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Real Adoption Impact : A Measure of Sustainability in Agricultural Practices

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ABSTRACT

Adoption of new technologies in the form of use of recommendation of various inputs plays a very crucial role in sustainable agricultural development. It has been noticed that most of the farmers cannot afford the recommendations made by the research station for different reasons and they deviate from the standard recommended practices. This study aims at deriving the real impact of adoption on yield by utilizing the degree of deviations observed in farmers' practices from the standard recommendations. It is argued that the more is the impact of adoption the more will be the sustainability in agricultural development. Hence attempt has been made to use this new measure of impact of adoption developed has as an effective measure of sustainability in agricultural practices. Moreover, using the newly developed real adoption impact (*RAI*) measure and the corresponding observed yield a regression function of observed yield on *RAI* has been fitted. Then, using the fitted regression function the expected yields were found for a given level of adoption i.e., for a given value of *RAI* and using the fitted regression equation of observed yield on *RAI*, the expected yields were obtained. The expected yield gap and the observed yield gap have been plotted on a graph for useful comparison. This new measure i.e., *RAI*, has been used to predict the yield in advance once one knows the capacity of the farmer to follow the recommended practices and consequently, suggestions for better yield can be made to the farmers.

***Key words* :** Adoption, *RAI*, regression, sustainable agriculture, yield-gap.

Introduction

It has been observed that for different technologies used in agricultural practices different standard recommendations are available from the research station or from the Government level. It has also been noticed that the farmers are deviating from the standard recommendations. There may be different reasons for their deviations like lack of knowledge about the recommended practices, constraint of money for using the recommended practices, etc. Here, this work has been focused on the degree of deviations in adopting the recommended technologies with proper weightage. It is very logical to think that mere use of any

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technology will not be appropriate for considering adoption of that technology and the time has come to redefine the adoption of a technology as the complete use of the recommended practice. It is argued that the more is the impact of adoption the more will be the sustainability in agricultural development. Hence, the new measure of adoption derived here can be used to indicate the sustainability in agricultural development. The newly developed measure of adoption, which is the modification of the existing measurement of adoption, is very sensitive to the deviations found in farmers' practices from the standard recommendations. This adoption impact measure is better than the existing one in the sense that along with the inclusion of a number of technologies considered by the farmers it also considers the degree of deviation in farmer's actual practice from the experimental station's recommendations. Here, for simplicity, major technologies were considered to be of equal weights, but in practice, the technologies will have different weights in accordance to their importance or role play in that particular agriculture practice. Suitable weight can be attached to a technology while deriving this new measure. After obtaining the Real Adoption Impact (*RAI*) for each farmer, a statistical test can be carried out to test the positiveness of the correlation (ρ) between *RAI* (x) and the observed yield (y). Once the significant positive correlation between *RAI* and observed yield is established an appropriate regression equation can be fitted by considering observed yield (y) as a dependent variable and *RAI* (x) as the independent variable. From the fitted regression equation, the expected yield can be obtained for each farmer according to his level of adoption. Let us use the notation y^*, y_{obs} and y_{exp} to denote experimental station yield, observed yield and expected yield respectively. Expected yield gap for each farmer as defined by $\{(y^*) - (y_{exp})\}$ can be obtained. The expected yield gaps can further be compared with the observed yield gaps defined by $\{y^* - y_{obs}\}$. A sensitivity analysis between *RAI* and the observed yield can also be done by varying one technology at a time and keeping all other technologies fixed at the recommended level.

Assumptions :

The new measure is based on the following assumptions:

(i) Equal deviation will affect yield equally for each of the given technologies when other factors remain constant.

(ii) The deviation cannot exceed the recommended inputs (doses) for all practical purposes.

