



UNIVERSITY
OF JUBA



STATUS OF HIGHER EDUCATION AND TVET SECTOR IN SOUTH SUDAN

Gender-based analysis of the ST&I Ecosystems



REPORT

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SUMMARY

Background

Since 1956 when Sudan gained its independence from Britain, to 9th July 2011 when South Sudan declared its independence, South Sudan's higher education sector was managed by the Sudanese government. The country is still emerging from decades of conflict that claimed some 3.5 million South Sudanese lives. The root causes of the long civil wars that culminated in South Sudan secession were concerned with its political and socioeconomic marginalization, aggravated by religious, ethnic, and racial tensions between the two parts of the then Sudanese State.

Sudan ran a system of higher education which it inherited from British colonial administration. And until early 1990s, there were mainly three public universities in Sudan (Khartoum, Juba, and Gezira) admitting just about 3,000 out of 100,000 students that took university entrance examinations every year. Sudan's public higher education was underfunded, and relied heavily on an outdated elitist model that favored only the brightest and

small section of the potential student population.

However, Sudan began to adopt a mass higher education strategy from 1989 and onwards. As a consequence, the number of higher education institutions in the country began to rise from three universities in 1990 to 26 public universities by 2011. Moreover, the total student enrolment at Sudanese universities soared from 8,000 in 1989, to 500,000 by 2011. Yet, South Sudan's share of enrollment was a mere 13,000 students (or 2.6% of the national student enrollment) in all public universities by that year. This was not surprising given the fact that South Sudan had always trailed behind other regions of Sudan in education and other areas of socio-economic and human indicators.

And as of July 2011, when South Sudan declared independence, it had nine public universities (of which only 5 were functioning) and 34 private universities, the majority of which were unaccredited by the Ministry of Higher Education and majority were later closed. And as of

the time of writing, South Sudan has five functioning public universities, two accredited private universities educating 36,000 students between them or 94% of students enrolled in university sector; and seven technical and vocational education (TVET) institutions serving about 2,500 students; or mere 6% of students enrolled in tertiary education.

Overview of the Report

This report was commissioned by the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM). It has reviewed the status and gender-based analysis of higher education, technical vocational education (TVET), and ST&I ecosystem in South Sudan. As a country emerging from decades of conflict and its acquisition of own sovereignty, and the political and economic difficulties the country found itself facing after declaration of the independence, it was quite a challenge to decide how the report was going to be organised, as well as determining what to include and what not to include in the analysis. Obtaining a coherent data has also been a challenge, although most of the data used in this study was collected through survey of seven universities and seven TVET

institutions.

Literature review included the status of public and private higher education in South Sudan in the period that followed the signing and implementation of Sudan's Comprehensive Peace Agreement (CPA) in 2005 and up to June 2011, one month before South Sudan ascended statehood with a focus on the representation of South Sudan in higher education sector in terms of share of enrollment. The review also included the system of higher education which South Sudan inherited, and the early challenges the country's higher education sector had faced in the run up to independence. Furthermore, the report considered, amongst others, the period that followed the declaration of independence from July 2011 to 2020. In particular, early efforts to envision the future of higher educations have been highlighted including providing the summaries of the proceedings and the recommendations of the "Conference on the Future of Higher Education in South Sudan", that was organised by the Academic and Researchers Forum for Development (ARFD) and the Ministry of Higher Education, Science and Technology at Herod Campsite Hotel in Juba, from 14 to 15 November 2011.

Next, the report provides an overview of financing and budgetary allocation to universities between 2013 and 2019 and the impact of funding policies on the sector. Gender-based statistics of staff and students at 14 institutions of tertiary education (five public universities, two private universities, and seven TVET institutions) have been presented. Aspects considered included: gender-segregated distribution of academic and non-academic staff, academic ranks, subject of specialization, institution of employment, educational attainment, student populations, their programmes of studies, field of specialization, and gender compositions; with focus on gender representation in Science, Technology, Engineering and Mathematics (STEM). Moreover, the report reviewed the status of ST&I and how it is governed in the country. And in order to deepen understanding, the report provides a brief overview of applicable legislative and regulatory frameworks that are relevant to higher education; in addition to current national agendas and development plans and strategies, and description of a proposed national project aimed at establishing Petroleum Institute of

Technology and Applied Sciences (PITAS) at the University of Juba.

Key Findings

- Historically, South Sudan has started from a very low base as gleaned from its meagre 4% representation in admission to Sudanese universities in 2005, the year the Comprehensive Peace Agreement (CPA) was signed.
- By 2005, South Sudan was still part of Sudan and did not run a separate higher education policy.
- By 2011, South Sudan had nine public universities (but in practice, only five of them were functioning).
- The breakup of Sudan into two separate States put South Sudanese universities, which were dependent on North Sudan staff, under difficult circumstances, due to acute staff shortages in the new State of South Sudan.
- South Sudan inherited an elitist system of higher education from Sudan which targeted only very talented but few able students.
- South Sudan Higher education is not differentiated and is top-heavy, with the majority of students (94%) enrolled in university sector, while very few (6%) are studying in TVET institutions or community

- colleges. This is contrary to experience elsewhere where there is differentiation and ability to absorb the mass entrants to universities using a three-tiered system, with largest population of students enrolling in the open and widely-spread community colleges.
- Financing mechanisms and policies for higher education, science and technology are problematic and not clear cut. The Government funding to universities is insufficient, while both the Government and students resist attempts by public universities to raise fees in order to make up for insufficient public funding.
 - Although South Sudan Vision 2040 has promised “an educated and informed nation”, much work is still needs to be done in order to make progress towards aspirational goal.
 - The most serious effort as yet to map out a path for higher education in South Sudan was the conference that took place in Juba in November 2011 that aimed to “Envision the future of higher education in South Sudan.”
 - Currently, there are 2,574 academic staff employed in tertiary education institutions of whom about 49% teach and conduct research in STEM-related specializations.
 - 79% of academics work in public universities and 21% in TVET sector
 - Only 19% of academics surveyed hold PhD
 - Half of non-PhD holders have only first degree
 - The majority of academic staff (87%) are males, and only 13% are females. Also, there are only 73 academics with rank of professor in the universities, of whom 4 (5%) are females
 - Only 13% (165) of all the academic staff who are specialised in STEM are females
 - There are 38,746 students enrolled in 14 institutions of higher education covered by the this study, of whom females constitute 26%.
 - 13,000 students are enrolled in STEM of which female students are 3,000 (24%)
 - 23,0000 (72%) of students enrolled in university sector are studying at the University of Juba, majority of whom are studying at undergraduate level
 - Overall, women are underrepresented in all aspects of higher education (from staff numbers, academic ranks, student population, STEM specialization, and post graduate studies
 - There is some legislation regulating higher education sector in South Sudan, but this legislation is incomplete
 - ST&I ecosystem is less developed as well

as TVET sector

- Wages for staff working in universities and TVET sectors are too low to attract the best

Recommendation and Conclusions

South Sudan higher education sector as well as its science, technology, and innovation ecosystems are facing multiple challenges. These challenges include Country's inability to respond effectively to increasing demand for higher education, underfunding, low staffing and research capacity, and underdevelopment of TVET sector. This situation has resulted in a top-heavy system, with more students being absorbed by university sector and fewer by TVET sector. What's more, women are seriously under represented in higher education sector, in staffing and high academic ranks, in STEM specialization, and in share of enrollment in universities and TVET sectors. Very few women hold PhDs or are enrolled on postgraduate programs. Add to this, the under development of ST&I ecosystems in form of absence of support systems, legal frameworks, and institution for coordination, means South Sudan will struggle to implement and make progress on its national agendas, such as Vision 2040: "Realizing Freedom, Equality, Justice, Peace and Prosperity for All" and goals of reducing poverty and eradication

of hunger, diversification of the economy, and industrialisation by 2040; unless higher education, TVET, and ST&I ecosystems are markedly transformed in order to be fit for the purpose.

Key recommendations are as follows:

1. South Sudan higher education system needs to expand and transform through differentiating vertically into a 3-tiered system with fewer well funded research universities educating fewer but most able students, more comprehensive universities for professional training absorbing a mass of new entrants, and open-widespread community colleges catering for TVET and needs of local industries including agricultural training institutes.
2. Development of admission policies with affirmative action is necessary in order to increase women participation in all sectors and levels of higher education and STEM.
3. It is imperative to avail resources for postgraduate training to PhD levels, and to increase the pool of women scientists.
4. Devise innovative schemes to resolve funding challenges facing higher education sector including soliciting higher tuition fees payment from students

and their families, provision of student loan schemes, and scholarships for the under privileged students.

5. Build research capacities through postgraduate and post doctoral training, and avail incentive to attract more women to STEM.
6. Improve the ST&I ecosystem by setting

up a special Ministry for Science, Technology, and Innovation.

7. Establish ST&I Council under Presidency.
8. Establish a Specialized Committee on ST&I in the National Legislative Assembly to support STI sector in the Country.

1. Introduction

Although higher education enrolment and graduation rates have increased considerably gross enrolment ratios remain low, with only 10% of Africans enrolled in universities (Bloom et al., 2006) compared to 40% in Latin America and 94% in North America. Moreover, the increase has come at the expense of quality with expenditure per student falling significantly. There is thus an urgent need to invest in higher education and for higher education to transform itself to produce the quality of graduates and knowledge needed to achieve the African Union's Agenda 2063-The Africa We Want.

Science, technology and innovation is critical for responding to the challenges of African agriculture and to elevate its performance and contribution towards economic development and poverty alleviation. Trained human resources in a wide range of topics, aligned to the Science Agenda for African Agriculture, are central to stimulating science-based technology innovation. Research has shown the returns to investment in higher education are around 20%, and in Africa closer to 30%, and are higher than for both secondary and primary education.

2. Rationale and Objectives of the Report

African higher education needs to be transformed so that it produces the graduates and research that will increase the use of science, technology and innovation for economic growth and ensure an Africa that is food secure. The Regional Universities Forum for Capacity Building in Agriculture (RUFORUM) is undertaking an assessment of higher and TVET education systems in Africa, with specific emphasis on the agricultural sector, Science, Technology and Innovation purposely to identify current gaps to support science and technology in national agricultural innovation systems. The overall objective of this report is to assess the current status of the higher education and TVET sector in South Sudan in terms of current challenges, gaps and opportunities, and to develop specific recommendations towards enhancing their performance and their contribution to the science, technology and innovation at national level.

3. Study Methodology and Organisation of the Report

This study is a mix of desk research and collection of raw data from relevant institutions through direct contact by a research assistant. The report is organised into 7 sections. Section 1 provides the introduction. Section 2 explains the rationale for the study and its objectives. The organisation of the report is described in Section 3. Section 4 reviews the literature on higher education and TVET sectors in South Sudan before independence in 2011. Then current gender based statistics on Higher and TVET are reviewed in Section 5. South Sudan's educational policies, legal frameworks, and national development plans and major projects are discussed in Section 6. Analysis of the report and key findings are described in Section 7. Conclusions and key recommendation are discussed in Section 8.

4. Review of Public and Private Higher Education Sector in South Sudan

4.1 Socio-Political Background

The education system of a nation is shaped by the country's political and socio-economic history. South Sudan's higher education sector is no exception. Since 1956, when Sudan gained its independence from Britain, to 9th July 2011 when South Sudan finally declared its independence, South Sudan was managed as part of Sudan. It is a country still emerging from decades of political conflict. The declaration of the independence followed two destructive civil wars that pitted southern Sudan against the northern Sudanese dominated central government. Both wars resulted in a combined 3.5 million deaths of South Sudanese (see Akec 2019, chapter 1). The root causes of civil wars that eventually led to secession of South Sudan are related to political and socioeconomic marginalization; aggravated by religious, ethnic, and racial tensions between the two parts of Sudan (see Dhal 2018, p. 16).

The first civil war claimed one million lives, and was fought between August 1955 and March 1972. An estimated one million South Sudanese lives were lost. It ended with the signing of a peace deal in Addis Ababa, Ethiopia, between Sudan Government and South Sudan Liberation Movement (SSLM), popularly known as the Anya Nya Movement. The peace agreement lasted only for twelve years when the autonomous government of Southern Sudan based in Juba was unilaterally dissolved by the Khartoum-based central government in May 1983. This led to the outbreak of the second civil war.

The second civil war raged from May 1983 to January 2005, ending with the signing in the Kenyan town of Naivasha of the Comprehensive Peace Agreement (CPA) between the Government of Sudan and Sudan People's Liberation Movement (SPLM). Two and a half million South Sudanese lives were lost as a result of this second war. The 2005 agreement had the backing of the US, UK, and Norway, in addition to many influential countries that included a number of EU Member States, Kenya, Uganda, Ethiopia, and South Africa.

An autonomous interim government of Southern Sudan (GOSS) was established in 2005 to manage the affairs of the region until a referendum was conducted in January 2011 in which the people of South Sudan were asked to determine whether their region was going to remain in the united Sudan; or opt out to form their own independent sovereign State. South Sudanese voted overwhelmingly in the referendum in favour of self-determination. The result was recognized by all the parties and stakeholders to the CPA. This was followed by the declaration of independence on July 9th, 2011, exactly six months after the referendum vote.

4.2 Higher Education Status in South Sudan between 2005 and 2011

One cannot discuss the status of higher education in South Sudan without referring to Sudan of which South Sudan was a part until July 2011. Akec (2011a, 2011b, 2012a, 2012b, and 2012c) provides an overview as well as highlights of the issues pertaining to the state of higher education in South Sudan in the period between 2005, when the Comprehensive Agreement was signed, and 2011, when South Sudan became an independent sovereign state.

