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BULK EXTRACTION OF RIVERBED MINERALS AND ITS IMPACT ON AGRICULTURAL CULTIVATION

Mr. Tawseef Ahmad Rather

Dr. Jatinder Kumar

Department of Management Studies

Baba Ghulam shah Badshah University, Rajouri-185234

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ABSTRACT

River water is the paramount in comparison to all other needs to exercise on-stream agriculture cultivation. Rivers deliver congenial quality of water which is integral for healthy cultivation, while benefitting the human race with other materials without upshot in overall development is unattainable. Due to blistering construction of roads, railway, and buildings etc. demand ample supply of riverbed minerals triggered the extraction of riverbed minerals at bulk. In fulfilling the demand of riverbed minerals mining mafia turned into myopic mode. They use big extraction machines in extraction process and work chiefly on night basis to rescind government intervention. Adoption of modern technology in extraction process gave birth to many harmful factors which affected on-stream agricultural, aquatic system, river morphology, river beauty and mainly the people who are living nearby the river. In connection with new challenges posed by riverbed mining the present study has made an attempt to analyze the impact of riverbed mining on agricultural productivity. In present study 5 mining hotspot villages have been taken under study under which 100 farmers were selected who do farming on nearby the river purposive sampling method. A well structured schedule was designed for the data collection purpose. After data collection Excel and SPSS software were used for descriptive and inferential analysis. Simple paired t test and ANOVA test were applied to test the hypothesis. The findings of the paper were drastic and needs immediate attention. The over use of technology caused bulk extraction of riverbed minerals which mainly ebb agricultural productivity and also diversify the cultivation practice. The changes occurred in the river morphology has bring a very hard challenge to farmers and has made them handcuffed and difficult to sustain the agriculture practice. The drop in the water level affected farmer's irrigation system and the people who are living nearby river also witnessed fall in the supply of drinking water from their sources especially from their tube wells. The findings of the research foreground the complication and cascading nature of affects of riverbed mining on agricultural, as well as the exactingness and urgency of the challenge. Based on the execrable results found a set of suggestions are listed at the end of the paper to halt and minimize the affect of bulk extraction mining on agricultural productivity.

Key words: Riverbed mining, agricultural productivity, cultivation shifts, river morphology, water level

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1. INTRODUCTION

Rivers play an important in delivering multiple services to mankind in many ways. Agricultural cultivation has the major dependency on river water. Agriculture cultivation practiced nearby the rivers is fully dependent on the river water which is used for the irrigation purpose. Brengi Nala has a huge contribution in providing fresh water to residents for washing, bathing, and drinking in upper areas and solely provides water for irrigating agricultural lands and other vegetation.

People who are doing farming around this river use simple gravity system to irrigate their agricultural fields and on places where water level is down use pump method to lift the water above ground level and then let go the water flow into the fields. Irrigation plays a vital role in increasing the productivity in agriculture (Zeki Bayramoğlu et al, July 2018), as the water proves to be the first input considered while farming practice can be imagined, about half of the earth's land surface is used for agricultural purpose (water encyclopedia, 2021). The river is the main source of water from which farmers make small channels to irrigate the farm lands. The irrigation system and the channel design have been affected due to heavy mining of riverbed minerals. The Jhelum River is unable to cope up with harm caused due to heavy extraction of riverbed minerals and makes the river hard to recover its natural structure. (Imran Khan and Mudasir Ali, 2012).

Riverbed mining is a process of removing riverbed minerals from the river base. These minerals include sand, gravel and boulders. With the intervention of new extracting machines riverbed minerals are loading into trucks, tippers, dumpers at a very fast speed. The heavy extraction of riverbed minerals puts ecosystem in danger. Riverbed mining has a negative impact on agricultural productivity (Fernando M. Arag´on and Juan Pablo Rud, May 2012), the most affected areas contacted by the excessive riverbed mineral extraction are agriculture and Fishers. High demand of riverbed minerals has triggered illegal mining (Nitin Kamboj and Vishal Kambo, 2019) Extractions through machines bring hazardous effects on river morphology and water level. The base of the river acts like home for many species of insects and fishes which are necessary for maintaining aquatic ecosystem. Removal of riverbed minerals make the water flow fast which makes impossible for the aquatic species to breed and flourish their generation.