1. Derivation of the Measure of Adoption and Sustainability

To derive the new measure of adoption i.e., *RAI*, any function of the proportion of deviations of the actual practice from the recommended practices, can be used like the mean, standard deviation (s.d.) etc. Standard deviation is found to be unsuitable here because the deviation proportions are very high in magnitude with a small scatteredness in many cases. Under such circumstance, the s. d. value of deviation proportions is very small which implies a high impact of adoption. However, the actual situation is different, to be specific, just the opposite. Thus, it was preferred to use the mean of deviation proportions while developing the new measure. The new measure of adoption is derived and given below (Pal *et al.*, 2019) :

Let, the total number of technologies recommended be N, the technologies used by the farmers be $T_1, T_2, \ldots, T_n$, the recommended inputs (in proper unit) are $r_1, r_2, \ldots, r_n$, the inputs used in actual practice (in proper unit) be $p_1, p_2, \ldots, p_n$.

Then, absolute deviations of the actual practice from the recommended practice are $d_1 = |r_1 - p_1|$, $d_2 = |r_2 - p_2|$, …, $d_n = |r_n - p_n|$.

Thus, the proportions of absolute deviation are $R_1 = \frac{d_1}{r_1}$, $R_2 = \frac{d_2}{r_2}$, …, $R_n = \frac{d_n}{r_n}$

Now, $RAI = \frac{n}{N} \times \frac{1}{\bar{R}} = \frac{n}{N} \times \frac{1}{\frac{1}{N}\sum_{i=1}^{N} R_i} = \frac{n}{\sum_{i=1}^{N} R_i}$, … (1)

where, $R_i = \frac{|r_i - p_i|}{r_i}$, $i = 1, 2, \ldots, n$, where n = number of technologies considered by the farmer, N = number of major technologies considered in the study.

Now, those farmers who are implementing the technologies as per recommendations i.e., who are adopting technologies in the context of that particular agricultural practice will have deviation proportions zero, i.e., when $r_i = p_i$, for all $i = 1, 2, \ldots, N$, then all $R_i = 0$, leading to $RAI = \infty$, the complete adoption case. The *RAI* will be zero when n is zero, i.e., no adoption case. Other values of *RAI* will remain within 0 and . Thus, the range of *RAI* is zero to infinity. Normally, a large value of *RAI* will indicate a situation of high adoption and thus, the *RAI* defined in Equation 1 can be effectively used as a measure of adoption. The correlation coefficient between *RAI* and the observed yield is obtained and tested for its significance. Next, a linear regression function for yield on *RAI* is obtained, and the expected yields are determined. Moreover, stability in *RAI* will indicate sustainability in the said agricultural practice. The sustainability index (S. I.) (Rama Rao I.V.Y. 2011; Kiresur *et al.*, 1996 and Sethy *et al.*, 2016) is defined by,

$$(\text{S.I.}) = \frac{Sd\ (RAI)}{Mean\ (RAI)} \times 100 \qquad \ldots(2)$$

1. A case study :

To study the use of this *RAI* in measuring sustainability and to develop the sustainability index of agricultural development, a case study was conducted on paddy crop with the recommendations of the Agricultural farm of Bihar Agricultural University (*BAU*), Sabour, Bhagalpur district in Bihar, India. A total number of 50 paddy growers of different blocks of Bhagalpur district were selected by a simple random sampling without replacement (*SRSWOR*). In the present study, agricultural farm of *BAU*, Sabour, Bhagalpur was the Experimental Station and the recommended yield of paddy was recorded from this research station as 48.00 q/ha.

For the present investigation, a total number of eight (8) technologies viz., N, P, K fertilizers (kg/ha), number of irrigations (in number), pest and disease measures (number), labour (man-days / ha), seed rate (kg/ha) and land preparation (in number) applied were considered. Table 1 reveals the technology gap (deviations) in the use of technologies mentioned above and Table 2 represents the RAI for each farmer obtained by using Equation1. Data were collected by interview method.

Table 1 : Absolute deviations (d_i) in the technologies used by the farmers.

