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Research Note

Impact of Watershed Development Projects on Seasonal Livestock Migration — A Study on Shivalik Foothill Villages in Haryana[§]

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Abstract

Seasonal migration of pastoral nomads, which constitutes a major proportion of human population in the Shivalik foothill villages in the Haryana state, is being practised since long in the region. To a large extent, these movements are associated with the absence of water resources development in the water-scarce regions. The present paper has examined the impact of watershed development programmes on seasonal livestock migration and has investigated the determinants of likelihood of such types of migration. The results have revealed that though the watershed development projects have helped in improving the productivity of agricultural land, the same gains are still to be realized on common lands because small and landless families entirely depend on common lands for livestock rearing. Evidence has shown that market access defines the degree of livestock exploitation and there is enormous scope for improving the effectiveness through focused interventions

Introduction

Migratory pastoralism is very common throughout the Himalayas, where various nomadic groups, such as *Gujjars, Bakarwals and Gaddis* keep sheep, goats, cows and even buffaloes under such systems (Kaul, 1998; Misri, 2003). Although with changing times a considerable decline has taken place in the number of pastoral nomads, this system is still the only occupation for a large number of local people. Livestock are a major livelihood asset of these people as livestock-related activities have the potential to cope with the risk of erratic monsoons in these rainfed areas by providing alternative employment or supplementary meagre incomes (Arya and Samra, 2001; Dev *et al.*, 2003; Gupta *et al.,* 2004; Singh *et al.,* 2005). Rapid depletion of natural resources, especially the common property resources, particularly due to growing human and livestock population and due to adoption of non-sustainable practices, have seriously affected the underprivileged, marginalized and landless people.

The *Kandi* area of Haryana has also been facing the problem of seasonal migration of pastoral nomads to the greener areas of the adjoining states. The migration in these areas is closely related with water scarcity for both irrigation and drinking, paucity of fodder and infrastructural facilities. The lack of employment opportunities locally in the agricultural and non-agricultural sectors has further complicated the situation.

When migration takes place as a result of environmental factors, it is usually because survival is threatened. And it is therefore as a survival mechanism that migration is adopted. And when migration is adopted, the natural local resources further degrade because of lack of incentive and supervision. Thus, migration is both a reaction to the deteriorating environment and economy and also a cause of deterioration (Kothari, 2002). Further, migration of the

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economically active adult males along with cattle also creates shortage of labour force to work in land for enhancing its productivity (Shah, 2001). The absence of male members, for 6 to 8 months, every year from the homes increases social and economic burden on spouses and children.

The Watershed Development Projects undertaken by various agencies in the area aim to ensure that the marginalized groups like migratory graziers and landless are not adversely affected by project intervention. It is envisaged that such population constitutes a significant proportion in the villages and it should receive culturally compatible social and economic benefits. In order to ensure that these marginalized groups are incorporated as integral beneficiaries of the project, it is important to understand their livelihood pattern, their aspirations, expectations as well as actual benefits from project interventions.

Although the impact of watershed development on the crop sector is well documented, there are hardly any reports on the area to show whether these projects have been able to reduce the extent of seasonal livestock migration. The extent of achievements, however, also depends upon the size and composition of investments made, and the mechanism of benefit sharing across households. Considering all these aspects, an in-depth study was conducted with the following objectives: (i) to study the existing pattern of livestock migration in the area, (ii) to examine the impact of watershed development projects on livestock migration, and (iii) to investigate the determinants of likelihood of livestock migration.

Data and Methodology

The study undertaken by the Central Soil and Water Conservation Research and Training Institute, Research Centre, Chandigarh, was carried out in the Panchkula district of Haryana state which lies in the foothills of Shivaliks. An area of about 1.2 lakh ha in the Shivalik foothills spread over the districts of Panchkula, Ambala and Yamunanagar is ecologically highly imbalanced. In order to prevent and reverse the degradation process of Shivalik hills, an Integrated Watershed Development (Hills) Project (IWDP), popularly known as '*Kandi*' project was undertaken for a period of 13 years in two phases from 1990-91 to 2003-04. The project was funded by the World Bank. It was aimed at providing a uniform integrated rural development platform to address the problems of social and natural resources of the Shivalik area.