Unscientific mining: Present scenario in Brengi Nala

Unscientific mining is the practice of extraction of riverbed minerals over the limit or against the geology and mining department guidelines. It's an activity undertaken without the state permission or in the absence of land rights, mining license of exploration .Any activity under these circumstances illegal. Before past few years minerals taken out from the Brengi Nala was quiet moderate as it was not considered good for standard construction and also due to availability of substitute and better quality of riverbed material available at the distance of around 3 kilometers flowing parallel to Brengi Nala which is called Sandran Nala. From the

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decades extraction of sand and bajri was done in Sandran nala only, due to heavy load and demand of riverbed minerals reached its exhausted level and shifted the mining mafia concern over to Brengi Nala. Heavy machines like bulldozers, JCB, Hydraulic excavators etc are used to extract riverbed minerals at a very high speed. The extraction process continuation in Brengi Nala has made severe damages to the river beauty, in-stream agriculture and its aquatic ecosystem system. Urbanization increases the riverbed minerals demand beyond the expectation.

Figure 1: Loading of dumper through heavy excavators in Shichen area

Figure 2: Deep mining decreasing the water level and failing irrigation system

Figure 3: Collection of bajri at bulk for fulfilling upcoming demand while compromising the future generation needs.

Figure 4: A tractor driver hiding while trying not to get Caught red-handed during filed survey.

The demand for construction of Roads, Buildings etc cause high calls of demand for sand, gravel, and boulders which gives ignition to mining mafia for excessive extraction of riverbed minerals. Unscientific mining supplies high volume of riverbed materials which made the river at unstable position. The ecosystem of Brengi nala undergone some adverse challenges from last few years and the consequences can be seen by decline in agriculture practice, inadequate water supply, decreasing water levels etc. In connection with the issue and depth understanding some national and international research studies were reviewed for understanding the problem in depth.

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Literature review

1. **Dr. Angela O Akanwa, April 2020**, this study was conducted to investigate sand mining and its effects on Ulashi River in Anambra state, Nigeria. The researcher used planetary health concept as a lens to examine the effects of sand mining on environment. Reports shows that sand mining has triggered the affected river bank vegetation, erosion, changes on the river system, water quality degradation and lowered riverbed which adversely affected the river and its associated ecosystem.
2. **Nitin Kamboj and Vishal Kamboj, 2019**, this study was carried out in the haridwar district near hotspot mining site in the Ganga river, reports revealed that riverbed mining in in-stream mining has influenced the pattern of river morphology which changed the river into small stream orders .The changed way of river flow has caused destructive damage to aquatic ecosystem and water quality.
3. **Putra Rizal Ichsan Syah, 2018,** Researcher used secondary data and reported that sand and gravel mining cause ecological imbalance and also triggered land use change and land degradation.
4. **Gurrappanidu Govindraj et al, December 2018,** This study was conducted tumkur district in Bangalore city in which 110 samples were taken and interviewed personally. According to the reports continuation of mining will bring irreversible damage to the land at an alarming proportion. Bivariate logit analysis reports that Age, education, proportion of dry land owned and social status have the significant impact of parting agricultural land to sand mining. It also reveals that if mining will not be stopped it will threaten the basic food security to humans and fodder availability to animals.
5. **D. Nukpezah at el, 2017,** this study has investigated small scale mining effects on water quality in Gana from a mining site and a reservoir, where 64 water sample. According to the study results the mining activity has affected water quality. The study also revealed the in mining activity there is a presence of high metal concentration which could become hazardous if not managed.
6. **Dalchand Jhariya and Rubina khan, Feb 2016.** This paper revealed that mining activities caused serious impacts to land degradation, loss of biodiversity, landslides and ground water pollution is one of the significant impacts of mining activity**.**
7. **P.S. PRASANNAKUMAR,2014,**this study was conducted in kolar district of Karnataka with an intention to analyze the effect of mining on economic activities of farmers .The reports clearly depicts that water level in bore well has decreased by 64% due to sand mining in sample villages. Further the researcher mention price hike of agriculture land because of sand mining. The study also revealed sand mining has drastic impacts on income, employment and food security.
8. **Alberto Gonzalez, 2013**, the study was conducted in eastern region of Ghana with an intention to study mining impacts on agricultural lands and food security. According to the results mining has affected the farming areas and left the farming lands at the mercy of

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weather. The study also revealed that mining has left the concerned areas at food insecurity status because of the fact that mining has taken up some farm lands also.

