

## **THE NEED FOR ANALYSIS OF PHILOSOPHY OF TECHNOLOGY VIEWPOINTS FOR SUSTAINABLE DEVELOPMENT IN AGRICULTURE**

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### **ABSTRACT**

Food supply is one of the essential demands of the human societies the burden of which lies on the shoulders of the farmers and agriculture organizations across the world. Thanks to application of modern technologies, agricultural sector has managed to supply more food for human communities by expanding cultivable lands, producing high-yield agricultural crops and using poisons and pesticides. Despite such positive development, the use of poisons and pesticides and application of biological technology have had destructive consequences such as the genetic mutation of plants, soil compaction, environmental destruction, water pollution and desertification, violating natural order of ecosystems, breaking the integrated chain of lifecycles, uncontrolled use of chemical poisons and mechanization in provision of planting media, tillage and harvest, neglecting agricultural ethics, violating security of food and agriculture. Lack of sufficient knowledge on the philosophical nature of technologies in agricultural sector will lead to undesirable consequences like uncontrolled and incorrect application of agricultural implements and methods, damage and excessive pressure on the environment, contradiction of human energy and forces of the universe, and violating the ordered and integrated rules of nature. With respect to the importance of technology on one hand, and the consequences and new challenges resulting from the use of technology in various agricultural sub-sectors on the other hand, this research work intends to analyze the need for clarification of the viewpoints of the philosophy of technology for realization of sustainable development in agriculture.

**Keywords:** *Sustainable Development, Agriculture*

### **INTRODUCTION**

#### ***A- Technology and Its Diversified Dimensions***

Etymologically, technology comes from the Greek term *technologia*, which is a combination of “*techne*”, meaning “craft”, and *logia*, which means “saying”. So technology might be considered literally as the articulation of a craft. Broadly speaking, technology refers both to artifacts created by humans, such as machines, and the methods used in creating those artifacts (Heidegger, 1954).

The words “*technique*” and “*technology*” have completely different definitions. *Technique* refers to a collection of methods used for realization of a goal or meeting a certain result. *Technology*, or in other words, innovation and modern and scientific application of crafts, includes the primitive types of human activities (Mitcham, 1941).

*Technology*, in a sense, is the purposeful activities of man and it includes design and manufacturing of various things such as clothes, food, handicrafts, machines, buildings, electronic tools, and computer systems. In other words, technology is attributed to the manufactured world (Torabi & Mohammadzadeh, 2010).

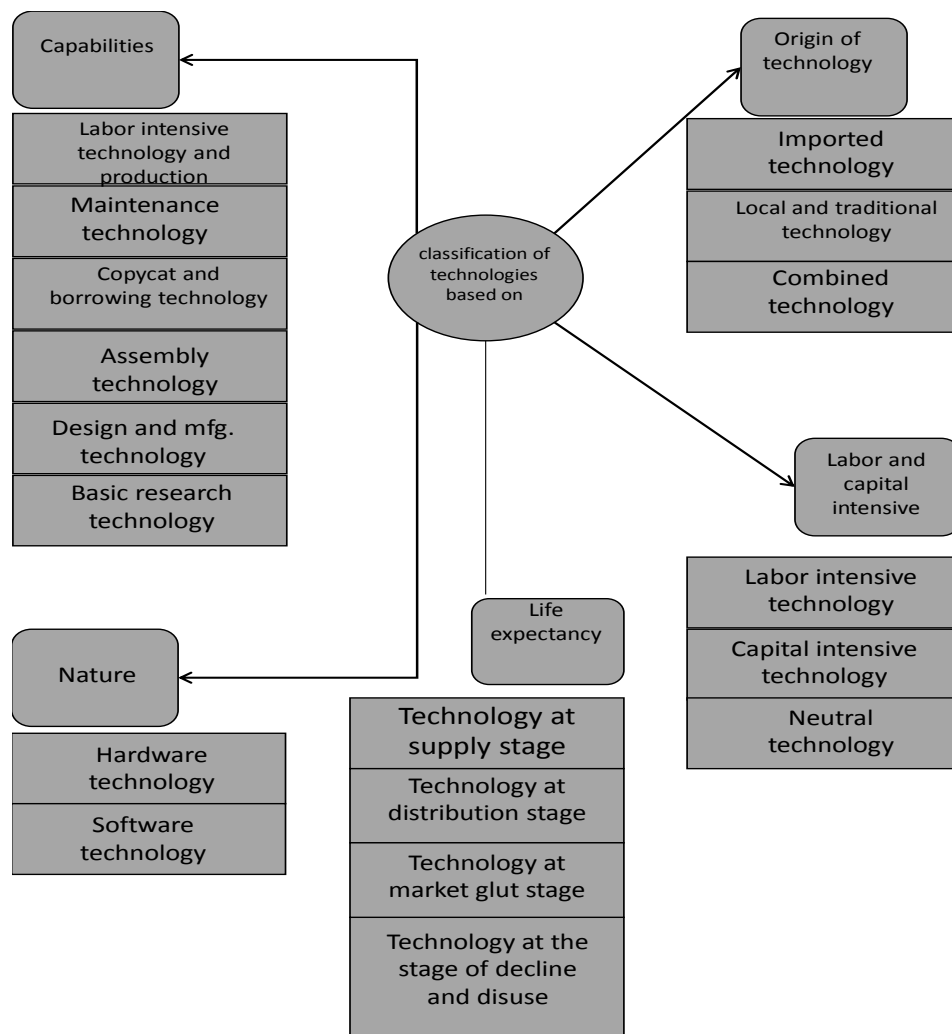
*Technology*, in its widest form, can be taken as the application of human intellectual ability to the task of harnessing nature in its entirety for humankind’s development and sustenance. This notion is contingent on the fact that technology is seen as the intermediary between humans and the vast resources available

