DRIVERS OF POLICIES AND STRATEGIES FOR OPTIMIZING IRRIGATION WATER MANAGEMENT IN IRAN

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ABSTRACT

Limited water resources in Iran have been a constraint for the further development of agriculture. About 90% of agriculture crops are produced in the irrigated lands. In this situation strong policies and strategies are needed to optimise the use of limited water and support food production. Iran Vision 2025 is the document that guides the social and economic development of the country in the long term. Therefore, the current and future endeavours on research, credit, economy and industrial programs shall follow the realization of these national aspirations during the vision period. The strategy includes specific targets to achieve higher water productivity, groundwater management and agricultural water share.

According to Iran’s National constitution all waters is of public interest and under responsibility of government. Based on Iranian water sector law the use of water resources requires obtaining water use License. Public water authorities shall issue optimum water use license for the agricultural water users according to the criteria declared in the fair water distribution law (1982). An extra 10% water use in agriculture shall be charged one and half time the official fee. Pricing policies play an important role in water demand management and its optimal allocation. Current prices policy for agricultural water depends on crops, source of water supply (surface or groundwater), and area to be irrigated. So to improve the performance of irrigation schemes, modernization programme has been taken up at all levels, bottom to up, from on-farm to irrigation canals and schemes and to national level in Iran. Adoption of sprinkler and drip irrigation methods is being encouraged to minimize losses in water application in field. Since the installation costs are high for these systems, central and state governments are providing subsidies to farmers as an incentive to adopt these systems. The policies and strategies applied to prevent water loss and encourage water savings in irrigation would be discussed in the article.

Keywords: Water Use License, Water Saving, Water Charging, Allocation.

1. INTRODUCTION

Iran is among the arid & semi-arid countries in the world. The limited available water resources in Iran have been a constraint for the further development of lands for agriculture. In view of the present condition of water resources in the world and especially in Iran, one of the most potential approaches to circumvent water crisis is to pay serious attention for judicious and efficient use of water. Iran’s agriculture depends on irrigation water, as about 90% of agriculture crops are produced in the irrigated lands (Ul Hassan et al., 2007). Irrigation water is the most important input in agricultural production in Iran. In this situation strong policies and strategies needs to protect limited water and support food production.

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Iran Vision 2025 is the document that guides the social and economic development of the country in the long term. Therefore, the current and future endeavours on research, credit, economy and industrial programs shall follow the rationale of these national aspirations. The long term development strategies for Iran's water resources was prepared by a group of experts in agriculture and water resources management and approved by the government in 2003. The strategy includes specific targets to achieve in regards to water productivity increase, groundwater management and agricultural water share, as follow. Most importantly, it envisages that agricultural water consumption in Iran should fall from present 92% to 87% in 20 years. Moreover, agricultural water efficiency per cubic meter should be doubled from the present condition up to the future period of 20 years. This could be achieved by increasing irrigation efficiency and allocating water to the products with higher economic values”, “Water allocation priorities shall be considered for potable water, sanitation, industry, orchards and farming purposes” and “Incentives should be provided to the private and cooperatives sector to invest capital in water supply, irrigation and drainage systems, soil and water projects (FAO, 2009).

In addition to vision 2025, there are other important policy and strategy documents regarding water, agriculture sector that are as follow; Fair water distribution law (1982); Nationalization of water resources act (1968); Law for protection of the natural parks, protected areas, and sensitive areas (1975); Law on economic, cultural, and societal development (1989); The law of the fourth economic, social and cultural development plan (2005-2009); The Law of the fifth economic, social and cultural development plan (2010–2015); General policies on principle 44 of the codified law (2008); Law of promotion of investment in water project in Iran (2002); Law of crop water price fixation (1990).

2. WATER USE POLICIES AND STRATEGIES

2.1 Water Ownership

According to Iran’s National Constitution, water in any form and at any place shall be at the disposal of the Islamic government for it to utilize in accordance with the public interest. In other words, all waters is of public interest and under responsibility of government.

2.2 Water Resources Administration

Iran Ministry of Energy and affiliated authorities play the main role in water management. But those are not the only stakeholder of water resources. Iran Ministry of Jihad-e-Agriculture involve in water management at the farm level, and improving irrigation method, as well as, financial support to provide facilities for developing agriculture. It can be said, it is the second important stakeholder in water sector after ministry of energy. Provincial governances are also contributing in the development of water supply and investment in industry and agriculture, as they have enough influence on difference provincial entities. On the other hand, High Water Council, headed by the President of Iran act as the Policy making body on water supply, distribution, and consumption, as well as coordination of governmental bodies (Alasti, 2013).

