
Science and technology higher education in Ethiopia

Melaku Wale*

Science College, Bahir Dar University, Bahir Dar, Ethiopia

ABSTRACT

This paper is an attempt to summarize the history of higher education in Ethiopia. Literature was not available equally for all science fields the author searched in the brief time he had; some were adequately represented while others were not. This work therefore represents what was available online at present. Here we define science as natural, engineering, medical, agriculture, etc. Higher education in general has started in the mid- 1950s and progressively widened its scope and geographic area coverage in the country. This article briefly highlights the beginnings of higher education, policy shifts, administration, financing, research attempts and challenges faced over the years.

Keywords: Education; Higher learning institutions; Policy; Science; Development; Ethiopia

DOI: <https://dx.doi.org/10.4314/ejst.v16iSpecial.5>

EDUCATION IN ETHIOPIA

The history of secular education in Ethiopia is only about 100 years (Sbhatu, 2021). The regimes of the 20th century Ethiopia had their own peculiar secular education systems and each of them left the scene with challenges of their own creation and inherited ones. Primary and secondary education systems varied with regimes and had problems of policy, curriculum practicality and inappropriate temporal and spatial alignment.

The beginnings of higher education institutions (HEI)

Modern higher education in Ethiopian has begun in the mid-twentieth century (Boateng, 2020). In July 1950, Emperor Haile Selassie managed to get the help of Jesuit Canadian teachers in establishing a college, the University College of Addis Ababa (later AAU). The college was established to prepare students for further overseas study or vocational certificate education (Lulat, 2005). Then six other specialized technical colleges had been established in the 1970s in addition to AAU, which was then followed by the establishment of Haramaya College in 1953 (Girma, 1967). They were all modeled more American than the former British East African colonies.

* Corresponding author: melakuwale68@gmail.com

©This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>)

The recent higher education policy

A few years ago, the then Ethiopian government was desirous to become a middle income nation by 2025 and transform agriculture based economy to industry and services (Salmi and Sursock, 2017). The backbone of this transformation was infrastructures such as roads, railways, energy, and telecommunications. Also, a climate-resilient green economy, renewable energy projects, industry, and construction were identified during the second Growth and Transformation Plan (GTP II). It included mining, chemicals, petrochemicals, pharmaceuticals, construction, transport, information and communication technology, and agro-processing industries.

New industrial parks were built and hydropower dams were under construction to meet local energy demand and for export. All these developments required middle- and highly-skilled workforce and the education system had to respond to these demands (Salmi and Sursock, 2017).

The higher education system meets these demands through high-quality graduates, especially in science and technology, problem solving research, and closer links between universities and industries. The GTP II underpins the need for enhanced national research and technology capacity of the country. According to the five-year plan, higher education was believed to enhance competitiveness and growth. For this to materialize, establishing centres of excellence were high in the agenda. The Education Sector Development Program V for 2015/16–2019/20 (ESDP V) and the National Science, Technology, and Innovation (STI) Policy, were in place to implement this agenda.

Higher learning institutions supply not only demand-driven, professionally competent, skilled and attitudinally mature graduates, but they also supply relevant and client/problem oriented technologies via innovative and adaptive research, and contribute to the realization of the national vision of a middle income economy by 2025 (Bechere *et al.*, 2015). Successive five-year education sector development plans (ESDP) have been implemented, i.e., ESDP I, ESDP II, ESDP III and ESDP IV (coinciding with GTP I).

With the GTP in action, the Science Technology and Innovation policy identified 17 sectors in which universities are urged to establish partnerships with industries in their respective domains. The first four successive ESDPs were criticized for inadequate reviews during annual education development planning. The culture of strategic thinking and long-term planning was practiced during the first GTP. ESDP V tactical plan and the education sector GTP II for the five year period from 2015/16 was to consolidate existing universities and establish 11 new ones, improve equity,

relevance and quality of tertiary education, strengthen research and technology transfer, and institutional leadership, collaboration and internationalization. Also, leadership, good governance, and performance improvement tools, such as the Business Process Re-engineering, Balanced Score Card, Kaizen and the Education Development Army were attempted in the higher education institutions.