For a start, it is worth to mention that Sudan ran a model of higher education it inherited from its colonial administration (Akec, 2011b; Akec, 2012a; Akec, 2012b). Until early 1990s, Sudan had three public universities admitting just a few thousands out of 100,000 students taking university entrance examinations every year. Egypt, which by then was operating a mass higher education policy, provided more opportunities for Sudanese to study at its universities. Sudan's public higher education was underfunded, and relied heavily on an outdated elitist model of capacity building that favored only the brightest and small section of the potential student population (Akec, 2012c).

However, after decades of a stagnant higher education sector, Sudan began to adopt a mass higher education strategy in 1989. As a consequence, the number of higher education

institutions in the country began to soar from three universities in 1990 to 26 public universities by 2011. Moreover, the total student enrolment at Sudanese universities increased from 8,000 in 1989, to 500,000 by 2011. Out of that number, South Sudan's share of enrollment was a mere 13,000 students in all public universities by 2011. This was not surprising given the fact that South Sudan had always trailed behind other regions of Sudan in education and other areas of socio-economic development that was further aggravated by the long North-South war (ibid).

For example, a study showing the distribution of newly admitted students to higher education institutions in Sudan in academic year 2005/2006, based on seven main regions of Sudan (Khartoum, Central, Northren, Darfur, Eastern, Kordofan, and Southern region), revealed the share of Southern Sudan to be 4%, compared to that of Khartoum (34%), Central Sudan (30%), Northern Sudan (10%), Darfur (8%), Eastern Sudan (8%), and Kordofan (6%) (Table 1 and Fig. 1). It is needs noting that, although South Sudan had 25% of the population, it only contributed 4% to overall university admission in that year in Sudan. This means that South Sudan was starting from a very low baseline with ample room to boost its total student enrolment at university by expanding its higher education institutions and admitting more students annually (Akec, 2012a, p. 38). As proceeding sections will demonstrate, that never happened.

Table 1. The distribution of students admitted to universities in Sudan in academic year 2005/2006 according to the region of origin

Region	Percentage share of the newly admitted students
Khartoum	34
Central	30
North	10
Darfur	8
East	8
Kordofan	6
South	4
Total	100

Source: Akec (2012a, p. 39)

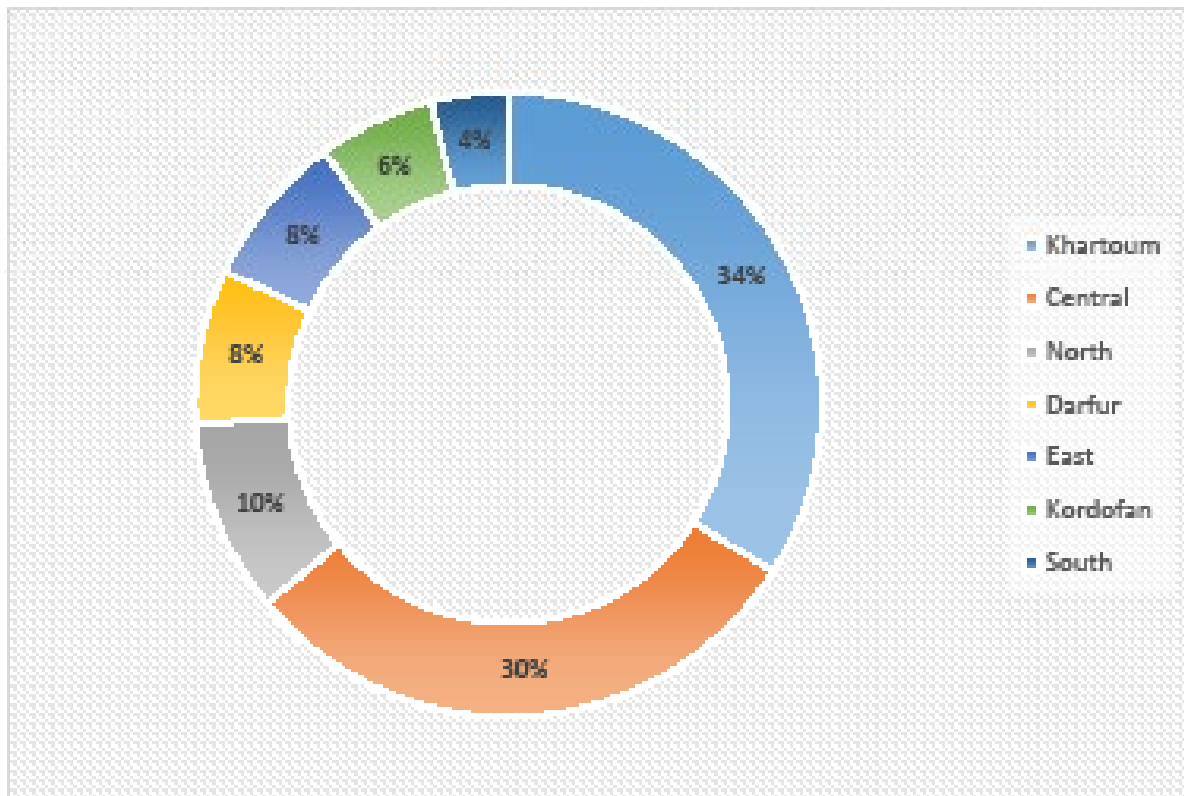


Fig.1. Percentage distribution of the newly admitted students to Sudanese Universities in 2005/2006 academic year according to the regions of origin

As of July 2011, when South Sudan declared independence, it had nine public universities and 34 private universities, the majority of which were unaccredited by the Ministry of Higher Education (Table 2). In contrast, Sudan had 26 public universities, and 7 private universities, in addition to 20 and 48 public and private colleges respectively (Tables 3). In short, South Sudan had 14% of public universities and colleges while other regions of Sudan had a combined 86% by July 2011 (Fig. 2). Furthermore, amongst the nine public universities in South Sudan, four were still setting up the necessary infrastructure and only five had students on their campuses. In 2011, there were 15,000 students applying for 3,000 places in South Sudan’s five functioning public universities (Akec, 2012a, p. 39).

4.3 Model of Higher Education in South Sudan

It is worth mentioning that South Sudan’s higher education system that was inherited from Sudan, sent too many secondary school students out to the world with no skills and no access to higher education. As demand continued to increase while the supply remained

static, the situation could only deteriorate, especially that there were 1.4 million children enrolled in primary school by 2010 whilst over 44,000 students were enrolled in some 158 secondary schools, according to the statistics by the Ministry of Education and General Instructions. What is more, a UNICEF report in 2011 reckoned the rate of increase of school enrolment in South Sudan was the fastest in the region. This was worrying because the increase in enrolment at school level was not matched by expansion in the number of higher education institutions.

In May 2012, a Higher Education bill was passed by the National Legislative Assembly and immediately signed into law by the President of the Republic. This was followed by the formation of a National Higher Education Council tasked with policy-making responsibility. The Council excluded the new four public universities and private universities and colleges, a decision by the Minister of Higher Education which invited some criticism (Akec, 2012b). Especially that the majority of Council members were senior academics committed to elitist higher education tradition and therefore, favored erecting fewer but well maintained universities, while vehemently discouraging the establishment of private universities (Akec, 2012a, p. 40).

Table 2. Public and Private Higher Education Institutions in South Sudan in 2011

Institution	Public	Private or Philanthropic
Universities	9	34 ²
Colleges	N/A	N/A

Source: Akec (2012a, p. 41)

Table 3. Public and Private Higher Education Institution in Sudan by 2010

Institutions	Public	Private or Philanthropic
Universities	26	7
Colleges	20	48

Source: Akec (2012a, p. 40)

²Among these, 22 private universities were closed down by the Minister of Higher Education in May 2012 due to poor quality infrastructure and teaching

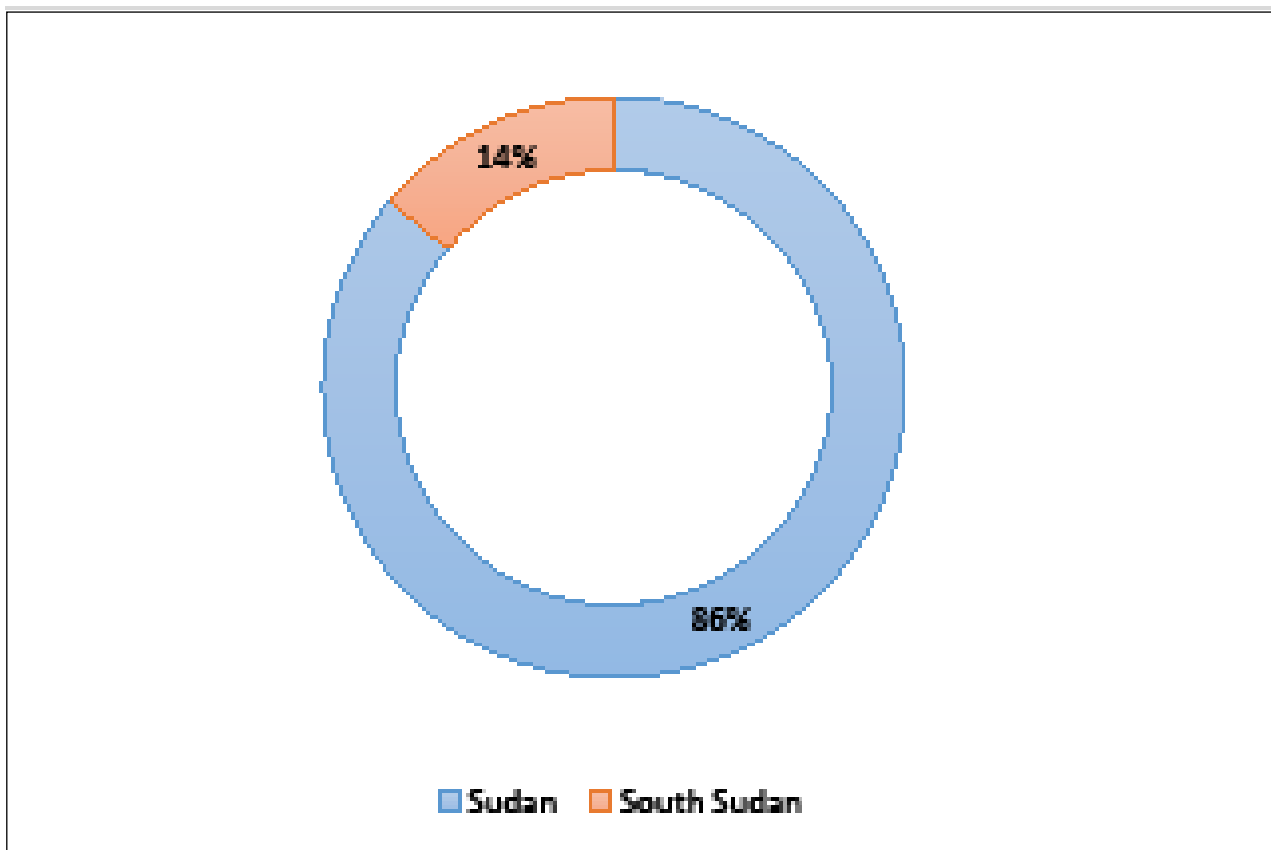


Fig. 2 Distribution of Public Institutions of Higher Education in Sudan in 2011

However, Akec (see Akec, 2011a, Akec, 2011b, and Akec, 2012c) argued that in order to be competitive in the knowledge economy, South Sudan needed to be able to turn out qualified graduates in large numbers every year, and at a faster rate than would be produced by a narrower, elitist model of higher education of the time. He called for expansion of higher education in South Sudan by establishing at least one public university in each of the South Sudan 10 States (Akec, 2011a).

4.4 Status of private Higher Education in South Sudan (2005-2012)

South Sudan witnessed a mushrooming of private higher education institutions (PHEIs) since 2005. As of May 2012, there were some 34 PHEIs, most which were operating without license in inadequate and poor quality infrastructure (see Table 2 above). The PHEIs attracted mostly former Sudan People’s Liberation Army (SPLA) combatants and working adults whose education was interrupted by the North-South war. The advantage of PHEIs was that they could admit students who had no formal qualification such as Sudan School Certificate nor its equivalent, so long as students could demonstrate they were literate enough to follow

lectures. Another advantage of the PHEIs in South Sudan was the flexibility of their time table (most operated in afternoons and evenings).

It was small wonder that the decision by the Ministry of Higher Education to close down 22 of these private universities and colleges in 2012 generated a heated debate. The reason, according to then South Sudan Minister of Higher Education, was to put more emphasis on quality as opposed to quantity. However, many former students of the PHEIs who were affected by the closures and their sympathizers, criticised the Ministry of Higher Education for the lack of pragmatism; describing the decision as an attempt to reinvent the wheel when it could have learned from accumulated experiences of many African countries in the provision of private higher education (Akec, 2012b).

In contrast, many African countries have legislations that define the steps to be followed leading to registration and accreditation and recognition of PHEIs (Akec, 2012a; Akec, 2012b). In others, there are PHEIs that are neither registered nor recognized by the accrediting bodies, yet still attract students. Cameroon is one such example where many private institutions operate illegally, and yet many of their graduates still find jobs. What that demonstrates is that even bad education where it might be found is still better than no education. In India, 90 percent of undergraduate education is carried out by PHEIs that are funded by the Government (Akec, 2012b).

Akec (ibid.) argued that a country from which South Sudan could learn invaluable lessons is South Africa because the country suffered from the discriminatory effect of Apartheid that marginalized its black majority in access to higher education. Since the ascendancy of black majority rule, the country has developed an elaborate system of ascension for school drop-outs and adults seeking a second-chance to join a university. South Africa also has 71 PHEIs, the highest number of PHEIs on the continent. In contrast, by 2012, South Sudan was still without bridging courses, and yet decided to close down private higher education institutions while providing no alternative solutions for facilitating access to higher education.