2.3 Obligation for Obtaining Water Use License

Public water authorities shall issue optimum water use license for the agricultural water users according to the criteria declared in the law. There are several reasons why water users are required to register their water use with the Water authorities. Most important are to manage and control water resources for planning and
development, to protect water resources against over-use, damage and impacts, and to ensure fair allocation of water among users. Permits are controlled, and not issued if the taking of more water in a given area would adversely affect existing users or the environment (Alasti, 2013).

Based on Iranian water sector law, the use of water resources requires obtaining water use License (Alasti, 2013). A committee should be defined for this objective and shall study the quantity of existing water, percentage of cultivable land, place of use, branch, quality of use, customs prevailing in the locality and other factors in accordance with a by-law which shall be prepared by the concerned ministry and Agriculture on the basis of essential information acquired and permits shall be issued according to this committee's recommendation. No one is allowed to use water for any other purposes than what has been mentioned in the permit, nor is the permit transferable to others. A water use License is applicable solely to the piece of land for which it has been issued, unless the government in the region decides otherwise and/or the use of the water is determined to be non-beneficial or uneconomical. The water resources authorities are permitted to proportionately decrease water delivery ceiling mentioned in the issued license during drought years as required. Discharge rate and deliverable water volume shall be reviewed according to the irrigation efficiency and crop pattern (Fair water distribution law, 1982).

2.4 Water Losses Penalties

Water delivery to the water users more than specific volume of water fixed in the water licenses is not permitted according to context of water law and regulations. Therefore, water agencies shall deliver the required water to the water users within the same limit of water license. If water authorities distinguish that a water user does not have the required conditions for applying optimum water use pattern, water delivery to the limit of 25% above the measure almost for two years is possible. In this case, water fee for the extra 10% of fixed pattern shall be one and half time as much as the official fee. However, within the limits of 10% to the ceiling of 25%, the water fee shall be three times as much as the planned fee to be calculated and collected, considering the extra water use and the kind of the irrigation system. Still, article 7 of law titled “Law of Crop Water Price Fixation” (Parliament of Iran, 1990) states: Water uses in excess of real cultivation needs (rational/advisable use) will be charged extra prices. Those extra prices would be implemented according to specific condition of region and will be up to 1.5 times more than normal water price in that region.

2.5 Water Saving Encouragement

On the others hand, the users who can reduce water consumption by adopting various methods of water saving and management shall benefit from advantages as follows; (a) Some decrease in the water fee per water saving ratio according to the water use license and permits; (b) Facilities in receiving input subsidies and agricultural machinery; and (c) Crop intensity permit in the planned areas for water intake proportionately with water saving in water uses. Subsidies for water charges and supervision charges will be levied on farmers whose yields are higher than average.

2.6 Water Charging

Pricing policies play an important role in water demand management and its optimal allocation. Having to pay for irrigation water encourages water-saving behaviour thus can be efficient tool for self-controlling and promoting water conservation (Perry, 2001). The policy and regulative framework for water tariffs is different in every country. Determining proper water price leads to optimal allocation of water especially
in agricultural consumptions. So, improvement of water demand and supply management could be achieved using price policies. Fair water distribution law (1982) insist that water tariff in municipal, agriculture, industry and other use should be determined according to quantity and quality of consumption. Also, in the case of adjusted water systems all variable costs include management, maintenance and depreciations should be including in water tariff considering social-economic conditions of each regions (Law for fair water distribution, 1982). Also, long-run development strategy of Iran's water resource and Fourth Iran's development Plan, economic and social program insist on economic valuation of water and calculating supply costs.

Current prices policy for agricultural water depends on crops, source of water supply (surface or groundwater), and area to be irrigated. Agricultural surface-water rate for the water users, who follow up the optimum water use pattern in the planned areas of modern, mixed, or traditional systems, shall be calculated according to fixed crop water rate law. In Iran's agricultural sector, the current price of irrigation water is derived from the value of the crops to which it is applied. For surface water resources, for traditional networks, semi-modern irrigation networks and modern irrigation networks, water rates are one, two and three per cent of the value of the crops, respectively (Nikouei, et al, 2011). Hence, this method needs information on prices of outputs in each province. Its advantage is that it does not require measurement of individual's water consumption which is very expensive or even impossible in many regions.

Based on the 1982 law, water pumping from groundwater resources was in accordance with the crop water requirement and proposed cropping pattern in each region. In this case, price for groundwater resources had determined 0.25-1.0 percent of the commercial value of crop yield. Unfortunately by Parliament law in 2004 the price for groundwater withdrawal got free of charge. The negative impact of mentioned law on over-exploitation of groundwater is completely sensible.