The Government viewed higher education and Science Technology and Innovation as the engines of economic growth and it soon enacted Higher Education Proclamation No. 650 in 2009. The proclamation gives direction to expand higher education, provides legal framework to ensure relevance and quality of education and research, provides bylaws and system of governance, etc. (FDRE, 2009).

Education Roadmap

In order to draw the roadmap for the future, a desk review and field work exercise were conducted geared towards the implementation of higher education in Ethiopia. Seven thematic areas, i.e., access, equity, unity with diversity, quality, relevance, efficiency, and financing of higher education were used as indicators during the study (Teferra *et al.*, 2018).

The findings show that higher education has expanded rapidly in terms of facilities, human resources, enrolment rate (10.2% in 2015/17), and graduation rate. However, gender gap in enrolment among male and female persists and most universities are confronted with insufficient supplies of text and reference books, laboratory and workshops equipment, and access to ICT facilities. To reach a middle-income category in 2025, Ethiopia had to achieve at least 22% gross enrolment, but the available resources and modalities of financing do not allow reaching 22% gross enrolment by 2025.

University-level Agricultural Education in Ethiopia

Higher education in agriculture goes back in time to the mid-1950s. An agreement between 'Point Four' of the United States of America and Ethiopia on June 16, 1951 heralded the beginning of higher education in agriculture in Ethiopia (Belay, 2010).

Further, the agreement for a Co-operative Agricultural Education programme between the Imperial Ethiopian Government and the Government of the United States of America was signed in Addis Ababa on the 15th of May 1952, laying down the foundations for the establishment of Jimma Agricultural and Technical School and Alemaya College of Agriculture, now Haramaya University (Belay, 2010). Subsequent agreements gave Oklahoma State University, USA, the mandate to establish and operate the College including nationwide agricultural extension, research, and its administration. The Emperor chose Alemaya, 525 km to the East of

Addis Ababa, for this project. A land-grant College system was adopted with three purposes, i.e., training, research and extension. On the other hand, Jimma Agricultural and Technical School was opened on June 24, 1952 in Jimma, southwestern Ethiopia, with the objective of training students in modern agricultural practices and solve the shortage of mid-level qualified manpower in Ethiopia. In Jimma, the first batch of 80 students (chosen from 500 applicants) started class in October 1952 and 19 of them graduated on 6 August 1953 and remained in Jimma to become the first freshman students there. The first university-level agricultural training program, with a 4-year curriculum leading to a BSc degree in General Agriculture, started in September 1953 in Jimma. And 11 of 19 students graduated with a BSc degree in July 1957. The curriculum of general agriculture was later revised to accommodate for Bachelors, Masters and Doctoral degree levels.

Alemaya College was independent and was run by its own ‘‘president’’ until the establishment of Haile Selassie I University (now Addis Ababa University) in February 1961 and Alemaya College became one chartered unit of the University with a new name ‘Haile Selassie I University College of Agriculture’. On July 1966, the post of the president was abolished and the college was run by a Dean. The contractual agreement with the USA terminated in 1968 and the College was run fully on Ethiopian government budget. The College remained a chartered member of the Addis Ababa University until 27 May 1985, the date of its upgrade to a university level.

Alemaya College of Agriculture, the Institute of Animal Health Assistants, Ambo and Jimma Institutes of Agriculture used to offer university-level education in agriculture until mid-1970s (Belay, 2010). After that different colleges of agriculture and other agriculture-related institutions have multiplied around the country. At present, most public universities offer various levels of degrees in agriculture and related fields.