Sl. no. of farmers	d_i	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
1	d_1	9.46	14.54	45.17	3	3	26	7	2
2	d_2	9.46	14.53	45.17	3	3	25	6	2
3	d_3	8.32	14.53	36.28	3	3	25	6	2
4	d_4	8.32	14.53	36.28	3	3	25	6	2
5	d_5	2.05	14.53	36.28	3	3	24	5	1
6	d_6	2.05	14.53	36.28	3	3	24	5	1
7	d_7	3.39	11.50	36.28	3	3	22	5	1
8	d_8	46.36	41.60	60.00	4	4	37	8	3
9	d_9	46.36	41.60	60.00	4	4	34	8	3
10	d_{10}	43.73	34.24	60.00	4	4	34	8	3
11	d_{11}	43.73	34.24	60.00	4	4	34	8	3
12	d_{12}	26.66	31.58	60.00	4	4	33	8	3
13	d_{13}	27.90	5.44	20.46	2	2	18	4	1
14	d_{14}	27.90	5.44	20.46	2	2	18	4	1
15	d_{15}	34.00	17.94	12.56	2	2	18	4	1
16	d_{16}	34.17	17.94	12.56	2	2	17	4	1
17	d_{17}	34.17	30.93	0.69	2	2	16	4	0
18	d_{18}	43.00	30.93	0.69	2	2	15	4	0
19	d_{19}	46.07	30.93	0.69	1	2	14	4	0
20	d_{20}	46.07	30.93	0.69	1	2	14	4	0
21	d_{21}	55.00	30.94	0.69	1	1	12	3	0
22	d_{22}	86.39	17.94	7.78	0	2	31	7	3
23	d_{23}	50.00	69.91	60.00	3	2	12	4	0
24	d_{24}	18.03	5.44	20.46	1	1	37	8	1
25	d_{25}	57.80	60.00	60.00	5	4	39	8	3

Sl. no. of farmers	d_i	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
26	d_{26}	57.80	60.00	60.00	5	4	39	8	3
27	d_{27}	54.00	46.20	60.00	4	4	39	8	3
28	d_{28}	54.00	46.20	60.00	4	4	38	8	3
29	d_{29}	9.46	14.54	45.17	3	3	26	7	2
30	d_{30}	9.46	14.53	45.17	3	3	25	6	2
31	d_{31}	8.32	14.53	36.28	3	3	25	6	2
32	d_{32}	8.32	14.53	36.28	3	3	25	6	2
33	d_{33}	2.05	14.53	36.28	3	3	24	5	1
34	d_{34}	26.66	31.58	60.00	3	4	32	7	3
35	d_{35}	25.52	29.69	60.00	3	4	31	7	3
36	d_{36}	12.37	23.63	48.80	3	4	29	7	2
37	d_{37}	12.37	23.63	48.80	3	3	28	7	2
38	d_{38}	10.45	23.63	45.21	3	3	28	7	2
39	d_{39}	10.45	14.54	45.21	3	3	27	7	2
40	d_{40}	9.46	14.54	45.17	3	3	26	7	2
41	d_{41}	9.46	14.53	45.17	3	3	25	6	2
42	d_{42}	8.32	14.53	36.28	3	3	25	6	2
43	d_{43}	8.32	14.53	36.28	3	3	25	6	2
44	d_{44}	2.05	14.53	36.28	3	3	24	5	1
45	d_{45}	2.05	14.53	36.28	3	3	24	5	1
46	d_{46}	3.39	11.50	36.28	3	3	22	5	1
47	d_{47}	8.00	11.50	36.28	3	3	22	5	1
48	d_{48}	25.52	29.69	60.00	3	4	31	7	3
49	d_{49}	18.03	28.17	54.00	3	4	31	7	3
50	d_{50}	18.03	23.63	54.00	3	4	30	7	2

