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## **Impact Analysis of Watershed Development Programmes on Allied Activities in Agriculture with Special Reference to Livestock**

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### **Abstract**

In India majority of population lives in rural area and its main source of income is agriculture and its allied activities. Out of allied activities, livestock sector is an important part of agriculture sector and there is strong inter-linkage between agriculture and livestock sector to improve the livelihood of rural population. So, this study assesses the impact of watershed development programmes on livestock's population, milk production and feed & fodder. For this, two districts were selected from DDP watershed development programme on the basis of maximum completed projects and maximum covered area. Two Micro watersheds were randomly selected from each district. 30 beneficiary and 30 non-beneficiary households were selected through random sampling from each micro watershed. Average and percentage methods were used for analysing the results. The study found that DDP watershed development programme the positive impact on the population of livestock in WSA in Bhiwani district but weak impact in Hisar district. The impact of on total milk production was positive in both of Bhiwani and Hisar districts as population of milch animals was higher in WSA of both the districts. The impact on the availability of green fodder in WSA as compared to Non-WSA has also been positive. The DDP programme had negligible impact on dry fodder in both districts.

**Keywords:** DDP, watershed, beneficiaries, non-beneficiaries

### **Introduction**

Livestock sector is an important part of agriculture sector in Indian economy. Since the process of civilization started, livestock and agriculture sectors continue to be an integral part of human life for overall food requirement. In India, most of population lives in rural areas and livestock sector plays an important role in the rural economy as supplementing family incomes, generating gainful employment and improving socio-economic condition of mainly small, marginal, landless farmers and women. According to NSSO 66<sup>th</sup> round survey (July2009 - June 2010), small, semi-medium and marginal farmers own about 87.7 per cent of the livestock. Besides providing supplementing income and generating employment this sector also contributes to foreign exchange through export, providing cheap and nutritious food to millions of masses of India and makes substantial contribution to environmental conservation, manure for fertilizer and domestic fuel that save on the use of non-renewable resources like petro-products. As per 2012 livestock census, India had 512 million total livestock and 190.9 million cattle, which further comprised of 108.7 million buffalo, 135.2 million goat, 65.06 million sheep and 10.29 million pigs. India continued to be the largest producer of the milk in world and milk production in 2012-13 with 132.43 million tonnes. The per capita availability of milk was around 296 grams per day in this year. As for as feed and fodder scenario in India is concerned, the land availability for fodder production has been decreasing so that gap between demand and supply of feed and fodder existed in India. So, observing the importance of livestock sector and its inter-linkage with agriculture sector, watershed development programmes have been implemented by the Ministry of Rural Development with making explicit provision for sustainable livestock development and taking advantage of inter-linkage development of both sectors. Keeping this view in mind thus, to know the impact of watershed development programme on the allied activities of agriculture with special reference to livestock economy, this study to assess the impact of watershed development programme on livestock's population, milk production and feed & fodder.

### Methodology

In Haryana, the Haryana Rural Development Department has implemented the watershed development programs under the Desert Development Program and Integrated Wasteland Development Program. The watershed projects under IWDP and DDP have been completed in three (Rohtak, Yamuna Nagar, Kaithal) and five (Bhiwani, Hissar, Sirsa, Narnaul, Rewari) districts respectively till 31-07-2013 which were implement under Haryali Guidline, 2003. So DDP programme has been selected for the impact analysis of watershed development programmes as covered maximum districts under completed projects. Bhiwani and Hisar districts from DDP were selected purposively for the study, which has maximum completed projects and maximum covered area. Two Micro watersheds were randomly selected from each district. 30 beneficiaries and 30 non-beneficiary households were selected by the following random sampling from each micro watershed. A total of 240 respondents, 120 beneficiaries and 120 non-beneficiaries have been selected. The study has been made an intensive reference to the primary data in trying to analyse the study objective. Interview schedule method has been used as the main tool for the data collection. Reference year of the study is 2014-15. For analyzing the impacts of watershed development programme on livestock's population, milk production and feed & fodder simple analytical techniques average and percentage methods were used. The following concepts were also used:

$$\text{Milk Production} = \text{Lactation period} \times \text{Milk yeild per day}$$

*Availability of Feed and Fodder Area per animal:* For working out the requirement of per animal feed and fodder area available, all animals were converted into standard and livestock units (buffalo equivalent). One animal was treated as equivalent to 1 buffalo/1 bullock/ 0.80 cow/ 2 calves/ 7 goats (above 1 year)/ 14 goats (up to one year)

### Results and Discussion

In this section impact of DDP watershed development programme on livestock's population, milk production and feed and fodder has been discussed at district level.

