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ASSESSMENT OF WATER AND LAND USE PRACTICES AMONG SMALL HOLDERS OF LABPUR AND NANOOR C.D. BLOCKS, BIRBHUM DISTRICT

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I. Abstract

Resource development, management and governance are crucial components which raise the productivity, protection and institutional arrangements to guide resource management. The practices of land and water Focus on water harvesting and soil conservation which state three objectives (Kerr, 2007): conservation and strengthen the natural resource base, make agriculture and other natural resource-based activities more productive, and rural livelihoods to alleviate poverty. In seasonally dry areas where water and land use practices focus on water harvesting, the natural resource base in question generally includes soil, water, agricultural land, pastures and forests. Steps to strengthen one of these natural resources inevitably affect others and the livelihoods that depend on them. The present paper has made an attempt to examine the different dimensions of the role of micro-level environment elements to sustain the livelihoods of small and marginal farmers. The objective of the paper is to examine the effectiveness of land and water use practices of small marginal farmers and to understand the livelihood security under the existing water and land use practices. The paper is based on a field based study done during 2022 in two community development blocks viz. Labpur and Illambazar of Birbhum District of West Bengal. Water and land use practices in the two community development blocks is to bring together the various dimensions of natural resources development under an overarching perspective of equitable, productive and sustainable development. These local level practices in tune to climate change and locally available resource base are desirable where micro-environment element interventions are more suitable to meet climate change effects at local level.

Key words: water and land use, natural resource base, sustainable development, small and marginal farmers

II. Introduction

The successful water and land use practices face socio-economic challenges across India in recent past. In more cases, benefits are incremental and gradual. Most of the interventions across India with less visible connection between investments made and benefits realized organizational challenges become more apparent (Kerr, 2002). The major challenges to water and land use practices is that its costs and benefits are distributed unevenly. Uneven impact result from spatial variation and multiple conflicting uses of natural resources. The conflict between using upper reaches of catchment area for grazing and protecting them for regeneration to support downstream irrigation is good example (Kerr, 2007). There are two categories i.e. farmers who get immediate benefits through the interventions and the those who receive benefits gradually in long term. Generally, the poor small and marginal farmers who highly depend on natural resources for their livelihood wait for incremental benefits for years. There is a need to create mechanisms to encourage natural resource utilization consistent with the common good. More so the actions of micro-level environment elements play a crucial role to mitigate and sustain the livelihood of the rural poor. Water and land use related and watershed projects may be exacerbating precisely the water shortage they aim at to overcome. At the macro watershed level covering many villages document cases where water harvesting in upper watersheds reduced water availability downstream (Batchelor et.al., 2003). Calder et.al. (2006) refers to this as 'catchment closure', where water

harvesting upstream concentrates groundwater locally and then intensive pumping exhausts the shallow aquifer. The water and land use practices prevents both surface runoff and groundwater from moving naturally downstream. It suggests two perverse project outcomes: first, what is good for one micro watershed can be bad for others downstream and second, what is good for a watershed in the short term can be bad in thew long term. More so, at village level electricity shortage is common or sometimes to run pump is free and subject to a low flat fee in others allowing pump owners to draw unlimited water without affecting their costs. It causes the objective of drinking water availability in these fragile resource regions in the long-run. In addition, whoever pumps water first owns it, (Singh, 1992) and this encourages over pumping. Uncertainty and misunderstanding about technical watershed relationships, combined with the uneven distribution of benefits and costs of management, create severe challenges to manage water and land use practices. This raises question about what really can be expected as a strategy for transforming rural natural resources and livelihood of the small and marginal farmers.