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from nature. Hence, the human is capable of recreating and modifying the environment in line with human intellectual capacity. Technology is therefore thinking about the best way to do things while drawing inspiration from the cultural mindset within a social praxis. Technology, as a term is a scientific attempt by man to transform the natural world in which he finds himself. It entails the ability to create devices, tools and machines through which the threats of the society can be subdued and brought under control...Indeed; the conglomeration of technological devices available at man’s disposal is best represented by the artifacts and edifices available within a given cultural terrain. In this sense, the culture of a people is symbolically the totality of both the material and nonmaterial innovative ideas and techniques (Ogungbure, 2011).

The most important aspects of technology are the following:

- A) Agents, i.e. thinkers, technologists, engineers, and their motives
- B) Technical aspects, i.e. existing technical system, methods, techniques of manufacturing, and collection of technical goals
- C) Political-economic aspects, i.e. political and economic forces involved in technological field, their interests and expectations, and achievements
- D) Cultural aspects, i.e. values, patterns and other existing cultural realities
- E) Environmental realities, i.e. environmental and natural grounds and realities



Source: (Tavakkoli, 2000)

**Figure 1: Classification of Technologies**

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All these aspects are effective and involved in facilitating and blocking technological activities. Then the social-technical systems are right in considering technology a total social activity because from from five components above, the three aspects of A, C and D are completely social and B and E are in constant interaction with social parameters (Tavakkol, 2011).

The most important criteria mentioned in the National Charter of Technology are conceptualism, valusim, futurism, prospect creation, oral clarification of interaction between culture and technology, paradigm orientation, leadership orientation, universalism (Torabi and Mohammadzadeh, 2010).

It should be noted that the selected technology must be low cost and not capital intensive and easily attainable. In terms of investment, its capital should be distributive and it should include small enterprises and diversified content. This technology is of low scope, controllable, repairable, trustable, safe, simple but advanced. In terms of decision-making, it is decentralized and democratic and production is under the control of domestic technology and consumer. Appropriate technology encompasses local innovation, and bottom to the top development in connection with meeting the basic demands of people. This technology is user type and produces meaningful jobs. It lacks complexity of the inappropriate technology and the resulting manufacturing relationships are non-hostile. It possesses freedom, openness and self-completion in labor. The emphasis is on domestic production for meeting domestic demands. The emphasis is also on the quality of life not the merely the economic development. It reduces employment, average living standards, and variations in income level. Also it creates conditions ecologically that preserves the quality of the environment (Lahsaeizadeh, 2000).