This table 1 summarises the findings of the study on impact of DDP watershed development programme on livestock's population in micro watershed of Bhiwani district. It reveals that livestock population as higher in WSA as compared to Non-WSA in both micro watersheds. This may be due to the fact that size of land holdings was higher in WSA as compared to Non-WSA and water resources increased for livestock purpose in WSA. Farmers with higher size land holding could spare land for livestock and green and dry fodder production. The difference between percentages of area under green fodder was 9.59 per cent and difference between livestock's population has been 40 per cent in WSA as compared to Non-WSA. This difference may be attributed to impact of size of land holdings as well as positive improvement of water resources in WSA due to implementation of watershed development programme. However, in micro watershed-2, no specific area under green fodder has been found in WSA as well as Non-WSA as they used weed (Kharpatwar) as green fodder which grow simultaneously with main crops as less fertilizer is being used in this area. The population of livestock were higher in WSA, which may be attributed to higher size of land holdings, availability of Guar crop for green fodder and greater availability of dry fodder in WSA (due higher production and productivity of wheat in WSA as compared to Non-WSA). The percentage deviation of livestock population over Non-WSA ranged from 25 (for bullocks) to 66.67 per cent (for cow) in micro watershed-1 and 0 (for bullock) to 50 per cent (for buffalos) in micro watershed-2. The average of total number of livestock per household was also found to be higher in WSA compared to Non-WSA. The highest percentage deviation was found in milch animals which were 66.67 per cent among cow in micro watershed-1 and 50 per cent among buffalos in micro watershed-2.

The data in the table 2 reveals that total milk production in WSA was high in both micro watersheds as milch animal population was higher in WSA. But per milch milk production of buffalo was low as compared to Non WSA in micro watershed-1. It could be due to the fact that per animal green fodder availability was lesser in WSA as compared to Non-WSA in micro watershed-1. In micro watershed-2, total milk production as well as per milch animal milk

production were higher in WSA as compared to Non-WSA. This could be due to the fact that land size of holdings was higher in WSA, as a result weed (Kharpatwar) availability was also higher in WSA besides higher productivity of green fodder crop like Guar and dry fodder crop (wheat).

Table 3 reveals that total area under green fodder increased significantly in micro watershed-1, but per animal availability of area under green fodder was lower due to higher population of livestock in WSA. In micro watershed-2, there has been no specific green fodder crop for livestock solely in both areas. The farmers used weed (Kharpatwar) as green fodder for livestock purpose and total land size holdings were higher in WSA so availability of weed (Kharpatwar) was also higher in WSA.

**Table 1**  
**Impact of DDP on Livestock's Population in Bhiwani District**

Name of ruminants	Micro Watershed -1					Micro Watershed -2				
	WSA*		Non-WSA*		Deviation (in %)	WSA*		Non-WSA*		Deviation (in %)
	No. of livestock	Average**	No. of livestock	Average**		No. of livestock	Average**	No. of livestock	Average**	
Buffalo	55	1.83	40	1.33	37.5	42	1.4	28	0.93	50
Cow	10	0.33	6	0.2	66.67	11	0.37	11	0.37	0
Bullock	5	0.17	4	0.13	25	2	0.07	0	0	-
Others	56	1.87	40	1.33	40	35	1.17	33	1.1	6.06
Total	126	4.2	90	3	40	90	3	72	2.4	25

Source: Field Survey

Note: \*30 respondents have been taken in each WSA/ non-WSA.

\*\* Average has been worked out by dividing the number of livestock by total number of respondents.

