

Chapter VI
Role of Agricultural Inputs on
Cropping Pattern

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6.1. Introduction

In the foregoing chapters the general land use, cropping pattern and changes therein have been analyzed. But the agricultural inputs have a profound influence on agricultural land use changes. Hence, the major objective of this chapter is to analyze the spatial variations in agricultural inputs and the associated land use change. Before, examining these agricultural inputs it would be pertinent to have some idea about the agriculture of the region before 1990-91.

The agriculture based on age old practices was more common in the region. Most of the essentials were home produced. In the traditional agricultural pattern mixed cropping was more common than cropping in pure stands. Cultivation by wooden plough was more widespread. Crop yields were low and fertility was maintained by using cow-dung and composite manures. Transport was inadequate and inefficient. Marketing facilities were almost absent. The use of mechanical power in farming operations was almost unknown. The role of Government had largely been limited. Trade too was unfavourable and middlemen made more profits than the cultivators. As a result, the region's agriculture continued to function as the backward sector in the economy.

But shortly after 1990-91, especially with introducing modern agricultural inputs throughout the entire subdivision drastic changes started in the subdivision's agriculture.

6.2. Irrigation

Assured water supply is one of the conditions most essential for a successful crop growth, particularly in areas where rainfall is uncertain and concentrated in a certain period. Where it is plentiful and well distributed over the year, there is no problem of water. Further, irrigation itself determines the use of other agricultural inputs.

Table 6.1 Gram Panchayat-wise Irrigated Area in Siliguri Subdivision (2010-11)

Gram Panchayat	Gross Irrigated Area	Gross Cropped Area	Net Cropped Area	% of GIA to GCA	% of GIA to NCA
Atharakhai	103	238.7	153.7	43.15	67.01
Matigara- I	102	198	128	51.52	79.69
Matigara -II	121	216	150	56.02	80.67
Patharghata	117	316.5	240.5	36.97	48.65
Champasari	17	124.5	39.5	13.65	43.04
Gossapur	451	1331	1139	33.88	39.60
Hatighisa	542	1001.8	814.8	54.10	66.52
Lower Bagdogra	301	550.6	383.6	54.67	78.47
Upper Bagdogra	399	795.4	574.4	50.16	69.46
Naxalbari	465	1453	1261	32.00	36.88
Moniram	212	448.2	250.2	47.30	84.73
Binnabari	765	1705	1482	44.87	51.62
Buraganj	581	2717	2106	21.38	27.59
Kharibari-Panisali	1033	4215	3657	24.51	28.25
Raniganj-Panisali	915	3241	2985	28.23	30.65
Bidhannagar-I	238	1691	1669	14.07	14.26
Chathat-Bansgaon Kismat	437	2718	2627	16.08	16.63
Ghoshpukur	278	2089	1957	13.31	14.21
Jalas- Nizamtara	369	2270	2126	16.26	17.36
Bidhannagar-II	258	1807	1687	14.28	15.29
Phansidewa-Bansgaon Kismat	420	3807	3628	11.03	11.58
Hetmuri-Singhjhora	300	1575	1398	19.05	21.46
Total	8424	34508.7	30456.7	24.41	27.66

Source: Office of Assistant Director of Agriculture, Matigara-Naxalbari block and Kharibari-Phansidewa block.

The proportion of gross irrigated area (GIA) to gross cropped area (GCA) varies considerably in different gram panchayats of the subdivision. The highest proportion of percentage of gross irrigated area to gross cropped area is occupied by the Matigara II (56.02%) gram panchayat while the lowest proportion of percentage of gross irrigated area to gross cropped area is found in Phansidewa-Bansgaon Kismat (11.03%) gram panchayat. Out of twenty two GPs, fourteen GPs rank above the subdivision average

while the remaining eight GPs rank below the subdivision average of percentage of gross irrigated area to gross cropped area. Hence, more than half of the total GPs show proportion of gross irrigated area higher than subdivision average while the remaining show proportion of gross irrigated area lower than the subdivision average.

