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Study on the causes of Water Scarcity in Pishin Lora Basin of Balochistan

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Abstract

Focusing on the importance of water a research study was conducted on the causes of water scarcity in Pishin Lora Basin (PLB) region of Balochistan. Pishin Lora Basin lies in the uplands of Balochistan covering districts of Pishin, Quetta, Killa Abdullah, Mastung and part of Kalat, between latitudes 28^o 43'and 31^o 00'N longitudes 66^o 12' and 67^o 43'E. It is one of the major basins known for its sever water scarcity. The study is based on primary data which has been collected from farmers through well-structured questionnaire. The number of farmers in PLB are 5000, out of which 1700 belong to Pishin, 1300 to Quetta, 1000 to Killa Abdullah, 600 to Mastung, and 400 to Kalat. For the collection of data a sample of 300 farmers has been selected through stratified sampling method. The current situation of water is very critical in PLB. However, the general reasons for water scarcity are power related problem, long duration of drought, rising population growth and over exploitation of water etc. Similarly, it has also been noted that installation of new tubewells, running hours of tubewells and water table depletion are also found to be the key factors that led to the shortage of water in the study area. On the basis of the result of this study, it has been recommended that the government should develop effective strategies to put restriction on installation of more tubewells, the introduction of high efficiency irrigation system at firm level and solution of electricity problem were some of the effective measures suggested for reducing the burden on available water resources and increase water of farmers' production.

Keywords: Water Scarcity, Drought, Installation of Tubewells, High Efficiency, Subsidy.

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INTRODUCTION

Water is one of the most indispensable of all natural resources, it is essential for humans, economic development and biodiversity. (Walter *et al.,* 2010). Water is essential for socio-economic development and for maintaining healthy ecosystem. As population increases, development calls for increased allocations of ground water, surface water for the domestic, industrial sectors, the pressure on water resources intensifies, leading to tension, conflicts among users and excessive pressure on the environment. The increasing stress on freshwater resources brought about by ever rising demand as well as by growing pollution worldwide, is of serious concern (Nasurullah *et al.,* 2011). However, many countries have to face the challenge of rapidly growing water demands, driven by an increasing population and economic growth, linked to urbanization, industrialization and mechanization (Walter *et al.,* 2010).

Rapidly increasing population, improved living standards and climate change are the main causes for the soaring global water demand, and it is expected to increase many fold in the next few decades. The per capita availability of water in many countries of the world has been declining sharply especially in countries having low rainfall. The countries facing serious water shortage for different uses exist in many parts of the world including North China, Pakistan, South India, Central Asia, Southern Spain, the Maghreb and Middle East. Similarly, most countries in the Near East and North Africa suffer from acute water scarcity, as do countries such as

Mexico, Pakistan, South Africa, and large parts of China and India (Nasurullah *et al.,* 2011). Irrigated agriculture, which represents the bulk of the demand for water in these countries, is also usually the first sector affected by water shortage and increased scarcity, resulting in a decreased capacity to maintain per capita food production while meeting water needs for domestic, industrial and environmental purposes. In order to sustain their needs, these countries need to focus on the efficient use of all water sources (ground water, surface water and rainfall) and on water allocation strategies that maximize the economic and social returns to limited water resources, and at the same time enhance the water productivity of all sectors. Pakistan is a country of 180 million people, out of which 98 million depend on agriculture, 50 million lack accesses to safe water and 74 million do not have sanitation facilities. The 90% of agricultural goods are produced in arid and semi-arid areas of Pakistan with the help of irrigation. The country has faced decline in the annual per capita water availability from 5,000 cubic meters in 1951 to 1,090 cubic meters in 2005 (UNDP, 2007). Balochistan is the water scarce province of Pakistan and is facing an unprecedented water shortage, owing to climate change and poor water management, resulting in exploitation of water at a rate faster than its replenishment. Particularly in the upland, the water scarcity problem is even more worrisome as water tables are falling at the rate on average five meter per annum, threatening the viability of agriculture communities (Khair *et al.,* 2010).

Pishin Lora Basin falls in upland of Balochistan, it is a major river basin (16928 sq. km with 10 sub basins) spread over five districts- Pishin, Killa Abdullah, Quetta, Mastung, and Kalat- with a total population of about 1.2 million (Halcrow, 2008). Agriculture, livestock and fruit productions are the major sources of income of the farmers in the basin area.

Most of the irrigation requirement in Pishin Lora Basin is met by minor sources of water like Spring, Kareze, ground water and flood water. Perennial sources are extremely scarce and cannot be relied upon. In the absence of sustainable perennial and surface water supplies there has been increasing dependence on ground water to meet the agriculture and domestic requirements. The scarcity of water resources in Pishin Lora Basin has always remained a problem and water supply position becomes acute during period of low rainfall. Like the rest of the province, drought has taken its toll on the livelihood patterns of the local population due to drying up of the irrigation and potable water resources, surface and ground degradation of range lands, reduction in agriculture production and devastation of economic activities as a whole.

