



BIOTECHNOLOGY IN IRAN AND INDIA: NECESSITIES AND CAPACITIES FOR COOPERATION

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ABSTRACT

Biotechnology is a novel technology which is considered as a powerful and effective tool to achieve sustainable development. In most developed countries and some developing countries, in order to benefit the advantages and applications of this technology, many efforts have been made. Creation and strengthening of regional and international relations as one of the key factors in development of the biotechnology industry could be heading a lot of research and leading negotiations among governments of different countries. Although Iran and India share many historical & cultural commonalities, in addition, the economic relations between the two countries have been constantly growing, but in this regard the role of biotechnology industry, products and related services, has largely been neglected. This paper is an attempt to elucidate the capabilities of Iran and India in biotechnology field and the necessity for the establishment and development of relations between two countries in this area. Research collaborations and joint ventures are regarded as appropriate fields for strengthen of biotechnological cooperation between Iran and India.

Keywords: Iran, India, sustainable development, biotechnology, Human resources training

INTRODUCTION

Today's condition of the international system is such that the development and the survival of other countries which are located at the region totally depend on the level, the quality of their cooperation and their convergence. There is a direct relationship between the level of the cooperation and the geographical, geopolitics features as well as the political, economic and the cultural capacity of the countries which are located in different regions [1]. On the other hand, in the current situation of the world it is impossible to achieve a sustainable development without gaining and using of advanced technologies. Among all these countries The Islamic Republic of Iran and India as two powerful influential Asian countries have so many similarities, cultural and historical ties as well that has been persuading both countries to expand the open communication [2]. Jawaharlal Nehru the first

Prime Minister of India in his book "The Discovery of India" mentioned: "No country is as close as Iran to India" [3]. India with the population over 1.28 billions a member of the Nuclear Club and the Non-Aligned Movement has the economic growth rate over %8 during the recent years. India has the fourth-largest economy in the world and the GDP growth over \$4.761 Trillion [4] with a great importance and a huge potential in Iran's foreign policy .This will lead to the strengthening the bilateral relationships between Iran-India especially in the economical and scientific areas.

Iran's high potential in energy, economy, politics and culture and India's increasing dependence on energy imports from Iran to continue its economic development and in the next stages paving the way for India to access the market of Russia and Asia [5]are of the few factors which persuade the government of India to show the interest towards expanding the bilateral relationship with Iran despite the fact that India's foreign policies set on the basis the relationships with major Powerful countries ,the government of India has always had a tendency to expand the mutual relationship with Iran.

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The main capabilities of the current state of Iran-India relationship can be explored in the economic and scientific cooperation between the two countries due to their high capacities of their needs fulfillment. Although the most persuasive factor which encourages India to boost and sustain its relationship with Iran is the energy element, Iran should try to use the opportunity as a win-win strategy to create the new capacities particularly in the scientific, technology and non-oil trading areas. This paper attempts to outline in brief the value of the biotechnology applications as the technology of the 21st century, the capabilities of Iran and the need to develop a bilateral relationship in the scientific and economic fields.

1. The economic cooperation between Iran and India

India now is the 6th major trading partners among Iran's non-oil trading partners, the 4th export market and the 10th import requirements providing country for Iran's needs [1]. The cooperation capacity of Iran and India is increasing now a days and the United Arab of Emirates has become an indirect destination for the Iran-India commercial transactions [6]. Trade exchanges rate between Iran and India in 2012 was \$4.315 billion, the statistics for the first six months of 2013 and the exchange value of these transactions was \$1.185 billion [7]. The biotechnology industry products and their related services with such capacity of trade and economic transactions don't have an appropriate place and they have just been confined to the export of Urea from Iran to India which for its production the traditional biotechnology methods are used.

2. The importance of paying attention to the biotechnology in the world, Iran and India

Today, the biotechnology industry is considered as the most important 21st century technology and is one of the seven key industries which will change the next few decades destiny [8]. The new science of the biotechnology is considered as a powerful tool to gain a sustainable development. Nowadays, attention to the biotech industry's countless abilities and capabilities particularly in the developing and the poor countries can be the important factors in achieving economic progress and social well-being [9]. The biotechnology industry not only can be considered as a tool to achieve sustainable development, but it also can be a powerful leverage for the equipped countries with the mentioned industry to dominate other countries [10]. The most important critical aspect which is caused by the lack of control over the biotechnology industry for these

countries is the deprivation from the higher incomes and full employment generated by these technologies. Also many other industry fields and manufacturing which have been affected by the aforementioned technology will be shut down in these countries [11]. The valuable achievements and capabilities of the biotechnology industry requires that all countries even Iran and India in spite of the fact that the success in some areas of the biotech industry yet cannot reach a top regional and global position but they can achieve their place in the world with the coherent cooperation.