Agricultural Technical and Vocational Education and Training colleges and Farmer Training Centres are also operational. The Agricultural Technical and Vocational Education and Training Colleges are funded and managed by Federal and/or Regional Governments. At present, 25 such colleges throughout the country are training middle level agricultural experts in Animal Health, Animal Sciences, Cooperatives, Natural Resources Management and Plant Sciences. The duration of study is three years, two years in campus and ten months apprenticeship. The Farmer’s Training Centers inform, train, and advice farmers and demonstrate practical operations in the field. These centers are found at the village level and they bridge extension activities and farmers in agriculture (Davis *et al.*, 2007).

What good were higher education institutions in agriculture anyway? Their mandate was to build capacity of experts, enhance skills, conduct quality and relevant research, contribute to the national extension drive, and to forge some organic and symbiotic community engagement (Belay, 2010). Their functions should be aligned with national strategies for meeting the challenges of food security, economic growth, and sustainable environmental management (Aregay, 2004; Belay, 2008; Davis *et al.*, 2007). This was an attempt to minimize the severe shortage of skilled manpower, solve persistent challenges through scientific research and contribute in community development.

Cognizant of the role the sector plays for the national economy, successive Ethiopian governments have invested in agricultural research. According to Bechere (2007), several institutions were involved in agricultural research in Ethiopia including Ambo Plant Protection Research Center (est. 1972), Institute of Agricultural Research (1955) with centers distributed around the country, Plant Genetic Resources Center (1974), later the Biodiversity Institute, Forestry Research Center (1975), Wood Utilization Research Center (1979), National Soils Laboratory (1989), and Institute of Animal Health Research (1992). Higher education institutions were also involved in agricultural research since the distant past including Alemaya University (1953), Hawassa College of Agriculture (1977), Wondo Guenet College of Forestry (1978), Faculty of Veterinary Medicine at Debre Zeit (1979), and Mekele University College. Recently, other old or new universities (such as Bahir Dar University) were also involved in training and research in agriculture.

Implementation of 70:30

Science education was run on the basis of bands identified, i.e., Natural Science students grouped in four bands: Engineering and Technology (band-1), Natural and Computational Science (band-2), Medicine and Health Science (band-3) and Other Agriculture and Natural Resources (band-4) (Asfaw and Gashaw, 2021).

Higher education instills relevant knowledge and advanced skills and supplies the human resources required for leadership, management, business and professional positions (Teshome, 2017). A quantitative study was conducted to compare higher education institutions (public and private) in Ethiopia in terms of implementing 70/30 professional and program mix intake policy using cross-sectional survey research design. For the purpose of comparison, 32 public universities were selected and grouped into 1st, 2nd, and 3rd generations on the basis of their years of establishment.

The findings show that though net entry rate has increased, there was a wide gap between policy and practice in implementing 70:30 policy among the three

generations of public higher education institutions and their respective bands with high enrollment to natural sciences and technology fields, and less of humanities and social science fields (Teshome, 2017).

The share of private enrollment was low and gender mix was not balanced. Public higher education institutions give priority to sciences, engineering and technology fields, and private higher education institutions mainly focus on business, social sciences and humanities. To narrow the gap between policy and practice, universities and national students' placement offices need to work closely, and carefully consider the national intake policy and align their intake with the country's future human power requirements.

Strong link and collaboration needs to be established between government and nongovernment institutions to fairly benefit from reforms introduced at different times. Low achieving and female students need to get necessary support to minimize imbalance of gender, and to improve enrollment and graduation rates in public higher learning institutions. Since social sciences fields can help in combating contemporary global challenges like corruption, terrorism, problem of good governance and other social disorders, universities need to heighten their priority towards this field.

Science research in Ethiopia

Ethiopia's research production is severely deficient, i.e., low number of researchers (45 per million inhabitants), less than half than the African average (Fosci *et al.*, 2019). The government employs over half of them (56%), and the rest are employed in higher education institutions. In 2013, gross expenditure on research and development was less than 1% of the GDP (0.6%), lower than the government objective of 1% but up from just 0.17% in 2007 (UNESCO). The number of universities has grown considerably (from 2 in 1991 to dozens in 2010s) but it still remains insufficient to serve a country with over 110 million inhabitants. Functioning universities also contribute little to research production (UNESCO) (Fosci *et al.*, 2019). Non-academic organizations or institutes conduct much of the research, and research capacity building and donor support in research is extremely low compared to other Sub-Saharan African countries. Research infrastructure, both physical and digital, remains underdeveloped (World Economic Forum).