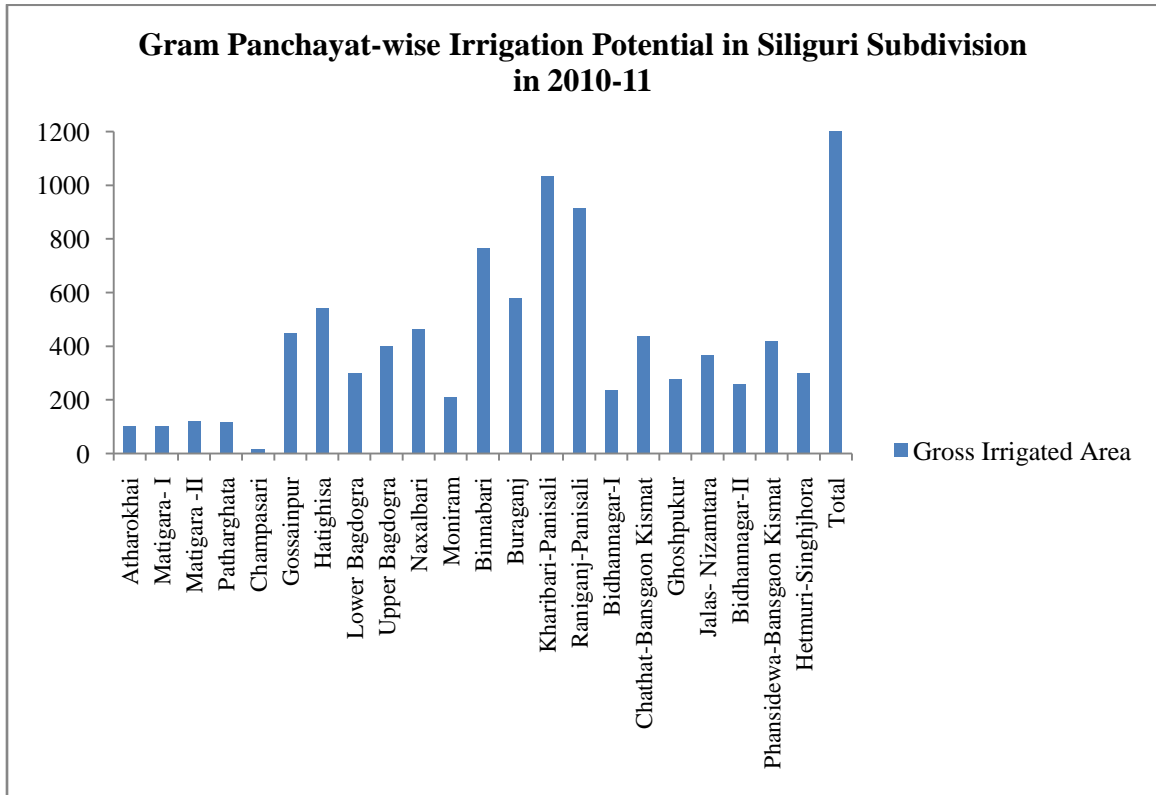


Figure 6.1 Gram Panchayat-wise Irrigation Potential in Siliguri Subdivision in 2010-11

Therefore, irrigation is a major lacuna to enhance the productivity of different crops in the subdivision. Because only 27.66% of the net cropped area and 24.41% of gross cropped area have been brought under irrigation up to 2010-11.

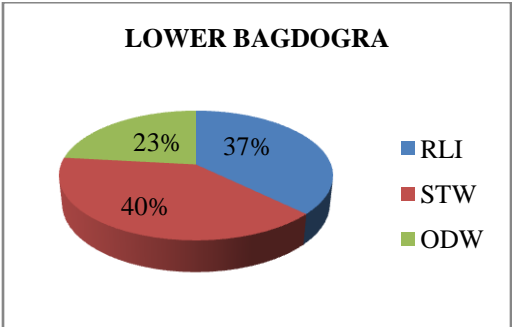
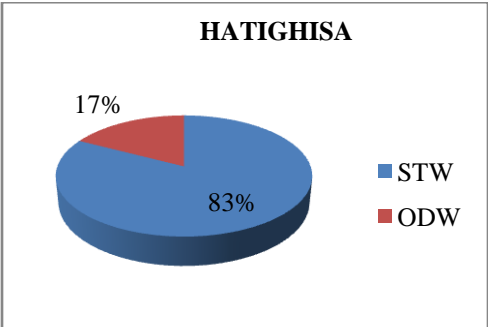
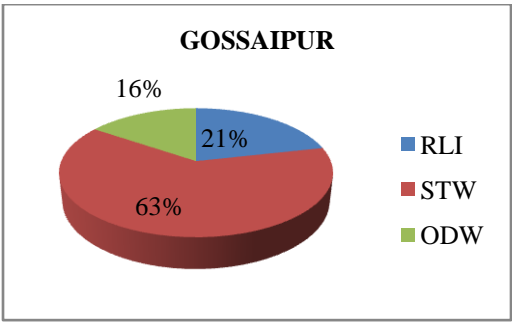
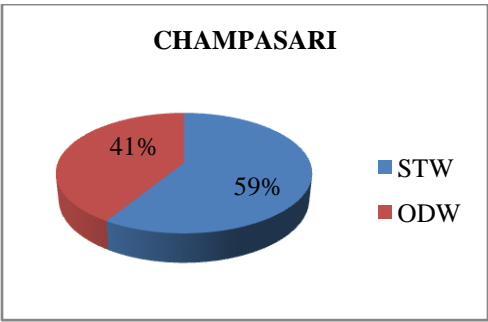
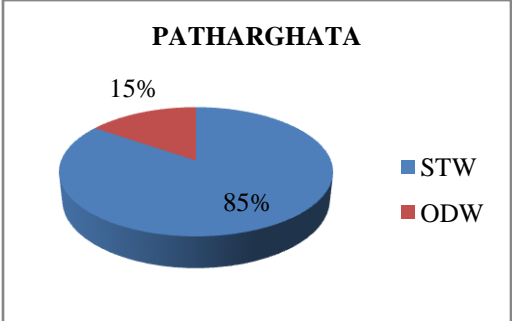
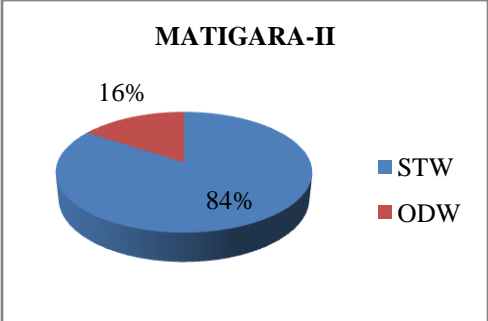
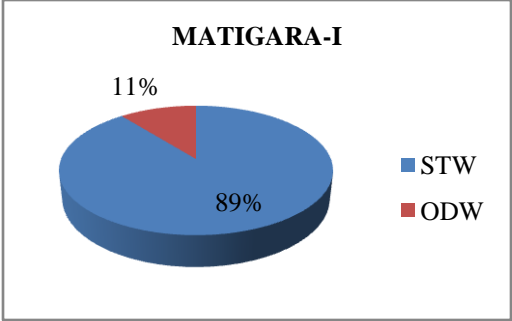
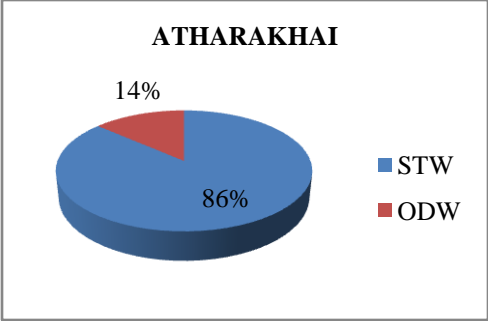
The study reveals that 59% of total irrigated area is irrigated by STW (shallow tube well) in the subdivision. RLI (river lift irrigation) contributes 26% of total irrigated area in this subdivision. And only 11% of total irrigated area irrigated by ODW (open dug well). The gram panchayats of Matigara block is irrigated by STW and ODW. The sources of irrigation in Naxalbari block and Kharibari block are RLI, STW and ODW. In