4.5 Early Challenges That Faced South Sudan Higher Education Sector (2005 to 2011)

According to Akec (2012a, and 2012b), by June 2011, there were about 956 North Sudanese academics in five functioning South Sudanese universities, of which 451 were based at University of Juba alone where they formed 73 percent of the estimated 620 academic staff total head count at that university (the University of Juba is the oldest and largest of South Sudanese universities). Nearly 700 Northern Sudanese were employed in administrative, technical, and support roles.

In the majority of colleges and schools in South Sudan's universities, the number of Northern Sudanese academics averaged 65 percent. In colleges such as veterinary and medicine, the percentage of North Sudanese academics could be as high as 90 percent or more. On average, following independence, most South Sudan universities lost an average of 65 percent of their teaching staff. As such, some departments in South Sudanese universities were forced to close because of the lack of staff. Other subjects such as pharmacy, dentistry, and petroleum engineering are not offered at any of South Sudan's universities. There was no coherent or well-articulated strategy by the Ministry of Higher Education to meet the shortage of academic and technical staff. There was a grave shortage of lecture halls, laboratories, and equipment at South Sudan public universities. Because all of the functioning universities relocated to Khartoum during the war, most of their accumulated assets and equipment were impounded by the Sudanese Government after declaration of South Sudan independence. In March 2012, the University of Juba closed for several months due to student violence, while the University of Bahr E1 Ghazal was operating at half its capacity because its School of Medicine and School Veterinary Sciences were closed for the lack of the staff (Akec, 2012b). Moreover, the new South Sudan's Ministry of Higher Education initially had no capacity for admitting new students to universities, and was obliged to rely on Sudan's Ministry of Higher Education to do it for them for fees. A combination of poor planning and lack of vision by the Ministry of Higher Education, and lack of political will by the Government, also meant that no student could graduate from any South Sudan's university for two successive academic years, beginning in 2010, and no new students were admitted to South Sudan universities in academic years 2011/2012 and 2012/2013 (Akec, 2012a).

The next section examines the status of higher education in South Sudan from 2011 to present day.

4.6 Status of Higher Education of South Sudan (2011 – to present)

4.6.1 Envisioning the Future of Higher Education in 2011

In an early attempt to evolve a collective vision on the future of higher education in South Sudan, Academics and Researchers Forum for Development (ARFD), a think-tank and an advocacy forum registered in South Sudan, in collaboration with the Ministry of Higher Education, Research, Science and Technology of the Republic of South Sudan, organised a conference entitled “*The Future of Higher Education in South Sudan*” at Heron Campsite Hotel, Juba, between 14 and 15 November 2011 (See Akec, 2011b and 2011c). The conference was attended by both the fledgling and seasoned South Sudanese academics. The speakers at the conference came from various South Sudanese universities, the Republic of Sudan, USA, Norway, United Kingdom, Egypt, South Africa, Kenya, and Uganda.

Amongst the institutions represented by the speakers were UNESCO (Office of Science, Eastern Africa region, Nairobi); Ministry of Higher Education, Research, Science and Technology, South Sudan; Ministry of Labour, Public Services, and Human Resource Development, South Sudan; SPLM Democratic Change party, London School of Economics (LSE), University of Bergen, University of North Texas, the American University in Cairo, University of Makerere, University of KwaZulu-Natal, University of Khartoum, University of Juba University, Dr. John Garang Memorial University of Science and Technology, Upper Nile University, and the University of Northern Bahr El Ghazal. The conference attendance peaked at 150 on the opening day, and only dropped to 91 on the second (final) day.

More than 20 papers were presented at the conference. The themes covered by the papers included: quality assurance and accreditation; networking as a strategy for building up human resources; consolidation of higher education institutions; building new universities as vehicles for socio-economic development; management challenges in higher education; students’ accommodation; media education; building new university campuses based on American university work models; meeting the increasing demand for higher education; elitist versus mass higher education, among others. Notably, quarter of the papers presented

recognized the need for South Sudan to prepare for the inevitable increase in social demand for higher education in the coming years that included presentations by Joseph Massaquoi (UNESCO-Nairobi Office), Marc Cutright and Beno Basheka (University of North Texas and Uganda Management Institute); Naomi Pendle (London School of Economics), John Akec (University of Northern Bahr El Ghazal); and Wilfred Ochieng, South Sudanese returnee from US as an independent author.

Participants urged the institutions of higher education to strive to design curricula that are aligned with the needs of South Sudan; asked the national government to allocate adequate resources for research, building lecture halls, libraries and laboratories. Whilst consolidating the quality of the current universities, the Government was urged to increase access to higher education through expansion of higher education institutions. And in order to develop human capital and staffing capabilities, South Sudan universities were encouraged by the speakers to collaborate and network with other peer institutions, nationally, regionally, and globally; that technical education be developed concurrently with academic higher education with government putting in place institutions and mechanism for quality assurance.

Moreover, the Council for Higher Education in South Sudan which was still being planned for establishment was urged to devise a mechanism for the ranking of institutions of higher education. Higher education institutions were also advised to embrace values of good governance, innovation, and enterprise; government and institutions of higher education were encouraged to review the students' accommodation model inherited from Sudan with a view to correcting the shortcomings. The Council for Higher Education to be established was to give special attention to the regulating and licensing of private higher education. That fixed retirement of tenured professors was to be abolished and made optional. Some participants also advised that the Government took a second look at its policy of 'free higher education for all' because it would not be sustainable with the expansion in higher education. Instead, they argued that the Government devised a cost sharing strategy in which students were to make contribution, and only financially support those who could not.

4.6.2 Funding of Higher Education in South Sudan

Budget for higher education caters for wages and salaries, and makes very insignificant allocation to operation/services for the Ministry, but hardly or very little for universities. There has never been funding for infrastructure since 2005.

The budgetary allocation to Higher Education, Science, and Technology for financial years 2013/2014, 2014/2015, 2017/2018, and 2018/2019 in South Sudan pound (SSP) and equivalent United States dollar (USD) at parallel market exchange rate are shown in Table 4. It shows that the approved budget for Higher Education, Science, and Technology sector was respectively USD 16.5 million (1.6% of the budget), USD 9.3 million (unknown percentage of total budget), USD 1.8 million (2%), and USD 2.4 million (2.9%) in fiscal years 2013/2014, 2014/2015, 2017/2018, and 2018/2019, respectively. In real terms, funding to the sector dropped by 85.5% during the period 2014 to 2019.

To operate, universities collect very small fees from students. The value of the fees has continued to fall as South Sudan pound has suffered steep depreciation since 2016 at the heel of drop in oil prices which began in December 2014. Over the same period, the cost of operating the university as well as consumer prices have increased 3,000 fold since January 2016, while little had changed in the salaries received by the professors at public universities, and the tuition fees paid by the students (Akec, 2019). As a result, the value of professors' salary fell to below USD 200 in 2017 compared to equivalent USD 3,000 in 2015 (Akec, 2017). And by January 2019, professors' pay had fallen to equivalent of USD 135 (Akec, 2019), the lowest in the East Africa region. It led to mass exit of teaching staff to NGO sector. For example, University of Juba alone lost 24 percent of its staff in 2018. It prompted the Government to increase pay by 2600 percent to restore purchasing power. However, a new depreciation of South Sudanese pound by 50 percent in August 2020 led to a loss of about half of the value of the new pay structure for academics.

Moreover, the purchasing power of tuition fees being paid by the students has continued to fall steeply since 2015. For example, a medical student paid annual tuition fees of SSP5,000 in 2014 and 2015 at the University of Juba. This was worth more than US\$1,500 per year at the

official exchange rate of the time and slightly less at parallel exchange rate. By March 2019 exchange rate, SSP5,000 was worth US\$18. In 2016, the University of Juba administration tripled the tuition fees so that medical students paid SSP15,000 which was worth US\$200, while social science students were required to pay SSP6,000 (US\$80) annually. The Government intervened and cancelled the fee rise, fearing student protests (ibid.).

However, the University of Juba administration succeeded in October 2020 to convince its students to pay tuition fees with value that ranged from USD 100 to USD 200 (depending on the type of subject studied by a student). This improved the situation but still the lowest tuition fees in the region and not enough to support both operation and improving physical infrastructure.

All in all, finding an optimal microeconomic model for funding higher education, science and technology, including payment of satisfactory wages for employees of universities presents a great challenge for South Sudan’s higher education sector. The dilemma is that the Government is unwilling to increase its annual subvention to universities and is nervous about universities charging higher tuition fees.

Table 4. Budget for Higher Education in three financial years (2013/2014; 2017/2018; 2018/2019)

Financial Year	Exchange rate (SSP/USD) in estimated parallel market	Approved Budget (SSP)	Approved Budget (USD)	Percentage of Total National Budget (%)
2013/2014	10	165,368,268	16,536,826	1.6
2014/2015	18	166,656,799	9,258,711	-
2017/2018	250	453,533,513	1,814,134	2.0
2018/2019	280	671,033,513	2,396,548	2.9

Source: Annual Budget Books, South Sudan Ministry of Finance and Economic Planning (February 2021).

4.7 Summary of the recommendations of the Higher Education Conference (November 2011)

The conference most important recommendations can be summed up as (Akec, 2011c):

- 1- In order to overcome challenges faced by the higher education sector and meet South Sudan's needs in skilled human capital, the Government was urged to adopt a mass higher education strategy.
 - 2- Each State of South Sudan should have at least one public university.
 - 3- Innovative schemes to be devised to resolve funding challenges of higher education sector.
 - 4- Improve the quality of teaching for mathematics, basic sciences, and English at school level in order to improve the standards at university level in the long-term.
 - 5- In order to attract academics who had abandoned the lecture hall for greener pastures (working for the Government or NGOs) as well as ex-patriate academics, pay structure for university teachers be improved.
 - 6- Students and parents to contribute to educational costs through self-financing and loans.
 - 7- More loans be made available to students studying science and technology.
- Unfortunately, very few of the recommendations made their way into the policies that were agreed agreed by the first meeting of the National Council of Higher Education in May 2012.

5. Review of the Current Statistics on Higher Education and TVET Institutions in South Sudan (2011 – 2020)

5.1 Review of the statistics of Academic Staff

This section presents the statistics on higher education as of August 2020. The statistics give gender-segregated data on the distribution of academic staff, support staff, students and academic programs. The data were collected from each institution of learning, both public and private institutions.

As of 2020, there were about 2,574 full-time academic staff employed in the five public universities, two private universities, and seven technical and vocational education (TVET)

colleges and institutes (See Fig. 3). More details are in Appendix I.

About 1,257 (48.8%) of the academics are employed in STEM, whereas about 1,317 (51.2 %) are in social sciences. Furthermore, overall academic staff are distributed according to academic ranks as follows: professors 73 (3%), associate professors 127 (5%), assistant professors 292 (11%), 1,058 lecturers (41%) and teaching assistants 1,027 (40%) (See Fig. 4). This means only 19% of the academic staff have PhDs or are qualified enough to carry out high level research. The bulk (that is, 81%) of the staff employed in tertiary education do not hold PhDs, and half of non-PhD holders have only the first degree. Public universities employ 72 % (1,845) of the academics, private universities 7% (190), and 21% (539) is distributed across seven TVET institutions. This indicates that about 79% of the academics are employed in university sector, while only 21% are employed in TVET sector.

Public learning institutions take a lion share of the staffing (90.6 percent), of which 34 percent are at the University of Juba (Fig. 5 and Fig. 6).

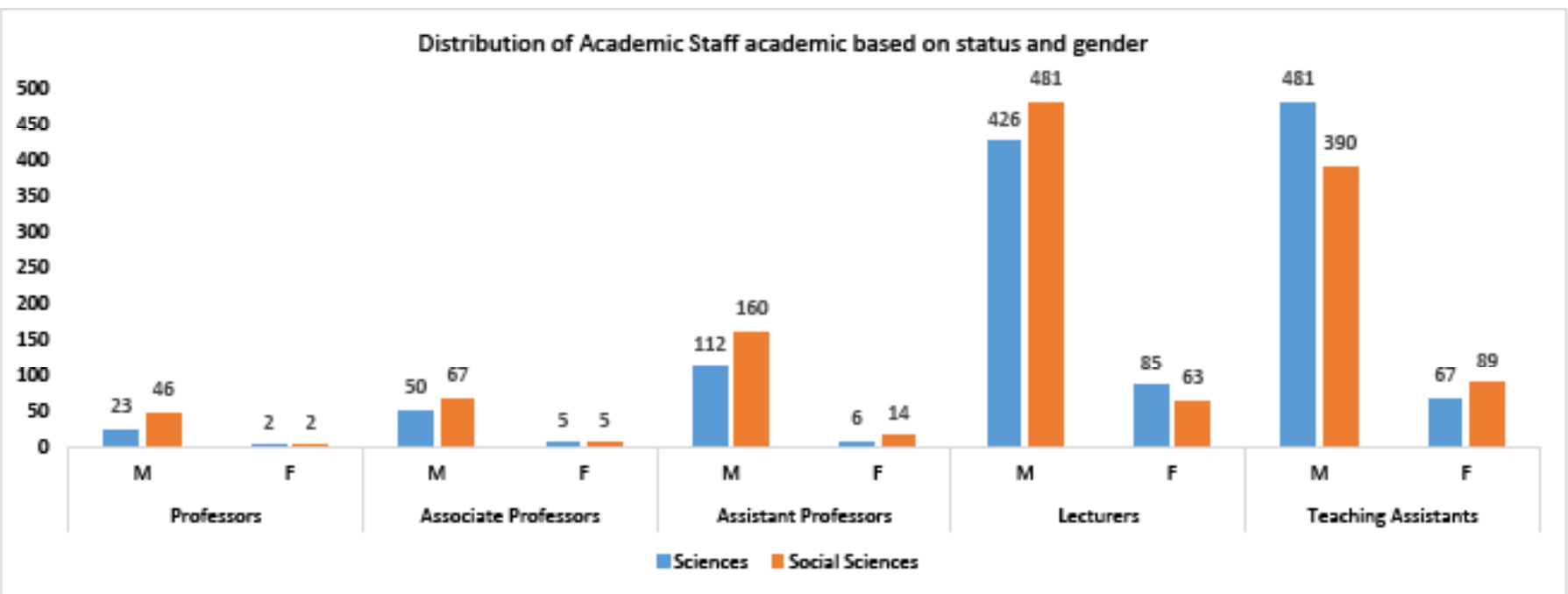


Fig. 3 Distribution of Academic Staff based on status, specialization, and gender

