LAND AND WATER MANAGEMENT PARADIGMS IN IRAN: TECHNICAL, SOCIAL AND ETHICAL ASPECTS

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ABSTRACT

With respect to land and water management in Iran, three paradigms can be distinguished. The pre-modern paradigm can be characterised by its key technical system (the 'qanat' underground irrigation system), its main social institution (the 'buneh' cooperative organisation of agricultural production), and its ethical framework (Zoroastrianism and Islam). The paradigm of industrial modernity can be identified by the partial replacement of 'qanats' by dams, the substitution of the 'buneh' by a system of smallholding, and the emergence of a mechanistic worldview. Since the 1970s, industrial modernity has gradually given way to what has come to be known as 'reflexive modernity'. In Iran, the new paradigm is still in its first stage, and must be conceptualised and developed in terms of new technical systems of land and water management, of corresponding social institutions and of a new ethical framework that is sensitive to the specific features of the region.

Kewords: land degradation, water scarcity, pre-modernity (tradition), industrial modernity, reflexive modernity

1. INTRODUCTION

The main challenge confronting Iran is to continue the expansion of food production to meet future demand without imposing negative effects on the environment. Since the country has a long history of agriculture, its habitants have already occupied almost all the fertile land. In the more recent past, however, there has been a slight increase in the total area under cultivation. This was achieved by bringing under cultivation the barren lands that have only a marginal agricultural potential. A comparison of the 1973 and the 1998 agricultural census show that in a quarter of a century only 483,000 ha (2.8%) of

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new land areas were brought under cultivation. On the other hand, the negative water balance implies (1) that no more new land can be brought under cultivation, and (2) that the country is already facing a critical situation regarding the management of water resources and sustainable food production in existing cultivated lands (Moameni, 2000). This means more pressure on the resources. The question is if and how we can stop this process. In order to answer this question, use will be made of the three paradigms with respect to land and water resource management identified by Allan (2006), the pre-modern paradigm, the industrial modern paradigm, and the reflexive modern paradigm. The aim of this paper is to study the technical systems, social institutions, and ethical frameworks of these paradigms, in order to get some theoretical and practical grip on the conditions for a successful transition from industrial modernity to reflexive modernity in Iran.

2. PRE-MODERN PARADAIGM (2500 BC-1960)

The pre-modern land and water management paradigm in the pre-capitalist Iran can be distinguished by its main social institution ('*buneh*'), its key technical system ('*qanat*') and its ethical framework (Zoroastrianism and Islam).

2.1 THE MAIN SOCIAL INSTITUTION: BUNEH

The pattern of landownership and the relation between peasant and landowner that played an essential role in the process of agricultural production in Iran were to a large extent determined by the circumstance that approximately 90% of Iran is arid and semi-arid. The annual evaporation loss is high, ranging from about 700 mm to over 4,000 mm, amounting to 16 times the annual average rainfall of 250 mm (Moameni, 2000).

The general pattern of land ownership in Iran prior to the land reform of 1962 was a combination of large-scale feudal landownership with small-scale absentee and peasant proprietorship (Lahsaeizadeh, 1993). Because of the importance of artificial irrigation to Iranian agriculture, sharecropping (*muzara-eh)* was dominant among the different types of relation between the peasant and landowner. In the arid and semi-arid areas of the country, a cooperative form of organization of agricultural production, *buneh*, prevailed. The major function of the *buneh* until the land reform of 1962 was the efficient exploitation of productive land and the careful use of scarce water resources. It was a complex system of the interrelated activities of crop farming, animal husbandry and handicraft production (Farshad and Zink, 1997). Although *buneh* had some disadvantages (e.g., an internal unequal division of labour and crop), it strengthened the socio-economic position of the peasants (Lahsaeizadeh, 1993).

2.2. THE MAIN TECHNICAL SYSTEM: QANAT

More than 3000 years ago, the inhabitants of the dry, mountainous regions of Iran perfected a system for conducting snowmelt through underground channels, the so-called '*Qanat*', which began in the mountains and carried water downwards to the plains by gravity, to farms, country gardens and towns (Foltz, 2002). About 73.5% of *Qanats* were located in the eastern half of the country; whereas the western part was mostly dependent on rivers and rainfall (Lahsaeizadeh, 1993). The *Qanat* irrigation

system rests on indigenous knowledge and experimental hydrology. Moreover, *Qanats* reflect collective and cooperative work, and, in areas where *Qanats* are constructed, labour or work opportunities are provided for the local community. *Qanat* systems are closely linked to the local community and its ability in planning and management of their own water resources, especially for agriculture. The management system is such that the water is distributed equitably. As a result, water security supply and water access equity are supporting the foundations of the local community (Haeri, 2006). It has been claimed that before the land reform, the life of about 70% of Iranian villages was totally or partly dependent on the *Qanat* system (Lahsaeizadeh, 1993).