III. Location and extent of the study area

Labpur block is community development block of Birbhum District of west Bengal. The study area is located in between $23^0$46'north to $23^0$50'north latitudes and $87^0$44'east to $87^0$50' east longitudes. Labpur is a part of the Rarh Bengal. The average elevation of the place is 35 metres. Administratively the block falls under the Bolpur Sub-Division. There are eleven Gram Panchayets (GPs) namely, Hatia, Indus, Bipratikuri, Chauhatta-I, Chauhatta-II, Labpur-I, Labpur-II, Jamna, Kurnahar, Thiba, Dwarka in Labpur Block. The total population of the block is 176,803 (Census, 2001). On its north-eastern side lies Murshidabad District and south-eastern side lies Burdwan District (figure- 1).

Illambazar Block is a Community Development Block of Birbhum District of West Bengal. The study area is located in between $23^0$33'00" north to $23^0$51'00"north latitudes and $87^0$21'00"east to $87^0$33'00"east longitudes. Administratively the block falls under the Bolpur Sub-Division. There are nine Gram Panchayets (GPs) namely, Batikar, Mongaldihi, Dahrampur, Bilati, Nanasole, Illambazar, Ghurisha, Joydev-Kenduli and Sirsha. The southern boundary is demarcated by the Ajoy River which runs as the boundary line between the study area and the Burdwan District (figure- 1).