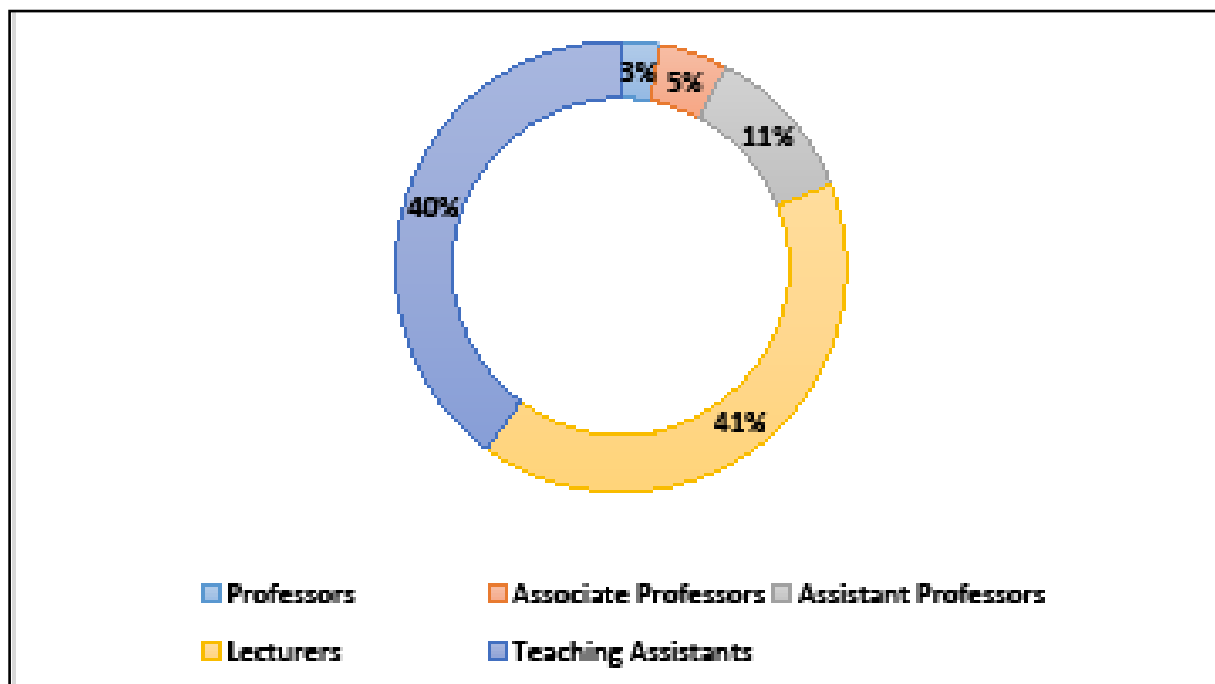


Fig. 4. Distribution of Academic Staff based on ranks

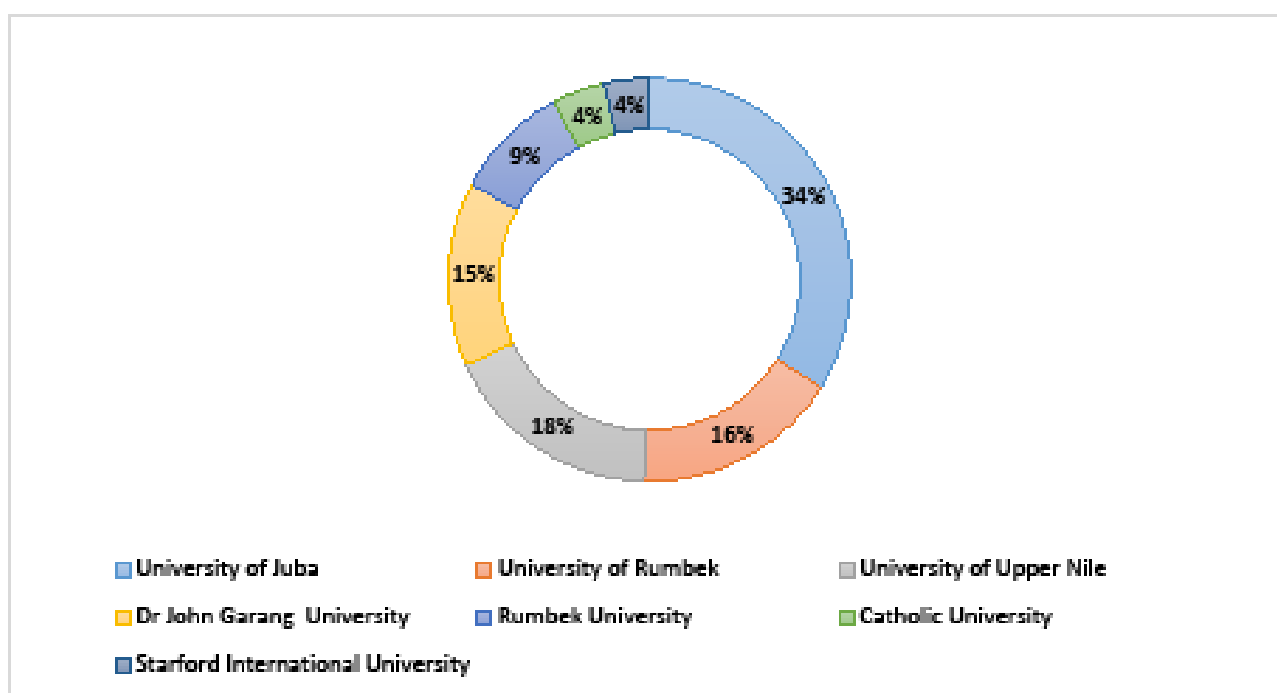


Fig. 5. Distribution of Academic Staff in five public and two private universities

5.2 Gender-based analysis of Academic Staff of Tertiary Institutions

5.2.1 Academic Ranks Distribution

Regarding gender representation in different academic ranks, 87% of the academics are males, and only 13% are females. There are 73 professors at the seven public and private universities in South Sudan, only 4 (5.4%) female academics are professors, compared to 69

(94.5%) males. Out of the 127 associate professors recorded, only 10 (8%) are females and the rest, 117 (92%) are males. Also while there are 292 assistant professors, there are only 20 (7%) female academics in that rank, while 272 (93%) are males. The total number of lecturers is 1,050 of whom only 148 (14.1%) are female academics, and the other 902 lectures are males. Finally, there are 1,027 teaching assistants, of whom 156 (15%) are females, compare to 871 (85%) males (see Fig. 7).

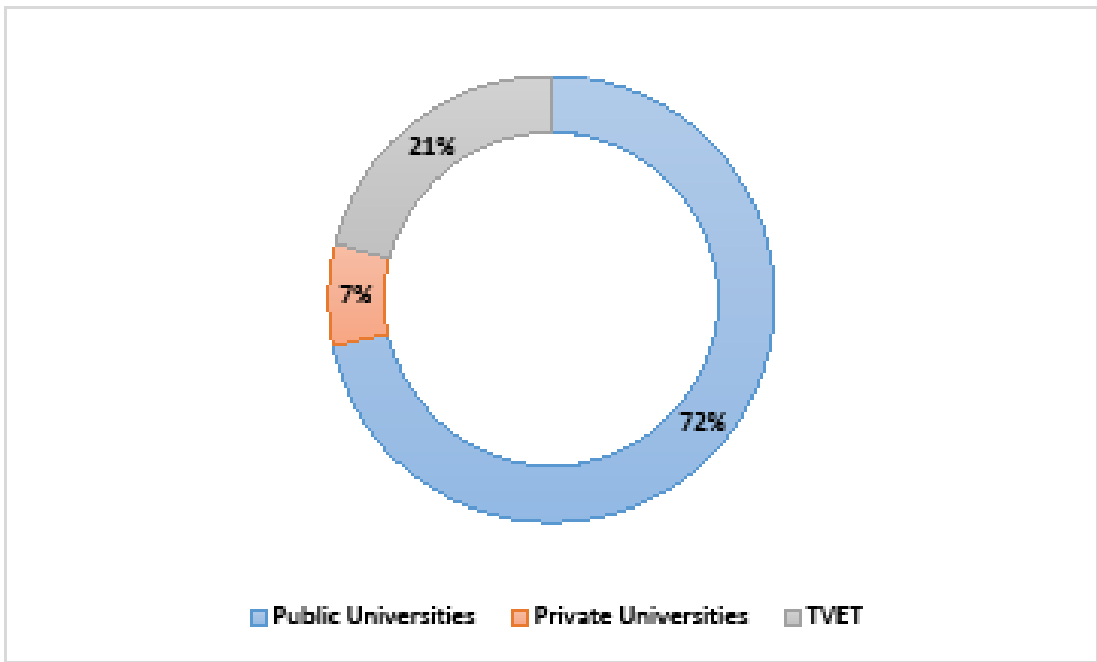


Fig. 6. Distribution of Academic Staff between public and private universities, and TVET institutions

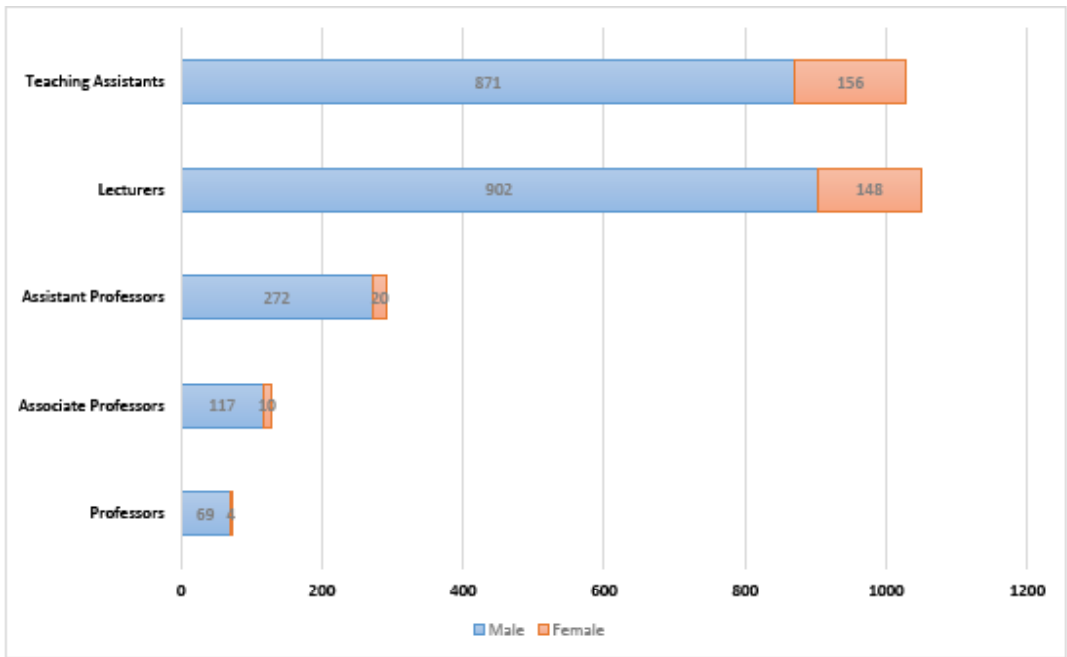


Fig. 7. Academic representation of Women in South Sudan's Higher Education institutions

5.2.2 Analysis of teaching staff distribution based on fields of specialization

When gender-based analysis is examined in terms of field of specialization, only 165 (13%) of female academics are employed in STEM sector compared to 1,097 (87%) of males. Overall, 173 (13%) female academics are working in the STEM sciences, compared 1,144 (83%) male academics (see Fig. 8).