**Table 2**  
**Impact of DDP on Milk Production per year in Bhiwani District**

Particulars		Micro Watershed -1		Micro Watershed -2	
		Buffalo	Cow	Buffalo	Cow
WSA	Total milk production	112750.00	21900.00	89460.00	25500.00
	Milk production of per milch animal	2050.00	2190.00	2130.00	2318.18
Non-WSA	Total milk production	84000.00	12900.00	59540.00	25300.00
	Milk production of per milch animal	2100.00	2150.00	2126.43	2300.00
Deviation (in %)	Total milk production	34.23	69.77	50.25	0.79
	Milk production of per milch animal	-2.38	1.86	0.17	0.79

Source: Field Survey

Table 4 reveals that all the respondents in micro watershed produced dry fodder on their farm. However, in case of micro watershed-2, 8.33 per cent farmers of non-WSA bought dry fodder as against 3.57 per cent of WSA.

Table 5 reveals that livestock's population was lower in WSA (micro watershed-3) and higher in micro watershed-4. This could be due to the fact that size of land holdings was higher in Non-WSA as a result they could spare land for fodder production and vice versa. Table 7 reveals that area under green fodder as percentage of total landholdings was higher by 19.86 per cent in micro watershed-3 and lower by 11.37 per cent in micro watershed-4 as against their respective non-WSA. Further, table 5 shows that live stock population was lower by 10.77 per cent in micro watershed-3 and higher by 12.50 per cent in micro watershed-4 as against their respective non-WSA. As more land (in percentage to total own land holding) is to be spared in WSA, therefore, there is tendency to keep less number of livestock in WSA. However, the relative change indicates somewhat positive impact of watershed development programme on livestock population.

The data in the table 6 reveals that total milk production by buffalo and per milch buffalo milk production were lower in WSA as compared to Non-WSA. This may be due to the fact that due to green fodder availability per animal has been lower in WSA. The population of buffalo was also lower in WSA as compared to Non-WSA in micro watershed-3. However, total milk production by cow and per milch cow milk production has been higher in WSA due to higher availability of water resources for livestock purpose. In micro watershed-4, impact of DDP watershed development programme on milk production of per milch animal was positive in micro watershed-4 due to more availability of green fodder in WSA as compared to Non-WSA. However, milk production of per cow milch animal was positively impacted in both micro watersheds which show that correlation between green fodder and milk production of cow was less and it was higher with water resources availability.

**Table 3**  
Impact of DDP on Area under Green Fodder in Bhiwani District

Name of crops		Micro Watershed -1			Micro Watershed -2		
		WSA	Non-WSA	Deviation (in %)	WSA	Non-WSA	Deviation (in %)
Area of Barseem	Farm produced	12.25	7.00	75.00	0	0	0
	Purchased	0	0.40	-	0	0	0
Area of Jawar	Farm produced	26.25	21.50	22.09	0	0	0
	Purchased	0	0.50	-	0	0	0
Total Area under green Fodder	Farm produced	38.50	28.50	35.09	0	0	0
	Purchased	0	0.90	-	0	0	0
Area available per animal under green fodder		0.40	0.43	-6.15	0	0	0
Farm produced area as percentage of total land holdings		12.43	22.02	-9.59	0	0	0

Source: Field Survey

**Table 4**  
Response of Farmers Related to Impact of DDP on Dry Fodder in Bhiwani District

Dry fodder	Micro Watershed -1		Micro Watershed -2	
	WSA (No. of farmers having livestock)	Non-WSA (No. of farmers having livestock)	WSA (No. of farmers having livestock)	Non-WSA (No. of farmers having livestock)
Farm produced	29(100)	28(100)	27(96.43)	22(91.67)
Purchased	0	0	1(3.57)	2(8.33)
Total farmers having livestock	29(100)	28(100)	28(100)	24(100)

Source: Field Survey

Note: Figure in the parentheses represent percentage figures.]

**Table-5**  
Impact of DDP on Livestock's Population in Hisar District

Name of ruminants	Micro Watershed -3					Micro Watershed -4				
	WSA*		Non-WSA*		Deviation (in %)	WSA*		Non-WSA*		Deviation (in %)
	No. of livestock	Average**	No. of livestock	Average**		No. of livestock	Average**	No. of livestock	Average**	
Buffalo	46	1.53	50	1.67	-8.00	38	1.27	33	1.10	15.15
Cow	4	0.13	3	0.10	33.33	2	0.07	3	0.10	-33.33
Bullock	11	0.37	12	0.40	-8.33	13	0.43	12	0.40	8.33
Others	55	1.83	65	2.17	-15.38	46	1.53	40	1.33	15.00
Total	116	3.87	130	4.33	-10.77	99	3.30	88	2.93	12.50

Source: Field Survey

Note: \*30 respondents have been taken in each WSA/ non-WSA.