Higher education research in Ethiopia is fragmented and inadequate. Absence of incentives, burden from other activities and lack of commitment constrain **research** undertaken by academic staff (Umer, 2020). It still suffers from shortage of finance, lack of data base for research work and lack of effective link to industry. English language problem, low number of PhD holders, adoption of foreign policies,

influence of international organizations, and lack of adequate stakeholders' participations all have their negative role to play. Research and industry are still not satisfactorily linked. Fragmented research activities, lack of organizing body responsible for making knowledge generated usable for policymakers, lack of a system of evaluation for research, very routine and tiresome financial procedure, and duplication of research efforts confound the problem. Staff capacity building, an organization linking research and policy makers will help solve some of the constraints mentioned here (Umer, 2020).

FINANCING HIGHER EDUCATION IN ETHIOPIA

The education sector in Ethiopia is financed by the government. On average, about a quarter of the national budget is allocated to the Education sector (about 15 to 20% of this to the Higher Education and 45 to 60% to the Education subsector as a whole) (Bechere *et al.*, 2015). In 2014/15, the budget of Higher education has increased from less than half a million Birr in 2000/1 to about 6 billion Birr. The government has also implemented students' cost sharing scheme for the undergraduate program, where students are subjected to pay 15% of all costs incurred by the government. A few Ethiopian universities, i.e., Addis Ababa, Haramaya, Mekele, Bahir Dar, Jimma, etc. often provide scholarships to selected students of the neighboring countries, such as Eritrea, Somalia, Rwanda, etc. Proclamation No. 650/2009 gives the authority to Higher education institutions to generate their own income, and use it to strengthen their institutional capacity. Financial dependence of the universities on the government is argued as a limitation because it decreases competition, and hampers institutional innovation (The World Bank, 2000). On the other hand, universities are expected to satisfy public interests, and this can only be ensured through the enforcement of the state. So, in the short-run, it had better stay within the government, while in the long-run, it could be by its own (in terms of like ownership, level of sophistication and financial outlays). Government ownership is for social benefits, while funds for research are secured primarily from external sources.

SOME CHALLENGES

Previous reforms have substantially increased financing, improved access and enrollment as well as transformed governance of the higher education system (Shibru *et al.*, 2015). However, despite the good access to higher education in Ethiopia in the last two decades, important gaps, such as quality and relevance, equity, leadership and governance issues still remain a handicap. There are currently 176 undergraduate and more than 300 postgraduate academic programs in Ethiopia, with 35% female, and 15% private students enrolled (Shibru *et al.*, 2015). Of these, 50 undergraduate, 74 Masters, and 22 Doctoral programs are related to agriculture in public universities. Because of changing scenarios, the training in various degree programs

should target employment, job creation and other opportunities in the immediate future.

The massification of Ethiopian higher education institutions with special emphasis given to Science and technology education had challenges of its own (Tasisa and Panigrahi, 2013). Quality of education declined and pressure increased on the existing higher education system of the country in an effort to respond to the needs of the society and build a base for development. Poverty had to be eradicated, and the country joins middle-income level, which universities had roles to play.

Challenges of higher education in agriculture are also a handicap. Most of these are also challenges of other fields of science and technology in general. The present staffing situation shows a chronic shortage of highly qualified and experienced staff, inadequate supplies and equipment, lack of up-to-date reference books and journals, poor practical training, dominance of traditional teaching methods, severe shortage of ICT facilities and connectivity, narrowly-focussed academic programs, low reference to local or Ethiopian conditions in teaching, poor inter-institutional linkage, and poor communication with key Stakeholders.