Because individual peasants possessed neither the capital nor the manpower that was needed for construction and maintenance of the Qanat system, independent production was at a disadvantage compared to other systems of production such as the *buneh* or the multi family collective.

2.3. THE ETHICAL FRAMEWORK: ZOROASTRIANISM & ISLAM

From an ethical point of view, Iranian civilization recognized both the ecological realities of the plateau's desert climate and the social imperative of conserving and distributing water in a way that ensures its availability to all. This ethical system is rooted in the two religious value systems, namely Zoroastrianism and Islam. Since the Islam has entered into Iran, these two belief systems have co-evolved to a large degree and are profoundly interconnected. The *qanat* system, for example, which originated long before the Islamic period, was incorporated into the developing Islamic legal code (Foltz, 2002).

Zoroastrianism, the dominant religion in the pre-Islamic era, rests on three pillars: *Humata* (Good Thoughts), *Hûkhta* (Good Words) and *Hvarshta* (Good Deeds). By "Good Thoughts", a Zoroastrian is able to concentrate his mind in divine contemplation of the Creator, and live in peace and harmony with his fellow man. By "Good Words," he is obliged to observe honesty and integrity in all commercial transactions, to prevent hurting the feelings of others, and to engender feelings of love and charity. By "Good Deeds," he is directed to relieve the poor, to irrigate and cultivate the soil, to provide food and fresh water in places where needed, and to devote the surplus of his wealth in charity to the well-being and prosperity of his fellow man. Nature is central to the practice of Zoroastrianism and many important Zoroastrian annual festivals are in celebration of nature: New Year on the first day of spring, the water festival in summer, the autumn festival at the end of the season, and the mid-winter fire festival (Jafarey, 2005).

Like Zoroastrianism, Islam also offers a basis for ecological understanding and stewardship (Foltz, 2002). According to the *Qur'an*, the universe and everything in it has been created by God and is considered a sign (*āyāt)* of God. Human beings, although at the top of creation, are only members of the community of nature. Humankind is considered as a trustee for the planet: humans are entitled to live on the earth and benefit from it but they are not entitled to pollute or destroy the environment. Any behaviour that can jeopardize the future of the natural resources is seen as an act against God and its creation (Abdel Haleem, 1989).

Nature has been created in order and balance, and with extraordinary aesthetic beauty, and all these aspects of nature, while enhancing humankind's life should be honoured, developed and protected accordingly. All patterns of human production and consumption should be based on an overall order and balance of nature. The rights of humankind are not absolute and unlimited: we cannot simply consume and pollute nature as we wish, carelessly (Özdemir, 2003).

Water like all other natural resources is considered as a gift by God. Mohammad attached great importance to the moderate use of water and forbade the excessive use of it even when performing ablutions, saying that to do so was "detestable" (*makrūh*). He even prevented people from using too much water for ablutions when preparing to enter the Divine Presence for prayer.

It should be obvious by now that the social, technical and ethical aspects of the pre-modern paradigm were highly interconnected and compatible to one another in many respects. The key technical system ('*qanat*') of the pre-modern paradigm was dependent on its main social institution ('*buneh*') to operate properly, while Zoroastrianism and Islam, the two belief systems that co-evolved in Iran during the past fourteen centuries, can be considered as an adequate ethical framework for both these technical and social aspects of the pre-modern paradigm.

3. INDUSTRIAL MODERNITY PARADIGM (APP. 1960-APP. 1980)

Industrial modernity in Iran can be characterized by the substitution of the *buneh* by a system of smallholding, the partial replacement of *qanats* by dams and the emergence of a mechanistic world-view with important ethical ramifications. These changes have been brought about as a result of the adoption of development models imported from the West (Foltz, 2002).

After the land reform of 1962, the major pre-capitalist collective organization of production (*buneh*) was eradicated and sharecropping (*muzara-eh)* gave way to individualism. Moreover, the indigenous knowledge acquired through *buneh* systems was neither used by nor transferred to the new generation. Although it was believed by the land reform officials that rural cooperative societies[1] could replace the *buneh* system and would fill the gap that would result from its destruction, no village-level institution has ever taken over its function (Lahsaeizadeh, 1993). These traditional systems are increasingly being abandoned in favour of such 'modern' practices as the damming of rivers and the pumping of groundwater. As in the United States, it was assumed that Iran's arid regions could only be industrialized by making the necessary water resources available through building dams[2], pumping up groundwater and bringing in water from remote sources (Foltz, 2002).