9. **Fernando M. Arag´on and Juan Pablo Rud, May 2012,** analyzed in Ghana to the impact of mining on agricultural productivity. The study reveals that mining activity has a negative impact on agricultural productivity. Further, the study reports the mining is associated with increase in poverty, and many health related problems.
10. **Rajendra Hegde at el, 2008** Analyzed that riverbed mining has uplifted economic conditions and has contributed in employment of the people from one side and soil loss, soil erosion, loss of soil fertility from the other hand. The study recommended comprehensive policy measures to make mining under tolerable range and maintain ecological balance.

2. STATE OF THE PROBLEM

Unscientific and unsystematic mining has negatively impacted the river and its surrounding ecosystem. It is clear from the literature review that beyond the limits mining has drastic effects on aquatic and agricultural cultivation. So I feel urgent need of research to study the impact of illegal mining on agriculture sector.

3. OBJECTIVE OF THE STUDY:

Over the past few years the Brengi-Nala is being harmed considerably by riverbed mining due to high demand of riverbed materials. Such demand is constantly increasing which results into drastic changes like cultivation shift and speedy decrease in agricultural activities around river ecosystem. Due to the continuous problems faced by the farmers around river the following objectives were framed for the present study.

1. To evaluate the impact of riverbed mining on Agricultural production.

2. To study the impact of riverbed mining on Agriculture cultivation shifts.

Hypothesis:

Ho1: There is no significant impact of riverbed mining on agricultural production.
Ho2: Riverbed mining has played no significant role in increasing cultivation shifts.

STUDY AREA AND THE CONTEXT:

Anantnag District is in southern sector of Jhelum Valley. Geographically the district lies between 33o-20′ to 34o-15′ north latitude and 74o-30′ to 75o-35′ east longitude. The present study covers 5 main hotspot villages namely Hiller, Dehruna, Larkipora, Fatehpora, Schen,

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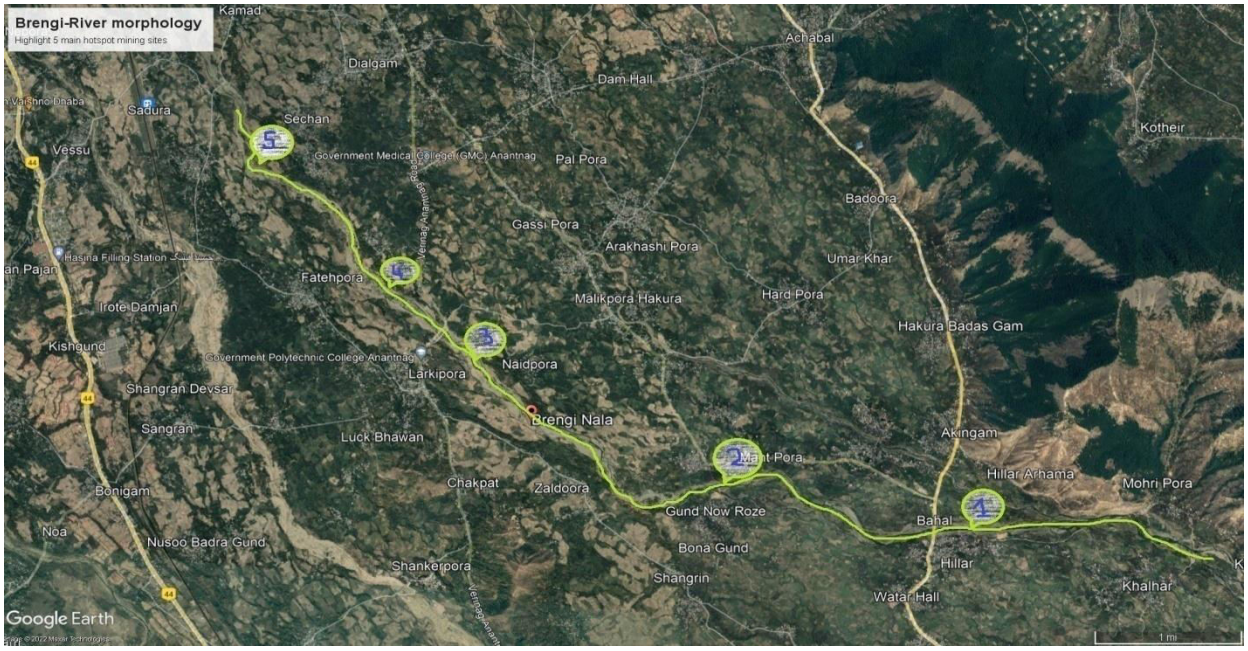

