

Agriculture Practices and Its Association with Livestock in Hilly Areas of West Bengal

M. RAY*, B. SAMANTA, P. HALDAR, S. CHATTERJEE, D. K. KHAN¹

ABSTRACT

The present study was done to evaluate the socio-economic condition as well as existing farming system practised in hilly areas of West Bengal. Data were obtained by formal interview using a pretested structured questionnaire. Level of crop diversification, animal rearing pattern and income from individual sector were compared among different land holdings. Most of the farmers practice medium level (<0.5 to >0.7) of crop diversification. The percent wise allocation of gross cropped area was maximum for cereals (57.79%), followed by vegetable (22.15%) and plantation (6.67%). This trend is similar for all categories of farmers. Non-descript cows constituted the major population of dairy animals followed by cross-breeds, while few farmers are getting their maximum return from piggery. The diversification of animals rearing varied as various communities living at different altitudes. Overall, livestock constitutes 19.65 % of total income, but in case of large farmers it was 25.06%.

Keyword: Crop diversification, Hill agriculture, Integrated Farming system, Livestock

INTRODUCTION

Globalization of market and change in agriculture trade and tariff policies called for drastic innovative changes of existing farming systems. In this era of stagnation and falling profitability of crop farming (Kumar et al. 2006), diversification of crop based agriculture with introduction of dairy, goatery, fishery, poultry, duckery, etc. has become imperative. The hilly areas of West Bengal constrained with the more availability of good and large extent of agricultural land. Agriculture along with animal rearing is the usual practice of total farming system. Lack of irrigation facility and lack of facilities for modern integrated farming are the major factor for low productivity. Yet the majority of the families depend solely on agriculture and allied activities to meet their livelihood. Thus a study is taken to evaluate the predominant farming systems in hilly areas of West Bengal.

MATERIALS AND METHODS

The hilly areas of West Bengal covering some parts of Darjeeling district is taken as study area. It

is a position of the hill zone of West Bengal with an average elevation of 1249 m above mean sea level with steep slopes. The soils are soft and loose in character

Information gathered from the farmers at different villages to evaluate their socioeconomic status particularly, how the resources are well managed to meet their livelihood. Data were collected through formal interview using a pretested structured questionnaire from farmer by multi-stage stratified random sampling method. In the first stage, four blocks (Kalimpong-I, Kalimpong-II, Ronglirongliot and Garubathan) were selected randomly from the hilly areas of West Bengal. Three villages were randomly selected from each of the selected blocks. Finally six farmers were randomly selected from each of the villages. The farmers are divided into four categories according to their land holding viz. marginal (< 0.5 ha), small (>0.5 ha to <= 1 ha), medium (> 1 ha and <= 1.5 ha) and large (> 1.5 ha). The data were collected during the agricultural year 2011. Crop diversification index was calculated by using Simpson Index of diversity referred by Joshi et al. (2003).

Simpson index of diversity: $I_i = 1 - (\sum Si^2) - (\sum Si)^2$

Where Si is the share of crop 'i' in gross cropped area. A high Simpson index indicates greater crop

AICRP on Integrated Farming Systems, BCKV, Kalyani, Nadia, 741235

¹University of Kalyani, Kalyani, Nadia, 741235

*Corresponding author's E-mail: manabbckv@gmail.com

diversity, while a low index reflects more specialization. Diversification index greater than 0.7 was considered as high, and less than 0.5 as low for different categories of farmers. Data collected in this survey were analysed by using SPSS-16 Software and LSD were tested by one-way ANOVA.

RESULTS AND DISCUSSION

Farmers' category

The majority of farmers in hilly areas belong to the small category (40.27%), followed by marginal (31.94%). Very few farmers belong to medium (11.11%) and large (16.66%) category (Table 1).

Table 1: Category of farmer in Kalimpong sub division according their land holding

	No of farmer	Percentage (%)
Total no of farmer=	72	
Marginal Farmers(<=0.5)	23	31.94
Small farmers(>0.5 H<=1H)	29	40.27
Medium Framers (> 1 and <=1.5H)	8	11.11
Large farmer(> 1.5 H)	12	16.66
Total	72	

* H- Hectare

Land Allocation pattern

The overall mean holding of this area varies between 0.34 ha (for marginal) to 2.00 ha (for large farmer). The holding size in this area is found to be smaller as compared to Western Uttar Pradesh

(Singh and Gangwar 2010) due to land reform policies adopted by Government of West Bengal (Banerjee et al. 2002). The percent wise allocation of gross cropped area was maximum for cereals (57.79%), followed by vegetable (22.15%) and plantation (6.67%). The trend is similar for all categories of farmers. The share of land towards cereals increased slightly with the increase in land holding, whereas small and marginal farmers allocate more land for the cultivation of vegetables compared to medium and large farmers. The cropping intensity was lowest (137.5%) for large farmers due to less availability of own human labour (Table 2). While working at Uttar Pradesh Singh and Gangwar (2010) have observed almost similar trend. The soil and climatic conditions in the hilly areas are not favourable for oilseed and pulse cultivation.