1- Recent studies show that the modern Agricultural Production Cooperatives (APCs) were unsuccessful in achieving land consolidation and group work, which were the main reasons for their establishment (Karami and Rezaei-Moghaddam, 2005).

2- Despite the incompatibility of damming with the ecological condition of Iran, the storage of water, the control of floods through the routing of excess water, the production of electricity and the preparation of water for irrigating new arable land are the arguments used to support the continuation of dam building (FAO, 2005)

As a result, the role of Qanats in securing all the functions of water in the country has decreased from 70 percent prior to the year 1950, to 50 percent around 1950 and to 10 percent in the year 2000 (Haeri, 2006). Likewise, control of the water resources has been transferred from pious endowments to government bodies.

The value system of industrial modernity is also at work in contemporary Iranian agriculture. Industrial agriculture rests upon a conception of nature based on the mechanicist world-view that has increasingly defined modern Western science since the Renaissance. According to the mechanicist view, natural systems are believed to be understandable, predictable and manipulatable.

The mechanicist view of nature promulgates a specific economic model of human-nature interactions: the farmer is to produce as much food as possible, and neither the producer nor the consumer should make value judgements about the non-economic worth of the land. Modern agriculture has become highly industrialized in order to reliably produce the largest amount of plant and animal product possible while minimizing labour inputs. Under the industrial production paradigm, the prime objective is to improve the productivity of a select set of plants and animals. At the heart of the production paradigm is the realization of the greatest possible quantity of agricultural product. Agricultural systems based on the production paradigm do not recognize ecologically important values that are hard to quantify. Although the structure, functioning and values of natural systems could provide important clues as regards developing sustainable agricultural systems, little effort is devoted to investigating them (Keller et al., 2002).

Thus, the design of agricultural systems is based on commodity production and its attendant economics, while the importance of modelling farming systems after natural systems, based on ecological principles, is widely overlooked.

4. REFLEXIVE MODERNITY PARADIGM (1980-)

The ideas underpinning industrial modernity were challenged during the 1960s and the 1970s. The disastrous effects of industrial modernity have begun to appear in Iran as in the US, Israel, India and elsewhere. Over the past four decades, Iranian farmers and others close to the land have watched water table drop as one well after another dries up and formerly fertile lands are forcibly taken out of production (Foltz, 2002). As a response to these challenges a new paradigm emerged, the paradigm of ‘reflexive modernity’ (Allan, 2006). This reflexive phase can be shown to have three sub-phases. In the first sub-phase, awareness of the environmental costs emerged. In the second sub-phase, there was growing attention to the economic value of ecosystem services, such as water resources. In the third sub-phase, these environmental and economic aspects were completed and combined with socio-political aspects. This is the case in integrated water resource management (IWRM), as well as in integrated pest management (IPM), integrated crop management (ICM), and integrated soil fertility management (ISFM).

The third sub-phase is leading to approaches that include participation, consultation and inclusive political institutions to enable the mediation of the conflicting interests of water users and the agencies that manage water. Moreover, Allan (2006) emphasizes that water users could adopt IWRM if the innovation of ‘integration’ would be appreciated as a political process and not just as a technical investment or information

sharing process. Therefore, this paradigm requires a new holistic approach and an unprecedented level of political cooperation.

Allan believes that the semi-arid North can be shown to have partially adopted all three reflexive management paradigms. In the South, by contrast, the professional community generally, and all water users and politicians have resisted the adoption of these reflexive paradigms. Allan concludes that, with some exceptions at the local level where small communities manage their water via transparent institutions that have been tested over time, the South is still very much involved in its 'hydraulic mission' that is characteristic of the industrial modernity paradigm. Socio-economic development priorities are considered more urgent than environmental priorities.

However, in Iran there are also signs and indicators of a turn to reflexive modernity, for example the change in water pricing and delivery methods, the announcement of a national strategic plan by the government (which is considering a land-use planning strategy based on integrated ecological and socio-economic issues rather than solely socio-economic ones), and the promotion of NGOs and community participation in the 1990s. This movement is continuing in the first decade of 21 century. For example, since 2002, Iran has joint the international Challenge Program on Water and Food (CPWF) with a project in Karkheh river basin.[1] Other clear signs of a reflexive turn are the emergence of the Iranian association for the ethics of science and technology in 2003 and of the International Center on Qanats and Hydraulic Structure (ICQHS) that has been founded in 2005 in collaboration with UNESCO.