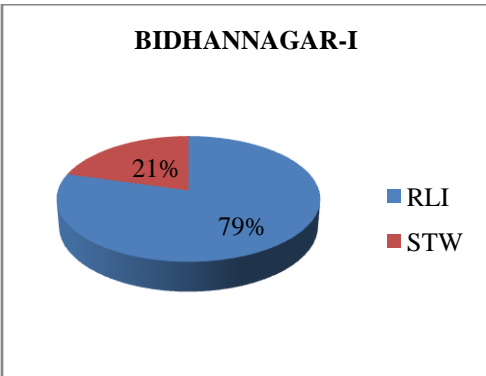
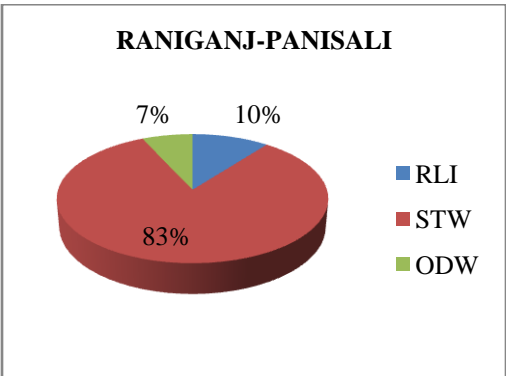
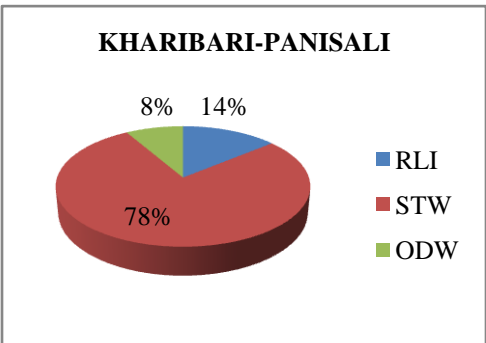
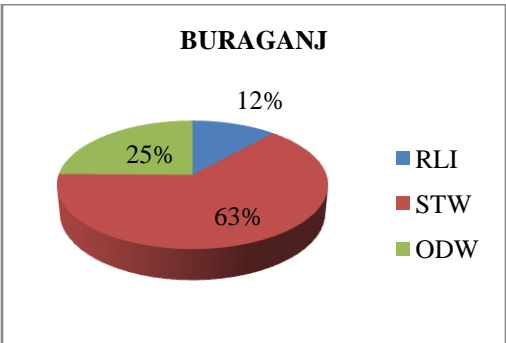
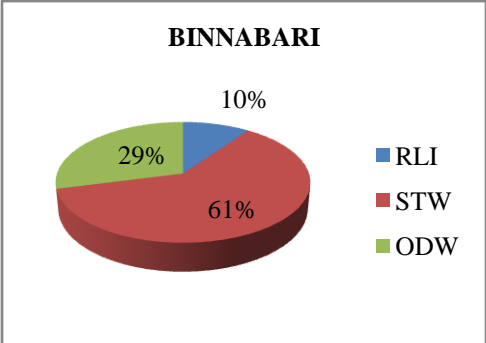
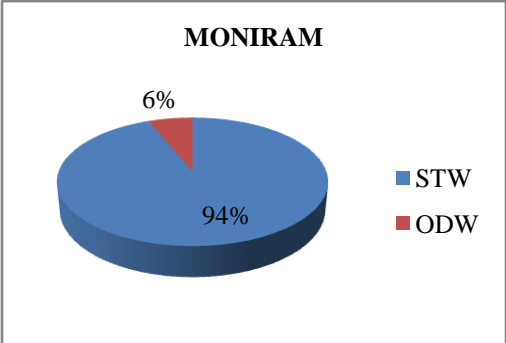
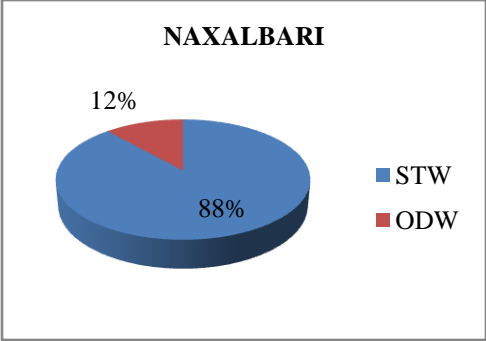
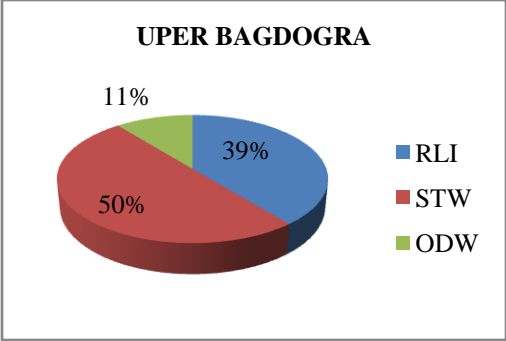
Phansidewa block sources of irrigation are RLI and STW. The following figures depict the distribution of different modes of irrigation.