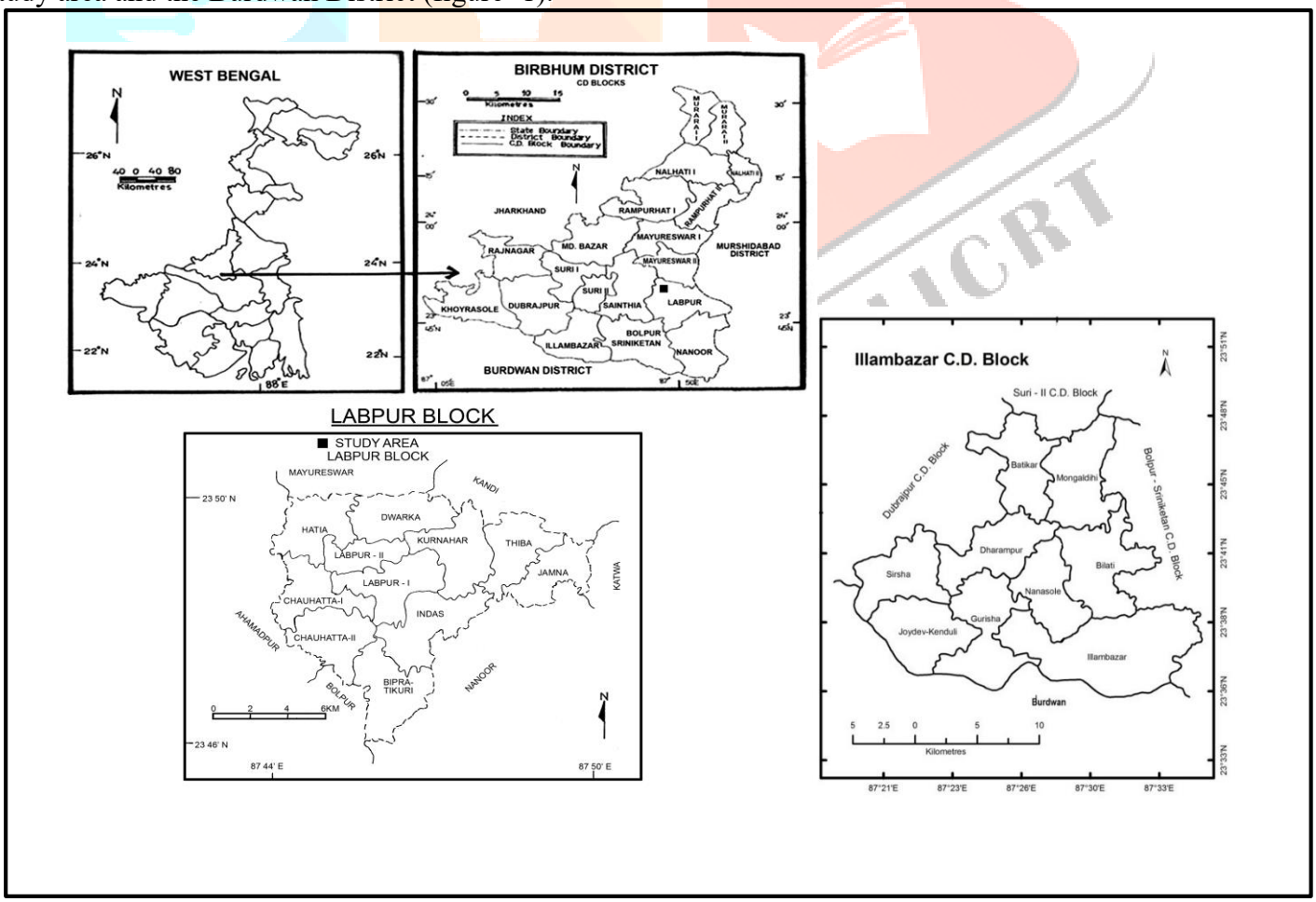

Fig.1

IV. Methods used

Based on the secondary data one rainfed district was selected from the state. The data are collected at two levels, primary and secondary. The primary data are collected at village household level through structured questionnaire. From the selected district, the study has identified two rainfed community development blocks viz. Labpur and Illambazar of Birbhum District, West Bengal. Based on same criteria from each C.D. Block two villages (Mouzas) are selected. The sample size was twelve where four small and eight marginal farmers households were taken from each village. In order to identify the intensity of participation and assess the impact of different water and land use patterns, land relationships, property right regime, poverty and livelihoods, a set of indicators are developed. The sample size is representative which covers marginal and small farmers as well as economic and social status and also includes participating and non-participating households (Table 1).

Table 1 Sample design

Name of the State	Name of the District	Block	Sample Villages (Mouzas)	No. of Sample Respondents
West Bengal	Birbhum	1. Labpur	I. Indas	12
			II. Thiba	12
		2. Illambazar	III. Mongaldihi	12
			IV. Joydev-Kenduli	12

Source: Primary Survey,2022

V. Physical characteristics of sample villages

The rainfall characteristics have liked an average annual rainfall, average number of rainy days and number of drought years in all four sample villages. The average annual rainfall and average number of rainy days is quite high in the study area. Run-off is assumed to be around 25-30 percent of the run-off producing precipitation due to a part of the watershed falling in the slope of 1.5 percent to 5 percent. The rainfall pattern also reveals that the average number of drought years is nominal in the study area. Due to the occurrences of these drought years crops suffer from severe moisture stress. The potential evapo-transpiration as well as the precipitation from these data reveal a possible crop-growing mid-April to third week of October and first week of November to last week of February. Thus, water is the major constraint in increasing and stabilizing agricultural production in these sample areas. The water and land use practices adapted in these areas provides for proper management of all the precipitation by way of collection, storage and utilization of run-off rainwater as also the use of groundwater in view of type of soil and potential for groundwater recharge.

VI. Traditional/institutional conservation practices in sample villages

In almost all the sample villages, the data reveal that both the practices of traditional as well as modern have taken up. In the arable land farm ponds are prominent where ground water recharges and come up irrigation is possible (Table 2). Considerable initiations such as renovation of traditional water bodies like ponds are also taken up in the sample villages. The water and land use practices of different re-harvesting mechanisms namely, tanks, farm ponds, contour bunds and structures such as furrows and surface detention have been taken in these villages. The other activities performed in non-arable lands are mostly agri-horticulture type of interventions, vegetative barriers and other plantations. These are the interventions where livelihood opportunities for landless and poor farmers involved much more. This intervention is crucial where creation of non-land based opportunities for poor people in the study area. The source-wise quality and quantity of water availability in the sample villages is also seen in Table 2. The source of drinking water as well as irrigation purpose water in the sample villages are open wells, bore wells and traditional water bodies like tanks, ponds and river. The quantity as well as quality of water is reported to be partial satisfactory and it varies from village to village.