3. The background and the status of the biotechnology Industry in Iran

Some believe that the middle and the new era of the modern biotechnology can be considered a milestone for the advanced biotechnology industry in Iran. This period coincides with the start of the vaccine production at the Pasteur and Raazi Institute in 1920 and 1925 [12] but in fact the modern biotechnology traces back to the 1980's although a review of resources which is allocated to this area is a relatively serious milestone in the mid-1990s of the biotechnology industry. The first biotech center "Iranian Research Organization for Science and Technology" was formed three decades ago. After that period other centers such as The National Center for Genetic Engineering and other research institutes in various sectors particularly the various universities became more active. Institutes and centers such as The Academic Center for Education, Culture and Research, The Food and Drug and Research deputies the Ministry of Health, Science and Technology, Agricultural Biotechnology Research Institute of Iran (ABRII), Biotechnology Department of Pasteur Institute and organizations such as "The Environmental Protection Agency" are some of the active centers and policy-makers in the field of the biotechnology in Iran. Iran with 35 research institutes, 42 universities and 25 active private companies in the biotech field and the production of the 58 types of the various biotechnological crops could take the important steps in this field (Table-1). Iran with total number of 815 laboratories and 2011 research projects which are either active now or going to be completed very soon, possesses an appropriate research capacity. The value of the international bio-products of Iran is approximately \$794 million for each year and the major products include serum, vaccines, biological fertilizers and pesticides and the medications such as antibiotics and hormones [13]. Iran produces the very precious products like Alfa/Gamma interferon and identifiable AIDS and

infectious diseases kits. The Ministry of Health convened a medical biotechnology and molecular medicine network entitled "The Regional Health Networks in Genetics and Biotechnology" which includes 9 countries of the region including countries such as Saudi Arabia, Pakistan and Egypt [14]. Exporting the recombinant biotech products to countries like Pakistan, Egypt, Turkey, Poland, South Africa and Syria are of the significant activities in the international cooperation arena [15]. In spite of setting up a National Biotechnology Document in 2004 and making some efforts and succeeding in different fields by Iranian government and related organizations, these efforts were not efficient [11] and the need to strengthen and promote the international cooperation of this field is more crucial than ever.

Table 1: Biotechnology Status in Iran, According to The United Nation statistics.

Title	Quantity
Research Institutes	35
Universities	42
Private companies (Equipment)	15
Private companies (chemicals)	10
Scientific Associations	5
Policy-makers committees	5
Available products in the market	58

4. Background and the current status of the biotechnology Industry in India

The biotechnology in India began in 1974, when the Indian government felt the urge to conduct various researches on molecular biology and established the National Biotechnology Board (NBTB) in 1982. The government measurements did not provide a quick development in the biotechnology industry and therefore, the Department of Biotechnology (DBT) was established in 1986. Monitoring the planning, coordination of the industrial and scientific applications of the biotechnology industry are the responsibilities of this department. Other institutions like the Council of Scientific and Industrial Research (CSIR), the Department of Science and Technology (DST), Indian Council of Agricultural Research (ICAR), the Indian Agricultural Research Institute (IARI) and the University Grant Commission (UGC) support the biotechnology researches. The skilled and cheap force work (researchers, medical doctors), the effective R&D system, a large local market, reach biological diversity, signing the contracts of research and production and large clinical trials conducted by the world major companies and the ability to speak English language has enabled India

to make an outstanding progress in the aforementioned field [16]. The biotechnology Industry as a field which is developing day by day has a key role in accelerating the economic development of the country. In India the biotechnology industry is a network of nearly 300 national laboratories and more than 300 universities in the public sector [17]. India is one of the first countries that have made a bio-informatics system [18].