Table 2 : Proportion of absolute deviation (R_i) used by the farmers

Sl. number of farmers	R_i	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	*n*	*RAI*
1	R_1	0.095	0.242	0.753	0.600	0.600	0.081	0.233	0.667	8	2.446
2	R_2	0.095	0.242	0.753	0.600	0.600	0.078	0.200	0.667	8	2.473
3	R_3	0.083	0.242	0.605	0.600	0.600	0.078	0.200	0.667	8	2.602
4	R_4	0.083	0.242	0.605	0.600	0.600	0.078	0.200	0.667	8	2.602
5	R_5	0.021	0.242	0.605	0.600	0.600	0.075	0.167	0.333	8	3.028
6	R_6	0.021	0.242	0.605	0.600	0.600	0.075	0.167	0.333	8	3.028
7	R_7	0.034	0.192	0.605	0.600	0.600	0.069	0.167	0.333	8	3.078
8	R_8	0.464	0.693	1.000	0.800	0.800	0.116	0.267	1.000	6	1.167
9	R_9	0.464	0.693	1.000	0.800	0.800	0.106	0.267	1.000	6	1.170
10	R_{10}	0.437	0.571	1.000	0.800	0.800	0.106	0.267	1.000	6	1.205
11	R_{11}	0.437	0.571	1.000	0.800	0.800	0.106	0.267	1.000	6	1.205
12	R_{12}	0.267	0.526	1.000	0.800	0.800	0.103	0.267	1.000	6	1.260
13	R_{13}	0.279	0.091	0.341	0.400	0.400	0.056	0.133	0.333	8	3.934
14	R_{14}	0.279	0.091	0.341	0.400	0.400	0.056	0.133	0.333	8	3.934
15	R_{15}	0.340	0.299	0.209	0.400	0.400	0.056	0.133	0.333	8	3.685
16	R_{16}	0.342	0.299	0.209	0.400	0.400	0.053	0.133	0.333	8	3.687
17	R_{17}	0.342	0.516	0.012	0.400	0.400	0.050	0.133	0.000	8	4.319
18	R_{18}	0.430	0.516	0.012	0.400	0.400	0.047	0.133	0.000	8	4.129
19	R_{19}	0.461	0.516	0.012	0.200	0.400	0.044	0.133	0.000	8	4.533
20	R_{20}	0.461	0.516	0.012	0.200	0.400	0.044	0.133	0.000	8	4.533
21	R_{21}	0.550	0.516	0.012	0.200	0.200	0.038	0.100	0.000	8	4.955
22	R_{22}	0.864	0.299	0.130	0.000	0.400	0.097	0.233	1.000	7	2.316
23	R_{23}	0.500	1.165	1.000	0.600	0.400	0.038	0.133	0.000	7	1.825
24	R_{24}	0.180	0.091	0.341	0.200	0.200	0.116	0.267	0.333	8	4.631
25	R_{25}	0.578	1.000	1.000	1.000	0.800	0.122	0.267	1.000	4	0.694

Sl. number of farmers	R_i	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	*n*	*RAI*
26	R_{26}	0.578	1.000	1.000	1.000	0.800	0.122	0.267	1.000	4	0.694
27	R_{27}	0.540	0.770	1.000	0.800	0.800	0.122	0.267	1.000	6	1.132
28	R_{28}	0.540	0.770	1.000	0.800	0.800	0.119	0.267	1.000	6	1.133
29	R_{29}	0.095	0.242	0.753	0.600	0.600	0.081	0.233	0.667	8	2.446
30	R_{30}	0.095	0.242	0.753	0.600	0.600	0.078	0.200	0.667	8	2.473
31	R_{31}	0.083	0.242	0.605	0.600	0.600	0.078	0.200	0.667	8	2.602
32	R_{32}	0.083	0.242	0.605	0.600	0.600	0.078	0.200	0.667	8	2.602
33	R_{33}	0.021	0.242	0.605	0.600	0.600	0.075	0.167	0.333	8	3.028
34	R_{34}	0.267	0.526	1.000	0.600	0.800	0.100	0.233	1.000	6	1.326
35	R_{35}	0.255	0.495	1.000	0.600	0.800	0.097	0.233	1.000	6	1.339
36	R_{36}	0.124	0.394	0.813	0.600	0.800	0.091	0.233	0.667	8	2.150
37	R_{37}	0.124	0.394	0.813	0.600	0.600	0.088	0.233	0.667	8	2.274
38	R_{38}	0.104	0.394	0.753	0.600	0.600	0.088	0.233	0.667	8	2.326
39	R_{39}	0.104	0.242	0.753	0.600	0.600	0.084	0.233	0.667	8	2.436
40	R_{40}	0.095	0.242	0.753	0.600	0.600	0.081	0.233	0.667	8	2.446
41	R_{41}	0.095	0.242	0.753	0.600	0.600	0.078	0.200	0.667	8	2.473
42	R_{42}	0.083	0.242	0.605	0.600	0.600	0.078	0.200	0.667	8	2.602
43	R_{43}	0.083	0.242	0.605	0.600	0.600	0.078	0.200	0.667	8	2.602
44	R_{44}	0.021	0.242	0.605	0.600	0.600	0.075	0.167	0.333	8	3.028
45	R_{45}	0.021	0.242	0.605	0.600	0.600	0.075	0.167	0.333	8	3.028
46	R_{46}	0.034	0.192	0.605	0.600	0.600	0.069	0.167	0.333	8	3.078
47	R_{47}	0.080	0.192	0.605	0.600	0.600	0.069	0.167	0.333	8	3.024
48	R_{48}	0.255	0.495	1.000	0.600	0.800	0.097	0.233	1.000	6	1.339
49	R_{49}	0.180	0.470	0.900	0.600	0.800	0.097	0.233	1.000	7	1.636
50	R_{50}	0.180	0.394	0.900	0.600	0.800	0.094	0.233	0.667	8	2.068

