their efforts to excel in what they do resulted in the introduction of hybrid maize for the first time in the 1990s. This came at a very opportune moment when the government was about to launch its program on improved food security and eliminating extreme poverty in collaboration with the Sasakawa Africa Association. These efforts demonstrated the importance of innovations in AR&D, thus resulting in appreciation by policy makers of increased investment;

Second, the Government of Ethiopia (GOE) launched an aggressive agricultural extension system that enhanced availability of farmer awareness and knowhow about new technologies in many major growing regions, especially on major and priority staple crops such as maize, wheat, tef, and legumes for improving food security across the country. It has been reported that GOE deployed up to 60,000 young men and women as agricultural extension agents throughout the country starting in the first half of 2000;

Third, in the early days, farmers also received seasonal input credit for seed and fertilizer through cooperatives and development banks;

Fourth, the number of hybrid maize varieties released and commercialised increased substantially starting from 2000, thus boosting productivity and production.

Fifth, EIAR introduced a shift in AR&D in the early 2000s, which is based on the innovation systems approach that involved partnerships with several actors along the value chain; the initiative was championed by the highest level of management;

Six, through proper targeting of the technology, maize varieties were adopted by farmers in central and north-west Ethiopia where the crop had not been grown traditionally on such a large scale; today these areas are among the largest producers of maize in the country. As new adopters, the farmers in these areas have the advantage of adopting the most modern mode of production – planting in rows, good level of fertilizer use, and good crop management;

Seventh, investment in markets, farmer cooperatives and infrastructure development in rural areas has created opportunities to remedy traditional market failures as agro-dealers, traders and other service providers increasingly connected the remote producing regions

into the national economy. It has also created incentives for farmers to consider commercial production as markets opened up and prices increased significantly in the rural areas, making adoption of new varieties and complementary inputs profitable and attractive.

Finally, all the initiatives and innovations mentioned above were homegrown – led by the Ethiopians themselves, and hence sustainable.

The lessons for policy makers in Ethiopia are obvious – their investment is paying dividends and they need to further strengthen their research system through increased investment in generating new products, enhancing the use of home-grown research results, giving recognition to outstanding researchers, retaining their experienced researchers and increasing competitiveness in the delivery of quality seed and services to farmers. ■

Tsedeke Abate (CIMMYT-Nairobi), Bekele Shiferaw (PEP-Nairobi), Gezahegn Bogale (EIAR-Melkassa), Dagne Wegary (CIMMYT-Addis Ababa), Mosisa W. Regasa (CIMMYT-Nairobi), Berhanu Tadesse (EIAR-Bako), Tolera Keno (EIAR-Bako)

News and Events

Major visits and meetings by DTMA scientists

Places visited	Scientist(s) involved	Date	Major tasks
Mali (Bamako, Bougouni, Kolokani, Sikasso)	T Abate, B Badu-Apraku	08-12 Oct	Consultation visits; meeting government officials
Ethiopia (Addis Ababa, Ambo, Bako, Hawassa, Rift Valley)	T Abate, D Wegary	15-18 Oct	Consultation visits; meeting researchers and other partners
Angola (Luanda, Huambo)	T Abate, C Magorokosho	21-25 Oct	National Coordination Unit meeting and training
Kenya (Nairobi)	T Abate, D Makumbi, F Sipalla	28 Oct	Seed commercialization meeting
Tanzania (Arusha)	T Abate, D Makumbi, M Regasa	04-05 Nov	Maize Working Group annual meeting
Uganda (Kampala)	D Makumbi, Y Beyene, M Regasa	07-08 Nov	Maize Working Group annual meeting
Thailand (Bangkok)	T Abate	13-15 Nov	Sentinel Grantees meeting
India (New Delhi)	T Abate	18-20 Nov	Maintaining Cereals Productivity
Ethiopia (Addis Ababa)	T Abate, D Makumbi, M Regasa	22-23 Nov	Maize Working Group annual meeting
Kenya (Nairobi)	T Abate, D Makumbi, K Lweya, K Kimani, M Regasa, F Sipalla	25-26 Nov	Maize Working Group annual meeting
Ethiopia (Addis Ababa)	T Abate	3-5 Dec	Seed Scaling, USAID
Mexico (El Batan)	All relevant staff	2-14 Dec	GMP and AGM