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Research Paper

# Sand mining and its impact on agriculture and ground water depletion in Karnataka- A natural resource economic prospective

■ **P.S. PRASANNAKUMAR, B.V. CHINNAPPA REDDY, P.S. RANJITH KUMAR AND H.S. ROOPA**

See end of the paper for authors' affiliations

Correspondence to :

**P.S. PRASANNAKUMAR**
Department of Agricultural Economics, University of Agricultural Sciences, GKVK, BENGALURU (KARNATAKA) INDIA
Email: shiprasannamk415 @gmail. com

**ABSTRACT :** The study was conducted in Kolar district of Karnataka state in the year 2014, to analyze how sand mining was affecting economic activities of farmers and rural people who are dependent on agricultural land, causing externalities and implications on labour scarcity, ground water depletion, welfare loss and inefficiency. The results of the study clearly indicated that the depth to water in borwells has increased by 64 per cent due to sand mining from 550 feet to 900 feet. These are the prima facie indicators of ground water depletion due to illegal sand mining in the sample villages of Kolar district. The price of agricultural land, before sand mining was around Rs.5 lakhs/acre shot up to 20 lakhs/acre, an whopping 300 per cent. The land price depends on the depth of sand availability, land area, quality of sand, road connectivity and labour availability to excavate sand. An estimated 707 acres of agricultural land valued at Rs. 140 crores were lost due to sand mining in sample villages, rendering them totally unfit for cultivation forever. Neither this land can be cultivated nor used for any other purpose including construction, since these lands are located in far interior and are excavated to depths exceeding 15 to 20 feet. The associated welfare loss due to income, employment, food insecurities will exacerbate the predicament. Hence, the government should make and enforce policies that prohibit sand mining activities on agricultural lands. Village institutions should also be empowered and monitored to implement these policies at local levels.

**KEY WORDS :** Sand mining, Ground water depletion, Village institutions, Filtered sand, Externalities

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## INTRODUCTION

In Karnataka, 64 per cent of the population depends on agriculture for its livelihood and irrigation plays a major role in ensuring agricultural productivity. Among the sources of irrigation, groundwater dominates with around 60 per cent share in the gross irrigated area. Along the riparian areas, sand beds serve as a recharge-augmenting source of groundwater. Sand is accumulated in layers along the river path, due to natural flow of surface water during monsoons. These layers form a spongy surface, which enhances groundwater recharge. Sand mining has two crucial impacts on water supply: first, it inhibits the riverbed's ability to hold groundwater. The recharge of groundwater is directly related to soil type. The fine sand allows water to seep without evaporation. Secondly, it reduces the flow of the water into local tanks. Sand mining effectively lowers the level of the riverbed below the level of the local tanks. (Manjunatha *et al*., 2006).

The sustainable management of groundwater resource lies in matching and maneuvering the recharge and the extraction factors. The primary source of groundwater recharge is rainwater which depends on the soil type, its physical properties, topography, nature of vegetation, etc. Thus, a proper harvesting of rainfall assumes significance in recharging the

groundwater. The surface irrigation sources like rivers, canals and tanks serve as the major secondary sources of groundwater recharge. On the other side, the extraction factors constitute different types of wells and groundwater lifting devices, which cater to the intersectoral water demand (Selvakumar *et al*., 2008).

The disturbances in either the recharge facilitating factors or abstraction factors dislocate the groundwater balance, which leads to externalities. When sand, the source of recharging groundwater body is mined, the groundwater level in the riparian areas declines resulting in increased initial and premature failure of open wells, filter point wells and bore wells. This is leading to additional investment on wells due to reciprocal and intertemporal externality (Hemalatha and Chandrakanth, 2003).

One of the most serious and subtle but ignored negative consequence of sand mining is on ground water recharge and quality as a result of the extraction process because for centuries, humans have been enjoying the natural benefits provided by rivers without understanding much on the river ecosystem, particularly alluvial channels (Nabegu, 2013)

The State government had imposed a ban on sand mining in Kolar district considering the depletion of ground water. However, the sand mining is still rampant in Chikkaballapur, Bagepalli and Mulbagal taluk especially where lakes have dried up. This sand is being loaded on lorries, tractors and is sold at high prices. Illegal sand mining is rampant at historically acclaimed Ranghastala lake bed in Chikkaballapur including the lake at Devareddypalya in Bagepalli. As both the lakes have dried up, it is easy to lift and transport sand (Ghosh and Kumar, 2004).