India's central government and some state governments with taking the key measurements such as encouraging entrepreneurs to create the biotechnology industry, delivering a separate and specific policy for this field, founding the biotechnology proprietary parks, increasing the investments in order to support the biotech industry financially, increasing the duration of IPR right for 20 years, setting-up the extensive biosafety rules and accomplishing the various international agreements enable this country to place itself among the 12 biotechnology target countries in the world and the 2nd favorable in the region of Oceania and Asia. The total value of the biotech market in India has reached the 12th grade in the world ranking with a steady growth curve of \$4.3 billion [19] (figure-1). It is expected the country annual growth of about %22 which means it will reach \$11.6 billion in 2017. Revenue from exports with annual growth of around %25.1 from \$400 million in 2005 could reach \$2.2 billion in the fiscal year of 2005 and this includes more than half (51%) of the total revenues of the country's industrial income [20]. The main stimuli for the country growth are the steady increasing investment in the biotechnology industry, outsourcing activities in the same field and the efforts to boost the exports [21].

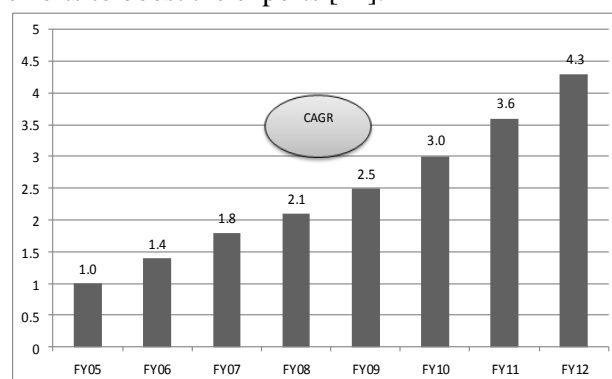


Figure 1- The value of the Indian biotech market in the past few years by U.S. Dollars (ABLE. Biospectrum industry survey, June 2012, Aranca Research) Note: CAGR- Compound Annual Growth Rate.

5. Indo-Iran cooperation areas in the biotechnology Industry

The areas and the capacity for cooperation between Iran and India in the biotech industry can be found in a few specific areas as a follow:

6.1 Educating and training the human resources

Trained manpower is the basis for the development of the biotechnology industry. The employment of trained and skilled workforce reduces the costs and increases the efficiencies up to a high level. India with over 3 million biotech professionals in the same and the respective areas has a high potential for educating and training of the skilled manpower [17]. Considering the multiplicity of manpower in India, the educational assistance in a short and long term can be one of the areas of cooperation. Dispatching the Indian specialists to Iran for the purpose of teaching the basic and advanced biotechnology techniques can be one of the important topics for this article.

The cooperation of the Indian biotech- educational companies with the Iranian manufacturing firms in order to train the workforces in Iran before employing them in the research and manufacturing fields can be an advantage for both countries and because of the abundance of cheap equipment and chemicals in India this issue can be done easily. A fast process of visa issuing and facilitating the travel to India even for those who are interested in learning the basic biotechnology techniques in a short term or long term form of courses with their personal expenses can be considered as a mutual agreement between two countries. Considering the drastic progress of Iran particularly in the fields like stem cells, transgenic animal production, animal cloning and production of the new recombinant drugs, India can benefit the experience of the Iranian scientists and scholars as well.

6.2 The establishment of the biotechnology companies for alumnus

Iran's recent established private companies can make special efforts to attract the Indian biotech professionals by the 5 to 7-year contracts. By adopting special work policies, these professionals can train the Iranian workforce by allocation a part of their time to this issue especially the practical training for graduates who had fewer opportunities to learn the basic techniques. By applying this policy, in addition to providing expertise for these companies at the very susceptible stages, we observe the training of the needed Iranian workforces in the biotech Industry and even the increasing number of the experienced manpower can lead to the

establishment of the new private firms and the development of the biotech industry in Iran. The India and government of Iran with the aim of creating job for graduates and adopting supportive policies can allocates a special supportive protection such as public facilities to establish private R&D manufacturing company in two countries especially for those Iranians who had graduated in India. This not only stimulates our graduates to enter the practical research and production field, but also will create the transformation, mobility and stability in both countries for the respective field.