\*\* Average has been worked out by dividing the number of livestock by total number of respondents.

**Table 6**  
Impact of DDP on Milk Production per year in Hisar District

Particulars		Micro Watershed -3		Micro Watershed -4	
		Buffalo	Cow	Buffalo	Cow
WSA	Total milk production	79350.00	7360.00	79420.00	4350.00
	Milk production of per milch animal	1725.00	1840.00	2090.00	2175.00
Non-WSA	Total milk production	87480.00	5430.00	61560.00	6150.00
	Milk production of per milch animal	1749.60	1810.00	1865.45	2050.00
Deviation (in %)	Total milk production	-9.29	35.54	29.01	-29.27
	Milk production of per milch animal	-1.41	1.66	12.04	6.10

(Source: Field Survey)

**Table 7**  
Impact of DDP on Area under Green Fodder in Hisar District

Name of crops		Micro Watershed -3			Micro Watershed -4		
		WSA	Non-WSA	Deviation (in %)	WSA	Non-WSA	Deviation (in %)
Area of Barseem	Farm produced	11.63	16.50	-29.52	12.75	8.88	43.66
	Purchased	0.75	0	-	0	0	-
Area of Jawar	Farm produced	19	20.13	-5.61	14.125	12.37	14.14
	Purchased	0	0	-	0	0	-
Total area under green fodder	Farm produced	30.63	36.63	-16.38	26.875	21.25	26.47
	Purchased	0.75	0	-	0	0	-
Area available per animal under green fodder		0.36	0.38	-5.35	0.36	0.32	12.75
Total farm produced area under green fodder as percentage of land holdings		36.94	17.08	19.86	27.44	38.81	-11.37

Source: Field Survey

**Table 8**  
Response of Farmers Related to Impact of DDP on Dry Fodder in Hisar District

Dry fodder	Micro Watershed -3		Micro Watershed -4	
	WSA (No. of farmers having livestock)	Non-WSA (No. of farmers having livestock)	WSA (No. of farmers having livestock)	Non-WSA (No. of farmers having livestock)
Farm produced	28(100)	29(100)	25(100)	27(100)
Purchased	-	-	-	-
Total farmers having livestock	28(100)	29(100)	25(100)	27(100)

Source: Field Survey

Note: Figure in the parentheses represent percentage figures.

Table 7 reveals that though the total area under green fodder was less in micro watersheds 3 and higher in micro watershed 4, its percentage to total owned land was higher in micro watershed 3 by 19.86 per cent and lower in micro watershed 4 by 11.37 per cent. Lower size of land holdings in micro watershed-3 and higher size of land holding in micro watershed-4 was the reason behind it. Sparing of more land (in percentage terms) led to lower number of livestock in WSA as compared to non-WSA in micro watershed-3 and vice versa in micro watershed 4.

The table 8 reveals that response of farmers related to impact of DDP on dry fodder was negligible. All the farmers under WSA and Non –WSA used the own farm produced dry fodder on both micro watersheds.

### **Conclusion**

On the basis of above discussion, it was concluded that the population of all livestock was found to be higher in WSA as compared to non-WSA in Bhiwani district. Increase in availability of water resources for the livestock seems to be the reason behind it. In Hisar district, the total population of livestock was found to be lower in WSA. Water resources had not increased sufficiently in WSA of Hisar, which was reflected in population of livestock. Thus, we may conclude that DDP watershed development programme had the positive impact on the population of livestock in WSA in Bhiwani district but weak impact in Hisar district. The impact of DDP watershed development programme on total milk production was positive in both of Bhiwani and Hisar districts as population of milch animals was higher in WSA of both the districts. The impact on the availability of green fodder in WSA as compared to Non-WSA has also been positive. The DDP programme had negligible impact on dry fodder in both districts.

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