Table 6.2 Area (in Hectare) Irrigated by Different Sources in Siliguri Subdivision (2010-11)

Gram Panchayat	Canal	Tank	RLI	DTW	STW	ODW	Others	Total
Atharakhai	-	-	-	-	89	14	-	103
Matigara- I	-	-	-	-	91	11	-	102
Matigara -II	-	-	-	-	102	19	-	121
Patharghata	-	-	-	-	99	18	-	117
Champasari	-	-	-	-	10	7	-	17
Gossaipur	-	-	97	-	284	70	-	451
Hatighisa	-	-	-	-	448	94	-	542
Lower Bagdogra	-	-	112	-	119	70	-	301
Upper Bagdogra	-	-	156	-	200	43	-	399
Naxalbari	-	-	-	-	411	54	-	465
Moniram	-	-	-	-	199	13	-	212
Binnabari	-	-	75	-	468	222	-	765
Buraganj	-	-	68	-	369	144	-	581
Kharibari-Panisali	-	-	145	-	801	87	-	1033
Raniganj-Panisali	-	-	96	-	756	63	-	915
Bidhannagar-I	-	-	189	-	49	-	-	238
Chathat-Bansgaon Kismat	-	-	325	-	112	-	-	437
Ghoshpukur	-	-	188	-	90	-	-	278
Jalas- Nizamtara	-	-	255	-	114	-	-	369
Bidhannagar-II	-	-	212	-	46	-	-	258
Phansidewa-Bansgaon Kismat	-	-	355	-	65	-	-	420
Hetmuri-Singhjhora	-	-	281	-	19	-	-	300
Total	-	-	2189	-	4941	929	-	8424

Source: Office of Assistant Director of Agriculture, Matigara-Naxalbari block and Kharibari-Phansidewa block.





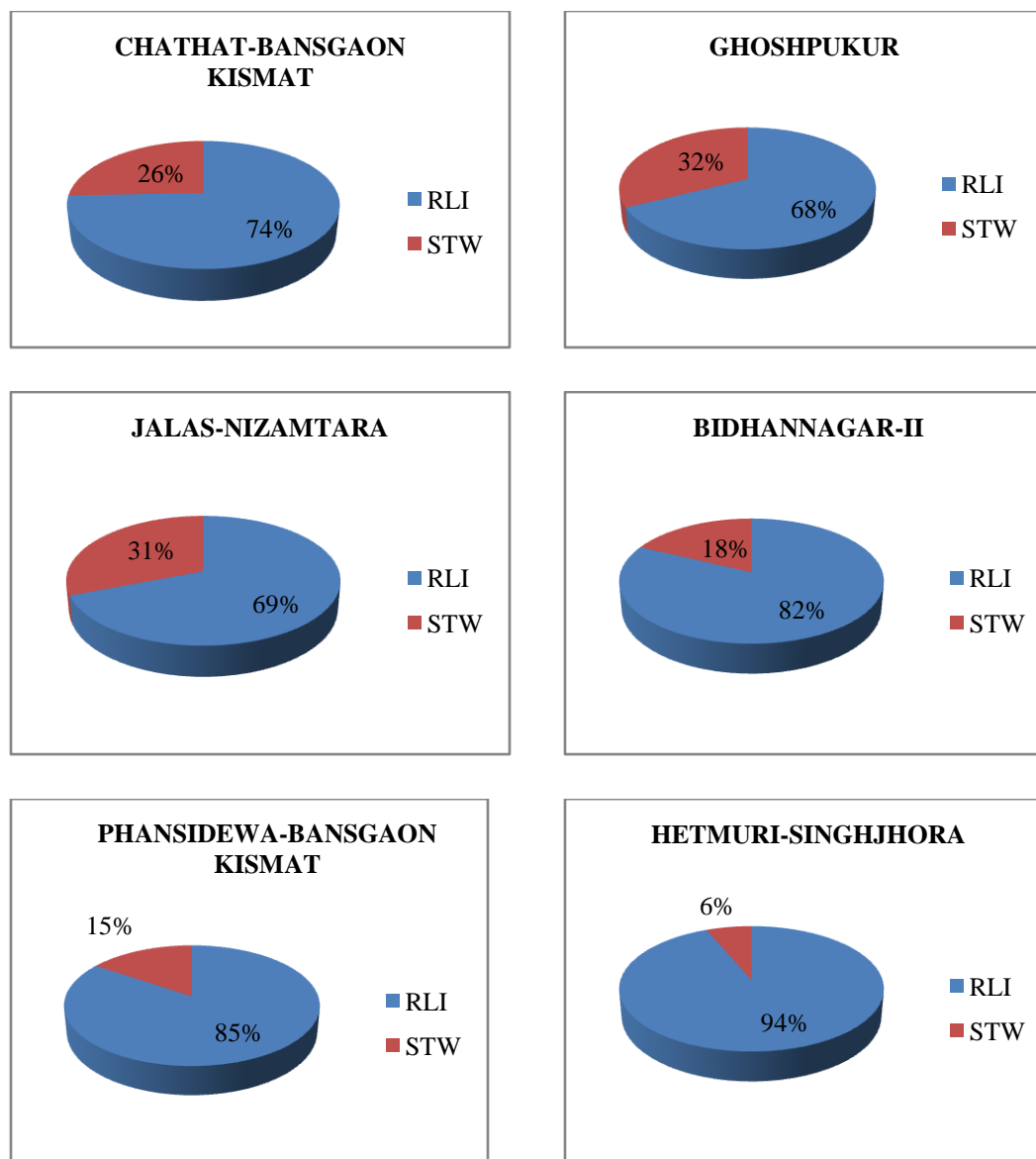


Figure 6.2 Distribution of Different Modes of Irrigation in Siliguri Subdivision (GP-wise): 2010-11

6.3. Agricultural Mechanization

One of the major technical developments of the post-independence period has been application of mechanical power to agriculture. The mechanization of agriculture in India simply means the use of tractors and power operated pump sets. It is labour and time saving and gives more spare time to farmers to look after other farm activities.