in orders to provide overall geographical view Google earth has been used to view the overall coverage and graphics of the studied areas.

5. DATA AND METHODOLOGY

The primary purpose of this study is to investigate the impact of Riverbed mining on farming around river ecosystem. The study emphases on analyzing the riverbed mining on 5 most nominated villages whereby extraction of riverbed minerals is hammered. The data used for analysis is primary in nature based on purposive sampling method, 20 active farmers were selected from each village around the river ecosystem. The required information was collected through well designed interview scheduled. The data has been analyzed through SPSS software for inferential and excel for descriptive statistics to study the impact of riverbed mining on agricultural sector.

6. Analysis and interpretation:

Agricultural Land holding:

Mostly small ownership of agricultural land were seen in all the villages in which people who are living under below poverty level hardly make both end meals. It has been observed that small farmers are highly affected by riverbed mining because of the fact that they have hardly any

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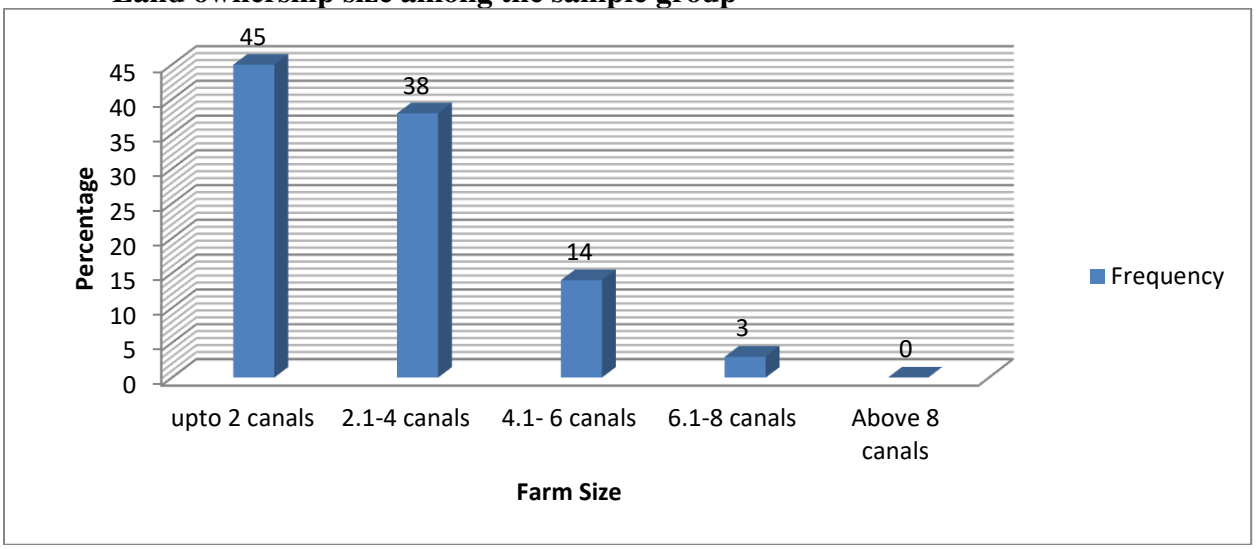
other source of income to bear expenses. As per the data around 3% of the respondents have major ownership of land.

Fig 1.1

Land ownership size among the sample group



Majority 45% of the respondents have land ownership size up to 2 canals and 38% of the respondents have 2.1 to 4 canals while 14% have land ownership size ranges from 4.1 to 6 canals .Very less frequency 3 % of the respondents have 6.1 to 8 canals of agricultural land .