To make decisions for adoption of appropriate technology the following points in Table 1 must be taken into consideration:

**Table 1: Major decisions in connection with technology strategy**

Decision on	Details of the decision
Candidate technologies for investment	Data gathering on the present and future status of technology, identifying technologies with strategic impact in comparison with rivals, decision-making on candidate technologies for development
Investment priorities (focus points of technological development)	Selecting the technologies that the organization must concentrate its programs for their development and implementation
Time of technology presentation	Decision-making on following or leading the rivals, identifying the benefits and risks of strategic strategy, assurance over conformity of the selected technology with the general technology of the organization
Technology acquisition method	Decision-making on internal development or technology transfer and in connection with both, decision-making on appropriate methods for domestic development or transfer, e.g. union with other organizations, joint investment, licensed production, technical know-how purchasing, manpower training
Technology acquisition methods	Decision-making on simultaneous use of technology in various products, various procedures, or various economic activities to boost value added
Selecting R & D projects	Evaluation and selection of R & D projects, budget allocation, and controlling selected projects
Technology and Management Infrastructures Organization Development	Determining required mechanisms for programming, coordination among various activities, designing motivation systems, awards for the researchers and technical experts, determining the degree of intervention of senior managers in decision making for budget allocation to the projects and making decision on way of information circulation in the organization

Source: (A'rabi and Mennati, 2010)

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A review of the factors for success of programs and science and technology policies in six developed states has highlighted the following factors:

**Table 2: Review of success factors in science and technology policies in six developed states**

Success factors in science and technology policies	France	UK	Japan	China	S. Korea	US
Steering scientific and technological policies by highest governmental authorities	*		*			*
Simultaneous attention to basic and applied research	*	*	*			*
Cultural, economic and social considerations in steering science and technology in the country	*					
Establishment of commissions and institutions of scientific research for pursuing scientific and technological discussions	*	*	*	*	*	*
State-science union and state's support of science and technology	*	*	*	*	*	*
Reformation of educational and research system of the country			*			
Coordination of researches in various private and governmental sectors and supporting them			*		*	
Creating new technology centers such as scientific estates, technology parks, and research towns			*		*	*
Paying attention to inter-industry research and development			*			
Upbringing the creativity morale for creation of technological innovations			*		*	*
Balanced development of basic, applied and developmental researches			*			
Paying attention to technology merging for technological innovations			*			
Formulating long-term strategy for access to the advanced technologies				*		*
Enjoying expert views and opinions of the scientists in line with technological development		*		*		
Centrality of scientific and technological programs on limited and highly effective goals and concentration on superb areas				*	*	
Formulating managerial strategies for administration and advancement of advanced research				*		*
Development of active intl. cooperation in line with steering technological development program				*		
Serious increase in R & D budgets			*		*	*
Identification, attraction, protection, leadership of national talents for supplying research experts			*	*		*

Source: (Ali Ahmadi & Akhavan, 2006)

Also, it should be noted that the most important signs behind the decline in a technology are the following:

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- 1- Reduction in productivity of the organization’s R & D
- 2- Growing failure in R & D projects
- 3- Shifting from R & D projects on products to procedure projects
- 4- Difference of opinion among R & D personnel
- 5- Change of orientation in market growth toward a smaller market
- 6- Tendency of weaker rivals in the industry for R & D investment in new ways (A’rabi& Mennati, 2010)

**B- Philosophy of Technology**

Philosophy of technology is the distinction between the nature of technique and technology and philosophical understanding of its components. Philosophy of technology is a tendency which has encompassed two opposing approaches including human and natural sciences: philosophy of technology based on engineering that is analytical; and philosophy of technology based on humanities that is interpretive. The first is chiefly practiced by engineers and technicians and the second by the humanities experts who are after understanding technology via hermeneutic and interpretive framework (Shaeidi, 2011).

The representatives of engineering based philosophy of technology are experts like Ernst Kapp, Peter Engelmeyer, Fredrick desavre and Mario Bunge and the representatives of humanities based philosophy of technology are Lewis Mumford, José Ortega y Gasset, Martin Heidegger and Jacques Ellul. The second approach, although not totally pessimistic about technology, does not yield fully to the technological achievements, does not wholly believe in technology, while the first approach accepts more or less technology and its achievements. The engineering based approach pays attention to the internal correlations in technology while the humanities based approach pays attention to the technology-world relations. One approach has serious concerns about technological developments and another approach has concerns over human progress (Kaji, 2013).