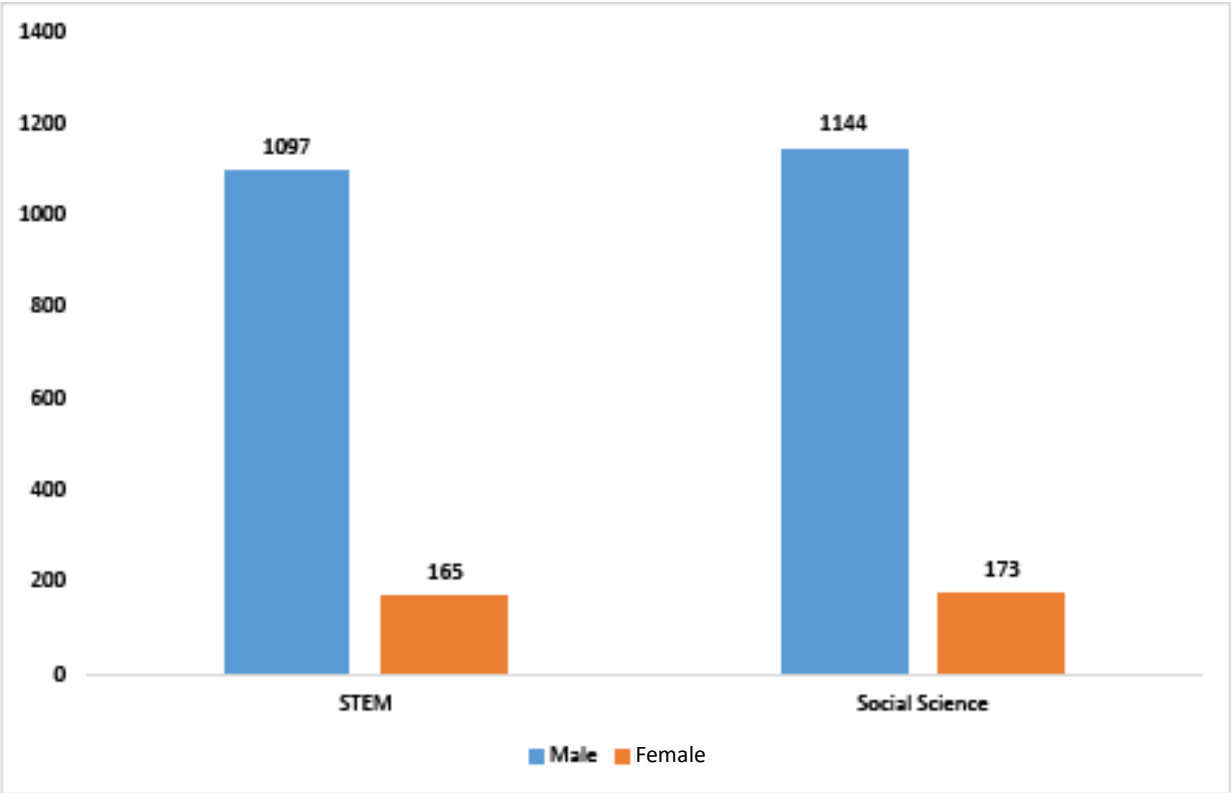


Fig. 8. Representation of women in employment in STEM and social sciences in Higher Education in South Sudan

5.3 Analysis of the distribution of administrative (Non-Academic) Staff

This category describes administrative, financial, technical, ICT, and manual support staff who have no teaching roles (although a few well qualified administrators may teach part-time in universities where their skills may be needed to fill the gap in staffing for certain subjects). The total number of non-academic staff is 3,089. The representation of women is 1,244 (40%) while males make up 1845 (60%) (see Appendix II).

5.4 Gender-based distribution of students in Higher Education and TVET Institutions

In 2020, some 38,746 students were enrolled in 14 institutions of tertiary education and TVET. About 28,909 (75%) were male students, and the other 10,137 (26%) were female students (see Fig. 9 and Appendix III for details). The great majority of students, or about 36,248 (94%), were enrolled in the university sector, while only 2,498 (6%) are enrolled in TVET. Furthermore, about 32,467 (84%) were enrolled in public universities; 3,781 (10%) in private universities; and 2,498 (6%) in TVET institutions (see Fig. 10). It is also worth noting that the University of Juba alone had 23,383 (62%) of the students enrolled in tertiary education institutions; which amounted to 72% of students enrolled in the whole university sector (both public and private) in South Sudan. Further, 26,150 students were enrolled in STEM and 25,528 students in social sciences.

5.5 Gender-based distribution of STEM Students

The distribution of students enrolled in STEM by gender in 14 institutions of tertiary education and TVET covered by the study is shown in Fig. 11 (see Appendix IV for details). Out of the 38,746 students that were enrolled in 14 institutions of tertiary education and TVET institutions, there were 13,218 (34%) enrolled in STEM, of whom 10,046 (76%) were male students, and 3,172 (24%) were females. All 14 institutions covered by this study, except St. John's College-Wau, had some STEM programs (see Appendix III and IV).

The distribution of STEM students by type of the institutions is shown in Fig. 12. It is noted that 10,619 (80%) of STEM students were enrolled in public universities, 408 (3%) in private universities, and 2,191 (17%) in the TVET sector. The bulk of STEM students were distributed as follows: 7,589 (57%) enrolled at the University of Juba; 1,416 (11%) at the University of Upper Nile; 1,273 (10%) at University of Bahr El Ghazal; 787 (6%) at Juba Technical School; and 430 (3%) at Juba Multi-Service Training Centre.

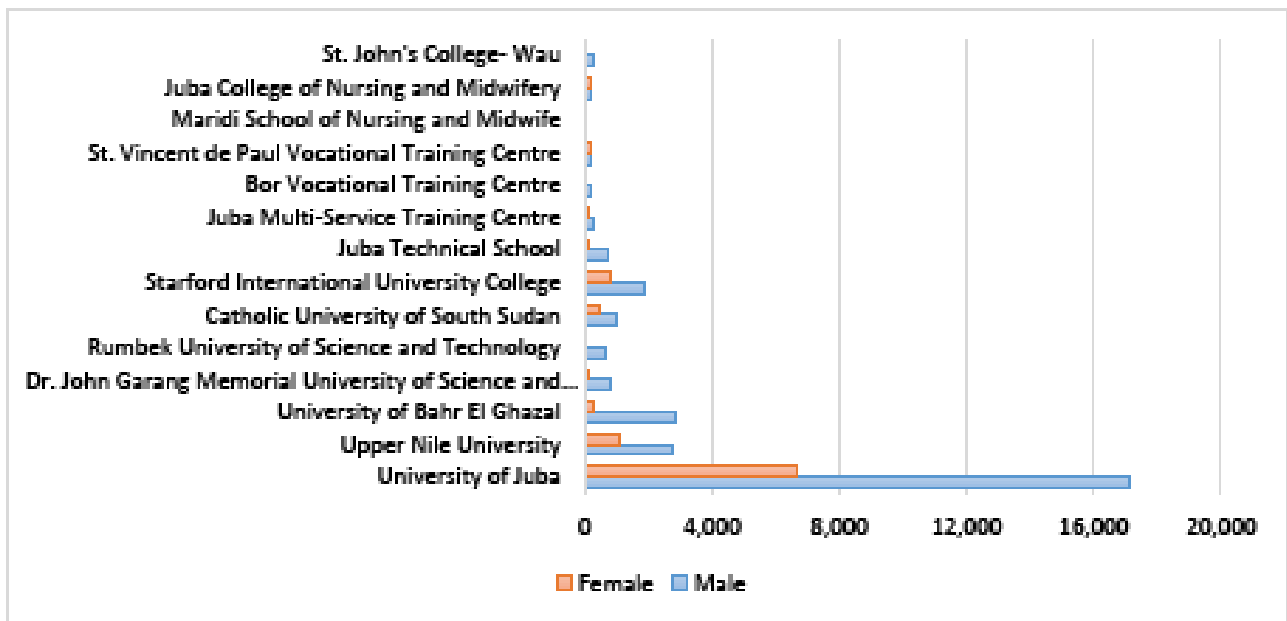


Fig. 9. Distribution of students by gender in 14 tertiary learning institutions and TVET in South Sudan in 2020

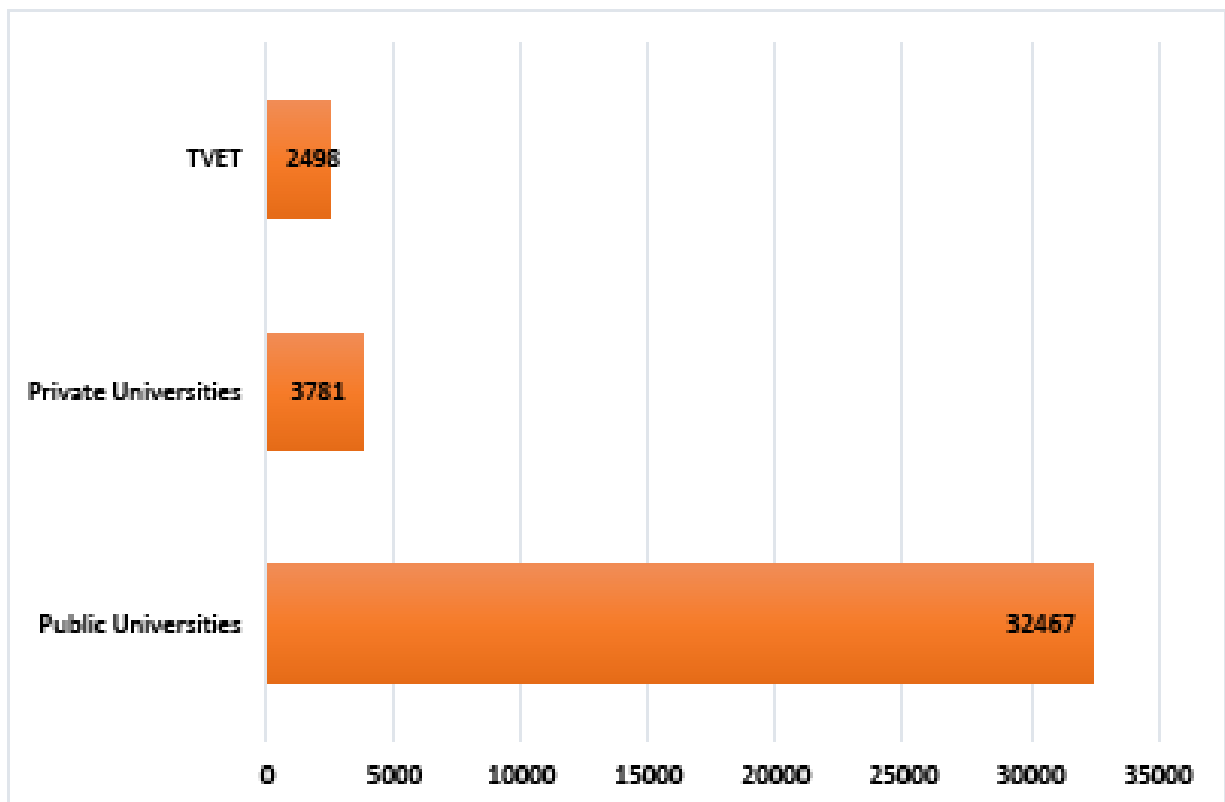


Fig. 10. Distribution of student population by the type of institutions in South Sudan in 2020

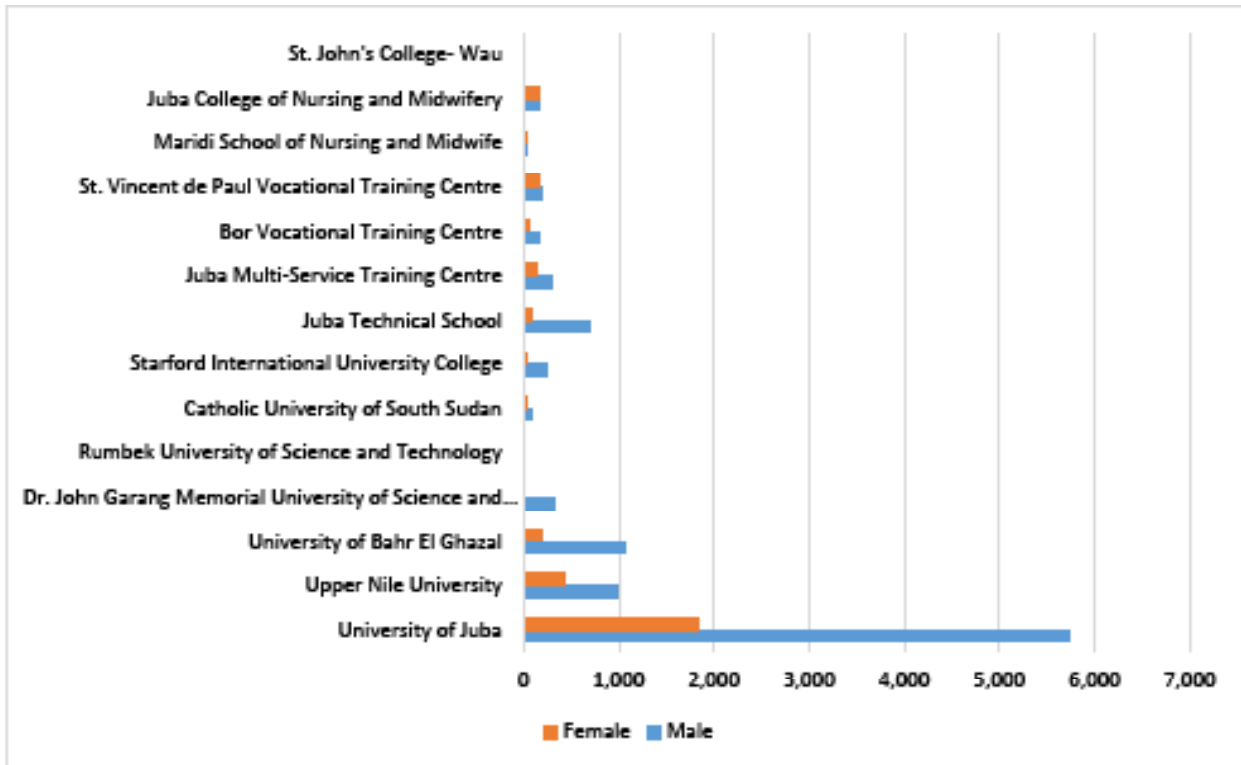


Fig. 11. Distribution of STEM students by gender in 14 institutions of tertiary education and TVET in 2020