A three-stage sampling technique was used in collecting the data for the study. The first stage involved the purposively selection of Panchkula district based on the preponderance of Shivalik area (74.8%) out of three districts. The second stage involved the selection of Dangri sub-watershed in the district where extensive watershed development activities were carried out. Selection of villages was the third stage of sampling. In all, six villages were selected in the sub-watershed, which were mostly inhabited by *Gujjars*. Of the six, three villages, namely Sambhalwa, Sher Gujjaran and Bunga were considered to be the most successful examples of watershed management projects, where water harvesting structures were constructed in the years 1996, 1998 and 1986, respectively by the Haryana State Agricultural Department. The other three villages, namely Aasrewali, Debbar and Khetparali were taken as non-watershed villages. Although earthen dams were constructed in these villages also during 1987-88 which became defunct in the very next year of construction, thereby these were taken as the control villages (non-project) with absolute rainfed conditions. The six representative villages were surveyed in detail and complete enumeration of data from all the households in all the six villages was carried out using a pre-structured schedule to capture the nature and extent of migration. Comprehensive information was collected about transhumant and pastoral nomads and socio-economic analysis of their life-style, land- use pattern, perception about seasonal migration and actual benefit from the project.

The data were analyzed to identify the determinants of seasonal livestock migration by estimating logit regression model using maximum likelihood method. The dependent variable was assigned the value one, if migration took place in a particular household, and zero otherwise. Our explanatory variables were: (log) cultivated area (x_1), proportion of irrigated area (x_2), number of adult cattle units (x_3), household size (x_4), inverse dependency ratio of the household (ratio of working members) (x_5), caste (x_6) (the reference caste group was *Gujjar* and otherwise zero), and lastly the non-agricultural incomes of the household (x_7). It was expected that households having more proportionate area under irrigation would be less likely to migrate and that larger family sized households with a higher inverse dependency ratio will be more likely to migrate.

Results and Discussions

Demographic Characteristics of Studied villages

The average landholding size in case of non-watershed villages varied from 1.3 ha to 1.81 ha, whereas it varied from 0.8 ha to 1.2 ha in the case of watershed villages. The data revealed that in the case of non-watershed villages, the percentage of livestock migrating households was 44 per cent, 62 per cent and 6 per cent, respectively in Aasrewali, Debbar and Khetparali villages (Table 1). The extent of migration was low in Khetparali because of the existence of alternative employment opportunities within the village in the form of mining in the *choe* (seasonal torrents) as is revealed in Table 2. It was hypothesized that the implementation of watershed and consequent availability of supplemental irrigation to agriculture would automatically check the cattle migration to distant areas for 8 to 10 months in a year. But, the analysis has revealed that of the three successful watershed villages, cattle migration completely stopped in one village (Sambhalwa) only. In other two villages, Bunga and Sher Gujjran, although supplemental irrigation facilities were available, the seasonal livestock migration was continuing for lack of facilities for selling of milk, coupled with very small size of landholding (only 1.0 ha/ household). Not even a single bus plies to village Sher-Gujjaran. The survey revealed a decline in the number of migrating households by 59 per cent in Bunga and 35 per cent in Sher-Gujjaran after the project implementation (Table 3). It showed that although the watershed development projects have helped in improving the productivity of agricultural land, the gains were still to be realized on common lands because small and landless families were entirely dependent on common lands for livestock rearing. Evidence also showed that market access defined the degree of livestock exploitation and there was enormous scope for improving the effectiveness through focused interventions.

Returns from Migration

The percentage income from various sources was calculated to find out the contribution of seasonal livestock migration activities to the total income. The data presented in Table 4 revealed that in the two non-WSMP villages, viz. Aasrewali and Debbar, livestock migration activities contributed more than 45 per cent to the total income of village. Needless to say, that this was the major source of income for households migrating their livestock seasonally for 6 to 8 months in a year. Only in the case of Khetparali, migration was

Table 1. Demographic characteristics of sample villages in Haryana and magnitude of livestock migration

Particulars	Non- WSMP villages			WSMP villages		
	Aasrewali	Debbar	Khet-parali	Sambhalwa	Bunga	Sher-Gujjan
Total area (ha)	951	132.33	396	208	399	72.5
Cultivated area (ha)	89	92.01	217.2	100.2	156	28.37
Irrigated area (%)	nil	17.91	11.5	100.0	59.64*	89.42*
No. of households	69	71	120	81	176	26
Population (No.)	530	453	818	444	1062	198
Average family size (No.)	7.68	6.38	6.82	5.48	6.01	7.62
Average landholding (ha)	1.30	1.29	1.81	1.24	0.82	1.09
Percentage of migrating households	44	62	6	nil	20	46
Animal population						
(a) Cows, No. (% migrating)	1279	522	361	32	791	348
	(97)	(85)	(74)	Nil	(85)	(82)
(b) Buffaloes, No. (% migrating)	352	585	321	334	758	190
	(28)	(79)	(36)	Nil	(28)	(81)
Adult cattle units per ha of cultivated area	16.38	7.64	2.38	3.84	8.53	14.69
Adult cattle units per household	21.13	9.92	4.32	4.75	7.56	16.03