In Kolar, sand is being lifted along the Kodikannur Tank on the outskirts of the city. Sand is being lifted at Byrakur, K. Bayyapalli and Devarayasamudra villages in Mulbagal taluk. Because of the ban, the price of sand has gone up steeply. An estimated 3500 truckloads of sand are required for Bangalore every day (400 cubic feet each). However, supply of river sand for construction purpose is constrained by natural resource limits. Public unrest among truckers transporting sand has been a regular affair since few years. The sand mining activity at times came to a halt for several weeks, which affects construction and construction workers. It is in order to appreciate the factors which lead to the ban on sand mining through issue of a Governemnt Order (GO) (Singh *et al*., 2007).

The Department of Mines and Geology has booked 270 cases of violation during April, 2013, and collected fines amounting to Rs. 13.81 lakhs. The police booked 324 cases during April and collected fines amounting to Rs. 16.89 lakhs, sizing several vehicles used in transportation of sand. Gowribidanur has been the "hub" of sand mining and contractors have also shifted their base to Kolar, Mulbagal and other taluks in the district. This paper is a modest attempt to highlight as also educate regarding the extent of sand mining in Kolar district as well as its external effects and the role of institutions, markets and technologies are discussed to find solutions for food and economic security of farmers.

## MATERIALS AND METHODS

The study was conducted in Kolar district of Karnataka state in the year 2014. Both primary and secondary data was collected to examine the impact of sand mining on agriculture and ground water depletion. Multistage random sampling method was adopted in selecting the villages based extent of sand mining. In the first stage, 30 villages were selected based on highest area under sand mining based on preliminary survey. In the second stage, 5 farmers from each village were selected. Thus total sample size constitutes 150 farmers. The data was analyzed using simple statistical tools like averages, ratios and percentages and appropriate inferences are drawn from the data.

## RESULTS AND DATA ANALYSIS

The findings of the present study as well as relevant discussion have been presented under the following heads :

**Access to ground water resource for irrigation :**

It was observed that the magnitude of bore well failure which was 28 per cent before sand mining has increased to 60 per cent after sand mining. The magnitude of open well failure which was 25 per cent before sand mining has increased to 100 per cent after sand mining. The depth to water in borwells has increased by 64 per cent due to sand mining from 550 feet to 900 feet (Table 2). These are the prima facie indicators of ground water depletion due to sand mining in the sample villages of Kolar district and the resulting welfare losses in income, employment, food security are yet to be assessed. It is clearly indicated in the Table 3 that the average depth of sand excavation about 22 feet in each village. Further, a total of 179 truck loads of pure sand and 233 truck loads of filtered sand is being transported from 30 sample villages which indicates the magnitude of sand mining in the sample villages.

**Estimated use value of sand mining from agricultural lands :**

The price of sand (of good quality) is Rs. 9000 while that of filtered sand (of poor quality) is Rs. 6000 per truck load. Each truck load has 350 cft and the price or cft of land is Rs. 25.71 for good quality sand and Rs. 17.14 for poor quality sand. Poor quality sand is filtered by filtering the silt /mud in the tank beds. These grains do not have the pores (as in the riverbed sand) and hence do not hold the cement well, hence, the price of filtered sand is lower than sand from agricultural land. The total value of sand extracted is Rs. 19, 35,000 per day from 81,550 cft of sand which is an