Level of Crop Diversification

Analysis of the field data revealed that irrespective of categories, farmers showed their maximum tendency towards medium level (>0.5 to <0.7) of diversification, viz. 60.86%, 65.51%, 87.5% and 66.66% respectively for marginal, small, medium and large category. Crop diversification is more prevalent features among the marginal and small farmers. At higher (>0.7) crop diversification small and marginal farmers recorded higher value (13.79% and 8.69% respectively) as compared to medium and large farmers (0% for both). The obtained value indicates that the increase in holding size decrease the diversification index (Table 3). This is may be due to the fact that marginal and small farmer poses small piece of land but plenty

Table 2. Cropping pattern of sample households in hilly zone of West Bengal

(in % of gross cropped area allocated to different crop enterprise replicated for each farmer)

	Total	Marginal (<=0.5 ha)	Small (>0.5 ha & <=1 ha)	Medium (>1 ha & <=1.5 ha)	Large (>1.5 ha)
N	72	23	29	8	12
Cereals	57.79	43.44	56.81	60.95	62.50
Pulses	2.95	5.38	2.42	0.0	4.24
Oilseeds	3.25	3.26	4.47	6.63	0.0
Vegetables	22.15	31.88	24.81	15.40	19.26
Plantations	6.67	9.78	2.73	10.39	7.88
Horticulture	6.50	6.28	6.86	6.63	6.12
Spices	0.70	0.00	1.89	0.0	4.24
Gross cropped area (ha)	1.39	0.53	1.27	2.26	2.75
Net cropped area (ha)	0.87	0.30	0.74	1.23	2.0
Cropping intensity	159.77	176.67	171.62	183.74	137.50

ha- hectare

of human labour, the scenario is just reversed for medium and large farmers.

Farming system wise analysis indicated that most of the vegetable based farmers (66.66%) come under high level of diversification, followed by horticulture (55.55%), piggery (50%), dairy (30%) and plantation based (25%) farmers. Majority of farmers in cereal based system comes under medium levels of diversification (66.66%). Small and marginal farmers with their available family labour allocate their land more towards the vegetable cultivation as well as horticulture, which are labour intensive and profitable. Thus highest level of diversification observed in vegetable and horticulture based system.

Farm income

Net income from crop production and livestock production was calculated after deducing total cost from the gross income. The income from individual farmer is positively related with the size of holding. The income per farm family increases from marginal (Rs. 66309) to medium farmer (Rs. 234276) but this income for large farmer (Rs. 166333) was less than that of medium farmer. Among the different agricultural component vegetable (Rs. 78067) recorded the highest income, followed by horticulture (Rs. 13945), dairy (Rs. 13577), piggery (Rs. 10582) and cereals (Rs. 4759) (Table 4). Though cereals occupied the largest area (57.79%) for agriculture land, they contributed only

Table 3: Number of farmers under each category with different levels of crop diversification

Basis of categorization	Category of farmer	No of house hold in different level of diversification			
		Low(<=0.5)	Medium (>0.5and<=0.7)	High(>0.7)	Total
According to Land Holding	Marginal	7(30.4%)	14(60.86%)	2(8.69%)	23
	Small	6(20.68%)	19(65.51%)	4(13.79%)	29
	Medium	1(12.5%)	7(87.5%)	0(0.0%)	8
	Large	4(33.33%)	8(66.66%)	0(0.00%)	12
According to Farming System	Cereals	1(33.33%)	2(66.66%)	0(0.0%)	3
	Vegetable	1(3.03%)	10(30.30%)	22(66.66%)	33
	Horticulture	1(11.11%)	3(33.33%)	5(55.55%)	9
	Plantation	1(12.50%)	5(62.50%)	2((25.0%)	8
	Dairy	3(30.0%)	4(40.0%)	3(30.0%)	10
	Goatery	0(0.0%)	1(100.0%)	0(0.0%)	1
	Piggery	0(0.0%)	3(50.0%)	3(50.0%)	6