Notes: *The irrigation is given only to the *rabi* crops based on the availability of water in the dam.
WSMP = Watershed Management Project

Table 2. Occupational distribution of working males in sample villages of Haryana

(in per cent)

Villages	Agriculture	Animal husbandry (within village)	Seasonal livestock migration	Service	Self-employed	Daily wages
Non-WSMP villages						
Debbar	27.0	8.5	42.8	2.0	1.3	18.4
Aasrewali	24.3	17.6	34.5	7.4	2.9	13.3
Khetparali	28.2	3.4	2.9	14.5	18.5	32.5
WSMP villages						
Sambhalwa	69.8	1.6	0.0	9.3	4.7	14.6
SherGujjran	47.8	4.2	17.9	7.4	1.5	21.2
Bunga	40.3	12.0	9.5	14.2	3.9	20.1

Table 3. Decline in migrating households after the project in sample villages of Haryana

(in per cent)

Village	Families migrating		
	Before project	After Project	Decline
Sambhalwa	86 (1994-95)	Nil (2008-09)	100
Sher-Gujjran	81 (1996-97)	46 (2008-09)	35
Bunga	79 (1984-85)	20 (2008-09)	59

reported to be low in spite of the fact that this village had the same type of physical and socio-economic constraints as in the other two non-WSMP villages. It was due to the availability of alternative employment opportunities in the village itself in the form of daily wages, which contributed 26 per cent to the total income. About 32 per cent of the adult males were working in the mining quarries in the village. Another important finding was that in the watershed villages, contribution of agricultural sector was much higher and varied from 25 per cent to 56 per cent, whereas in the non-WSMP villages it varied from 8 per cent to 18 per cent. It was found that 40 - 70 per cent of the working males were involved in agriculture in the watershed villages as against the average of 25 per cent in the non-WSMP villages.

Determinants of Migration

To identify the determinants of seasonal livestock migration, regression analysis was carried out by logit method. The results revealed that there was a significant negative relationship between the land-owned, proportion of irrigated area, non-agricultural income and livestock migration. The more the cultivated area, the less the household was likely to migrate and so on. The results have been presented in Table 5. The regression analysis shows that number of livestock within a household was also a strong determinant of the likelihood of migration. Having more animals significantly increased the likelihood of livestock migration. And an increase in non-agricultural income decreased the probability of migration by 9.6 per cent. Availability of labour and ratio of working to non-working members within a household turned out to be positive but non-significant.

Table 4. Income from various sources in sample villages of Haryana

(in per cent)

Particulars	Non-WSMP villages			WSMP villages		
	Aasrewali	Debar	Khetparali	Sambhalwa	Sher Gujjran	Bunga
Agriculture	8.5	15.2	18.0	55.8	34.2	25.1
Animal husbandry	20.8	19.5	6.4	20.5	10.5	33.1
Seasonal livestock migration	48.3	46.7	9.6	0.0	31.8	9.1
Service	6.9	4.4	26.7	13.8	7.3	25.2
Daily wages	9.8	9.6	26.5	5.5	2.3	5.2
Self-employed	5.7	4.6	12.8	4.4	13.9	2.3

Table 5. Factors correlated with migration : Regression using logit method

Explanatory variables*	Effect on likelihood of migration	Significance level
Cultivated area	-0.4035	0.026*
Irrigated area	-1.0376	0.000*
No. of livestock (ACU)	1.7251	0.000*
Household size	0.2894	0.176
Dependency ratio	0.2013	0.247
Caste	16.063	0.997
Non-agricultural income	-0.0959	0.051*
Constant	15.0	0.4582

Notes

1. The first column shows the estimated amount by which each explanatory variable affects (in multiplicative terms) the 'odds ratio': the likelihood that livestock migration takes place in a particular household as a ratio of the likelihood that it does not. The second column shows the level of statistical significance of each estimated effect. For instance, an increase in (log) cultivated land area of one unit reduces the probability that livestock migration takes place in a particular household, elative to the probability it does not , by a factor of 0.67 per cent or 33 per cent. This result is significant at 1 per cent level.
2. * 1. Cultivated area
   < 1 ha = 0
   1 to 2 ha = 1
   2 to 3 ha = 2
   > 3 ha = 3
   2. Irrigated Area =1, if unirrigated=0,
   3. No. of livestock
   < 10 = 0
   10 to 20 = 1
   Above 20 = 2
   4. Household size
   < 3 Members = 0
   3 to 5 Members = 1
   > 5 Members = 2
   5. Dependency ratio
   < 0.2 = 0
   0.2 to 0.3 = 1
   0.3 to 0.4 = 2
   6. Caste: Gujjars=1, others = 0
   7. Income from non-farm sources
   < Rs 10000 = 0
   Rs 10,000 to Rs 20,000 = 1
   Rs 20,000 to Rs 30,000 = 2
   8. Livestock migrating household = 1, otherwise =0

