



Transferring Indian Technology to Sudan for Agricultural Development: A Case of Science Diplomacy



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Introduction

Science diplomacy can be defined as the technique of maximization of the benefit of scientific collaboration between the states or nations to solve common problems or to achieve common goals. India is the fastest growing developing country in the last years and the challenges that has been facing this great nation couldn't stop her from reaching this level. Meanwhile so many efforts has been made by the Indian governments since independence, starting by sending their most brilliant scientist to the developed countries to make use of their very good school of diplomacy ,so they can learn the latest technologies in each and every sector , Dr. Ashok Jain was the first Indian scientist attaché in Japan during 1963-65 (Krishna 2001) and he did contribute and been part of transferring Japanese automobile technology (SUZUKI) to India.

The engagement of India with the countries like USA, UK and France also made it easier to bring their best technologies to India and there comes the Indian revolution and this been clear to the world that this country is writing its name again to become a powerful country although it had to deal with sanctions and obstacles from not getting the nuclear technology and the refuse to transfer the technology to India. Thus, by end of nineteenth century, India became a nuclear power, using it both for military and civilian use. India continues to surprise the world again by its space technology; the ISRO (Indian Space Research Organization) launched Mangalyaan or the Mars Orbiter Mission in September 2014.

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Historical Review

Sudan is a country located northeast of Africa, with a population of 40 million and area of 1.860.000 square kilometers. It got its independence from Anglo-Egyptian colonization in 1956. According to the relationship journal of the Sudan-India relationship started very long time ago historically there was relations between India and the Fung (Sinnar) sultanate gold, silver and steel also some other materials shaped that relationship to be a sort of economic relationship between the two nations and it was even in the culture of this sultanate in their poems they use to say:

Hey soldiers of Mohammed Ali don't you know Sinnar has been protected by an Indian swords and arrows (referring to its quality).

Sudan has imported two steel bridges from India, one located in the capital Khartoum and the other in city of Atbara. Mahatma Gandhi visited Sudan once in 1935 when he was going to England and Jawaharlal Nehru visited Sudan also 1938 on his way to United Kingdom. Sudan and its people would never forget Bandung conference 1955 when the Sudanese delegate the country had no flag on that time, Prime minister of India Jawaharlal Nehru wrote "Sudan" on his handkerchief and this represented Sudan at Bandung. (India Sudan Relations 2016)

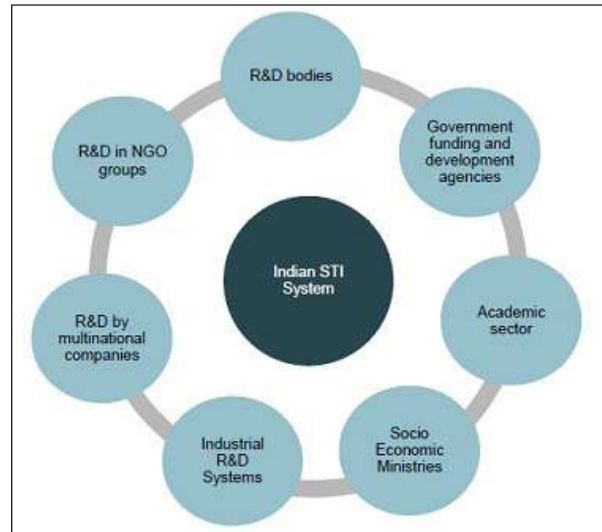
STI in India

Science technology and innovation in India to look what performance has been achieved in these fields first we should understand Indian science and technology system earlier of 2000s the policy was to invest in R&D to address the national problems by bringing STI together, on the last five years launching of different initiatives like SWAYAM (Webs of Active-Learning for Young Aspiring Minds), Innovation of Science Pursuit for Inspire Research (INSPIRE), Science, Technology, Innovation and Creation of Knowledge (STICK), all these played a big role in STI policy in India (IBEF 2015-16).