Humanities, or what might also be called hermeneutic philosophy of technology, seek by contrast insight into the meaning of technology — its relation to the trans-technical: art and literature, ethics and politics, religion. Therefore, this type of philosophy intends to boost awareness on non-technologic concepts. Perhaps in philosophy of technology one can identify traditions to the same number of philosophical schools: Anglo-American analytical tradition (dealing with artificial intelligence), phenomenology (dealing with everyday experience of existential technology), pragmatism, Catholic Neo-Thomism, Marxism, etc. The existence of a Marxist tradition and contemplation on technology are the major challenges before this school of thought. Frankfurt School in West Europe is recognized by such theorists as Max Horkheimer, Theodor Adorno, Herbert Marcuse, and Jurgen Habermas. They are known as theorists of scientific-technological revolution in East Europe. Like Radovan Richta and others, and Latin American Marxists like Enrique Dussel, all and all are part of the social criticism tradition of technology all inspired by Marx. We can say for sure that Marxist tradition – and perhaps the entire tradition of social sciences in philosophy of technology – are indicative of an approach sufficiently distinctive from the engineering and humanities technologies, thus they are worthy of special attention. In a sense, the main approach of this tradition is neither acceptance and expansion of technology (engineering approach) nor questioning technology (humanities), but social criticism and technological reformation (Mitcham, 1941). Carl Mitcham in his studies on formation of the philosophy of technology has distinguished four major approaches under Thinking through Technology. According to him, thinking about technology is concentrated on four ways of conceptualization on technology:

**Table 3: Various technological approaches**

<b>Technological approach</b>	<b>Explanation</b>
Technology as object	Quest into the nature of technologic crafts
Technology as knowledge	In view of epistemological scrutiny of technology
Technology as activity	On methodological issues
Technology as volition	Teleological, ethical, and aesthetic considerations

Source: (Zare’ Mirakabad, 2010)

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### **C- Technology and Sustainable Development of Agriculture**

At present, there are facts around the world that are serious risks to the environment and agriculture. Every year around 8 million people are added to the 5.8 billion world population. Every two seconds five children are born, three of who are Asian. Until the end of the 21<sup>st</sup> century, world population would be probably above 14 billion. Population growth on one hand, and greenhouse effects on the other hand, destruction of ozone layer, acid rains, chemical pollution, etc. have become serious concerns of the earth and sources of pollution and destruction of this planet. Carbon oxide and the gasses emitting from industrial activity have led to the global warming phenomenon. Environmental problems are being increased with the industrialization of developing countries. According to UN experts, over 50 flora and fauna and animal species on earth get closer to extinction on earth. Research by the UN Environmental Program show that industrial development is the most important factor behind destruction of various species of living creatures on earth. Due to environmental pollution, the germination capacity of soil has been declined substantially. At present, land shows little reaction to chemical fertilizers, thus it will fail in future to supply required food for human beings coming from over-population and the underground water resources will be diminished day by day.

On the other hand, with respect to the population growth and increasing demand to food in the near future, it is necessary to shift to mechanization in agriculture in order to guarantee food for the coming generations. Mechanization implies the use of various power sources and improved farm tools and equipment, with a view to reduce the drudgery of the human beings and draught animals, enhance the cropping intensity, precision and timelines of efficiency of utilization of various crop inputs and reduce the losses at different stages of crop production. This is realized by various irrigation methods, using chemical and biochemical substances, using pesticides and applying mechanical energy in various stages of production (Verma, 2010).

The stabilization of agricultural system by on-time implementation of plans, improving quality of agricultural work, boosting performance of farm by precision activities, an crop rotation are advantages of agricultural technologies for the farm management. On the other hand, mechanization of agriculture can have disadvantages. For instance, high cost of fuel, labor and agricultural implements, high traffic of agricultural machinery, increased soil compaction, sowing the weed seeds, reduction in organic substances of soil, weakening soil texture as a result of uncontrolled and inaccurate use of agricultural implements, violating the lives of soil microorganisms as a result of pressures made by agricultural machinery are some disadvantages.

Although development programs have improved the quality of life, success in various fields such as health and education, and eye-catching increase in incomes, two important issues made these achievements risky: 1- Over one billion poor people in the world who have no access to the resources, education, healthcare, infrastructure and whatever needed for improving the quality of life; 2- The technology oriented approach and optimistic view toward the world causes uncontrolled use of natural resources and lavish and greedy consumption of resources, specially the renewable energy resources that has broken the balance of ecosystems. To remove these two serious problems, the issue of sustainable development was introduced that regulates and organizes man-environment and man-man interactions. The idea was the result of various activities. The main principles of sustainable development in agricultural sector and environment are: abandoning the imagination of man's absolute power, ecosystem is much more important than what is understood and imagined today, justice and social equity, reconciliation of development and sustainability, partnership and concord, public orientation, comprehensive plan, crop rotation and combined methods, a systematic and universal approach, construction on what it is, flexibility, wise use of resources, world ideology and local initiatives (Zahedi, 2014).