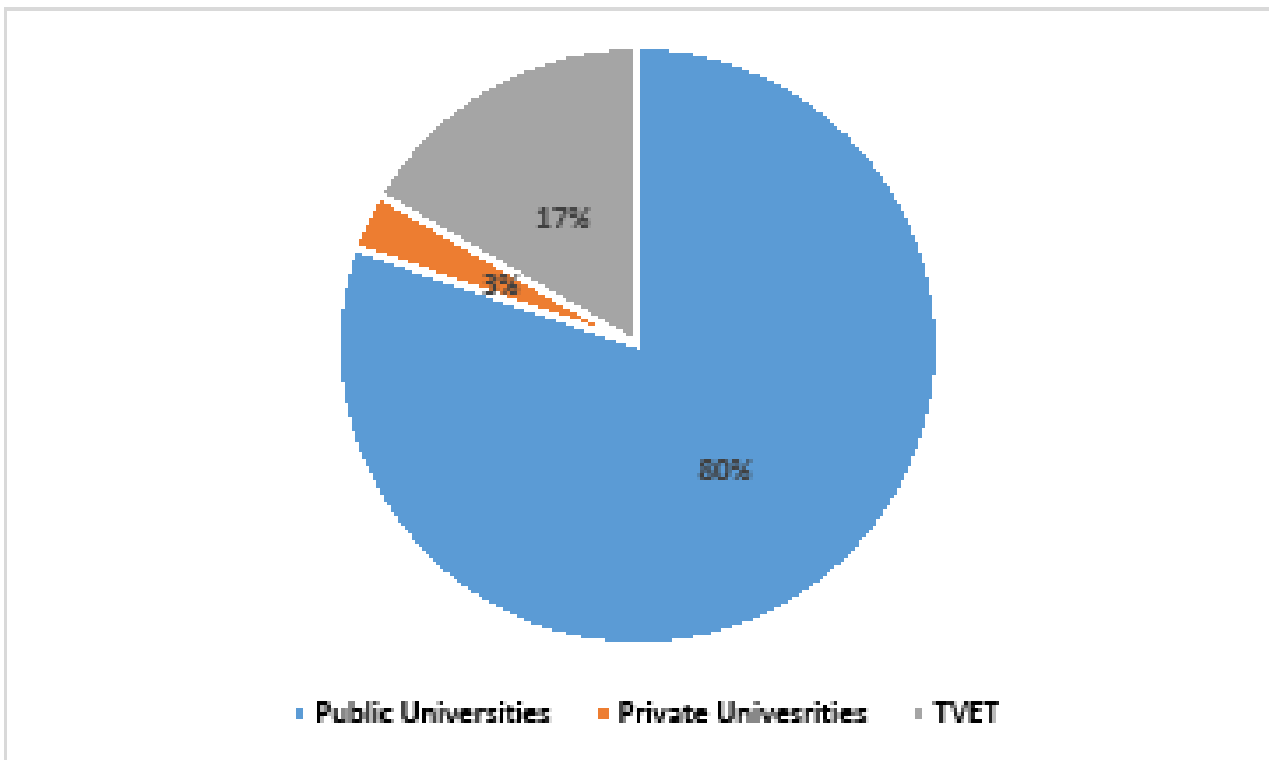


Fig. 12. Distribution of STEM students by the type of institutions

5.6 Distribution of students according to level of the programme by gender

In 2020, the students distributed by gender according to level of the programme of enrollment are shown in Table 4, and Fig. 13. A total of 12,403 (32%) were studying at diploma/certificate level with 3,575 (29%) being female and 8,828 (69%) male students; 25,309 (65%) were studying at bachelor degree level of whom 6,222 (25%) were female and 19,087 (75%) being male students; 171 (0.4%) were studying for postgraduate diploma of whom female students formed 10%; 864 were studying at master level with female students being 70 (8%) while 92% were males; and 15 students were enrolled in PhD programmes, all of them being males.

Table 4. Distribution of students according to the level of programme

Level of Programme	Males	Females	Total
Diploma/Certificate	8,828	3,575	12,403
Bachelor	19,087	6,222	25,309
Postgraduate Diploma	154	17	171
Masters	794	70	864
PhD	15	-	15
Grand Total			38,762

5.7 Distribution of students according to field of STEM specialization

For the bachelor STEM-based programmes, 624 students were enrolled in physical and biological sciences; 1,911 in computer science and information technology; 2,492 in health sciences; 1,189 in agricultural sciences; 1,069 in education; 1,128 in engineering and architecture; and 990 in natural resources (see Table 5 and Fig. 14). Only agricultural science had students enrolled in masters (19) and PhD levels (1). Vocational training was confined to diploma and certificate levels. Nearly half of all students or 19,545 (50%) were enrolled in business, economic, and social studies; followed by 5,670 (14%) of students enrolled in arts and humanities at undergraduate level. The third largest number of students were enrolled in health sciences (3,253 or 8.4%), followed by computer science and information technology (3,223 or 8.0%).

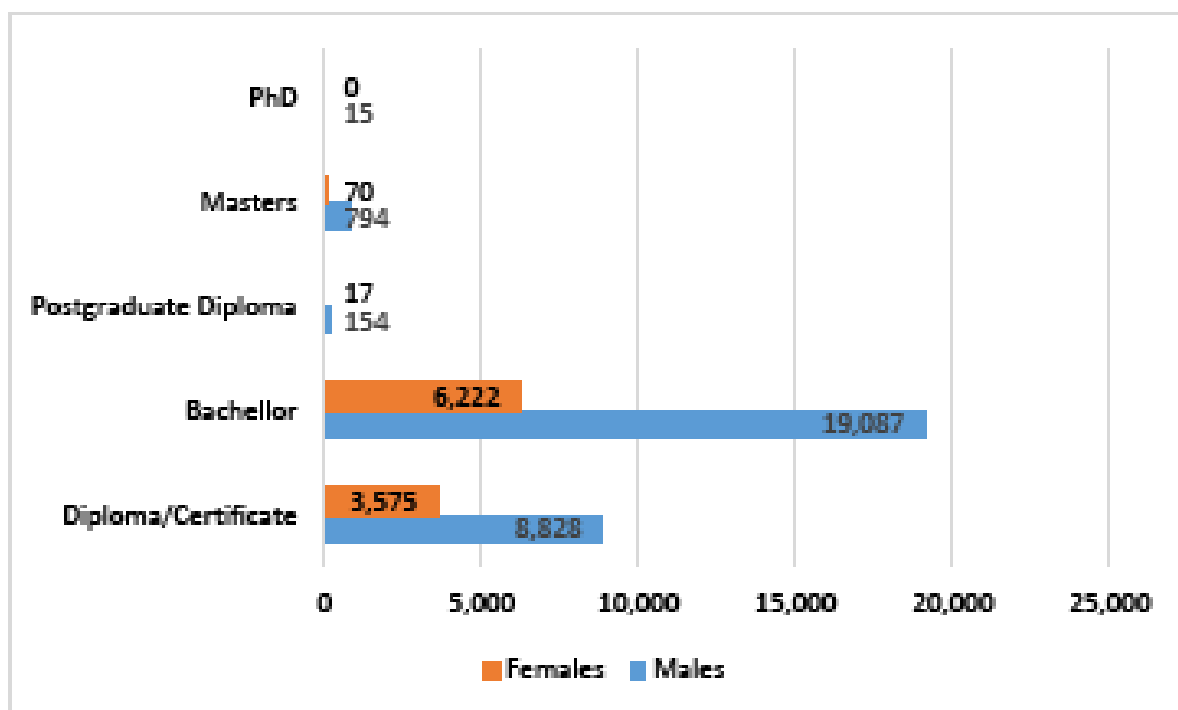


Fig. 13. Distribution of students by gender and level of study programmes

Table 5. Distribution of Students according to field of specialization

Field of Specialization	Diploma /Certificate	Bachelor	Postgraduate Diploma	Master	PhD
Physical and Biological Sciences	-	624	-	-	-
Computer Science and Information Technology	1,312	1,911	-	-	-
Human Health Sciences	761	2,492	-	-	-
Agricultural Sciences	-	1,189	-	19	1
Education	91	1,069	12	8	2
Engineering and Architecture	-	1,128	-	-	-
Natural Resources	348	990	-	-	-
Arts and Humanities	1,863	3,807	56	154	2
Business, Economic and Social Studies	6,650	12,099	103	683	10
Vocational/Technical Training	1,378	-	-	-	-
Total	12,403	25,309	171	864	15

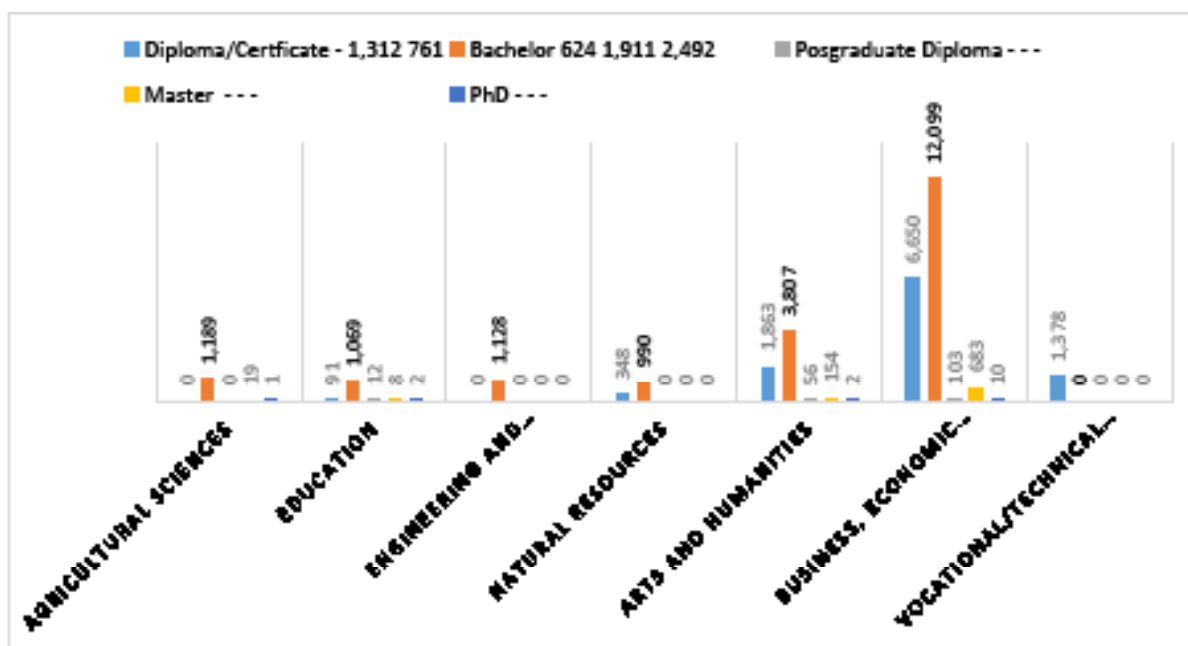


Fig. 14. Distribution of students according to field of specialization

5.8 Assessment of demand for Tertiary Education

The number of candidates that are for the South Sudan School certificate examinations of education is shown in Table 6. It is noted that the numbers have shown an upward trend from 19,425 candidates in 2017 to 23,111 candidates in 2019. The percentage of female was on average 28% over the three years. However, the data exclude South Sudanese holders in Sudan, Ugandan, Kenyan, and Ethiopian who apply every year to study at South Sudanese universities. There is always a difference between number of candidates who sit exams, those who pass, and those who apply to study at tertiary education levels. Overall, those who apply are more than those who pass South Sudan School certificate exams. According to information from the Ministry of Higher Education, Science, and Technology, the number of candidates applying to study at public universities in 2021 was about 24,000 candidates. In 2019, it was less than 20,000. It is further noted that the number of students admitted have increased, while the capacity to admit increasing number of students remains the same.

Table 6. Number of applicants for South Sudan School Certificates from 2017 to 2019

Year	Males	Females	Total	Percentage of Female Students
2017	13,342	5,993	19,425	31%
2018	10,225	3,816	14,041	27%
2019	16,862	6,249	23,111	27%

Sources: South Sudan National Examination Secretariat, the Ministry of General Education and Instructions (February 2021)

6. South Sudan’s Educational Policies, Legal Frameworks, and Development Plans

6.1 Applicable Legal Framework for Higher Education

Article 29 Section (1) of the Constitution of the Republic of South Sudan 2011 (As amended in 2013) holds that “Education is a right for every citizen and all levels of government shall provide access to education without discrimination as to religion, race, ethnicity, health status including HIV/AIDS, gender or disability.” And Section (2) of Article 29 of the Constitution stipulates that “all levels of government shall promote education at all levels and shall ensure free and compulsory education at the primary level; they shall also provide free illiteracy eradication programmes.” Further, Article 16 Section (2) upholds the right of women “to equal pay for equal work and other related benefits with men.” Section (3) of Article 16 gives women equal rights to participate in public life. Section (4a) of Article 16 calls for all levels of government to “promote women participation in public life and their representation in legislative organs by at least twenty-five percent as an affirmative action to redress imbalances created by history, customs, and traditions.”

Higher education in South Sudan is regulated by the Higher Education Act 2012 and University

Bill 2013 (partly operational but has not been signed into law as yet). The Higher Education Act 2012 sets the strategic goals and objectives of higher education in South Sudan (Section 6); established Council for Higher Education as a policy making body; defined the functions, powers, and membership of the Council for Higher Education, and procedures of appointing university vice chancellors and deputy vice chancellors of public universities (see Sections (8) to Section (25) of Higher Education Act 2012).

The strategic objectives of the Higher Education Act 2012 (Section 6) are: 1) stimulation and promotion of the higher education system in order to meet learning needs of South Sudanese national development and transmission of appropriate skills, and creation of relevant and useful knowledge; and 2) building of a highly skilled human resource capital in order to stimulate and utilize the creative and intellectual energies of the entire population.

The general objectives of Higher Education Act 2012 (Section 7) include a) modernizing higher education by enhancing its capacity and ensuring better utilization of its resources, development of methodologies and technologies so that higher education can fulfill its role effectively; b) supporting knowledge creation and scientific research...applying and improving its method, quality of its curricula, and linking them to social and economic needs of the Country; c) training of vital elements of society to build human resources for socioeconomic and cultural progress; d) service to society through social and economic initiatives, and protecting the environment, and e) promoting international cooperation and joint scientific research with foreign universities and research institutions, among others.

Furthermore, Section 14(b) of the Act 2012 stipulates that vice chancellors and their deputies are nominated by the minister of higher education and confirmed by the President of the Republic. In addition, Section 28 empowers the vice chancellors to appoint deans and directors of centres and institutes at the universities in consultation with the Chairman of University Council. The tenure of vice chancellors, deputy vice chancellors, deans of schools, and directors of institutes and centres is 4 years, renewable.