Impact of Migration on Income –Inequalities

The search for secure livelihood drove many migratory movements, and was most common where survival was at stake (Nyberg-Srenson *et al.,* 2002; Whitehead, 2002). Access to migration, as an opportunity, the ability to choose whether or not to migrate, and the outcome of migration for livelihoods were not evenly distributed. Inequality clearly influenced and in turn, was influenced by migration (Hampshire, 2002; Martin *et al.,* 2002). Not only did inequality influence who could migrate where, when and how, it could also be the primary cause of migration.

The socially embedded nature of access to land tenure and to other resources like water or irrigation caused out-migration, where there were not sufficient opportunities for other kinds of employment (temporary, or unsustainable). Gaps in access to water and land resources were also documented as causing migration (Rwelamira *et al.,* 2000; Schrieder and Knerr, 2000; Rogaly *et al., 2003*; Mosse *et al.,* 2002).

To reduce inequality, rich families and individuals needed to have more and easy access to certain resources like water and irrigation, possession of large landholdings and more avenues for skilled employment. However, when the social, physical and environmental constraints remained the same for the majority of households or individuals and migrants were not drawn from the poorest section of the society, migration was more likely to increase inequalities. The migrants' families at least, were able to use the remittances to gain access to land, repair, maintain and construct new houses and a secure livelihood.

In these villages, the absence of resources like water or irrigation caused out- migration along with cattle because there were not sufficient opportunities for other kinds of employment. The Gini-coefficient was used to measure income inequalities among households in both WSMP and non-WSMP villages. The results have been presented in the Table 6.

The detailed analysis of the Lorenz curve revealed that in non-WSMP villages, income from livestock migration activities had enhanced the income inequalities. There was a positive impact of migrants' earnings on income and expenditure which acted as a safety valve for their household economy. In the WSMP village, where watershed project had been implemented and all the households had more or less equal access

Table 6. Income inequalities as measured by Gini-concentration ratio

Villages	Total income excluding income from migration	Total income, including migration income
	Non-WSMP villages	
Aasrewali	0.2760	0.4516
Khetparali	0.4170	0.4326
Debbar	0.2635	0.4173
	WSMP villages	
Sambhalwa	-	0.1561
Sher Gujjran	0.2510	0.2145
Bunga	0.3212	0.2967

to irrigation, income inequalities as revealed by Gini-coefficients (0.1561 to 0.2967) were much lower in comparison with the other villages (0.4173 to 0.4516) (Table 6). The inequalities as a result of migrants' income reduced in watershed villages because only resource-poor farmers migrated, which could not get the sustained benefits of irrigation.

Conclusions and Policy Implications

The study has brought out certain important aspects that have crucial bearing on the impact of watershed projects on income generation and checking distress cattle migration among a large number of households within and outside the watershed communities**.**

A significant decline in livestock migration could be achieved only when there was a substantial increase in the irrigation intensity, as has been reported in the case of Sambhalwa village. It means that availability of irrigation is central to increased cropping intensity, crop and fodder productivity, and hence more labour absorption and less livestock migration. The studies by Chopra and Gulati (2001), Shah (2001), and Deshingkar and Start (2003) have highlighted this gap through a detailed empirical analysis, suggesting that irrigation intensity and regeneration of forests have a direct impact on reducing distress cattle migration. There is a need for assessment and inclusion of livestock owners and fodder demand in the projects. Except the Khetparali village, all households in other villages own livestock. This indicates that maximum participants of watershed projects own livestock themselves. However, participation is especially crucial for those households that depend on common lands for their feed requirement. There is a need to explore a large part of the available water as common pool resources and thereby expand its net of beneficiaries. At the same time, emphasis should be on efficient use of resources on private lands also. Market access for livestock producers also needs attention. There is a considerable lack of linkages between production and marketing centres of milk due to poor infrastructure, as in the case of Sher Gujjran and Bunga villages where, in spite of availability of water and fodder to a considerable extent after the project interventions, the livestock migration is still prevalent. Efforts are needed to organize the livestock owners into user, self-help or beneficiary groups to have a strong voice in the decision-making process. It will also help the livestock owners in availing the advantage of institutional support like credit, etc.

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