2.7 Modernization of Irrigation Methods

Iranian major policy objectives and strategies that govern the agricultural sector are achieving self-sufficiency (especially for wheat) in strategic products and improving food security. Providing financial and technical support to farmers in order to modernize irrigation methods, applying plant varieties better adapted to the different regions of the country, increasing productivity and improving water consumption patterns in the agriculture sector. Adoption of sprinkler and drip irrigation methods is being encouraged to minimize losses in water application in field. Having the objective of optimum use of the country's water resources and improving water productivity, the Iranian government is determined to develop controlled irrigation methods such as pressurized irrigation, green houses and the application of pipes instead of open canals. Since the installation costs are high for these systems, the government has committed to pay about 60-85% of total investment and the rest low-interest loans for investment in pressurized irrigation to provide an incentive for farmers to use such techniques (Ehsani and Khaledi, 2012).

2.8 Reconsideration in Water Allocation

Negative balance between withdrawal and recharge of ground water aquifers in most of plains is one of main challenges in Iran. The long term development strategies for Iran's water resources were prepared by the government in 2003 issued special statement on protection of ground water. In this case surface water resources consumption should increase from the present rate of 46% to 55% in 20 years to compensate groundwater withdrawal decrease (FAO, 2013).
The recent law in relevant to reconsideration of water allocation approved by Iran Parliament in 2011 in order to stop immediately excessive ground water withdrawal and recover water table. Negative balance between withdrawal and recharge of ground water aquifers in most of plains is one of main challenges in Iran. The recent law in relevant to reconsideration of water allocation approved by Iran Parliament in 2011 in order to stop immediately excessive ground water withdrawal and recover water table. To fulfill to goal Ministry of Energy is obliged to; (a) implement structural and non-structural projects throughout the plains of the country, (b) implement activities related to protection of water resources, preventing illegal withdrawal of ground water resources, (c) implementing the water management system of the country at national, provincial and basin levels so that at the end of the 5th Five Year Plan the negative trend of ground water table recovers by 25% as compared to the end of the fifth Five Year Plan (12.5% by controlling surface waters and other 12.5% by watershed management and ground aquifer management) (Iran 5th Five Year Plan, 2011).

So the Ministry of Energy is obliged to make changes in the water existing allocation and permits and supply water on volumetric basis to the water user association, so that to reduce annually at least 1% of current water use (Iran 5th Five Year Plan, 2011). The Iran Government is authorized to ensuring purchase water saved by water users (having water rights) with an agreed price or through allocation of subsidy based on a guideline endorsed by the Economic Council.

2.9 Volumetric Water Delivery to Users

An orderly system of distributing water must be in place through some existing and respected regulatory framework for allocating water among farmers, as well as, rules and procedures defining rights and responsibilities; priorities in case of shortage or excess supplies for both side. In order to optimizing agricultural water use and increasing water productivity, the Iran Government intends to adopt new measures to regulate water allocation by developing a volumetric approach and to water utilizations for all farmers and water user associations. A bylaw on agricultural water usage optimization regulation approved by Iran Government in 1996, as well as, Iran 5th Five Year Plan approved by Parliament in 2011 insisted on mentioned above policy. According to volumetric water delivery approaches water agencies shall deliver the required water to the water users of each zone according to the optimum water use based on regional cropping pattern. Volumetric water delivery point of the irrigation systems shall be the priming point of the planned areas and the point water user associations receive water. For fulfilling voluminous water delivery, water agencies shall take action in establishing irrigation stream gauging systems and by using proper equipment with water users’ budget. In case if it was distinguished that the installed equipment for measuring water delivering is broken or defected so that intake water current is not properly determined, they firstly give notice to the relevant water users association or its formal representative to remedy the defects. If water users do not remedy the defects in time, or repeat violation of law, the official’s water organizations shall take actions to stop water delivery (Bylaw on agricultural water usage optimization regulation approved by Iran Government, 1996).

2.10 Smart Meter for Groundwater Usage

Groundwater is one of the most important water resources of Iran. About 55 percent of irrigated lands relying on groundwater, the rest is irrigated with surface water sources and treated wastewater (FAO, 2009). Utilization of the underground water resources through the drilling of any type of well anywhere in the country should be carried out with the permission of public water authorities. Unfortunately Over-
pumping is the main cause for ground water shortage and sharp decreasing of water table in arid and semi-arid regions of Iran (FAO, 2009). Effective management system for monitoring and management of ground water resources is top priority of Iran Government according to recent policies and strategies. Iran Supreme Water Council approved a statement on ground water protection in 2015.

According to laws and regulations mentioned above Iran public water authorities shall equip all the deep and semi-deep water-wells with volumetric system. Installation and maintenance costs of such equipment shall be paid by the water-well license owners. To use advantage of technology to fulfil systematic control and monitoring of groundwater abstraction in Iran the relevant ministries determined to apply smart meter which called smart energy and water meter. The meter measures and record consumed energy and relevant parameter. This also capable of measuring and storing the amount of water withdrawal, water flow and other quantitative parameters required by public water authorities. The meter indicates water credit, validity and start and expiry date. It is also collect data of water wells and transfer to control centre via telecommunication infrastructure (Ehsani and Khaledi, 2011). This strategy is strongly under progress and expected during five years of work plan all wells equip to smart water device.