5. TRANSITION TO REFLEXIVE MODERNITY PARADIGM IN IRAN

However, in Iran the new reflexive paradigm is in the first phase and should be conceptualized and developed in terms of new technical, social and ethical systems that are sensitive to the economical, environmental and political features of the region. To this end, the traditional paradigm needs to be revitalized and integrated with the industrial paradigm, in such a way that the benefits and advantages of both will be maintained as much as possible. We will sketch the contours of the new ethical framework, the institutional and technological requirements, and the scientific approach that are required for the transition to the reflexive modernity paradigm.

5.1. THE NEW ETHICAL FRAMEWORK

First, this transition requires a holistic, inclusive and participatory approach to rethink agricultural practice within a post-mechanistic (rather than a mechanistic) framework that will provide the basis for the development, maintenance and improvement of sustainable agro-ecosystems. With respect to a post-mechanistic ethics, it is contended that the methods used to mechanistically dissect agriculture and its components need to be revised and that the non-mechanistic aspects of agricultural systems (i.e. ecological and qualitative values) need to be considered when constructing sustainable systems.

1- CPWF is an international, multi-institutional research initiative with a strong emphasis on north-south and south-south partnerships. Its 5 themes are: 1) Increasing crop water productivity, 2) multiple users of uppers catchments, 3) aquatic ecosystems and fisheries, 4) integrated basin water management systems, and 5) the global and national food and water systems.

Therefore, in order to develop an ethical framework that can accommodate the passage from industrial modernity to reflexive modernity, different philosophical sources should be explored, particularly Iranian pre-Islamic and Islamic ethics. Because of its inclusiveness and community-based character, another source of moral inspiration is the 'land ethics' of Aldo Leopold. Its goal is to strengthen the ties between humans and between the human community and the larger ecological community. According to Leopold's land ethics, land is not merely soil: it is a fountain of energy flowing through a circuit of soils, plants and animals. He therefore concludes that the land ethic simply enlarges the boundaries of the community to include soils, waters, plants and animals, or collectively: the land.

The next philosophy that should be taken into account for developing an ethical framework of reflexive land and water management is *pragmatism,* in part because it is better equipped to deal with technology than current ethics (Keulartz et al., 2004). The core moral intuitions of pragmatism revolve around the possibilities for living and working together. Because of its attention to the settlement of conflicts for the sake of further cooperation, pragmatism has always been interested as much in the *process* of moral inquiry as in its ready-made *products.* To promote the fairness and quality of the process of inquiry and deliberation, it is essential that all those concerned in the issues of land degradation and water scarcity can have their say and that decisions are made on the basis of a careful consideration of all relevant conflicting moral claims and arguments. A second shift to which the standard of fruitful cooperation and peaceful cohabitation gives rise is a shift in emphasis from the context of *justification* to the context of *discovery*, from the cognitive capacity for argumentative problem-solving to the creative capacity for the innovation and invention of vocabularies that provide new meanings and open new perspectives. A pragmatist ethics should pay special attention to the exploration of future worlds disclosed and shaped by technology and the management of deep value conflicts inherent to a pluralist society.

5.2. INSTITUTIONAL AND TECHNICAL REQUIREMENTS

The high variability of ecological processes and their interactions with heterogeneous social, cultural, political and economic factors generate local systems that are unique in countries like Iran with its dominant small farming systems. Altieri (2002) believes the only way that the specificity of these local systems, from regions to watersheds, and all the way down to a farmer's field, can be taken into account is through site-specific natural resource management, based on agroecology, which incorporates elements of both traditional knowledge and modern agricultural science. Agroecology provides the basic ecological principles for the design and management of agroecosystems that are both productive and natural resource conserving, and that are also culturally sensitive, socially just and economically viable (FAO, 1993).