6.3 Research cooperation

According to the world-renowned universities such as Sharif University, The University of Tehran etc., research institutes like Royan, Raazi and Pasteur in Iran that are active in the field of biotechnology, and activities of more than 600 universities and research centers with an annual training capacity over 500,000 students in the biotech field [22] Iran and India can have the valuable contributions to accomplish different projects of cooperation. Both countries can plan to hold mutual conferences, meeting and have the student sex change and special scholarship granting programs. Wide variety of crops in both countries and production the precious products such as pistachio, almond, apple and saffron in Iran and spices and other fruits like papaya, banana and mango in India, the respected government scan be a thrilling start to do a joint research in the field of agricultural biotechnology. Cooperation in this area can be conducted with a focus on the agricultural biotechnology by research centers such as Iranian Agricultural Research Institute and IARI from India. Iran's usage of the medicinal plants dates back to 9000 years and it has ranked the 7th country in Asia for its medicinal plant diversity. India has a 3000 year-history in this field and ranked 3rd in the Asian medicinal plant resources and consumes more than 10,000 medicinal plants with over 40,000 separate formulas [17]. Both countries can establish different research centers to conduct the collaborative research actions with a focus on the usage of medicinal plants biotechnology applications. This enables them to protect and save precious resources, formula stabilizing and exporting functioning ingredients of medicinal plants (Table-2).

Table 2: Capabilities and the areas of cooperation between Iran and India in the field of the medicinal plant biotechnology.

Country	Experience & Capabilities	Area of collaboration
Iran	9000 years of history in medicinal plants usage	<ul style="list-style-type: none"> ● Maintenance and saving of the resource ● Exporting of the functioning ingredients ● Stabilizing of formula
	Ranked 7 th grade in Asia for its varieties	
India	3000 years of history	
	ranked the 3 rd grade for its diversity of medicinal plants	
	Using of 10,000 plant varieties and 40,000 separate individual formulas in Ayurveda	

India with 450 sub-groups and 40 major ethnic groups is as the largest human biological diversity in the world and it placed a massive profile of a large population of patients with different diseases and within and it has become a good place to do experiments and clinical research [17]. According to Iran efforts and appropriate supports of the Ministry of Health from medical and pharmaceutical biotechnology research, a part of the clinical trials research of Iran can be conducted in India through the treaties just like the other countries.

6.4 Commercial joint investment

Parsis presence in India who operate at the managerial and economic high-level and Jamsetji Tata who was originally a Parsi, known as the father of Indian Industry and the founder of the strongest economic hand of India called "TATA group" can consider as the valuable assets to strengthen the bilateral relations in the economy field and can be used in the biotech industry area as well. This capacity can be used to support and exploit the financial management and joint ventures for the development of the biotechnology industry in both countries.

The low cost of manufacturing, skilled and cheap labor, rules and policies of the respective field in India [16] have provided a great opportunity for a direct investment of the joint Iranian-Indian companies. This is an area which has remained untouched despite the fact that many countries have exploited it. Although a naive view on any

investment in the India territory may seem a one-way benefit for this country, but no one can deny the numerous long-term benefits that such investments will have for Iran as well. The final return of capital and money to Iran and the valuable experience that the respective companies will gain in the huge market of India are of the examples of results of this type investment. Training and employment a part of Iranian workforce in order to bring the experience and technology in to the country, establishing different subsidiaries in Iran and having strong and successful relationship with the developed countries that have productive activities in the Indian market can be considered as the other parts of the benefits. Despite of the fact that Iran and India are both among the developing countries the laws and rules in these countries are free to some extent and therefore, working in these countries is much more convenient than working in the stem cells or the reproductive assisted technology field in America or UK [17]. This issue creates a huge potential for the research conducting cooperation and joint efforts to encourage other countries in the region for investment in both countries. One of the problems that need to overcome and be sorted out by reasonable strategies in Iran is the lack of planning to find a market and export the biotech products to other countries. Access to a large and diverse market of India can be a good motive for the Iranian authorities to plan and attract entrepreneurs or investors. Part of the problem refers to the stage of accrediting a quality certificate and approval for the biotechnology products from the international organization [23] that enables Iran to cooperate and communicate with the Indian companies and obtain licenses in order to export or exploit its products to the worldwide market.

DISCUSSION AND CONCLUSION

Besides all the internal factors which affect the scientific development and thus the biotechnology industry in any country, the international cooperation is one of the most important factors that influences and flourishes this field. Statesmen and officials of this industry in the various sectors particularly in developing countries have momentous responsibilities to strengthen the partnerships' cooperation with governments which need not to spend too much expenses to work with due to the similarities and of course a good communication can be prioritized. The urge for having a clear-cut relationship between Iran and India is an example of these partnerships. Due to many reasons that have been cited before, there is a great possibility to improve co-educational, research, commercial products in most branches of

the biotech industry particularly the medical, pharmaceutical and agricultural areas. Although few works have been done, so far for the collaboration between two countries there is a huge potential among them to persuade both parties.

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