Table No. 1.1

Factors affected after observing bulk extraction of riverbed mining:

Pairs	Factors	Mean	Difference	Std. Deviation
P1	CPB	3.04	-0.84	0.196
	CPA	2.2		1.2878
P2	WAB	4.13	-1.59	0.960383
	WAA	2.54		6273
P3	SFB	3.34	-1.15	0.4761
	SFA	2.19		0.9608
P4	CHB	3.47	-0.93	1.16736
	CHA	2.54		0.8694

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P5	SEB	2	-0.69	0
	SEA	1.31		0.4682

Number of Crop produce before/after (CPB/A)* Irrigation water availability before/after (WAB/A)* Soil fertility before/after (SFB/A)* Overall crop health before/after (CHB/A)* Soil erosion before/after (SEB/A)*

Source: Field survey

In the above table 1.2, the mean value of total number of crop produced decreased from the 3.04 to 2.2 with a decrease of -0.84 .Water availability has also been affected which reports decrease in the mean value from 4.13 to 2.54 which shows a difference mean value of -1.59. Similarly soil fertility has also shown considerable decline from the mean value of 3.34 to 2.17, which shows of negative mean difference of -1.15. Crop overall health has also been affected which declined from mean value of 3.47 to 2.54 a mean difference of -0.93. Soil erosion has been also triggered due to riverbed mining which brings mean value of soil erosion from 2 to 1.31 a negative difference of 0.69.

Impact of riverbed mining on agricultural productivity

Table No. 1.2

Impact of Riverbed mining on agricultural Productivity

Agri-land ownership size	TFP before	TFP After	Difference	% change
Up to 2 canals	1.032967	0.555556	-0.47741	-46.2175
2.1-4 canals	0.830986	0.616438	-0.21455	-25.8184
4.1- 6 canals	0.819672	0.612903	-0.20677	-25.2258
6.1-8 canals	1.25	0.923077	-0.32692	-26.1538
Above 8 canals	0.00	0.00	0.00	0.00
Total	0.905229	0.610932	-0.2943	-32.51

Source: Field Survey

Fig. 2.1

Impact of Riverbed mining on agricultural Productivity

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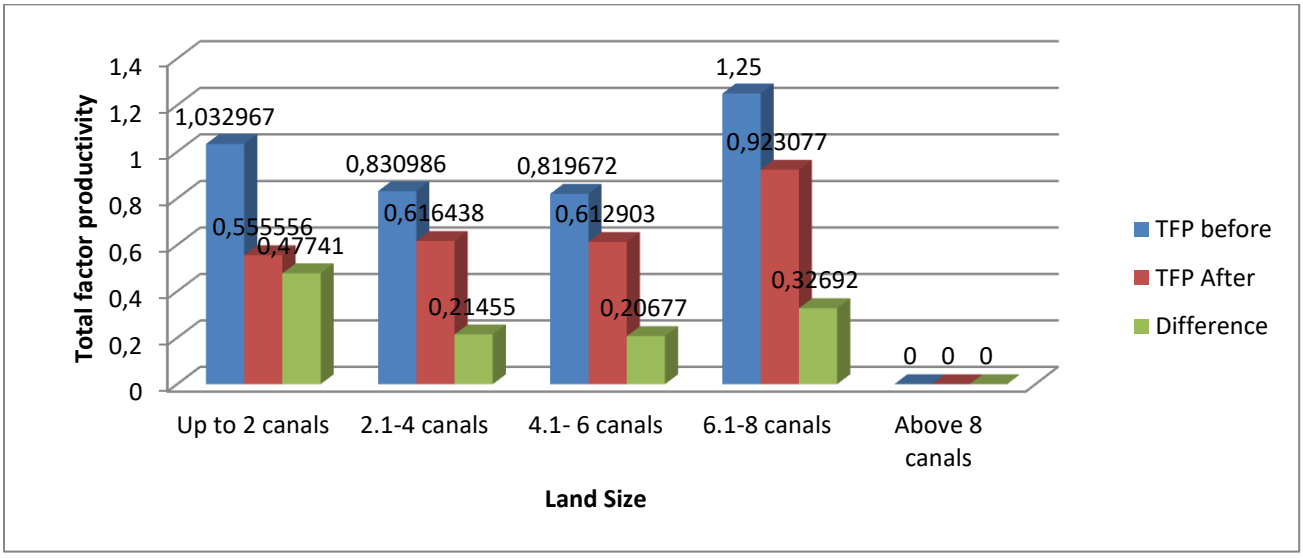