The functions and powers of Council for Higher Education include (see Higher Education Act

2012 Section 12): development and formulation of higher education and scientific research policies; accreditation of institutions of higher education; protection of university autonomy; promotion of social, cultural, and economic progress; determination of admission standards; and certification of private higher education institutions.

The Council performs its functions through six permanent committees and eight specialized scientific committees. The permanent committees are (see Section 17(a) of Higher Education Act 2012): Admission, Evaluation, and Accreditation; External Relations and Training; Technical and Technological Education; Administration and Finance; Planning, Budgeting, and Grants; and Private and Foreign Education. The Admission, Evaluation, and Accreditation is regulated by the Admission to Higher Education Institutions Regulations 2012.

Specialized scientific committees (see Section 17(b) of Higher Education Act 2012) include: Engineering Sciences; Technical and Technological Education; Agriculture, Veterinary, and Natural Resources; Medicine and Health Sciences; Economics and Social Sciences; Law; Education and Humanities; and Environmental Science. The specialized scientific committees of the Council for Higher Education studies make their recommendations to the Minister of Higher Education to approve, reject, or send the curricula back for modification. Its work is regulated by the Specialized Scientific Committee Regulations 2012.

The President of the Republic is the Chancellor of all public universities (Section 20 of Higher Education Act 2012). The Council for Higher Education is chaired by the designate Minister of Higher Education, Science, and Technology.

It is worth mention that many permanent committees of the Council of the Higher Education still do not have documents regulating their work. Moreover, the Admission Regulations 2012, was really a copy and paste from Sudan admission regulations. Attempts have been made to make adjustments to fit the regulation to the new context of a sovereign independent South Sudan. Until the time of this writing, no substantive progress has been made. What is more, the University Bill 2013 has not been passed into law. Currently, universities in South Sudan are working without a law regulating their work, although in practice, elements of the new University Bill 2013 are being implemented by the universities. These include having

two deputy vice chancellors, as opposed to one deputy vice chancellor under Sudan. In Sudan, universities are headed by vice chancellors who is assisted by one deputy vice chancellor, an academic secretary, and a principal (who is responsible for finance and administration). However, in South Sudan, currently university vice chancellors are deputized by two positions: deputy vice chancellor for administration and finance, and deputy vice chancellor for academic affairs, each assisted by a registrar for administration and finance, and a registrar for academic affairs, respectively.

6.2 Review of South Sudan Vision 2040

In 2011, South Sudan developed a long-term strategic plan called: “South Sudan Vision 2040: Towards Freedom, Equality, Justice, Peace and Prosperity for All.” The Vision has seven pillars as follows: (a) Educated and Informed Nation; (b) Prosperous, Productive and Innovative Nation; (c) Free, Just and Peaceful Nation; (d) Democratic and Accountable Nation; (e) Safe and Secure Nation; (f) United and Proud Nation; and (g) Compassionate and Tolerant Nation.

On creating “Educated and Informed Nation”, South Sudan Vision 2040 was informed by the facts that in 2010 (the time when the 2040 strategy was being developed):

1. 63% of the school-age children had never attended school.
2. 68% of school-age children in rural areas never attended school while 72% of school-age girls never attended school.
3. Primary school enrolment had increased from 1,284,252 in 2008 to 1,380,580 in 2009. Over half a million of these pupils were girls.
4. Secondary school enrolment in Southern Sudan was 44,027 in 2009; however, girls made up only 12,050 of the total.
5. Student classroom ratio had improved in Southern Sudan from 171 in 2007 to 129 in 2009.
6. Student teacher ratio in Southern Sudan went up from 43 in 2007 to 52 in 2009.
7. Out of 26,575 teachers in Southern Sudan, 13,071 were not trained and the training status of a further 3,092 was not known.

Accordingly, the plan envisaged that by 2040, South Sudan will have a quality education system that is able to prepare its youth to cope effectively with the global dynamic environment.

That the education system will be relevant, of high quality, and accessible. That South Sudan will have obtained the latest information technology available, which is capable of placing it firmly on the path of becoming “*an educated and informed nation.*”

On the second pillar (Prosperous, Productive and Innovative Nation), the plan noted that by 2040:

1. South Sudan will be a society characterised by pursuit of excellence through skilled and dedicated human capital with a culture of hard work where innovative ideas are promoted and rewarded. The government will be a facilitator in partnership with the private sector to create an environment where business and entrepreneurial activities are encouraged and supported.
2. South Sudan will have a diversified economy driven by agriculture, industry, mining, tourism, and services to be a vibrant economy that is able to compete and attract investors. The Government will have to take the lead by initiating and investing in agriculture to achieve food security. The diversification will have advanced the role of women in the mainstream of development and promoted partnership between local and foreign investors. This partnership will have empowered citizens, developed investment and substantially increased resource ownership and management by citizens. Appropriate measures will have been taken to limit pollution that may result from rapid industrialization and promote sustainable environment.
3. The key resources and assets of the Country will be equitably distributed between its people. Communities will be involved in the use and preservation of their environmental assets and will benefit directly from their exploitation. The attitude towards natural resources will pay attention to fair distribution between present and future generations. The eradication of poverty will have created a situation where no one will be compelled to damage the environment in order to obtain their basic needs.
4. It is anticipated that by 2040 all South Sudanese shall have obtained access to good quality basic shelter, either in the urban or rural areas.

And in order to “build an educated an informed nation”, South Sudan would aim for the following key strategic objectives:

1. Increasing access to general and higher education opportunities

2. Providing educational infrastructure to meet the need of the nation
3. Building institutional capacity
4. Designing curricula that meet the needs of the people of South Sudan and enhances their international outlook
5. Improving quality of and widening participation in teacher education programmes
6. Improving quality of education
7. Promotion of the use of English as medium of instruction
8. Promotion of equity and social change
9. Promotion of application of science and technology
10. Promotion of access and use of Information and Communication Technology

6.3 South Sudan 3-Year Development Plans (2011-21)

6.3.1 South Sudan Development Plan 2011-2013

South Sudan Vision 2040 was to be implemented through a number of 3 to 4-year national development plans. The first national development plan was South Sudan Development Plan 2011-2013 under the theme: “Realizing Freedom, Equality, Justice, Peace and Prosperity for All.” The plan’s Social and Human Development pillar aimed to *“promote the well-being and dignity of all the people of South Sudan by progressively accelerating universal access to basic social services.”* The Education Objective of the plan was: *“to ensure equitable participation in a rapidly expanding and quality education system, geared to promoting sustainable development throughout South Sudan.”* This was to be achieved by:

1. Expanding the number and increasing quality of teachers
2. Increasing access to general education by increasing primary education enrolment by 65% and setting up at least one higher education institutions in each of South Sudan’s 10 States in the first 3 years of statehood.

The South Sudan Development Plan 2011-2013 was never implemented because of shut down of oil production in January 2012 over conflict with Sudan that lasted for 18 months up to September 2013. The shutdown deprived the Government of 98% of its revenues. When the oil production finally resumed in September 2013, civil war broke out in December 2013, barely three months after resumption of oil production. The plan was revised in 2014 as South

Sudan National Development Plan 2014-2016. However, because of continued conflict and low oil prices in 2014 and onward, very little was done towards education, especially towards higher education and TVET.

6.3.2 South Sudan National Development Strategy 2018-2021

The South Sudan National Development Strategy (SSNDS) was launched in November 2018 under the theme: “Consolidate Peace, and Stabilize the Economy”, as overall theme. It followed the signing of Revitalized Agreement on the Resolution of the Conflict in the Republic of South Sudan (R-ARCSS) between the Government and opposition groups in August 2018. Its socioeconomic guiding principles were as follows (SSNDS 2018):

- a) Inclusive and equitable economic growth,
- b) Service delivery,
- c) Social safety nets for the vulnerable
- b) Creation and development of markets;
- c) Productive capital accumulation;
- d) Poverty reduction and eradication of hunger;
- e) Economic recovery and management of inflation;
- f) Economic diversification;
- g) Infrastructural services;
- h) Empowerment of women and youth;
- i) Improving the quality of education and expanding training opportunities;
- j) Support to scientific and socio-economic research;
- k) Provision of vocational technical training;
- l) Adoption of communication and information technologies;
- m) Industrialization of the economy;
- n) Export promotion.

On education, strategic objectives include providing equitable and inclusive infrastructure for general and tertiary education institutions and improving grant transfer system to education institutions and learners.

6.4 ST&I Ecosystem

6.4.1 ST&I Governance

South Sudan has no established working system for the coordination and support of science, technology, and innovation (ST&I) policy, including the absence of budgetary allocation in support of ST&I for industry, research, or education. This state of the affairs was confirmed by a report prepared by Economic Commission for Africa (UNECA), entitled: *Towards a Framework for Governing Science, Technology, and Innovation in the Republic of South Sudan (2019)*. The report was prepared at the request of the Government of South Sudan. The key findings of the report indicate that the whole ST&I policy has been entrusted to a directorate at the Ministry of Higher Education, Science, and Technology, and noted that: “South Sudan does not have a national policy that guides the science, technology and innovation development process. The priority sectors for STI intervention have not been identified, and there are no coordinating mechanisms for inter-institutional efforts in developing STI programmes and activities in various sectors of the economy.” (UNECA, 2019, pp. ix).

The report also acknowledged that some initiatives have been carried out to establish agricultural research system and expand support to higher education and technical vocational education. The report used China and South Korea STI governance systems as benchmark to make several recommendations for grounding South Sudan’s STI systems and policy. The key recommendations include:

- a) Creation of a Parliamentary Committee for STI to champion legislation pertaining to STI and be a voice for STI when drafting or passing annual budgetary allocation to STI
- b) Establishment of Science and Technology and Innovation Council chaired by the President of the Republic with the Minister responsible of science, technology, and innovation as Vice Chair. The role of STI Council is to set priorities, and encourage policy makers in various ministries to commit resources to science and technology and innovation.
- c) Making choice between i) retaining and strengthening the science, technology, and innovation mandate of the current STI governance system, ii) creation of a standalone Ministry of Science, Technology, and Innovation, iii) decentralisation of science, technology, and innovation functions to all sector ministries or to subnational jurisdiction (states).

6.4.2 Establishment of Petroleum Institute of Technology and Applied Sciences (PITAS)

When South Sudan declared independence on 9th July 2011, the country ranked third in Sub-Saharan Africa after Nigeria and Angola in terms of oil production output and fifth in terms of proven oil reserves. Until 2018, the oil sector provided more than 90% of the country's export earnings and 98% of government revenue. However, beginning from 2012 and onward, a combination of factors that includes but not limited to conflict with Sudan over transport fee of crude oil, civil war, struggling national managerial and technical capacity in the oil sector, and drop in oil prices in the global market have led to reduction in overall production output from 450,000 bpd in 2011 to less than 130,000 bpd by July 2018. It also led to diminished exploration activity and lack of investment in the sector. Without taking drastic measures to turn the sector around, the future looks bleak.

However, the Ministry of Petroleum has a vision for “the development of the oil sector for the greater good and benefit of the people of South Sudan.” These benefits include investing in skills and assets acquisition to sustain the nation's productive capacity into the future, long after oil reserves have been exhausted. Hence, the University of Juba was tasked by the Ministry of Petroleum to develop a concept note in regard to the establishment of training and research institution that will enable the Ministry of Petroleum to achieve its vision, especially in regard to skills acquisition and transfer of technology and know-how to the oil sector and other industries.

Accordingly, a project was proposed to establish an integrated education, research, and training institution to be based at University of Juba under the name: Petroleum Institute of Technology and Applied Sciences (PITAS), in partnership with the Ministry of Petroleum, Nile Petroleum Corporation, and Joint Oil Operating Companies (JOCs); and technical support of the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM).

The mission of PITAS is “to utilise petroleum resources to develop and enhance the nation's technological and managerial capacity for exploitation of its vast natural resources, value creation, infrastructural upgradation, innovation, and industrial development.”

PITAS has the following goals:

- 1- Education: imparting scientific knowledge through undergraduate and postgraduate training
- 2- Research: enhancing technology transfer and improved efficiency of resource recovery; design of optimal petroleum policies for administration and management of the sector; provision of consultancy services to petroleum, gas and mining industry and the government; development of green energy and diversification of energy sources
- 3- Training: provision of practical skills relevant to oil sector and other industries
- 4- Technology transfer to key economic sectors and acceleration of industrialisation: oil, mining, agriculture, manufacturing, energy, communications, transportation, and tourism
- 5- Assisting in improved infrastructure and technological upgradation
- 6- Community outreach

PITAS will be organised into 11 schools and 4 research centres as follows:

- 1- School of Petroleum and Minerals (New)
- 2- School of Applied and Industrial Sciences (Upgradation)
- 3- School of Mechanical and Mechatronics Engineering (Upgradation)
- 4- School of Chemical Engineering (New)
- 5- School of Materials and Manufacturing Engineering (New)
- 6- School of Mathematics, Computation, and Applied Statistics (Upgradation)
- 7- School of Civil and Environmental Engineering (Upgradation)
- 8- School of Electrical and Electronic Engineering (Upgradation)
- 9- School of Technology Management (New)
- 10- School of Architecture, Urban Planning, and Land Administration (Upgradation)
- 11- School of Agricultural Engineering and Water Technologies (Upgradation)

The research centres will be as follows:

- 1- Energy Research Centre: petroleum and alternative sources of energy (solar, hydro, biomass, wind, geo-thermal, and nuclear), and energy policy
- 2- Technology, Mineral Processing, and Innovation Research Centre
- 3- Human Resource Development Centre: vocational training, in-service training, and professional courses

- 4- Water Resources Research Centre: water policy and quality, ground water, integrated water resource management (water harvesting and storage, flood management, irrigation technologies), and waste water treatment and reuse

Some of the schools and institutions already exist and will only need to be upgraded, while others will be built from the scratch. Bringing all the diverse fields and related schools under one roof will allow the sharing of resources (both human resources and infrastructure resources) and will lead to the creation of economies of scale and better outcomes. The staffing shall consist of full time staff of the University of Juba and partial or joint appointments and/or secondments from the Ministry of Petroleum, Ministry of Mining, Nile Petroleum Corporation, and JOCs. Additional international staff may need to be recruited in order to fill in existing gaps in some specialist areas.