**Table 1 : List of current rules and policies in operation related to sand mining**

| Sr. no. | State | Rules and policies and Key features | Key rivers affected |
|---|---|---|---|
| 1 | Kerala | Kerala Protection of River Banks and Regulation of Removal of Sand Act, 2000. To permit sand mining in select areas and each selected area or Kadavu will be managed by a Kadavu Committee which will decide on matters such as quantum of mining to be permitted, and to mobilise local people to oversee these operations and ensure protection of rivers and riverbanks. | Bharatapuzha, Kuttiyadi river, Achankovil, Pampa and Manimala, Periyar, Bhavani, Siruvani, Thuthapuzha, and Chitturpuzha, rivers in the catchments of Ashtamudi and Vembanad lakes |
| 2 | Tamil Nadu | Policy that ensures that quarrying of sand in Government poramboke lands and private patta lands will only be undertaken by the Government. Mechanised sand mining is prohibited. In 2008, this policy was countermanded by the government and private parties were given permits for mining. | Cauvery, Vaigai, Palar, Cheyyar, Araniyar and Kosathalaiyar, Bhavani, Vellar , Vaigai Thamiraparani, Kollidam. oastal districts of Nagapattinam, Tuticorin, Ramanatha-puram and Kanyakumari hill regions of Salem and Erode districts |
| 3 | Karnataka | The Uniform Sand Mining Policy does not allow sand mining in Coastal Regulation Zone (CRZ) area and prohibits the use of machineries to mine sand from river. High Court of Karnataka banned mechanised boats for sand mining in the state from April 2011. From September 2011, according to Karnataka Minor Mineral Concession (Amendment) Rules 2011, the responsibility of oversight of sand mining has been transferred to the Public Works, Ports and Inland Water Transport Department. | Cauvery, Lakshmanateerta, Harangi, Hemavathi, Nethravatai, Papagani |
| 4 | Andhra Pradesh | In 2006, the government brought in a new policy that allows only manual labour and bullocks to mine sand in riverbeds. Bullock carts, mules and other animals would be exempted from any mining tax. Contractors will be allotted sand through open bidding by a committee headed by district joint collectors. Sand can be sold only if it has a maximum retail price tag, otherwise there will be a penalty. Use of poclaines has been banned entirely, and mining will be disallowed below three metres. | Godavari, Tungabhadra, Vamsadhara, Nagavali, Bahuda and Mahendratanaya |
| 5 | Maharashtra | New policy announced in October, 2010, under which It is compulsory for contractors to obtain permission from the Gramsabha, for sand mining. Ban on use of suction pumps in dredging and sand mining licences can be given only through a bidding process. Also sand mining projects have to obtain environmental clearances. | creeks at Thane, Navi Mumbai, Raigad and Ratnagiri |

Source: www.cseindia.org

**Table 2 : Access to ground water resource for irrigation before and after sand mining in sample villages in Kolar district of Karnataka (2014)**

| Particulars | Bore wells | Open wells |
|---|---|---|
| Before Sand Mining | | |
| Functional | 43 | 18 |
| Non Functional | 17 | 06 |
| Overall | 60 | 24 |
| Proportion of bore well failure | 28.33 | 25.00 |
| Depth to water in feet | 400-550 | |
| After Sand mining | | |
| Functional | 68 | All are dried up |
| Non Functional | 120 | All are dried up |
| Overall | 202 | |
| Proportion of bore wells failures | 59.40 | 100% |
| Depth to water in feet | 750-900 | |

indicator of loss of agricultural land and agricultural activities due to sand mining activities (Table 4).

**Rise in price of land due to sand mining :**

Perusal of Table 5 clearly showed that the price of agricultural land before sand mining was around Rs. 5 lakhs/ acre which shot up to 20 lakhs/acre, an whopping 300 per cent. The land price depends on the depth of sand availability, land area, quality of sand, road connectivity and labour availability to excavate sand. An estimated 707 acres of agricultural land valued at Rs. 140 crores are lost due to sand mining in sample villages rendering them totally unfit for cultivation forever. Neither this land can be cultivated nor used for any other purpose including construction, since these lands are located in far interior and are excavated to depths exceeding 15 to 20 feet. The associated welfare loss due to income, employment, food insecurities will exacerbate the predicament.