Table 6.3 Gram Panchayat-wise Distribution of Agricultural Implements in Siliguri Subdivision

Gram Panchayats	Agricultural Implements per ha. of gross cropped area		
	Tractor/Power Tiller	Pump sets	Threshers
Atharakhai	0	0.020947	0.029326
Matigara- I	0.005051	0.005051	0.020202
Matigara -II	0	0.023148	0.032407
Patharghata	0.00316	0.022117	0.031596
Champasari	0	0.024096	0.024096
Gossaipur	0.000751	0.009016	0.009016
Hatighisa	0	0.008984	0.01098
Lower Bagdogra	0.001816	0.010897	0.01453
Upper Bagdogra	0	0.007543	0.008801
Naxalbari	0.000688	0.006882	0.009635
Moniram	0	0.031236	0.022311
Binnabari	0.001173	0.007038	0.004692
Buraganj	0	0.004049	0.004049
Kharibari-Panisali	0.000237	0.002372	0.002847
Raniganj-Panisali	0.000309	0.004011	0.00432
Bidhannagar-I	0	0.005322	0.00414
Chathat-Bansgaon Kismat	0.000736	0.004415	0.003679
Ghoshpukur	0	0.004787	0.004308
Jalas- Nizamtara	0.000441	0.005286	0.005286
Bidhannagar-II	0.000553	0.005534	0.002767
Phansidewa-Bansgaon Kismat	0.000263	0.004465	0.004203
Hetmuri-Singhjhora	0.000635	0.008889	0.008254

(Compiled by the Researcher)

Agricultural machineries are a crucial input for efficient and timely agricultural operations facilitating multiple cropping and thereby increasing production. Therefore, promotion of farm mechanization has been considered essential for increasing agricultural production. The success of agriculture largely depends upon the type of implements used by the farmers. The agricultural implements used by the cultivators of the district are simple and not as efficient as the improved ones. The machineries used in the region under study are tractor, power tiller, reaper, electric and diesel pump set,

power sprayer and some small implements like paddy thresher, wheel hoe, delivery pipe, spade, seed drill and cono weeder.

Table 6.3 depicts the use of various agricultural implements in different gram panchayat in the subdivision. The number of modern implements like agricultural tractor, agricultural power tiller are insignificant. But the numbers of electric and diesel pump sets are significant in the subdivision. Small implements like paddy thresher and pump sets are also present in each gram panchayat significantly. It is observed that the farmers of the subdivision have to share some of their agricultural implements with others which indicate that they do not possess the implements individually, but they borrow or lend on exchange basis.

However, spatial differences in the use of modern implements are observed in the district. It is further identified that the use of modern agricultural implements has increased during the study period. The use of agricultural implements also changes on account of changing socio-economic status of farmers linked with the changing cropping pattern. There is an urgent need to mechanize the agricultural operations so that wastage of labour force is avoided and farming is made convenient and efficient. However, despite progressive increase in the use of agricultural machines, its sustainable benefits towards agricultural development have remained confined to the rich farmers. The role of modern agricultural implements on crops from tillage to post harvest operation has much bearing in respect of production aspects of different agricultural crops. Use of Improved Agricultural Implements is essential to complete the agricultural operation quickly to reduce the cost of production in multiple cropping system of the subdivision.

6.4. High Yielding Variety Seeds (HYV)

The domestic varieties of seeds are unsuitable for the new production techniques. So, high yielding varieties of seeds are used which added new scene to cropping pattern. The introduction of high yielding variety seeds programme indeed marked the beginning of a new era in the field of agricultural development. Farmers came forward to adopt this new method, only in case of paddy, jute, wheat and other crops which include vegetables. This rapid adoption was also facilitated by improvements in the supply of irrigation water and successful research in bringing out better varieties. Further, the rapid adoption of high yielding variety seeds was made possible by response of the farmers in this region.

From the following table it is clear that the use of HYVs is increasing during the study period. In Siliguri subdivision farmers have been adopted 6 crops, namely aus, aman, boro, wheat, jute and other crops, in case of HYVs. The area covered by HYVs of different crops has been presented by table no 6.4. In Atharakhai gram panchayat there was no use of HYVs have been seen in 1990-91. But in other GPs of the subdivision have started the use of HYVs in case of aus, aman, wheat and jute. The use of HYVs in case of

Table 6.4 Area (in Hectare) under HYVs in Siliguri Subdivision (2010-11): GP-wise

Gram Panchayat	Distribution of area under HYVs per ha. of gross cropped area
Atharakhai	0.402178
Matigara- I	0.227273
Matigara -II	0.328704
Patharghata	0.252765
Champasari	0.353414
Gossaipur	0.441773
Hatighisa	0.324416
Lower Bagdogra	0.199782
Upper Bagdogra	0.114408
Naxalbari	0.317275
Moniram	0.379295
Binnabari	0.07566
Buraganj	0.188075
Kharibari-Panisali	0.139265
Raniganj-Panisali	0.191608
Bidhannagar-I	0.777646
Chathat-Bansgaon Kismat	0.6766
Ghoshpukur	0.790809
Jalas- Nizamtara	0.747137
Bidhannagar-II	0.740454
Phansidewa-Bansgaon Kismat	0.780405
Hetmuri -Singhijhora	0.829841

(Compiled by the Researcher)

boro paddy and other crops including vegetables, etc. has been started in 2010-11. In each GP we have observed the increasing trend in area coverage of HYVs over the years. The gram panchayat-wise utilization of HYV seeds (Table no. 6.4) in the region reveals that the distribution pattern is closely related to the proportion of irrigation.