REFERENCES

- Aregay, W. (2004). Country report: The case of Ethiopia. In: Sundstøl, F. (Ed.), Poverty reduction strategies and relevant participatory learning processes in agricultural higher education: case studies from Ethiopia, Malawi, Tanzania and Uganda, Noragric, Centre for International Environment and Development Studies, Agricultural University of Norway, Noragric Report No. 21A, Norway, p.p. 11-26.
- Asfaw, D and Gashaw, Z. (2021). Field assignment, field choice and preference matching of Ethiopian high school students. *Annals of Data Science* 8(2): 185–204. <https://doi.org/10.1007/s40745-018-0182-z>
- Bechere, E. (2007). Agricultural research and development in Ethiopia. *International Conference on African Development Archives* 127. https://scholarworks.wmich.edu/africancenter_icad_archive/127
- Belay, K. (2008). Linkage of higher education with agricultural research, extension and development in Ethiopia. *Higher Education Policy* 21(1): 275–299.
- Belay, K. (2010). The role of agricultural higher education in transforming Ethiopian agriculture. Dr. Norman E. Borlaug Symposium, organized by the Sasakawa Africa Association and the Nippon Foundation, held on 13-14 July 2010, Addis Ababa, Ethiopia.
- Boateng, F.K. (2020). Higher education systems and institutions, Ethiopia. J.C. Shin, P. Teixeira (eds.), *Encyclopedia of International Higher Education Systems and Institutions*.
- Davis, C., Ekboir, J., Mekasha, W., Ochieng, C.M.O., Spielman, D.J. and Zerfu, E. (2007), Strengthening agricultural education and training in sub-Saharan Africa from an innovative systems perspective: Case studies of Ethiopia and Mozambique, International Food Policy Research Institute, Washington DC.
- Federal Democratic Republic of Ethiopia (FDRE). (2009). Higher education proclamation No. 650/2009; No. 64 Addis Ababa. 9
- Fosci, M., Loffreda, L., Chamberlain, A and Naidoo, N. (2019). Assessing the needs of the research system in Ethiopia. Report for the SRIA program, October 2019. Report commissioned by: The UK Department for International Development. <http://www.dfid.gov.uk>

- Girma, A. (1967). Aims and purposes of church education in Ethiopia. *Ethiopian Journal of Education* **1**(1): 1–11. https://doi.org/10.1007/978-94-017-9553-1_449-1
- Lulat, G.M. (2005). A history of African higher education from antiquity to the present: A critical synthesis. Westport: Praeger.
- Salmi, J and Sursock, A. (2017). Improving the performance of Ethiopian universities in science and technology: A Policy Note. World Bank Group. Pp. 112
- Sbhatu, D.B. (2021). Challenges of 20th century Ethiopian science education. *Heliyon* **7**: e07157. <https://doi.org/10.1016/j.heliyon.2021.e07157>
- Tasisa, W and Panigrahi, M.R. (2013). Internal quality assurance of science and technology education in Ethiopian university. *E-Reflection - An International Multidisciplinary Peer-Reviewed E-Journal* **1**(6): 321-338.
- Teferra, T., Asgedom, A., Oumer, J., Woldehanna, T., Dalelo, A and Assefa, B. (2018). Ethiopian education development roadmap (2018-30). An integrated Executive Summary. Ministry of Education Education Strategy Center. Pp. 101
- Teshome, A. (2017). Policy and practices of enrollment in higher education: A comparative analysis among public higher education institutions of Ethiopia. 15th International Conference on Private Higher Education in Africa, 25-27 July, 2017
- Umer, U.A. (2020). Exploring the link between higher education research and policy in Ethiopia: Contributions of Universities. Master in Research and Innovation in Higher Education (MARIHE) - A joint program provided by the Danube University Krems (Austria), Tampere University (Finland), and Osnabrück University of Applied Sciences (Germany). Master's Thesis, March, 2020.
- World Bank. (2000). Higher education in developing countries: Peril and promise. Washington, D.C. 20433, U.S.A.