Urbanization, rapid population growth, availability of electricity from the national grid system subsidy on electric tariff of agriculture tubewells, indiscriminate installation of tubewells have been instrumental in over exploitation of groundwater and lowering of water table at an alarming rate. However for understanding the factors causing the water scarcity for agricultural irrigation, there is a lack of studies both at the public and private level. The present study has been carried is an initiative to cover this gap.

MATERIALS AND METHODS

The study was confined to the analyses of water scarcity and its causes in the agriculture production of farmers in Pishin Lora Basin of Balochistan.

Sample Size

The data have been obtained from the respondents (farmers) through a well structured and comprehensive questionnaire. As the aims of the present study was to analyze the causes of water scarcity in agriculture sector of Pishin Lora Basin (PLB), the farming community of the area of PLB has been taken as a target population. PLB is consisting of five districts namely Pishin, Killa Abdullah, Quetta, Mastung and Kalat. The total population in the area of PLB is about 5000 farmers, we have collected data from 300 farmers through stratified random sampling. One hundred and five farmers were interviewed in district Pishin (Pishin district was divided into two areas, 55 farmers were interviewed in Barshore/Karezat tehsil and 50 from Huramzai/Pishin tehsil). Fifty farmers were interviewed in district Killa Abdullah, 55 in district Quetta, 50 in district

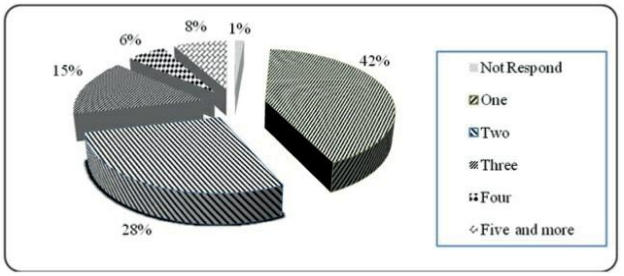
Mastung and 40 farmers were interviewed in district Kalat. Each district was divided in the cluster of union councils. The number of farmers within union council was selected randomly. This strategy gave the spatial coverage of the area.

RESULTS AND DISCUSSION

Factors Causing Water Scarcity in Pishin Lora Basin

Subsidy on Electricity

The federal government in collaboration with provincial government and the Water and Power Development Authority (WAPDA) is providing subsidy on electricity to the agriculture sector of Balochistan. The farmers are allowed to pay a flat rate of Rs. 6000 per month. Whereas, the remaining amounts is shared by the federal, provincial government and WAPDA with ratio of 40%, 30% and 30% respectively (Halcrow, 2008). Although on one side the subsidy has facilitated the farmers in installation of new tubewells and the replacement of diesel operated tubewells to electric tubewells and on other side subsidy played a big role in the inefficient utilization of tubewells for irrigation purpose. However, due to over exploitation of water resources, the water table has declined alarmingly and has led to the scarcity of groundwater resources. Also, another factor responsible for that is mismanagement, unplanned development of deep tubewells with no control over its operation, has led to further decline in water table. During survey, the majority of the farmers blamed the indiscriminate installation of tubewells and over exploitation of groundwater for the water table decline. When the farmers were asked about the running hours of electric tubewells per day, 40% of the respondents replied that they run the electric motors for 12 hours in a day, 33% respondent that 10 hours per day and 27% mentioned 8 hours per day. On average the responses of the farmers showed that they run tubewells for 10 hours per day. The main reason for that is the availability of electricity because of the subsidy providing by the government. The farmers pointed that until the electricity is available they will run the motors. The main reason for that is lack of regulation, the farmers were asked what they think if the government withdraw subsidy on electricity? They replied that they will strike, block the road and will not accept that scheme. When the farmers were asked about the number of tubewells per farmers, the following were the response of the farmers as show in figure below.