Table: 2 Traditional/institutional conservation practices of water and land use in sample villages

Arable Land	Non-Arable Land	Water Resources	
		Quantity (Open Wells, Bore Wells, Tanks, Ponds)	Quality
Renovation of tanks, farm ponds, field bunds	Horticulture development, pasture development	112	Partial satisfactory

Source: Primary Survey,2022

Community based resource management or co- management between communities, group and among individuals and governments is the key area where management of land and water practices reflects its effectiveness. The nature of technology in tune to development and management of land and water resources and biomass reflects positive in almost all the sample villages (Table 2). The level of technology adaptation, proper water and land use systems and its effects more positive. The watershed management policies that relied mostly on traditional water and land rights were no longer appropriate as water demand and conflicts increased. However, stringent efforts were made by village institutions at gram panchayat level and proper regulations at village level over natural resources are effectively managed. The type of technology and proper use of water and land use practices in four sample villages reveal that there is close correlation with location-specific as well as local cultures, size and homogeneousness of the community.

Table 3 Nature of technology in management of natural resources

Soil Conservation		Technology Adopted		Transfer of Management Skills		Proper Land Use Systems		Effects	
Traditional	Institutional	Traditional	Institutional	Positive	Negative	Yes	No	Positive	Negative
7 (58.3%)	5 (41.7%)	8 (66.7%)	4 (33.3%)	5 (41.7%)	7 (58.3%)	7 (58.3%)	5 (41.7%)	9 (75%)	3 (25%)

Source: Primary Survey,2022

Intervention through the agri-horticulture model

The farmers planted horticulture seedlings of their small holdings and developed their lands as agri-horticulturte model. These farmers used to cultivate vegetables and rainfed paddy every year. The soil type in their farm has varied in nature. They themselves made available to the farm yard manure and fill the pit and then planted the seedlings during June, September and October immediately after the first rain. Further they were also cultivating vegetables along with paddy.

Water harvesting structures by user groups

While taking up the information of farm pond, the gram panchayat persuaded the people to prepare to construct farm ponds in the farmers' as well as user groups' fields. Being other farmers are very small category, they could not able to spare the lands for construction of farm ponds. Hence some of the sample villages it is observed that the farmers agreed to spare some area for construction of farm pond. Based on the soil type of the area and siltation rate the information of farm ponds are designed so by the farmers themselves with the help of gram panchayat members in the watershed area. User groups have desilted and deepened the soil whenever siltation occurs and made bunds along the periphery of the ponds to hold more water during rainy days.

VII. Awareness

The awareness regarding the water and land conservation practices is quite high among the communities. It is mainly spread among the farmers. It is observed through the field study that the awareness level of household in the sample villages about purpose of Institution, role of Institution, effectiveness of institution, problem associated with the institution, fund availability and relationship with the village panchayat and other institutions (Table 4).

Table: 4 Opinion of the existing institution and its role in different practices of water and land

Purpose of the institution		Role of the institution		Effectiveness the institution			Problem associates with the institution			Fund availability		Suggestions for improvement			Relation with the village panchayat		Other formal/informal institution	
Clear	Partial	Aware	Not aware	Can't say	Very effective	Not effective	No problem	Minor Problems	Not responded	Sufficient	Insufficient	Proper repair	Devolution of power	Revenue related solutions	Satisfactory	Not Satisfactory	Satisfactory	Not Satisfactory
8 (66.66)	4 (33.33)	8 (66.66)	4 (33.33)	2 (16.7)	8 (66.7)	2 (16.7)	00 (00)	10 (83.3)	2 (16.7)	00 (00)	12 (100)	5 (41.66)	5 (41.66)	2 (16.7)	10 (83.3)	2 (16.7)	7 (58.33)	5 (41.66)

Source: Primary Survey,2022

VIII. Alternative practices required

The first alternative practice is risk management and asset building. Small and marginal farmers have limited tools with which to manage the high risks associated with the impact of greater climate variability on production systems. Small and marginal farmers can have the alternative choice is hedging production choices to manage these risks i.e. farmers are responding to increasingly unpredictable rainfall by dividing their rice plots: on one half, using conventional wet-paddy rice techniques which is resistant to heavy precipitation and, on the other half, applying a system of rice intensification requiring much less water.