Stevens says that agricultural development indicates change in agricultural sector. These changes violate the balance of traditional agriculture meant to realize faster growth in agricultural products and rapid increase in the income of farmers. He believes that in this process four main factors are involved: 1- technological changes; 2- institutional and organizational changes; 3- investment in manpower training;

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4- investment in agricultural research and education to accelerate technological and institutional changes (Arabiun & Popzan, 1998).

In addition to the importance of institutionalization of sustainable development, agricultural education can be considered as a social innovation and an important factor in revolutionizing the agricultural sector that has been reformed and completed in the course of centuries. The most important philosophical schools governing the educational and instructive systems, including agricultural education include idealism, realism, and pragmatism. The modern-day developments in the world highlight the need for a new approach in applying these instructions more than before. In each of the above schools of philosophy there are common points on agricultural education, abiding by which will be very helpful in optimal use of innovative strategies of education. The common points of idealistic school of philosophy in terms of education are: emphasis on development of individual personality, emphasis on methods of thinking and contemplation in the process of learning. The common points in realism are: self-reliance, emphasis on solving the problem in real environment, presenting basic and essential knowledge. Also there are common points between pragmatism and agricultural education: leaning to fight environmental changes, explorative learning and using pragmatic strategies, explorative and experimental learning. The most important practical specifications of existentialism in agricultural education are: emphasis on individual and his freedom of choice, empowerment of individuals in decision making, ability to recognize the status quo and the ability to study and analyze issues. The most important common aspects between the school of rehabilitation and agricultural education are: belief in positive change in the society, belief in distance education, considering the promotion worker as a social activist, all-out partnership in educational activities and problem-solving, initiative-orientation and emphasis on group work (Farajollah and Omid, 2006).

**Table 4: A Comparison of Schools of Philosophy**

Schools	Idealism	Realism	Pragmatism	Existentialism	Rehabilitation
Major emphasis	Idea	Reality	Practice	Existence	Reconstruction
Ways to find truth	wisdom	Intuitive experience	Practical experience	Intuition	Initiative orientation and group work

*Source: (Farajollah Hosseini and Omid, 2006)*

**CONCLUSION**

Modern day man is in need of spiritual interpretation of the world more than anything else, and spiritual interpretation in turn needs a different explanation of functions, mental and inner powers of human being in an age that associates a cemented surface of the age of iron and tools on man and the world. One of the important manifestations of this age is the rule of technique and technology on the hearts and minds of men, the brainchild that seems to advance restlessly by overpowering of ideologies to fascinate the creative man of strong imagination. “The technology is participation in creation and the greatest experience of immortal man.”It is one form of manifestation of Truth in the ocean of human existence that has given new depth and richness to human approach. Perhaps it can be said that despite chaos man himself has given birth to, technology will finally serve as an instrument for deeper understanding of the philosophy of creation and the mission of man in the endless existence.

Technology makes history. It is the full mirror of man’s efforts and endeavors for overcoming his shortcomings. “Technique, to a great deal, is free of external restrictions and it has an internal dynamics that drives it froth and other conditions are subject to and followers of it.” On one hand, one can say that tools are lifeless solid things that are animated by man. Perhaps it can be claimed that the instrumental aspect of human mind has been awakened more and more in the course of history, and it is advancing forward fast to enrich its active imagination and manifestation of technical works and elucidate its astonishing inner power in order to live an easy life and lead peace of mind amidst hardships of life. Man has grasped a new understanding of phenomena by using tools. Therefore, it is natural to face various contradictions in the beginning, because change in the status quo is the prerequisite for any

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metamorphosis. Undoubtedly we are at the beginning of the growth in technologic thinking. It is not far from truth that man may attain a high level of delicacy, speed, and precision in exploring the truth via new technologies that ultimately technical functions arising from man's unbridled imagination is understood well when the designers get ample understanding on their genuine capabilities, thus instead of thinking about absolute hegemony, they tend to find concordance with it.

On the other hand, some demands and motives can be addressed as the reasons for man's technologic behavior: physiological demand, needs to safety, need to attachment and sentiment, need to appreciation and trust and self-promotion, motif for survival, motive for power and control, motif for rational capabilities. With respect to this point, we see every day destruction and damages resulting from uncontrolled and unconscious use of technologies in various fields, to remove this feeling to need – that has violated comprehensive communication and participation of natural elements, has caused serious pollution of natural resources and the environment. It has violated the food safety of man by using chemical fertilizers and has seriously violated the ruling balance of the world. Apparently the technology created by man is a juxtaposition of positive and negative traits in his beliefs that negate the theory of neutrality of its nature. Kant believed that new science is technologic in its nature. Therefore, it seems there is no way to escape confrontation with and understanding of technique oriented world in the powerful and amazing environment of science today.