6.5. Chemical Fertilizers

During the study period use of chemical fertilizers has been gradually increasing. The use of fertilizers is not the same throughout the district being generally higher in the irrigated areas. The obstacles in the lesser use of fertilizers are lower proportion of irrigation, lack of finance, high prices, non-availability at the required time and the small landholding size which discourage the use of fertilizers.

Table 6.5 Fertilizers Consumption (M. tonnes) in Siliguri Subdivision, 2010-11

Gram Panchayat	Distribution of area under fertilizers per ha. of gross cropped area
Atharakhai	0.092166
Matigara- I	0.060606
Matigara -II	0.092593
Patharghata	0.066351
Champasari	0.040161
Gossapur	0.023291
Hatighisa	0.024955
Lower Bagdogra	0.039956
Upper Bagdogra	0.025145
Naxalbari	0.017206
Moniram	0.100402
Binnabari	0.014663
Buraganj	0.004785
Kharibari-Panisali	0.003796
Raniganj-Panisali	0.003394
Bidhannagar-I	0.047901
Chathat-Bansgaon Kismat	0.012877
Ghoshpukur	0.005266
Jalas- Nizamtara	0.011894
Bidhannagar-II	0.060874
Phansidewa-Bansgaon Kismat	0.013659
Hetmuri -Singhjhora	0.024762

(Compiled by the Researcher)

6.6. Levels of Agro-Technological Development

Agricultural land use change could be achieved only through the level of technological development. Modern inputs like, agricultural machinery, fertilizers, high yielding varieties seeds and irrigation have played as the key factors affecting the agriculture. Further, regional inequalities in the level of agricultural technology responsible for regional imbalances in the level of agricultural performance. Therefore the need arises for measuring and mapping the regional inequalities to identify backward and advanced areas in terms of agricultural technology, which are responsible for agriculturally prosperous and backward area.

6.6.1. Methodology

To analyze the spatial disparities in the levels of agro-technological development we have been used the equation evolved by Dutt and Sen Gupta (1969) with further modification by Jasbir Singh (1994) and composite index values have been derived. The computation procedure is as follows:

$$It = \frac{I_g}{I_s} + \frac{F_g}{F_s} + \frac{H_g}{H_s} + \frac{T_g}{T_s} + \frac{P_g}{P_s} + \frac{Th_g}{Th_s}$$

Where,

It = composite index of the level of agricultural technology

I = proportion of irrigated area to total cropped area

F = fertilizer consumption of per hectare of cultivated area

H = proportion of area under HYVs to total cropped area

T = tractors per hectare of cultivated area

P = pump set implements per hectare of cultivated area

Th = threshers per hectare of cultivated area

g and s subscripts symbolize respectively the gram panchayat and subdivision as a whole.

The above procedure is adopted to compute the index value of each gram panchayat. The summed up index values of all indicators then multiplied by 100 to derive the degree of agricultural technology.

$$\text{Degree of Agricultural technology} = \frac{\sum LQS}{N} \times 100$$

Here N indicates the number of indicators of agricultural technology.

6.6.2. Results and Discussions

The composite index derived from the method stated above have been categorized in three level of regions, namely, i) High (>550), ii) Moderate (450-550), iii) Low (<450).

i)Region of High Level of Agricultural Technology

It includes seven gram panchayats namely Bidhannagar-I, Chathat-Bansgaon Kismat, Ghoshpukur, Jalas-Nizamtara, Bidhannagar-II, Phansidewa-Bansgaon Kismat and Hetmuri-Singhjhora. The Index value of this category ranges >550. This category has been characterized by assured irrigation facilities, availability of agricultural inputs, forward looking attitude of farmers. All these have led to high level of agricultural technology. As a result this region has been experienced maximum change in agricultural land use pattern.

ii)Region of Moderate Level of Agricultural Technology

The index value of this category ranges from 450-550. Five GPs namely Atharakhai, Matigara-I, Matigara-II, Patharghata and Moniram are included in this category. The first four GPs located in the north of the study area and only Moniram located in western part of the area. These GPs have better position in some indices and poor in others but measured by the composite index of agro-technological development they belong to moderate category. But all these GPs may attain their level of development in near future, if efforts made to extend area under irrigation along with other agricultural inputs.

iii)Region of Low Level of Agricultural Technology

The region of low development comprises ten GPs namely Champasari, Gossaipur, Hatighisa, Lower Bagdogra, Upper Bagdogra, Naxalbari, Binnabari, Buraganj, Kharibari-Panisali and Raniganj- Panisali. The index value for this category is <450. The predominance of forest lands seems to have restrained agro-technological development. The poor position in the use of agricultural inputs brought these GPs in the low level development category.