India has increased R&D investments from 76.9 billion USD 2017 to 83.3 billion USD 2018 this

posts India to be the sixth country in the world. The R&D open up the opportunities in different sectors Pharmaceuticals India targeting to be the 3rd market in the world in manufacturing technologies targeting making 100 million job by 2025 so many international companies targeting India's skilled manpower and scientist (IBEF 2018).

Figure 2.1: Indian ST system



STI in Sudan

Sudan has many opportunities in Human Recourses, Tourism, Fishing, agriculture, minerals recourse and livestock but the main challenge is the US sanctions to Sudan which stopped Sudan from growing as there is no any access to any technologies from outside. Also, the bigger problem of financing these kinds of projects which require huge funds; the sanctions leave no funding resources available to Sudan., This situation has resulted in the problem of brain drain in Sudan, resulting in serious lack of skilled manpower, the lack of new technologies and huge unemployment are another problem that the country is grappling with. Dr. Sara Satti Noor in her paper Science technology and Innovation policy in Sudan reveals the various challenges in R&D in the field of STI, some of them being lack of finance from the public as well as private sectors, low human resource pool mostly because

of the brain drain and lack of proper co-ordination between universities and research centres. She has suggested measures for improving economy of Sudan and emphasized on the need for improving public and private sector finance on research and development in the country.

Science diplomacy is going to play big role and can be the golden key to Sudan and Sudanese people in transfer of scientific knowledges from countries like India, Russia, China and Brazil, where Sudan holds friendly diplomatic relations. India, being the fastest growing economy of the world is of particular interest to Sudan because of the revolutionary work it has been doing in the field of science and technology. Indian products are recognized around the world for their competitive quality and reasonable prices. The country is also playing a big role in transferring and sharing its technology with other countries of the south, giving new meaning to the diplomatic relations and south-south cooperation.

Science Diplomacy to improve agriculture in Sudan

The agriculture and livestock sectors in Sudan contribute 30-35% to Sudan's GDP and also about 80% of non-oil exports. 24 million of Sudan's total population of 40 million depends on agriculture for their living (World Bank 2016)¹. Science

diplomacy can play a major role in boosting the Sudan economy by transferring suitable agricultural technologies such as hybrid seeds. The table below shows how much percentage of hybrid seeds are used by different crops in India (Nain and Kumar 2012).

Table 3.1 Percentage of hybrid seeds use

Crops	%Hybrid seeds used
Cotton	80
Maize	55
Bajra	80
Sunflower	100

The above table shows the huge need of the seeds as the production is not covering and the real need of the internalization of seed production in order to develop agricultural production and seeds production.

SWOT Analysis

This part contains the SWOT analysis of the agriculture sector of Sudan.

Strengths

- Huge agricultural lands
- Water resources (River Blue Nile, River White Nile, River Nile, River Atbara and huge reservoirs of underground water).

Table 3.2 Annual seeds production and coverage

Crop	Annual Seeds Requirements (MT)	Average Annual Seeds Production (MT)	Estimated coverage of certified seeds %
Sorghum	66,162	15095.64	22.82
Wheat	29,900	13887	46.44
Millet	11,670	1465.62	12.56
Sesame	6,339	2555.9	40.32
Cotton	1,070		100.00
Groundnut	192,120	1823.67	0.95
Sunflower	454		100.00
Maize	688	733.71	100.00
Cowpea	1,020	49.62	4.86
Total	309,423	35611.16	11.51

Source: AFSTA 2011.