It can be seen from the above table that the total factor productivity among farmers had been decreased from (0.9052) to (0.6109) in the period of before and after observing riverbed mining. Farmers whose landholding size ranges up to 2 canals show higher decrease in their annual productivity which is (0.477) whereas, farmers whose landholding size ranges from 2.1 to 4 canals report (0.214) decrease in their annual productivity. Farmers whose land holding size ranges from 4.1 to 6 canals reports (0.206), (0.326) decrease in the productivity were associated with the farmers whose landholding size ranges from 6.1 to 8 canals.

Hypothesis:

H0:μ1= μ2 There is no significant impact of riverbed mining on agricultural productivity.

Ha: μ1= μ2 There is a significant impact of riverbed mining on agricultural productivity

Table No. 1.3

Paired Samples Statistics				
	Mean	N	Std. Deviation	Std. Error Mean
Agricultural productivity before observing riverbed mining	2.7700	100	.89730	.08973
Agricultural productivity after observing riverbed mining	1.9000	100	1.06837	.10684

Source: field survey

Agricultural productivity has been declined after observation of riverbed mining through heavy excavator machines. In the above table we can see the mean value of agricultural productivity is

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2.7700 and after observing riverbed mining is 1.900, which shows a decline of mean difference of - 0.87 decline of overall mean value of agricultural productivity.

Table No. 1.4

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	Agricultural productivity before & Agricultural productivity after observing riverbed mining	100	.903	.000

The factors before observation of riverbed mining and the factor after observation of riverbed mining has a close correlation 0.903 which is close to one, we can say that there is high correlation between the variables.

Table No. 1.5

Paired Samples Test

		Paired Differences					t	Df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Agricultural productivity before observing riverbed mining Agricultural productivity after observing riverbed mining	.87000	.46395	.04640	.77794	.96206	18.752	99	.000

In the above table the column labeled “t” is the calculated t statistics from the data and the column “df” is the degree of freedom associated with the t statistic. The degree of freedom is calculated by subtracting 1 from the total number of observation which is 100-1=99.The last column of the table is two tailed significance of the calculated t-ratio which is referred to as the p-value.

The value of t for the degrees of freedom 99 at 5% level of significance is 1.990. Calculated value of t is 18.752, which is greater than table value (1.990). So we reject the null hypothesis

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and conclude that riverbed mining play a significant role in decreasing agricultural productivity. Riverbed mining and agricultural productivity are not interdependent. Hence the hypothesis '*Riverbed mining has played a significant role in decreasing agricultural productivity'*.

Impact of riverbed mining on Agriculture cultivation shifts:

Agricultural shifts has been a serious issue for the agricultural development sector, it also creates imbalance in the agricultural environment .From the past several years' agricultural shifts has been made a drastic change in land occupation under the agriculture activities.

Table No. 1.6

Switched Cultivation

	Observed N	Expected N	Residual
Yes	64	50.0	14.0
No	36	50.0	-14.0
Total	100		

From the above table 64 % of the farmers who does farming on the banks of Brengi Nala have switched their crop cultivation, remaining 36 % of farmers have showed stability while maintaining the same crop cultivation.

Table No. 1.7

Main reason of changing/switching cultivation

Reasons to change	Observed N	Expected N	Residual
No change	18	21.33	-3.33
Riverbed Mining	42	21.33	20.91
Other	4	21.33	-17.33
Total	64		

In the above table farmers who have not changed /shifted their cultivation were 28.12 % and the farmers who have shifted their cultivation due after observing riverbed mining were 65.62 % and farmers who have other reason like risk of flood, water availability, low income from previous crop cultivation etc. are 6.25 %. The majority of the farmers have claimed that the cultivation shift has been done due to riverbed mining observed nearby agricultural fields.

Crop cultivation before /after riverbed mining observation in Brengi nala

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From last 3 to 4 years excessive riverbed mining has triggered many factors which creates challenges to farmers and also forced them to switch their crop cultivation.