Along with new development and technical developments, one of the important challenges of the world today is population growth and the increasing demand to food and agricultural produce. Therefore, using modern technologies in agricultural sector and agricultural mechanization is one of the strategies ahead for boosting the quality and quantity of products. On one hand, lack of sufficient knowledge on philosophical nature of technologies in agricultural sector will lead to creation of useless, non-ideal, non-competitive, non-futuristic, and non-humanistic techniques and technologies that are non-conformant with the universe. This will end in such undesirable consequences as uncontrolled and inaccurate use of tools and methods, damaging the environment, contradiction of man's energies with the universal forces and interference in the orders and rules of the earth.

Since man is a creature seeking the ultimate of everything, the technology which is his brainchild, must have an ultimate end. On the other hand, since attaining sustainable development plays a key role in social, economic, environmental, and food security of man, the need for paying attention to the philosophy of technology in agricultural development and environment protection, and more assurance over welfare and survival of the coming generations must be paid due attention more than before by the technology planners.

### **REFERENCES**

- A'rabi Seyed Mohammad and Mennati Hossein (2010).** *Strategy of Technology* (Mahkameh Publications).
- Tavakkoli Alireza (2000).** Technology and Agricultural Education, Report on Future Science and Technology Seminar at Center for Strategic Research. [Tarvijo88.blogfa.com/post-8.aspx](http://Tarvijo88.blogfa.com/post-8.aspx).
- Torabi Taqi and Mohammadzadeh Asl Nazi (2010).** Globalization, Foreign Investment and Technology Transfer, Science and Research Branch of Islamic Azad University.
- Tavakkol Mohammad (2011).** *Sociology of Technology* (Jame'eh Shenasan Publications).
- Zare' Mirak Abad Ali (2010).** Philosophy of Technology, Faculty of Modern Science and Technology, Tehran University.
- Zahedi Shamsosadat (2014).** *Sustainable Development* (SAMT).
- Shaeidi Ali (2011).** Role of IT in Cultural Technology with the Centrality of Iranian-Islamic Culture Development, IT and Communications Group, Payam Nour University, Tehran.
- Arabiun Abolqasem and Popzan Abdolhamid (No Dtae).** Selecting Appropriate Technology for Agricultural and Rural Development in Iran. *Jahad Periodical* XVIII(212-213) 69-84.
- Amani Ahmad Reza, Farajollah Hosseini and Seyed Jamal (2005).** Comparative Study of Philosophical Schools with an Approach based on Rehabilitation School. *Jahad Periodical* 267 3-12.



**Review Article**

**Ali Ahmadi Alireza and Akhavan Peyman (2006).** Studying Reasons for Success of Science and Technology Programs and Policies in Developed Countries. *International Magazine of Engineering Sciences* **17** (2) 19-28.

**Farajollah Hosseini, Seyed Jamal and Omidi Maryam (2006).** Need for New Approaches in Philosophy of Agricultural Education. *Jahad Periodical* **275**.

**Kaji Hossein (2013).** *Don Ihde's Philosophy of Technology* (Hermes Publications).

**Lahsaeizadeh Abdolali (2000).** *Rural Sociology*, first edition (Zar Publications).

**Heidegger Martin (1954).** *The Question Concerning Technology*, translated by Siavash Jemadi (Qoqnoos Publications).

**Heidegger M (1954).** *The Question Concerning Technology & Other Essays*, translated into Persian by Shapour Etemad 5-36.

**Mitcham Carl (1941).** *What Is Philosophy of Technology*, translated into Persian by Taghavi et al.

**Ogungbure Adebayo A (2011).** The Possibilities of Technological Development in Africa: An Evaluation of the Pole of Culture. *The Journal of pan African Studies* **4**(3).

**Verma GR (2010).** *Philosophy of Technology*. Available:

[https://www.google.com/webhp?sourceid=navclient&ie=UTF-8&rlz=1T4ASUT\\_en\\_\\_494IR494&gws\\_rd=ssl#q=verma+2010+philosophy+of+technology](https://www.google.com/webhp?sourceid=navclient&ie=UTF-8&rlz=1T4ASUT_en__494IR494&gws_rd=ssl#q=verma+2010+philosophy+of+technology).

**Wieczorek Anna and Vellinga Pier (2004).** *The Need for Industrial Transformation*. Environmental Policy Research Center: Berlin 21-30.