Note : Here total number of technologies recommended i.e., N = **8** and n is as indicated in this table for particular farmer

Here Sustainability Index =

(S.I.) = $\frac{Sd\ (RAI)}{Mean\ (RAI)}$ x 100, where *Sd* (*RAI*) = standard deviation of the *RAI* scores and *Mean* (*RAI*) = mean of the *RAI* scores.

Here, *S. I.* = 42.7354.

For notational simplicity let us consider *RAI* as the independent variable (x) and observed yield as the dependent variable (y). Let ρ be the population correlation coefficient between *RAI* and the observed yield. The null hypothesis H_0: = 0 is then tested against the right sided alternative H_1: > 0 at 1 % level of significance. The correlation matrix is given below :

Correlation Matrix

	***RAI* (*x*)**	***Observed Yield (q/ha) (y)***
***RAI* (*x*)**	1	0.9356
Observed Yield (q/ha) (y)	0.9356	1

Appropriate test statistics for testing H_0 against H_1 is $= \frac{r\sqrt{(n-2)}}{\sqrt{(1-r^2)}}$, where the statistic follows a '*t*' distribution with (n-2) degrees of freedom (*d. f.*) under 'H_0', where n is the number of paired observations (x_i, y_i) and r is the correlation coefficient, calculated on the basis of the sample observations (Bhattacharya and Roychowdhury, 2017).

Since, the calculated value of t (= 18.3652), which is greater than the tabulated value of t i.e., $_{(0.01,48)}$ (= 2.6822), the null hypothesis H_0 is rejected at 1% level of significance. On rejection of H_0 a positive correlation between *RAI* (y) and observed yield (x) is established. Then a regression equation between *RAI* and observed yield was obtained as follow :

y = 25.6286 + 4.3168 x, ...(3)

where = yield, = *RAI*. (Bhattacharya and Roychowdhury, 2010))

On the basis of this regression equation the expected yields (y_{exp}) are obtained (Table 2).

ANOVA Table

	df	**SS**	***MS***	***F***	***p*-value**
Regression	1	1088.074	1088.074	337.2895	0.0001**
Residual	48	154.8449	3.225936		
Total	49	1242.919			

** significant at 1% level of significance

The regression model between observed yield (y) and *RAI* (x) is overall highly significant which is clear from the above ANOVA table.

Regression Statistics

R Square	0.8754
Adjusted R Square	0.8728
Standard Error	1.7961
Observations	50

On the basis of R^2 (0.93886) it is clear that the model given in Equation 3 fits well to the observed data (Nath *et. al.*, 2020). It is noticed that the Adj. R^2 (0.93733) is also very high and is more or less same as the value of R^2. The observed standard error is low (1.33784), which also justifies the fitting. The expected yield gaps and observed yield gaps are plotted on the same graph for comparison purpose (Figure 1).