Table 6.6 Agro - Technological development region, 2011

Gram Panchayats	GIA	Fertilizers Consumption	Area under HYVS	Tractors per ha cropped area	Pump sets per ha cropped area	Threshers per ha cropped area	Index Value (It)	Category of Region
Atharakhai	0.431504	0.092166	0.402178	0	0.020947	0.029326	539.5918	Moderate
Matigara-I	0.515152	0.060606	0.227273	0.005051	0.005051	0.020202	515.5062	Moderate
Matigara-II	0.560185	0.092593	0.328704	0	0.023148	0.032407	508.7348	Moderate
Patharghata	0.369668	0.066351	0.252765	0.00316	0.022117	0.031596	533.492	Moderate
Champasari	0.136546	0.040161	0.353414	0	0.024096	0.024096	433.7793	Low
Gossairpur	0.338843	0.023291	0.441773	0.000751	0.009016	0.009016	446.056	Low
Hatighisa	0.541026	0.024955	0.324416	0	0.008984	0.01098	351.0617	Low
Lower Bagdogra	0.546676	0.039956	0.199782	0.001816	0.010897	0.01453	356.6309	Low
Upper Bagdogra	0.501634	0.025145	0.114408	0	0.007543	0.008801	183.9826	Low
Naxalbari	0.320028	0.017206	0.317275	0.000688	0.006882	0.009635	341.1806	Low
Moniram	0.473003	0.100402	0.379295	0	0.031236	0.022311	542.0466	Moderate
Binnabari	0.44868	0.014663	0.07566	0.001173	0.007038	0.004692	175.5493	Low
Buraganj	0.213839	0.004785	0.188075	0	0.004049	0.004049	179.1309	Low
Khairbari-Pamisali	0.245077	0.003796	0.139265	0.000237	0.002372	0.002847	145.7719	Low
Ramganj-Pamisali	0.28232	0.003394	0.191608	0.000309	0.004011	0.00432	197.6695	Low
Bidhannagar-I	0.140745	0.047901	0.777646	0	0.005322	0.00414	649.4172	High
Chathat-Bansgaon Kismat	0.16078	0.012877	0.6766	0.000736	0.004415	0.003679	570.8692	High
Ghoshpukur	0.133078	0.005266	0.790809	0	0.004787	0.004308	621.1513	High
Jalas- Nizamtara	0.162555	0.011894	0.747137	0.000441	0.005286	0.005286	617.4717	High
Bidhannagar-II	0.142778	0.060874	0.740454	0.000553	0.005534	0.002767	651.378	High
Phansidewa-Bansgaon Kismat	0.110323	0.013659	0.780405	0.000263	0.004465	0.004203	628.0147	High
Hetmuri -Singhijhora	0.190476	0.024762	0.829841	0.000635	0.008889	0.008254	716.4954	High

(Compiled by the Researcher)

6.7. Changes in Agricultural Land use

The changes which took place in agricultural land use pattern of Siliguri subdivision during the period under review had a marked impact of agricultural inputs and have been brought many changes in cropping pattern. A change in the agricultural land use implies a change in the proportion of area under different crops at two different times (1990-91 and 2010-11). With the adoption of new technological factors the farmers have continually altered the proportion of land under different crops.

6.7.1. Methodology

The method used for measurement of change and direction of change of individual crops is as follows:

The percentage of area involved in change for every areal unit (GP) is calculated for individual crops. The crops of leading increase and decrease have been marked in each gram panchayat and same have been mapped in each gram panchayat providing a comparative view of the direction of change. For the quantitative measurement of the overall change in agricultural land use pattern during 1990-91 to 2010-11, Weaver's Index (1954) is used.

$$\text{Index of change in Agricultural Land use} = \frac{A}{B}$$

where, 'A' is the difference in percentage of crops of increase and 'B' is the difference of percentage of crops of decrease for the period under review.

The summation of the numerator and the denominator should be the same and this only be achieved if land use statistics are accurate and carefully computed. It is the percentage of land which is actually involved in the transfer of area from one crop to another. Having thus achieved the percentage of land involved in change for every gram panchayat, giving a comparative view of the areas where agricultural land use patterns have been highly dynamic and by contrast other areas where they have been highly stable. The higher the index, the more radical are the changes in the land use pattern and

lower the index, the more is the stability. The technique determining the index of change is given in table 6.7.

7.2 Results and Discussions

Crops of leading increase and decrease

The important crops of leading increase are jute, aman and the crops of leading decrease are aus, aman and wheat with considerable areal percentage strength.

The shift from cereal, namely aus, aman and wheat growing area to aman, jute and maize is observed in the gram panchayats. The shift from aus growing area to aman is remarkable and have been registered in Atharakhai, Matigara-I, Matigara-II, Patharghata, Champasari, Bidhannagar-I, Chathat-Bansgaon Kismat, Ghoshpukur, Jalas-Nizamtara, Phansidewa-Bansgaon Kismat and Hetmuri-Singhjhora. In Gossapur and Upper Bagdogra it is from aus to jute; in Bidhannagar-II it is from wheat to aman; in Lower Bagdogra it is from Aman to Maize. The shift from aman to jute has been registered in Gossapur, Hatighisa, Naxalbari, Moniram, Binnabari, Buraganj, Kharibari-Panisali and Raniganj-Panisali.

6.7.3. Overall change in agricultural land use

The overall area involved in change is studied in collaboration with the technological factors and individual crop pattern changes. It provides the overall comparative picture of the areas where the cropping pattern has been relatively dynamic and where by contrast cropping pattern has been relatively stable. Three areas of change which occurred during the period under review in the study area have been obtained.

The very outstanding areas of change with dynamic swing (39%-55%) are observed in Bidhannagar-I, Chathat-Bansgaon Kismat, Ghoshpukur, Jalas-Nizamtara, Bidhannagar-II, Phansidewa-Bansgaon Kismat and Hetmuri-Singhjhora gram panchayats. These are the leading gram panchayats in total crop shift and the crop of leading increase is aman and crops of leading decrease are aus and wheat. These gram panchayat enjoys high level of technological development.