**Collection of fees by villagers due to deterioration of roads and noise havoc at nights due to sand transporting Lorries :**

About 529 sand trucks transport sand per day and deteriorate roads and the villagers collect around Rs. 9 lakhs per month and use the same for village welfare activities. The villagers have no permission for this type of amount collection. However, there is poor governance and lack of awareness for the village level institutions about the impact of sand mining

**Table 3 : Magnitude of illegal sand mining in sample villages in Kolar district of Karnataka (2014)**

| Sr. no. | Particulars | Units | Average (30 villages) | Total (30 villages) |
|---|---|---|---|---|
| 1. | Depth of excavation | Feet | 22.2 | - |
| 2. | Truck loads of sand excavated and transported per day | Number | 8.95 | 179 |
| 3. | Percentage to total number of truck loads of sand transported per day | Percentage | 2.7 | - |
| 4. | Trucks of Filtered Sand (per day) | Number | 11.65 | 233 |

**Table 4 : Estimated use value of mined sand from agricultural lands in sample villages of Kolar district of Karnataka (2014)**

| Sr. No. | Particulars | Average (30 villages) | Total (30 villages) |
|---|---|---|---|
| 1. | Sand trucks per day | 8.95 | 179 |
| 2. | Price of sand Rs.9000/Truckload | 80550 | 1611000 |
| 3. | Trucks of filtered sand | 2.7 | 54 |
| 4. | Price of filtered sand Rs.6000/ truckloaad | 16200 | 324000 |
| 5. | Total turnover of sand mining (per day) | 96750 | 1935000 |

**Table 5 : Estimation of damage to agricultural land due to illegal sand mining in sample villages in Kolar district of Karnataka (2014)**

| Sr. no. | Particulars | Average (30 villages) | Total (30 villages) |
|---|---|---|---|
| 1. | Depth of excavation (feet) | 22.2 | 444 |
| 2. | Extent of Agricultural Land loss in acres | 35.35 | 707 |
| 3. | Value of land before Sand mining (in lakhs) | 176.75 | 3535 |
| 4. | Value of land for sand extraction (equivalent to the Damage to agriculture) (in lakhs) | 707 | 14140 |

**Table 6 : Collection of fees by villagers due to deterioration of roads in sample villages in Kolar district of Karnataka (2013)**

| Sr. no. | Particulars | Average (10 blocks) | Total (10 blocks) |
|---|---|---|---|
| 1. | No. of sand trucks per day | 52.9 | 529 |
| 2. | Estimated fee amount collected by villagers from sand trucks | 53 | 530 |
| 3. | Fee collection per month (Rs) | 90,990 | 9,09,900 |

**Table 7 : Predicament of illegal sand mining in sample villages in Kolar district of Karnataka (2014)**

| Sr. no. | Particulars | Frequency of responses (n=150) | Percentage | Ranking |
|---|---|---|---|---|
| 1. | Loss of lands | 28 | 19.31 | II |
| 2. | Ground water depletion | 30 | 20.69 | I |
| 3. | Destruction to roads | 18 | 12.41 | V |
| 4. | Land conflicts | 05 | 3.45 | VII |
| 5. | Loss of vegetation | 17 | 11.72 | VI |
| 6. | Destruction of property | 22 | 15.17 | IV |
| 7. | Scarcity of labor to agricultural purposes | 25 | 17.24 | III |
| | Total | 145 | 100.00 | |

on agriculture lands (Table 6).

**Predicament of illegal sand mining :**

It is clear showed from the Table 7 that the farmers indicated ground water depletion is the major problem caused by the sand mining (20.69 %) followed by land loss (19.31%) and scarcity of labor to agricultural purposes (17.24 %).

**Conclusion :**

Sand mining affected the agricultural production, livelihood of farmers and ground water depletion. If sand mining continues for some more years on agricultural lands, the lands would become completely dry and futile for cultivation. Hence, the government should make and enforce policies that prohibit sand mining activities on the agricultural lands. Village institutions should also be empowered and monitored to implement these policies at local levels.

Authors' affiliations:

**B.V. CHINNAPPA REDDY AND H.S. ROOPA,** Department of Agricultural Economics, University of Agricultural Sciences, GKVK, BANGALORE (KARNATAKA) INDIA

**P.S. RANJITH KUMAR,** Department of Agricultural Marketing, Co-operation and Business Management, University of Agricultural Sciences, GKVK, BANGALORE (KARNATAKA) INDIA

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