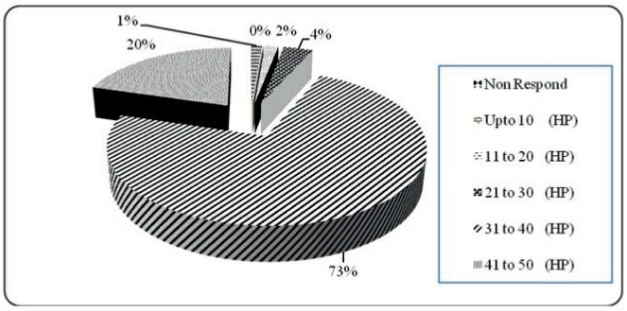
Sources: Field Survey

Figure 1: Percentage of farmers having number of tubewells

Figure 1 showed the responses of the farmers about the number of electric tubewells they are having. 8% of the responses answered that they have five and more tubewells. 6% mentioned four, and 15% said three, 28% pointed out two and 42% replied only one. Only 1% of the respondents did not reply. These results clearly show that on one side majority of the farmers having more tubewells whereas on the other hand a few numbers of the respondents are having only one tubewells. This discrimination in the installation of the tubewells, another major factor caused the overexploitation of groundwater in the area

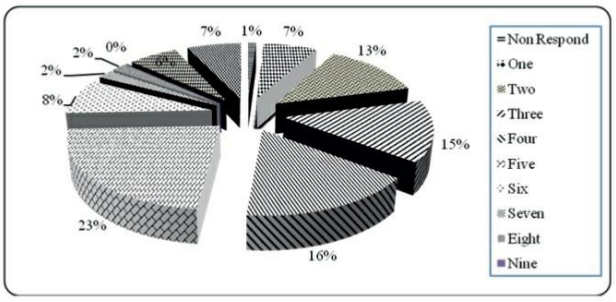
Uncontrolled Installation of Tubewells

During the survey another important thing which has been noted is that in spite of the persistent decline of the water table and groundwater; the farmers are installing additional tubewells for the fulfillment of their agriculture requirements. There is no mechanism for the installation of these electric tubewells. Anyone can drill the boreholes and installed the tubewells anywhere, without any care any kind of standard for the selection of site, proper technique for drilling, material and design. In the past when the water situation was good, the farmers were using 25 HP motors. Now as the water situation is bad majority of the farmers are using 40 HP to 50 HP motors for running their tubewells. When the farmers were asked about the type of tubewells they are using for their irrigation purpose. The following were the responses of the farmers.



Sources: Field Survey
Figure 2: Percentage of farmers having prime mover type of T/W

Figure 2 showed that majority of the farmers using prime mover type of tubewells for irrigation of their fields. 73% of the farmers pointed that they using 31 to 40 HP prime mover type of tubewells. 20% mentioned that 41 to 50 HP prime mover types of tubewells, 4% were having 21 to 30 HP. These results showed that 93% of the farmers were the prime mover amongst the 31 to 50 HP turned to be an important factor causing water scarcity in PLB. In addition, another factor which also contributed to this water scarcity is the large number of tubewells per 1000 square feet. When the farmers were asked about the present installation of tubewells per 1000 square feet, the following responses as per figure 3 were received.



Sources: Field Survey
Figure 3: Percentage of T/W Installation within 1000 Square Feet

Figure 3 shows that 7% farmers replied that there are 7 tubewells within every 1000 square feet, 16% pointed out that 6, 23% respondent that 5, 6% mentioned that 4. These results clearly show that the number of the installation of the tubewells per 1000 square feet is also very high. It has also been noted that no permission is required for the installation of the tubewells because of the lack of proper regularly system both from the federal and provincial government.

Power Related Problems

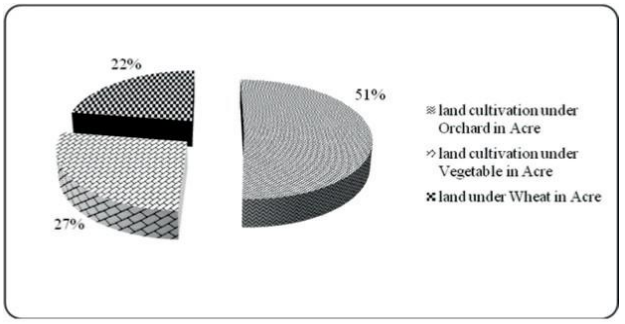
Another cause of the water scarcity in the region is the longer and frequent power breaks, and the electricity low voltage in the area resulting in the power theft, installation of heavy new tubewells to meet their irrigation needs and out of order of the present machineries. When the farmers were asked about whether there is load shedding in their area, out of 300 farmers 291 farmers responded that load shedding take place in their area and 9 farmers do no responded to this to this question.

In addition almost all of the farmers respondent that the voltage fluctuates most of the time which causing the burning of machines. Hence, because of the low voltage and load shedding the water is not available for irrigation. It has also been noted that in the study area where there is more than one feeder for the electricity provision some of the farmers are getting connection from both of the feeders resulting in the shortage of electricity supply for the rest of the people.

Growing High Delta Crops

Due to electrification, increase number of tubewells and improvement in the road transport, the area under high value crops like fruits and vegetables increased tremendously. The area under apples was increased more than any other fruits in Pishin Lora Basin.