### 2.11 Preventing land fragmentation

Land fragmentation is a major threat to efficient production system due to the fact that continuous subdivision of irrigated area would lead to small sized land holdings that may be hard to economically operate. Preventing land fragmentation in order to improve technical efficiency, increase water productivity and enhance utilization of water and land. In this respect a law was passed in 2007 by which the minimum acceptable area of farmers would be 4-10 hectares for irrigated agriculture and 10-25 hectares in rained farms. In order to support landowners to join small holdings above the determined limits, the government would provide special financial and technical privileges and the required infrastructure for consolidation of agricultural lands, overcoming the excessive fragmentation of farmlands. The government committed to pay the insurance fees of such farmers' products for at most 5 years after the land integration has taken place (Law for Preventing land fragmentation, 2007). So by Five-Year National Economic, Social and Cultural Development Plan law (2011-2016) financial support through allocation of credits facilities, administered values, interest subsidy and banking commission for development of job opportunities for rural and tribal households with priority given to local methods and strengthening integrated management through partnership with legal associations for preventing land fragmentation and integration of small land holders.

### 2.12 Investment for Irrigation Projects

In Iran, the investment and construction works are implemented in most of the water supply and irrigation networks under the government programs. There is an attempt to move towards for facilitating to promote cooperative and private sectors to invest in the project for water supply and construction of irrigation networks, hereby the relevant ministries authorized to entrust according to conditions mentioned in the law of promotion of investment in water project in Iran 2002. This law allocates all the exploitable water to the investor, except for water rights which already exist. In addition, all lands potentially irrigated by the new facilities will be transferred to the investors at the price of undeveloped land, and in case the investor is unable to use all the water, the government is bound to buy surplus water at agreed prices (Law for promotion of investment in water project in Iran, 2002).
In addition to speed up investment for developing irrigation schemes, improvement of water management by institutional reform through involvement of private sector capital investment. It is believed the private sector management is more economically and more efficient comparing to governmental bodies (Ul Hassan et al., 2007). It is expected the private sector apply new materials, technologies and techniques to upgrade the structures of irrigation systems and improve water management. The investing works include reinforcing and upgrading water storages, upgrading canals and control structures, replacing and reinforcing dilapidated structures, upgrading pumping systems, lining canals, upgrading on-farm irrigation systems, applying information and automation technologies to operate and control irrigation systems, reforming management institutions and establishing water user associations. By facilitating the mentioned law, five irrigation schemes works are under construction by private sectors (General Policies on Principle 44 of the Codified Law, Started in 2008, unlimited).

3. CONCLUSIONS

Iran has a comprehensive legal framework regarding the use of water in agriculture. According to Iran’s National Constitution all waters bodies are public wealth and property. Based on law the use of water resources requires obtaining water use License. No one is allowed to use water for any other purposes than what has been mentioned in the permit, nor is the permit transferable to others. Water delivery to the water users more than specific volume of water fixed in the water licenses is not permitted. If it distinguished that a water user does not have the required conditions for applying optimum water use pattern, water fee for the extra 10% of fixed pattern shall be one and half time, and within the limits of 10% to the ceiling of 25%, the water fee shall be three times as much as the planned fee to be calculated according to Agricultural water usage optimization regulation approved by Iran Government in 1996. On the others hands, the users who can decrease water consumption shall benefit from advantages of water fee and agricultural machinery subside. Having to pay for irrigation water encourages water-saving behaviour thus can be efficient tool for self-controlling and promoting water conservation. Current prices policy for agricultural water depends on crops, source of water supply (surface or groundwater), and area to be irrigated. For surface water resources, for traditional networks, semi-modern irrigation networks and modern irrigation networks, water rates are one, two and three percent from the value of the crops respectively. But groundwater is free of charge for agriculture.

Iranian major policy objectives and strategies that govern the agricultural sector are achieving self-sufficiency in strategic products (especially for wheat) and improving food security. Providing financial and technical support to farmers in order to modernize irrigation methods, increasing productivity and improving water consumption patterns in the agriculture sector. Hence, the government has committed to pay about 60-85% of total investment and the rest low-interest loans for investment in pressurized irrigation to provide an incentive for farmers to use such techniques. In order to optimizing agricultural water use, the Iran Government intends to adopt new measures to regulate water allocation by developing a volumetric approach through installing proper devices on water delivering point for all farmers with water users budget. So Iran public water authorities shall equip all the deep and semi-deep water wells with volumetric system call Smart Water Meter.

Increased awareness of the limitations of natural resources has played an important role in adopting appropriate policies and strategies to maximize water allocation and use. Policies will encourage the farmers to use less water and maintain their production at reasonable levels using proper management practices.
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