Table 6.7 Technique for Calculation of Crop Land Use Change of Siliguri Subdivision: GP-wise

Gram Panchayats	Aus	Aman	Boro	Wheat	Masur	Maskalai	Khesari	Mustard	Linseed	Til	Potato	Jute	Maize	Other Crops	Index Value
Atharakhai	-16.31	21.29	0	-2.87	0	0	0	-3.09	0	0	2.32	-5.93	1.26	3.33	-28.2/+28.2
Matigara-I	-16.05	23.04	0	-2.48	0	0	0	-0.75	0	0	1.9	-9.52	1.01	2.85	-28.8/+28.8
Matigara-II	-17.9	20.19	0	-2	0	0	0	-0.68	0	0	3.19	-5.66	0.93	1.93	-26.2/+26.2
Patharghata	-17.54	26.13	0	-5.6	0	0.32	0	-2.69	0	0	1.59	-5.83	1.26	2.36	-31.6/+31.6
Champasari	-12.96	14.43	0	-2.91	0	0	0	-0.26	0	0	1.89	-4.07	0.8	3.08	-20.2/+20.2
Gossaipur	-11.51	-0.11	1.8	-1.85	0	0.08	0.08	0.53	0	0.15	2.68	5.68	1.95	0.52	-13.4/+13.4
Hatighisa	-4.42	-11.14	3.09	-2.56	0.1	0.1	0.1	1	0	0.08	3.8	7.28	2.1	0.47	-18.1/+18.1
Lower Bagdogra	-3.05	-5.23	2.54	-1.45	0	0	0	0.11	0	0	2	2.49	2.72	-0.13	-9.86/+9.86
Upper Bagdogra	-5.06	-0.49	1.51	-0.93	0.38	0	0	0.05	0	0	0.27	2.27	2.01	-0.01	-6.49/+6.49
Naxalbari	-7.39	-7.51	3.92	-2.69	0.14	0.14	0.14	0.62	0	0.28	3.74	5.35	2.62	0.64	-17.6/+17.6
Moniram	-3.54	-21.02	5.13	-2.43	0	0	0	1.12	0	0.04	4.6	10.25	4.23	1.62	-26.9/+26.9
Binnabari	-4.75	-5.65	4.64	-3.22	0.06	-0.63	0	-5.33	0	-0.14	3.23	9.07	2.46	0.26	-19.7/+19.7
Buraganj	-1.58	-6.07	1.31	-1.48	0	-0.37	0	-3.78	0	-0.65	2.96	8.83	0.68	0.15	-13.9/+13.9
Khariabari-Pamisali	-2.05	-7.62	2.38	-3.28	0.05	0.05	0.02	-4.88	0	-0.22	3.66	9.39	2.21	0.29	-18.1/+18.1
Raniganj-Pamisali	-2.74	-9.77	3.22	-2.14	0.06	0.37	0	-4.52	0	0.18	2.2	11.72	1.23	0.19	-19.2/+19.2
Bidhannagar-I	-15.96	46.6	5.57	-9.55	0	-1.04	0	-14.38	0	-3.34	-0.53	-7.3	0.54	-0.61	-52.7/+52.7
Chathat-Bansgaon Kismat	-13.76	39.97	7.53	-11.4	0	-1.2	0.04	-10.07	0	-7.97	-0.73	-2.2	0.7	-0.91	-48.2/+48.2
Ghoshpukur	-15.98	37.67	4.31	-8.48	0	-0.86	0	-10.31	0	-4.89	1.92	-3.47	0.57	-0.48	-44.4/+44.4
Jalas- Nizamtara	-14.91	36.58	7.87	-8.59	0	-0.85	0.04	-14.86	0	-2.86	0.58	-2.73	0.62	-0.89	-45.6/+45.6
Bidhannagar-II	-10.96	47.89	5.74	-14.45	0	-0.91	0.06	-14.15	0	-2.04	-0.39	-9.97	0.39	-1.21	-54.1/+54.1
Phansidewa-Bansgaon Kismat	-19.45	48.51	3.3	-10.34	0	-1.39	0.05	-10.96	0	-3.3	-0.4	-5.25	0.55	-1.32	-52.4/+52.4
Hermuri - Singhjhora	-16.97	43.18	4.88	-5.85	0	-0.8	0	-16.56	0	-2.01	-0.86	-5.56	0.38	0.17	-48.6/+48.6

(Compiled by the Researcher)

The proportion of 23 to 39 percent change region categorized as moderate change region is largely confined to Atharakhai, Matigara-I, Matigara-II, Patharghata and Moniram gram panchayats. Here the significant expansions are in aman and jute and reduction in aus and in only Moniram it is in aman. Here we have found moderate level of agro-technological development.

The low change (6%-23%) in agricultural land use occurred in Champasari, Gossaipur, Hatighisa, Lower Bagdogra, Upper Bagdogra, Naxalbari, Binnabari, Buraganj, Kharibari-Panisali and Raniganj-Panisali. Here the important increasing crop is jute and maize and declining crops are aman and aus. Here the stable condition is due to the low level of technological development.

Thus we have proved the third hypothesis that modern agricultural inputs have direct impact on agricultural land use pattern. Because every gram panchayat has been experienced agricultural land use changes according to their level of agricultural technology.

6.8. Conclusions

Agricultural inputs play a pivotal role in changing the agricultural land use pattern. The study about levels of agricultural technology reveals that its high proportion is confined the areas having high intensity of irrigation with forward looking attitude of farmers. Highest change has occurred in Hetmuri Singhijhora and lowest change has observed in Upper Bagdogra. In these areas agricultural land use highly changed over the periods. The areas with low level of technological development experienced low changes in agricultural land use pattern. Therefore we can say that agricultural inputs have direct impact on agricultural land use pattern.

6.9. References

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