As there was a demand in the domestic markets of the country for apples and apples being less perishable than other fruits like apricots, grapes and peaches, therefore farmers preferred growing apples. In response to a question about the cropping pattern in the area, the following responses as per figure 3 received.



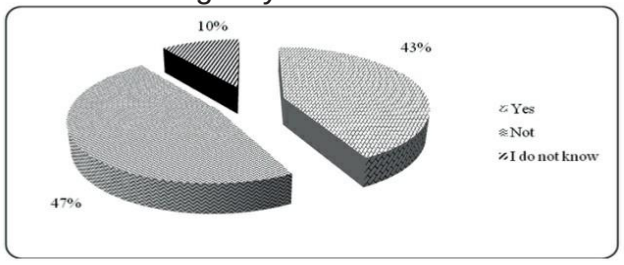
Sources: Field Survey
Figure 4: Cropping pattern of the farmers in PLB

Figure 4 show the cropping pattern of the farmers in the area of PLB. It has been found

out that 51% of the area is used for orchards, 27% of the area is used for the vegetables and 22% area for wheat. In this figure it shows that apples are still the major crop in the area. It is consuming more water than other crops. After the provision of subsidized electricity the area under apple cultivation steadily increased. It has also become the cash crop so the farmers have cultivated it more than other crops. Income from apple orchard is more than the other crops. When the farmers were asked about their income from different type of crops, they responded that 77% income was receiving from orchard, 17% income from vegetable and 6% from wheat. The presence of apples in the area is the main cause of over abstraction of groundwater resources. The water requirement for apple was more than other fruits like grapes, pomegranates, peaches and plums but climatically apple growing was not suitable in area like Pishin Lora Basin having altitude less than 1600m and apple replaced the traditional crops like pomegranates, grapes, plum, peaches and almonds which are climatically suited and adapted to that area like PLB

High Efficiency Irrigation System

High irrigation efficiency system such as sprinkler and trickle irrigation system plays an important role on one side in the irrigation system development and on the other side in the growth of agriculture sector. During the survey it has been observed that the farmers are not receiving any education and training from the agriculture department about the usage of high efficiency irrigation system. Moreover, they are not receiving any information about the innovations and techniques of methods for irrigation and cropping pattern. When the farmers were asked whether they have any awareness about the application of high irrigation efficiency system? The farmers responded in the following way:



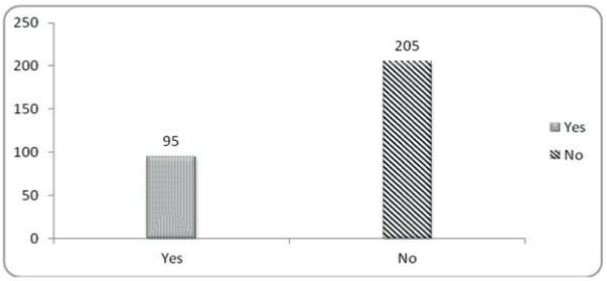
Sources: Field Survey

Figure 5: Farmers perception about high efficiency irrigation system

Figure 5 shows the information about the farmers' perception about the usage of high efficiency irrigation system. Due to lack of awareness about the usage of high efficiency irrigation system, majority of the farmers respondent that the system does not help in the increase of output with the same amount of water. Out of 300 farmers 47% responded that they think high efficiency irrigation system put no impact on their output production. Whereas, 43% of the farmers started that they are in favor of the usage of high efficiency system and it can result in the increase of their output production. Hence the lack of awareness about the high efficiency system is also on of the major factor causing water scarcity in the area of PLB.

Lack of Merit in Government Programme for Water Saving

When the farmers asked about received any technical/material support from development project like Agriculture Extension, Own Form Water Management, and Trickle Irrigation Project from government, following responses as per figure 6 were received.



Sources: Field Survey

Figure 6: Showing the number of farmers provided government support

Out of 300 farmers, 205 stated that they are not receiving any support from the government for the construction of water tanks and pipe line etc. whereas, only 95 farmers mentioned that they are receiving the government support.

CONCLUSION

The main finding of the study is that the current situation of water resources is very scarce in Pishin Lora Basin. The reasons for the water scarcity are installation of new tubewells, running hours of tubewells and water table depletion are found to the key factors led to the shortage water in the study area. Similarly, most of the farmers are having more than one heavy electric tubewells operating it for around 10 hours in

a day were also found to the one of the key reason for the shortage of in the area. Moreover the results also show that most of the farmers were not aware about the modern high efficiency irrigation system led to the mismanagement of water resources in the area. Likewise another important reason for causing of water scarcity in the area was also mentioned by the farmers is the lack of government support.

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