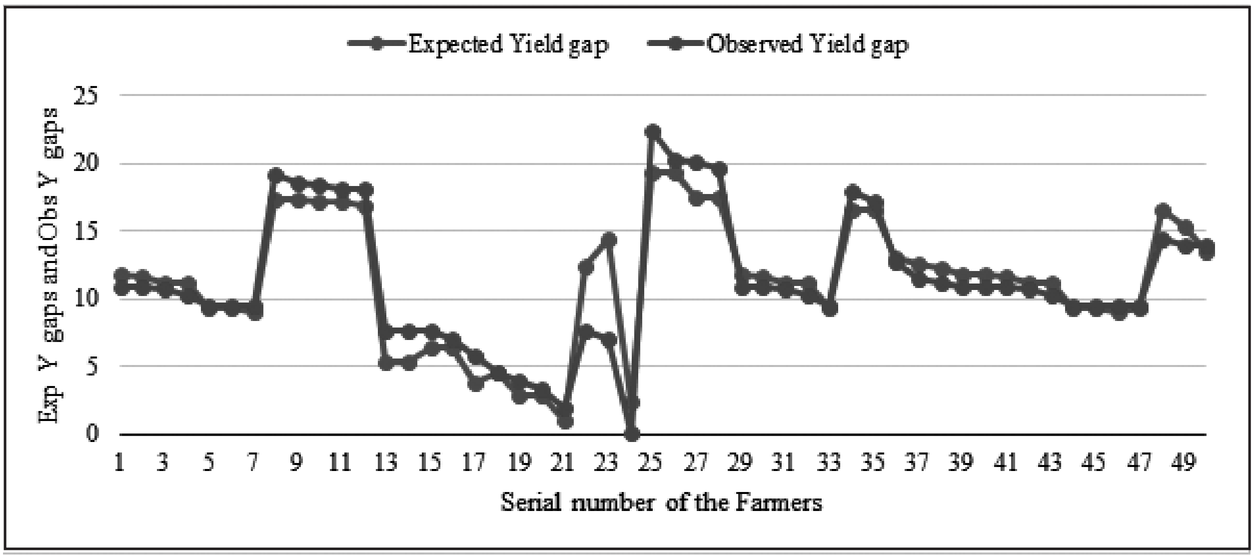

Figure 1 : Plots of the observed yield gaps and expected yield gaps

In the graphs (Figure 1), the expected yield-gaps and the observed yield-gaps are very close to each other depicting that the gap difference may be due to environmental factors. Also, we have tested the significance of these gaps using the appropriate χ^2 test for goodness of fit as,

$$\chi^2 = \sum_{i=1}^{k} \frac{(O_i - E_i)^2}{E_i} \sim \chi^2_{(k-1)},$$

where, H_0: there is no significant difference between the observed yield gap and the expected yield gap against H_1: observed yield gaps and expected yield gaps are significantly different, and k being the number of farmers considered for the study. The calculated value of χ^2 statistic is 16.1380 which is less than the tabulated value of $\chi^2_{(0.01,48)}$ (= 33.9303), then we fail to reject the H_0 and conclude that these differences in observed yield gaps and expected yield gaps are by chance and there is no evidence that the differences are significantly different.

Table 3 : Observed yield gap (Obs Y gap) and expected yield gap (Exp Y gap)

Sl. No.	RAI	Y (Observed) y_{obs}	Y (Expected) y_{exp}	Obs Y gap $(y^* - y_{obs})$	Exp Y gap $(y^* - y_{exp})$
1	2.4457	37.1867	36.1861	10.8133	11.8139
2	2.4733	37.1867	36.3055	10.8133	11.6945
3	2.6017	37.2061	36.8596	10.7939	11.1404
4	2.6017	37.7858	36.8596	10.2142	11.1404
5	3.0276	38.4271	38.6980	9.5729	9.3020
6	3.0276	38.4371	38.6980	9.5629	9.3020
7	3.0781	38.4460	38.9164	9.5540	9.0836
8	1.1675	28.8600	30.6684	19.1400	17.3316
9	1.1696	29.3700	30.6776	18.6300	17.3224
10	1.2046	29.6155	30.8286	18.3845	17.1714
11	1.2046	29.8700	30.8286	18.1300	17.1714
12	1.2598	29.8897	31.0668	18.1103	16.9332
13	3.9339	40.3049	42.6103	7.6951	5.3897
14	3.9339	40.3275	42.6103	7.6725	5.3897
15	3.6845	40.3451	41.5341	7.6549	6.4659
16	3.6870	40.9800	41.5449	7.0200	6.4551
17	4.3193	42.2178	44.2743	5.7822	3.7257
18	4.1293	43.5000	43.4541	4.5000	4.5459
19	4.5328	44.1082	45.1960	3.8918	2.8040
20	4.5328	44.7380	45.1960	3.2620	2.8040
21	4.9545	45.9865	47.0164	2.0135	0.9836
22	2.3158	40.3049	35.6253	7.6951	12.3747
23	1.8248	40.9800	33.5061	7.0200	14.4939
24	4.6307	47.9014	45.6184	0.0986	2.3816
25	0.6937	25.5100	28.6230	22.4900	19.3770
26	0.6937	27.7547	28.6230	20.2453	19.3770
27	1.1324	27.8520	30.5169	20.1480	17.4831