The project concept note was discussed and approved by the Council of Ministers in August 2018. Some feasibility studies have been carried out. However, no much progress has been achieved in moving the project forward.

7. Analysis of the Report Findings and Key Recommendations

This report was commissioned by Regional Universities for Capacity Building in Agriculture (RUFORUM). It has reviewed the status and gender-based analysis of higher education, technical vocational education (TVET), and ST&I ecosystem in South Sudan. As a country emerging from decades of conflict and its acquisition of own sovereignty, and the political and economic difficulties the country found itself facing after declaration of the independence, it proved quite a challenge how the report could be organised, as well as determining what to include and what not to include in the analysis. Getting coherent data has also been a challenge, although most of the data used in this study were collected through the survey of seven universities and seven TVET institutions, thanks to the generous financial support from the RUFORUM.

Issues covered included the status of public and private higher education in South Sudan

in the period that followed immediately after the signing and implementation of Sudan's Comprehensive Peace Agreement (CPA) in 2005 and up to June 2011, one month before South Sudan ascended statehood with a focus on gender representation and the model of higher education which South Sudan had inherited from Sudan, and the early challenges faced by the higher education sector in South Sudan in the run up to independence. Furthermore, the report considered the period that followed the declaration of independence from July 2011 to 2020. In particular, early efforts to envision the future of higher educations have been highlighted including providing the summaries of the proceedings and the recommendations of the “*Conference on the Future of Higher Education in South Sudan*”, that was organised by the Academic and Researchers Forum for Development (ARFD) and the Ministry of Higher Education, Science and Technology at Herod Campsite Hotel in Juba, from 14 to 15 November 2011. Next, the report provides an overview of financing and budgetary allocation to universities between 2013 and 2019 and the impact that it had on the sector. Gender-based statistics of staff and students at 14 institutions of tertiary education (5 public universities, 2 private universities, and 7 TVET institutions) was compiled and analyzed. Aspects considered included: gender-segregated distribution in staffing, academic ranks, subject of specialization, institution of employment, educational attainment, student populations, their programmes of studies, field of specialization, and gender compositions, institution of enrollment, with a focus on gender representation in STEM. The report also reviewed the status of ST&I and how it is governed. And in order to deepen understanding, the report provides a brief overview of applicable legislative and regulatory frameworks that are relevant to higher education; in addition to current national agendas and development plans and strategies, and description of a proposed national project aimed at establishing Petroleum Institute of Technology and Applied Sciences (PITAS) at the University of Juba.

7.1 Key findings:

- Historically, South Sudan has started from a very low base as gleaned from its meagre 4% representation in admission to Sudanese universities in 2005, the year the Comprehensive Peace Agreement (CPA) was signed.
- By 2005, South Sudan, was still part of Sudan and did not run a separate higher education policy.

- By 2011, South Sudan had nine public universities (but in practice, only five of them were functioning).
- The breakup of Sudan into two separate States had put South Sudanese universities, which were dependent on North Sudan staff, under difficult circumstances, due to acute staff shortages in the new State (South Sudan).
- South Sudan inherited an elitist model of higher education from Sudan which targeted only very talented and few able students.
- South Sudan Higher education is not differentiated and is top-heavy, with the majority of students (94%) enrolled in university sector, while very few (6%) studying in TVET institutions or community colleges. This is contrary to experience elsewhere where there is differentiation and ability to absorb the mass entrants to universities using a three-tiered system, with largest population of students enrolling in the open and widely-spread community colleges (see Akec 2020).
- Financing mechanisms and policies for higher education, science and technology are problematic and not clear. The Government funding to universities is insufficient, while both the Government and students resist attempts by public universities to raise fees in order to make up for insufficient public funding.
- Although South Sudan Vision 2040 has promised “an educated and informed nation”, much work is still needs to be done in order to make progress towards the aspirational goal.
- The most serious effort as yet to map out a path for higher education in South Sudan was the conference that took place in Juba in November 2011 that aimed to “Envision the future of higher education in South Sudan.”
- Currently, there are 2,574 academic staff employed in tertiary education institutions of whom about 49% teach and conduct research in STEM-related specializations.
- 79% of academics work in public universities and 21% in TVET sector
- The majority of academic staff (87%) are males, and only 13% are females. Also, there are only 73 academics with rank of professor in the universities, of whom 4 (5%) are females
- Only 13% (165) of all the academic staff specialised in STEM are females
- There are 38,746 students enrolled in 14 institutions of higher education covered by the

this study, of whom females constitute 26%.

- A total of 36,000 (94%) are enrolled in university sector while only 2,498 (6%) are enrolled in TVET institutions. Hence, tertiary education in South Sudan is dominated by university sector (that is, it is ‘top-heavy’)
- 13,000 students are enrolled in STEM of which female students are 3,000 (24%)
- 23,000 (72%) of students enrolled in university sector are studying at the University of Juba, majority of whom are studying at undergraduate level
- Only 19% of academic staff hold PhDs, or 19% are qualified to carry out independent research, while half of non-PhD holders or about 40% of all academic staff have only a first degree
- Overall, women are underrepresented in all aspects of higher education (from staffing numbers, academic ranks, student population, STEM, and post graduate studies)
- ST&I ecosystems in form of policies, legal frameworks, institutions, funding arrangements, and coordination and support systems have not been developed.
- There is some legislation regulating higher education sector in South Sudan, but this legislation is incomplete

7.2 Conclusions and Key Recommendations

South Sudan higher education sector as well as its science, technology, and innovation ecosystem are facing multiple challenges. These challenges include Country’s inability to respond effectively to increasing demand for higher education, underfunding, low staffing and research capacity, and underdevelopment of TVET sector. This situation has resulted in a top-heavy system, with more students being absorbed by university sector and fewer by TVET sector. What’s more, women are seriously underrepresented in higher education sector, in staffing and high academic ranks, in STEM specialization, and in share of enrollment in universities and TVET sectors. Very few women hold PhDs or are enrolled on postgraduate programs. Add to this, the under development of ST&I ecosystems in form of absence of support systems, legal frameworks, and institution for coordination, means South Sudan will struggle to implement and make progress on its national agendas, such as Vision 2040: “Realizing Freedom, Equality, Justice, Peace and Prosperity for All” and goals of reducing poverty and eradication of hunger, diversification of the economy, and industrialisation by

2040; unless higher education, TVET, and ST&I ecosystems are markedly transformed in order to be fit for the purpose.

Key recommendations are as follows:

- South Sudan higher education system to expand and transform through differentiating vertically into a 3-tiered system with fewer well-funded research universities educating fewer but most able students, more comprehensive universities for professional training absorbing a mass of new entrants, and open-widespread community colleges catering for TVET and needs of local industries including agricultural training institutes.
- Development of admission policies with affirmative action that will assist in increasing women participation in all sectors and levels of higher education and STEM.
- Availing resources for postgraduate training to PhD levels, including increasing the pool of women scientists
- Devise innovative schemes to resolve funding challenges facing higher education sector including soliciting higher tuition fees payment from students and their families, provision of student loan schemes, and scholarships for the under privileged students.
- Consider affirmative action, building of capacities through postgraduate and post doctoral training, and incentive to attract more women to STEM.
- Improve the ST&I ecosystem by setting up a special Ministry for Science, Technology, and Innovation;
- Establish ST&I Council under Presidency;
- Establish a Specialized Committee on ST&I in the National Legislative Assembly to support STI sector in the country

Acknowledgements

This report was made possible by a generous grant from the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM). I am particularly indebted to Professor Adipala Ekwamu for generous encouragement and advise. I would also like to acknowledge the assistance of Atem Bul of Department of Statistics, School of Mathematics for collection of primary data from universities and TVET institutions. Last, but not the least, I want to express my deep gratitude to Becky Namubiru for her patience, editorial assistance, layout, and front and back covers design for this report.

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APPENDIX I**Statistics for Academic Staff Employed in Tertiary Institutions in South Sudan (2020)**

S/No	Institutions	Category	professors		Associate Pro-fessors		Assistant Professors		Lecturers		Teaching Assistants		Total		
			M	F	M	F	M	F	M	F	M	F	M	F	Total
0	South Sudan	Total	69	4	117	10	272	20	907	148	871	156	2,236	338	2,574
		Sciences	23	2	50	5	112	6	426	85	481	67	1,097	165	1,257
		Social Sciences	46	2	67	5	160	14	481	63	390	89	1,144	173	1,317
1	University of Juba*	Sciences	12	1	30	2	78	5	134	32	141	21	395	61	456
		Social Sciences	10	-	21	1	65	4	170	25	65	10	331	40	371
2	Upper Nile University*	Sciences	3	-	4	1	18	1	73	13	128	20	226	35	261
		Social Sciences	-	-	6	1	30	2	50	5	36	13	122	21	143
3	University of Bahr El Ghazal* Sciences	Sciences	5	1	9	2	5	-	20	6	28	7	67	16	83
		Social Sciences	8	2	14	3	19	3	82	23	142	53	265	84	349

4	Dr. John Garang Memorial University of Science & Technology*	Sciences	3	-	7	-	5	-	90	20	145	15	250	35	285
		Social Sciences	-	-	5	-	8	-	27	3	29	2	69	5	74
5	Rumbek University of Science & Technology*	Sciences	-	-	-	-	2	-	5	-	11	1	18	1	19
		Social Sciences	26	-	21	-	18	2	73	-	68	-	206	2	208
6	Catholic University of South Sudan**	Sciences	-	-	-	-	2	-	4	-	3	1	9	1	10
		Social Sciences	-	-	-	-	14	3	35	4	27	9	76	16	92
		Social Sciences	-	-	-	-	14	3	35	4	27	9	76	16	92
7	Starford International University College**	Sciences	-	-	-	-	2	-	39	-	14	-	55	-	55
		Social Sciences	2	-	-	-	3	-	27	1	-	-	32	1	33
8	Juba Technical School*	Sciences	-	-	-	-	-	-	17	2	-	-	17	2	19
9	Juba Multi-Service Training Centre*	Sciences	-	-	-	-	-	-	19	3	2	-	21	3	24

10	Bor Vocational Training Centre*	Sciences	-	-	-	-	-	-	13	1	-	-	13	1	14
11	St. Vincent De Paul Vocational Training Centre**	Sciences	-	-	-	-	-	-	8	-	6	1	14	1	15
12	Maridi School of Nursing and Midwifery*	Sciences	-	-	-	-	-	-	1	-	3	1	4	1	5
13	Juba College of Nursing and Midwifery*	Sciences	-	-	-	-	-	-	3	8	-	-	3	8	11
14	St. John's College-Wau**	Social Sciences	-	-	-	-	3	-	17	2	23	2	43	4	47

* Means Public Institution and ** means Private Institution

APPENDIX II

Gender-based distribution of non-academic staff in Higher Education in South Sudan

S/No	Names of Institutions	Male	Female	Total
0	South Sudan	1,845	1,244	3,089
1	University of Juba*	610	491	1,101
2	Upper Nile University*	438	402	840
3	University of Bahr El Ghazal*	689	263	952
4	Dr. John Garang Memorial University of Science and Technology*	239	215	454
5	Rumbek University of Science and Technology*	163	161	324
6	Catholic University of South Sudan**	43	24	67
7	Starford International University College**	13	12	25
8	Juba Technical School*	2	5	7
9	Juba Multi-Service Training Centre*	28	21	49
10	Bor Vocational Training Centre*	4	3	7
11	St. Vincent De Paul Vocational Training Centre**	13	7	20
12	Maridi School of Nursing and Midwife*	9	5	14
13	Juba College of Nursing and Midwifery*	5	14	19
14	St. John's College- Wau**	4	4	8

* Means Public Institution and ** means Private Institution

APPENDIX III

Gender-based distribution of student population in Universities and TVET Institutions in South Sudan in 2020

Names of Institutions	Number of Students		
	M	F	Total
South Sudan	28,909	10,137	38,746
University of Juba	17,171	6,668	23,839
Upper Nile University	2,729	1,087	3,816
University of Bahr El Ghazal	2,841	319	3,160
Dr. John Garang Memorial University of Science and Technology	855	66	921
Rumbek University of Science and Technology	673	58	731
Catholic University of South Sudan	962	435	1,397
Starford International University College	1,863	821	2,384
Juba Technical School	706	81	787
Juba Multi-Service Training Centre	301	129	430
Bor Vocational Training Centre	153	62	215
St. Vincent de Paul Vocational Training Centre	203	158	361
Maridi School of Nursing and Midwife	36	24	60
Juba College of Nursing and Midwifery	161	177	338
St John's College – Wau	255	52	307

APPEDIX IV

Distribution of STEM students by gender in 14 institutions of tertiary education and TVET in 2020

Institution	Male	Female	Total
University of Juba	5,745	1,844	7,589
Upper Nile University	987	429	1,416
University of Bahr El Ghazal	1,076	197	1,273
Dr. John Garang Memorial University of Science and Technology	317	3	320
Rumbek University of Science and Technology	17	4	21
Catholic University of South Sudan	94	28	122
Starford International University College	250	36	286
Juba Technical School	706	81	787
Juba Multi-Service Training Centre	301	129	430
Bor Vocational Training Centre	153	62	215
St. Vincent de Paul Vocational Training Centre	203	158	361
Maridi School of Nursing and Midwife	36	24	60
Juba College of Nursing and Midwifery	161	177	338
St. John's College- Wau	-	-	-



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