Table 4: Income from various agricultural sectors per farm per annum over different farm size in hilly zone of West Bengal

(data in parenthesis indicating the % share of that particular component out of total income)

Components	Total	Marginal	Small	Medium	Large	
Cereals	4759 (3.57)	1144 ^b (1.73)	4040 ^b (2.79)	7067 ^b (3.02)	11889 ^a (7.15)	*
Oilseed	68 (0.05)	22 ^{ab} (0.03)	81 ^{ab} (0.06)	249 ^a (0.11)	0 ^b (0.00)	*
Vegetable	78067 (58.89)	39925(60.21)	96244 (66.49)	142419 (60.79)	64341 ^a (38.68)	NS
Horticulture	13945 (10.47)	4338 ^b (6.54)	15070 ^{ab} (10.41)	17894 ^{ab} (7.64)	27008 ^a (16.24)	*
Pulses	1736 (1.30)	171(0.26)	3076 (2.13)	0 (0.00)	2652 (1.59)	NS
Plantation	846 (6.35)	4522 ^b (6.82)	2892 ^b (2.00)	24562 ^a (10.48)	18757 ^a (11.28)	*
Total crop share	99421 (80.63)	50123(75.59)	121403 (83.88)	192191 (82.04)	124648 (74.94)	
Dairy	13577 (10.19)	893 ^b (13.47)	13291 ^b (9.18)	34118 ^b (14.56)	9482 ^a (5.70)	*
Goatery	926 (0.69)	859 (1.29)	1211 (0.84)	893 (0.38)	387 (0.23)	NS
Piggery	10582 (7.94)	5800 (8.75)	7520 (5.20)	6833 (2.92)	29643 (17.82)	NS
Poultry	918 (0.69)	597(0.90)	903 (0.62)	239 (0.10)	2021 (1.22)	NS
Apiary	191 (0.14)	0 (0.00)	411 (0.28)	0 (0.00)	153 (0.09)	NS
Total livestock share	26194 (19.65)	16186 (24.41)	23336 (16.12)	42085 (17.96)	41685 (25.06)	
Total	125615 (100)	66309 (100)	144739 (100)	234276 (100)	166333 (100)	

NS- non significant

Similar alphabets (a, b, etc) along rows denotes homogeneous (P>0.05) shares (Duncan's test)

Similar alphabets (a, b, etc) along column denotes homogenous (P>0.05) shares (Least Significant Difference test)

3.57% of total return of the farming system. Whereas, farmers allocated only 22.15% land area and got 58.89% of total return from vegetable cultivation (Table 2 and Table 4). This is due to fact that the farmers in this area cultivate the cereals in a neglected way and got very poor yield, whereas, the vegetable cultivation (especially off season) is very remunerative and farmers put their maximum resource and attention.

The livestock rearing pattern shows that, number of livestock increases slightly with increase in size of holding (Fig.1). This is due to the fact that livestock ensures better utilization of agricultural by-products as well as reduces the uncertainty of agriculture. Non-descriptive (*desi*) cows constitute the major population of dairy animals followed by cross-breed and jersey (Table 5.). This indicates that the farmers were less interested in keeping the

crossbred cows because the price of milk is not attractive and non-descriptive (*desi*) cows require less care and management as well as having more disease resistant capacity compared to cross-breed and jersey. Similar types of observations were recorded by Singh et al. (2009). In this area farmers are disinterested in sheep-rearing due to lack of demand of mutton compare to chevon. The number of milch cow (cross-breed and local) reared per farmer was significantly greater among large (1.6) and medium (1.62) compare to small (0.51) and marginal (0.43) farmers (Table 5).

Cropping system contributed 80.63% of total farm income. This share was 75.59%, 83.88%, 82.04% and 74.94% for marginal, small, medium and large farmers respectively. Whereas, livestock contributed 19.65% of total return and this share was 24.41%, 16.12%, 17.96% and 25.06% for