Sl. No.	***RAI***	***Y (Observed)*** y_{obs}	***Y (Expected)*** y_{exp}	***Obs Y gap*** $(y^* - y_{obs})$	***Exp Y gap*** $(y^* - y_{exp})$
28	1.1331	28.2800	30.5198	19.7200	17.4802
29	2.4457	37.1867	36.1861	10.8133	11.8139
30	2.4733	37.1867	36.3055	10.8133	11.6945
31	2.6017	37.2061	36.8596	10.7939	11.1404
32	2.6017	37.7858	36.8596	10.2142	11.1404
33	3.0276	38.4271	38.6980	9.5729	9.3020
34	1.3256	30.1100	31.3509	17.8900	16.6491
35	1.3392	30.8757	31.4097	17.1243	16.5903
36	2.1497	35.2940	34.9085	12.7060	13.0915
37	2.2738	36.5468	35.4443	11.4532	12.5557
38	2.3261	36.7988	35.6699	11.2012	12.3301
39	2.4356	37.1769	36.1424	10.8231	11.8576
40	2.4457	37.1867	36.1861	10.8133	11.8139
41	2.4733	37.1867	36.3055	10.8133	11.6945
42	2.6017	37.2061	36.8596	10.7939	11.1404
43	2.6017	37.7858	36.8596	10.2142	11.1404
44	3.0276	38.4271	38.6980	9.5729	9.3020
45	3.0276	38.4371	38.6980	9.5629	9.3020
46	3.0781	38.4460	38.9164	9.5540	9.0836
47	3.0245	38.4460	38.6847	9.5540	9.3153
48	1.3392	33.6200	31.4097	14.3800	16.5903
49	1.6355	34.0263	32.6887	13.9737	15.3113
50	2.0683	34.0263	34.5572	13.9737	13.4428

Note : y^* = Research station yield recorded at agricultural farm of *BAU*, Bhagalpur (Bihar).

Conclusion and Discussion

Sustainability index was found to be 42.7354%. This figure shows that the sustenance of the agricultural practices of paddy in the blocks of Bhagalpur, Bihar is 42.73%. The consistency of this measure can be tested if the same experiment is done over the years and observed the change in stability of *RAI*. From the regression model given in equation 3, it will be possible to predict the yield of a farmer once the capacity of the farmer to follow the recommended package of practices is known and consequently, suggestions for improving the yield can be made accordingly by the concerned person. This recommendation could be done with greater accuracy if the sensitivity of *RAI* with reference to a particular technology is studied keeping all other technologies constant at a standard level. Farmer with the serial number 24 gives a situation where the research station yields and observed yield both are almost same, then the gap becomes less for that farmer. Also, we have noticed that the *S.I.* will be higher for the farmer who has a less amount of yield gap or closer to x-axis.

There are some farmers for which the gap between the observed yield gap and the expected yield gap looks wide. These farmers may be treated as outliers for better prediction purposes. The appearance of such outlier observations may be avoided if the farmers could follow the following steps :

(i) The data on actual yield are recorded properly at the right time.

(ii) Proper weights of different technologies according to their importance on yield are introduced.

(iii) More numbers of key technologies are considered in the study.

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