Table 3.3 Estimated annual seeds requirements

Crop	(05/2006-09/2010)		(2010-2011)		(2010/2011)	
	Average Area (000Fed)	Annual Seeds Requirements (000MT)	Average Area (000Fed)	Annual Seeds Requirements (000MT)	Estimated Value of the seed in SDG	Estimated Value of the seed in USD
Sorghum	21,323	64	22,054	66	59,545,800	20,966,831
Wheat	690	35	598	30	71,880,000	25,309,859
Millet	8,427	13	7,780	12	18,672,000	6,574,648
Sesame	4,178	6	4,226	6	25,915,950	9,125,335
Cotton	333	3	107	1	6,955,000	2,448,944
Groundnut	2,701	108	4,803	192	345,816,000	121,766,197
Sunflower	310	1	227	0	11,350,000	3,996,479
Maize	133	1	86	1	1,238,400	436,056
Cowpea	43	1	85	1	3,060,000	1,077,465
Total	38,138	231	39,966	309	544,433,150	191,701,813

- Livestock resources approximately (140 million).
- Human Resource
- Political willingness for sustainable development
- Unique location of Sudan

Weaknesses

- Poor technology use (low percentages used of hybrid seeds, poor agro-mechanism, poor processing and poor storing methods)
- Low livestock production.
- Lack of quality and safety control measures
- Minimal R&D funds and a smaller number of agricultural scientists due to Brain drain
- Poor Cooperation among different stakeholders.
- Lack of industrial technology to meet the need of agricultural equipment.

Opportunities

- General willingness and awareness among the public about importance of agriculture sector for Sudan's economy.
- Rapid growth in producing Gold, Oil and other resources to finance infrastructure and industrial sector.

- Water harvesting proving to be successful.
- Potential for the utilisation of huge water
- Possibility of Sudan being a major exporter of agricultural products to Africa and the Arab region.

Threats

- Low skilled manpower
- Lack of capacity building projects and the poor technical institution facilities.
- High risk of plants and animal diseases.
- Limited markets for Sudanese products
- High migration from neighbouring countries, like Egypt and Ethiopia into
- Sanctions of technology transfer from US and EU
- High cost of importing fertilisers and agricultural equipment.
- Low cooperation with partner countries regarding technology transfer to Sudan

The above SWOT analysis shows the huge opportunities in Sudan where Indian public and private sector can play a big role. The Sudan India bilateral corporation can result into a win-win situation for both countries.

Possible Technologies to Transfer

- There are so many possible technologies which it can be transferred to Sudan from India
- Transferring farming equipment and machinery.
- Transferring technology of processing organic food in order to maintain Sudanese exports.
- Transferring of livestock reprocessing technology (Sudan has approximately 110 million.
- Transfer Solar energy for agriculture and green technology.
- Transferring forest development in order to face desertification.
- Transferring fisheries in order to maximize the user of Sudan resources of Rivers and the red sea.
- Transfer India Seeds development.
- Transfer India agro-processing technology and drying technologies
- Transfer India technology of livestock and Animal health services Vaccinations, Disease surveillance and quarantine.
- Harmonization of rules and regulations of lands and also quality control of agriculture and livestock products in Sudan to meet up the international market regulations.

Sudan has so many different sectors to engage with India in order to develop its agricultural sector and Agro-industrial sector.

Conclusion

This paper shown how much India making huge efforts in research and development in Science and technology and also the huge need of Sudan to develop it is agricultural sector which it will going to improve Sudanese Agro-products to enter the world markets. The SWOT analysis of Sudan can open the way to Indian public and private sector to invest in Sudan and the engagement between research centers in Sudan and its counterpart from India can make all this possible and make use of India's previous technology transfer experience either transfer to India or outside India and Sudan has the chance to maximize the benefits of the

capacity building programs, scholarship and cultural relations program that offered by Indian government to all developing countries.

This paper also shows how science diplomacy can play a big role in transferring the Indian technology in Agricultural sector which it can be a first step forward to an ultimate Sudan-India collaboration, initiatives and joint R&D could be an excellent start up to fulfill above possible technologies to be transferred in order to develop Sudanese Agricultural sector. and the bilateral relation looking forward to the 9th inter-ministerial committee between the two respective countries that it will be in Khartoum next December.

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