The second alternative practice is improved access to markets can substantially increase returns to poor producers, reducing poverty and enabling more sustainable production. Valu-added practices such as improved primary processing, drying, storage and sorting or grading will often increase economic returns to agriculture, livestock, fisheries and forestry activities. Improving linkages to markets through creating economies of scale by linking small and marginal farmers and improving transport facilities will also facilitate the poor farmers.

The thirds alternative practice is information, education and campaign activities using accessible media such as community radio or local events.

The fourth alternative practice is participatory community-based management of common pool resources is how to link knowledge and perceptions with scientific assessments.

IX. Impact and livelihood strategy

Changes in area and irrigated crops

The initiation of water and land use practices has late to significant changes in the additional area brought under cultivation, which is the prime impact for bringing changes in crop production diversification. It is observed that proportion of area under different crops has increased across sample villages. Despite the increase in area, there also substantial shifts in cropping pattern in terms of new crops have been taken place though there were changes in the area allocations towards different crops. There are cases where farmers have shifted to Horticulture vegetables crops in specially in some of sample village households of the study area. Though there are substantial shifts in cropping pattern, land productivity has increased considerably.

Table: 5 Changes in area and irrigated crops

Changes in area and irrigated crops	Paddy cultivation	
	Before	After
Area under different crops (in bigha/acre)	170	222
% change	30.6	
Area irrigated (in bigha/acre)	95	185
% change	94.7	
Average productivity (in qtls. Per acre)	9.0	12.0
% change	33.33	
Cost of cultivation (per bigha/acre Rs.)	3550	4275
% change	20.4	
Annual average income (per bigha/acre Rs.)	7900	10000
% change	26.5	

Source: Primary Survey,2022

Drinking water

One of the important environmental impacts expected from any reform are the improvement in and accessibility of drinking water facility. In the recent past, the prevailing drought conditions have negatively impacted on environment such as decline of livestock population, depletion of fodder availability and fuel and also depletion of groundwater as well as drinking water. The study examined the impact in terms of availability of drinking water. Improvement in groundwater table will ease the drinking water problems. A major impact of this would be on the sources of drinking water, depth of water and time is spent on fetching water. As far as the sources of drinking water are concerned, the number of sources such as open wells and tanks has come down drastically while public taps and tubewells increased in different locations. Accessing the public taps and tubewells is one way of going for safe drinking water, but the concern here is depletion of groundwater though it is not unique to the sample villages (Table 6).

Table 6 Status of drinking water

Drinking water sources	Paddy cultivation	
	Before	After
Nos of public taps- hand pumps, tubewells and borewells	06	14
% change	33.3	
Quality of water (Lt./Day/hh)	06	8.5
% change	41.7	
Time spent in fetching drinking water (hrs./Day/hh)	0.8	0.4
% change	-50	
Depth of water table (in ft.)	158	120
% change	-24.1	