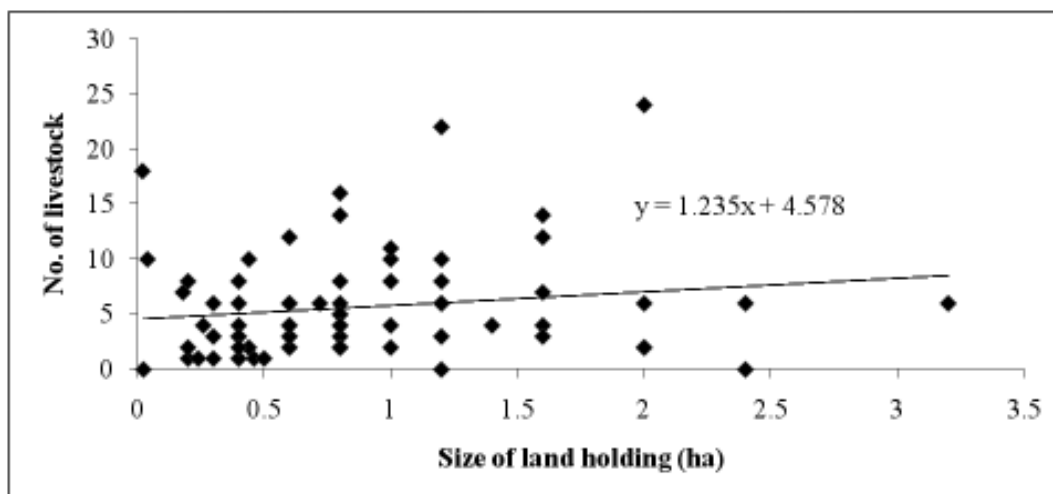


Fig. 1: Effect of holding size on number of livestock in Hilly areas of West Bengal

Table 5: Farm size wise livestock pattern of households in different study zones

(No. of animals/farmer in each category)

Category of Livestock	Total (n=72)	Marginal (n=23)	Small (n=29)	Medium (n=8)	Large (n=12)	Sig.
Milch cow (Cross bred)	0.8	0.43 ^b	0.51 ^b	1.62 ^a	1.6 ^a	*
Milch cow (local)	1.95	0.86 ^c	1.34 ^c	4.62 ^a	3.75 ^b	*
Milch cow (Jersey)	0.16	0.0	0.0	0.5	0.66	NS
Bullock	0.75	0.56	0.51	0.75	1.66	NS
Calves	0.72	0.52	0.72	0.87	1.0	NS
Goat	1.55	1.86	1.44	1.75	1.08	NS
Sheep	0.0	0.0	0.0	0.0	0.0	NS
Pig	2.59	2.08 ^b	3.0 ^{ab}	3.25 ^a	2.16 ^b	*
Poultry	2.84	3.13 ^a	2.86 ^a	0.75 ^b	3.6 ^a	*

Similar alphabets (a, b, etc) along rows denotes homogeneous (P>0.05) shares (Duncan's test)

Similar alphabets (a, b, etc) along column denotes homogenous (P>0.05) shares (Least Significant Difference test)

marginal, small, medium and large farmers respectively. These findings are supported by Khatun and Roy (2012).

The number of pig and poultry per farmer was more compared to all other livestock animal in the hilly areas. The number of pig per farmer was maximum in medium category farmer and it was significantly varied from others. In case of poultry rearing the number of bird per farmer was higher in large category farmer which was at-par with marginal and small but significantly varied from medium category farmer.

CONCLUSIONS

This study reveals that in hilly areas of West Bengal as the size of holding increases, crop diversification decreases with the increase in number of livestock and more allocation of lands towards vegetables. Among the different livestock piggery is popular in this area. Livestock contributed only 19.65% of total income. This

indicates that livestock is a subsidiary enterprise with tremendous potential for further growth.

REFERENCES

- Banerjee A, Gertler P, Ghatak M (2002). Empowerment and Efficiency: Tenancy Reforms in West Bengal. *Journal of Political Economy* 110 (2): 239-280
- Joshi PK, Gulati AA, BIRTHAL PS, Tewari L (2003). Agriculture diversification in South Asia: Pattern, determinants and policy implications. Discussion Paper No. 57. Market structure studies division. International Food Policy Research Institute Washington DC
- Kumar P, Singh NP, Murthy VC (2006). Sustainable agriculture and rural livelihoods: A synthesis. *Agricultural Economics Studies* 32 (6): 850-75
- Khatun, Roy BC (2012). Rural Livelihood Diversification in West Bengal: Determinants and Constraints. *Agricultural Economics Research Review* 25 (1): 115-124
- Singh SP, Gill MS, Gangwar B, Singh MP (2009). Livestock in irrigated system of Uttar Pradesh. *Indian Journal of Animal Sciences* 79 (9): 925-931
- Singh SP, Gangwar B (2010). Economics of crop livestock production in Uttar Pradesh. *Indian Journal of Animal Sciences* 80 (9): 924-931