Altieri (2002) mentions that since the early 1980s, hundreds of agroecologically based projects have been promoted by NGOs throughout the developing world. There is a variety of projects that feature resource-conserving yet highly productive systems such as polycultures, agroforestry, and the integration of crops and livestock. Moreover, the

analysis of dozens of NGO-led agroecological projects shows that agroecological systems are not limited to producing low outputs, as some critics have asserted.[1]

However, despite increasing evidence and awareness of the advantages of agroecology, it has not spread worldwide. According to Altieri (2002), a key obstacle to the use of agroecology is the demand for specificity in its application. Contrary to conventional systems that feature homogeneous technological packages designed for ease of adoption and that lead to agroecosystem simplification, agroecological systems require principles to be applied creatively within each particular agroecosystem. Field practitioners must have more diversified information on ecology and on agricultural and social sciences in general. Thus, major changes must be made in policies, institutions and R&D agendas to ensure that agroecological alternatives are adopted, made equitably and broadly accessible, and multiplied so that their full benefit for sustainable food security can be realized. It must be recognized that a major constraint on the spread of agroecology is that powerful economic and institutional interests have backed R&D for the conventional agro-industrial approach, while R&D for agroecology and sustainable approaches has been largely ignored or even ostracized.

What is needed for a more reflexive land and water management are changes in attitudes and philosophy among decision makers and scientists who should acknowledge and promote alternatives. Also needed are strategies of institutional innovation to encourage equitable partnerships with local NGOs and farmers. The top-down model of technology transfer should be replaced by the bottom-up model of participatory, demand-driven and farmer-centred, technology development (Altieri, 2002).

5.3. A NEW RELATION BETWEEN SCIENCE AND SOCIETY

Finally, reflexive modernity, with its emphasis on participation and inclusion, requires a new social contract between science and society. Such a contract is strongly needed not just as a procedural means to ratify the new arrangements but also as a necessary requirement to settle a concomitant crisis that is linked to the changing character of science and society in our times. The image of science as an objective and impartial provider of the empirical facts and rational explanations upon which politicians and policy makers can safely rely has become outdated. Especially in the case of environmental sciences and the life sciences, which deal with very complex problems, this traditional image does no longer match with reality. With these disciplines we find ourselves each time in a situation where the facts are uncertain, values in dispute, stakes high and decisions urgent.

Under these conditions the puzzle-solving strategies of ‘normal science’ (in the Kuhnian sense) are no longer appropriate and we have to switch over to what Silvio Funtowicz and Jerome Ravetz (1992) have called ‘post-normal science’. The most prominent feature of post-normal science is the extension of the peer community and the inclusion of an ever-growing set of scientific and non-scientific stakeholders.

1- Another example of the integration of indigenous and scientific knowledge can be found in Wessels and Hoogeveen (2006). They show how in Qarah, Syria, the combination of ancient qanats and modern drip irrigation systems for fruit trees might prolong the life of some qanats and encourage younger generations to commit to their conservation.

All these new developments indicate that the societal relationship with the environmental sciences and the life sciences are very dynamic and produce new controversies, dilemmas and ethical problems. In addition, all these developments make one thing clear: the values, standards and competences of food and agriculture professions are not sufficiently endorsed by society at large (Korthals, 2004). Therefore, it is necessary to study research ethics for the soil and water science profession to communicate with the public (e.g. by improving and redeveloping the ethical statements of soil and water science professional organizations). This profession should take its responsibility with respect both to the general public as to those who are directly involved (stakeholders), by encouraging public participation respectively stakeholder participation.

6. CONCLUSION

To highlight the problems and perspectives of land and water management in Iran and comparable (semi-)arid countries, three subsequent paradigms have been identified: pre-modernity, industrial modernity and reflexive modernity. The technical, the social and the ethical aspects of the pre-modern paradigm have in some respects been more compatible with the ecological and social requirements of the country than the current paradigm of industrial modernity. Since the 1960s and 70s the technologies, organizations and ethical underpinning of industrial modernity have been challenged. In the industrialized North industrial modernity gradually gave way to what has come to be known as ‘reflexive modernity’. In Iran too there are signs and indicators of a turn to the paradigm of reflexive modernity in the 1990s. But, the new paradigm is still in its first stage and must be conceptualised and developed in terms of new technical systems, social institutions and a new ethical framework. The traditional technical, social and ethical structures need to be revitalized and integrated with the structures of industrial modernity, in such a way that the benefits and advantages of both will be preserved as much as possible. The contours of reflexive modernity have been sketched in an Iranian context: a post-mechanistic ethics as a new metaphysics, agroecology as a natural resource management strategy, and post-normal science as a soil and water science approach.

ACKNOWLEDGMENT

The authors appreciate Iranian Ministry of Science, Research and Technology (MSRT) and Agricultural Research and Education Organization (AREO) which financially support the PhD research project that this paper is part of its result.

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