Table No. 1.8

Cultivation before observing riverbed mining in Brengi-Nala

Crop	Frequency	Percent
Both Rabi and Kharif	96	96.0
Apple and other fruit cultivation	4	4.0
Total	100	100.0

Source: Field Survey

In the above table the table depicts that 96 % of the farmers around Brengi-Nala ecosystem cultivate Rabi and Kharif crops and only 4 % of the farmers cultivate apple and other fruit production.

Cultivation after observing riverbed mining in Brengi-Nala

Cultivation	Frequency	Percent
Rabi Crops	51	51.0
Kharif Crop	1	1.0
Rabi and Kharif	25	25.0
Apple and other fruit cultivation	23	23.0
Total	100	100.0

Source: Field Survey

From the above table its clearly mention that 51 % of the farmers are able to cultivate only Rabi and 25 % of the farmers are able to cultivate both Rabi and Kharif crops whereas, only 1% of the farmers are able to cultivate only Kharif crops. Farmers who do apple and other fruit cultivation were 23 %.

Hypothesis:

H0:μ1= μ2 Riverbed mining has played no significant role in increasing cultivation shifts.

Ha: μ1= μ2 Riverbed mining has played a significant in increasing cultivation shifts.

Table No. 1.10

ANOVA

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Cultivation Shifts after observing riverbed mining

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	15.267	2	7.634	95.264	.000
Within Groups	7.773	97	.080		
Total	23.040	99			

In the above ANOVA table we can clearly see that the F calculated value is 95.264 which is greater than the table value of 19.00 at the significance level of 0.05 %. The significance value (p value) is below than the alpha value of 0.05 %. So we reject the null hypothesis and accept that alternate hypothesis that *Riverbed mining has played a significant in increasing cultivation shifts.*

7. Conclusion and recommendations:

Agricultural productivity

Agricultural productivity is necessary to sustain the practice, decreasing the mean value of agricultural productivity from 2.770 to 1.9000 is significantly high. Riverbed mining is one way necessary for the development of roads, railways, building etc but if extraction is limitless than it shows its bad impacts in one way or the other way. Villages that have agricultural property on the banks of river are facing many problems and recorded disturbance while continuation of agricultural practice. Farmers are facing water deficiency and soil erosion threats due to unprotected boundaries which were destroyed by heavy excavator machines. Rice and mustard cultivation was quiet high around the banks of the rivers before observation of riverbed mining in the Brengi-nala but after initiation of riverbed mining farmers were compelled to shift their cultivation to other alternatives which will create a imbalance in future.

Cultivation Shifts

Riverbed mining has played an active role in cultivation shifts, which were witnessed in the affected area in a drastic speed. Around 65.62 % of the farmers switched cultivation due to many reasons. One of the main reason for triggering cultivation shifts is riverbed mining, it directly attacks the input sources needed for cultivation purpose. Decreasing water level has highly affected the farmers to grow crops which require less water. After observing riverbed

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mining apple cultivation becomes common practice around the river ecosystem, decreasing water level becomes beneficial for many landlords.

Agriculture cultivation is not done for the rice consumption purpose only, it is because it has vital benefits associated with it. The rice /maize/wheat/muturd cultivation provides necessary outputs for the feeding the live stock besides the satisfaction of primary food need of humans. If riverbed mining was done at bulk, it will show speedy growth in cultivation shifts and agricultural imbalance scenario in future.

In connection with minimizing the impact of riverbed mining on agricultural productivity and cultivation shifts. The following points can be used to halt and neutralize illegal mining.

1. Route entrance: The efficient control over the illegal mining can be achieved through establishing supervision shed at entrances where from vehicles get into river channels.
2. Government intervention: Without active participation of government officials control the mining mafia is impossible. Notices should be published for breaking the geology and mining department rules and fines, imprisonment threats should be given.
3. Autonomous control: Government should not privatize the mining, it becomes less controllable when business person got the right to do mining. In the view of making more and more profit situation of the river ecosystem and its associated gets worsen.
4. Awareness programme: Farmers who convert/ sell their land for some amount of money shall be given awareness about the future dependency and uncertainty which could be faced.
5. Inter-department collaboration: Agriculture and geology department shall show collaboration in dealing the threat of illegal mining posed challenge to both the departments.

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