(-) sign indicates positive effect
Source: Primary Survey,2022

Impact on groundwater is the major positive externality of and water and land use practices. The major outcome expected is to have one of the prime objectives a positive impact on groundwater availability. This study examined the impact in terms of drinking water availability. Improvement in groundwater table situation will ease the drinking water problems. Taking the before and after scenarios, as sources of drinking water for beneficiary sample households within the watershed area use of drinking water has increased in the villages after the advent of watershed. Along with the increase in the quality consumed, the time is spent on fetching water has gone down in four sample villages. This indicates substantial improvement in the drinking water situation. The data reveals that in all the water shades the economic as well as social class wise household owns a well (open/ bore well) indicating the uneven distribution of access to irrigation water. In most of the cases it is the medium and large farmers own majority of the wells. The number of wells and by an increase in the water table are given a clear sign of practices of land and water and biomass initiated by the villagers. The effects of these practices influence positively and the number of people below poverty line reduced significantly. This in turn affect on their asset generation like increase of pacca houses and houses got electrified significantly. Goods and devices traded by the people in the sample villages increased, agricultural products and dairy products marketed by the villages

after initiation of these land and water use practices in these villages. The effect is positive where subsistence level of agriculture has diversified into some sort of healthy way of commercialisation agriculture and other related dairy development activities.

changes in occupation structure

Emergence of new occupations and establishment of livelihoods is visible in almost all sample villages, but varied in nature (Table 7). These impact mainly because of collective action of different stakeholders and the initiations of land and water use practices at micro environment locations. Though the initiations are small, but these are all sustainable in nature. The size of the intervention and group dynamics also causes positive impact on the livelihood securities almost all the sample villages. The data reveal that the new occupation and livelihood increase range between 75% to 83%. Self- consumption of agricultural and dairy development inputs to market oriented sale of agricultural, dairy related products has increased. Significant impact has also same through our study that the status of wage labour increased. Migration status has marginalised where dependency ratio decreased to some extent due to the initiation of water and land use practices have taken collectively in the sample villages.

Table: 7 Water and land use practices and effects on new occupation and livelihood

New Occupation and Livelihood		Diversification of Farming		Co-Agricultural Activities		Status of Wage Labour		Migration Status	
Increase	No Increase	Self-Consumption	Sale	Improved	No Change	Increased	No Change	Dependency Decreased	No Change
9 (75.0)	3 (25.0)	5 (41.7)	7 (58.3)	8 (66.7)	4 (33.3)	4 (33.3)	8 (66.7)	6 (50.0)	6 (50.0)

Source: Primary Survey,2022

Changes in the poverty and income

Increase of income from different sources of agriculture, livestock, horticulture, labour have established significantly in almost all the sample villages. The study has worked out poverty and income levels social class twice both in numbers as well as their average income per family per annum. Impact of household income due to water and land use practices collectively can be attributed to number of factors. Some of them include cropping pattern, animal husbandry and employment diversification. Cropping pattern in turn is governed by involvement of risk and prices of different crops in the market. Animal husbandry is an alternative livelihood of the farmers. The agriculture is the dominant source of income, followed by livestock. The relative shares of income have positively changed after the introduction of different practices not only from agriculture, livestock and horticulture but also from labour in different locations of farmers. The percentage decrease of poverty before and after scenario shows that there is significant impact among different section of people social class wise in all sample households (Table 8).

Table: 8 Water and Land Use Practices: Effects on Poverty

No. of households below poverty line		No. of households with pucca houses		No. of households electrified		Goods and services traded by the people	
Before	After	Before	After	Before	After	Before	After
77	33	12	30	30	100	--	agriculture products and dairy products, paddy and vegetables

Source: Primary Survey,2022

X. Conclusion

The following discussion of different water and land use practices in four sample villages is to bring together the various dimensions of natural resources development under and overarching perspective of equitable, productive and sustainable development. The interventions and group dynamic approach is feasible itself needs continuous follow up and active involvement of different stakeholders and all levels. This local level practices in tune with climate change and local level available resource base is desirable, micro-environment element interventions are more suitable to meet climate change effect and local level. The practices of water and land use practices in four sample villages across two CD Blocks of Birbhum District reveal the impact of drudgery on poverty is positive. The data show that number of houses below poverty line has come down. The effects of this practices influence positively and the number of people below poverty line reduced significantly. Increase in income from different sources agriculture, livestock, horticulture and labour have established significantly in all the sample villages.

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