Impact Assessment of Zero Budget Natural Farming in Andhra Pradesh – Rabi 2018-19

A comprehensive Approach using Crop Cutting Experiments

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Authors

EXECUTIVE SUMMARY

1. Context

The Government of Andhra Pradesh has introduced Zero Budget Natural Farming (ZBNF) in 2016 as an alternative to chemical-based agriculture through its implementing agency RythuSadhikaraSamstha (RySS).The main objective of the ZBNF is to make agriculture economically viable, agrarian livelihoods profitable and climate-resilient. ZBNF aims to reduce cost of cultivation, enhance soil fertility, enhance yields, reduce risks, and protect from uncertainties of climate change by promoting the adoption of an agro-ecology framework. Extension support is led by farmers (including women) through a process of farmer-to-farmer learning. ZBNF also aims to create the human and social capital necessary for vibrant and inclusive agricultural production. The ZBNF is a paradigm shift in agricultural development and it has passed through three agricultural years of implementation since its inception. RySS thought it is the time to assess the impact of the ZBNF on farming and farming community. Hence the present study is sponsored to assess the impact of ZBNF and to suggest policy inputs for bringing improvements in the ZBNF, if any, required.

2. Research Questions

In the above backdrop, the study addresses itself to the following research questions:

1. What is the impact of ZBNF on the levels and composition of input use for crops grown?
2. How far the input use of ZBNF has contributed to the cost of production of crops?
3. How far the ZBNF inputs have impacted yield of crops?
4. What is the impact of ZBNF on incomes of farmers?
5. What are the benefits accrued to farming and farmers beyond costs and returns?

3. The Methodology

The detailed narration of methodology for assessing the impact of ZBNF is in order.

In order to assess the impact of ZBNF, a comparison has been made between ZBNF farmers and non-ZBNF farmers in regard to input use, cost of cultivation and yield of crops; and net income to farmers; and impact beyond costs and return. This evaluation methodology is based on what is known as **"with and without" approach**. The study has deployed both quantitative and qualitative methods. Listing Survey and Household Survey have been conducted to collect quantitative data from the households. Focussed Group Discussions, Case Studies and Strategic Interviews have been conducted to obtain qualitative data.

The parameters considered for assessing the impact of ZBNF include: cost of inputs per hectare (biological inputs in case of ZBNF and chemical inputs for Non-ZBNF), percentage of cost of inputs in the total cost of production per hectare, cost of production per hectare, yield in quintals per hectare, net income per hectare accrued to farmers. The data on yields of crops were collected from farmers as well as through Crop Cutting Experiments (CCEs).The other parameter considered for assessing the impact of ZBNF on Eco-System Services include: health status of soils, quality of crop output, resilience of crops to weather variability, Softening of soils, presence of earthworms and green cover in the fields are considered to measure soil health. Weight of the grains, strength of stems and taste are considered to measure quality of output. Resilience of crops withstanding to dry spells and wind is considered to assess the resilience of crops to weather variability.

The study has covered all the districts of Andhra Pradesh. It is conducted in the villages where there are at least 10 farmers those have adopted all the practices i.e., seed to seed farmers of ZBNF and where the farmers have grown at least one major crop of the district. A Listing Survey has been conducted to cover all the households in the village to generate a sample framework for selecting the farmers for household survey. Stratified random sampling method is adopted to select the farmers belonging to pure tenant farmers, marginal farmers, small farmers and other farmers from the sample frame generated from the Listing Survey conducted in all the sample villages. A detailed household questionnaire has been administered across all the sample farmer households to collect the data on the impact parameters mentioned above. Qualitative data has been collected through FGDs with farmers. FGDs with the farmers, Case Studies of farmers and villages and Strategic Interviews with RySS staff at district level in regard to adoption of ZBNF practices, impact of ZBNF on farming and farmers and the difficulties encountered in accessing/preparing ZBNF inputs and marketing of ZBNF crop outputs.

4. Major Findings

The major findings of the analysis are in order.

Coats and Returns of Crops (Table 1)

- There is no statistically significant difference in the yields of crops grown under ZBNF and non-ZBNF is in case of Banana, Bengal gram, Black gram, Green gram, and Groundnut. Moreover, the yields of crops of Maize, Sesamum and sugarcane grown under ZBNF are significantly higher than those under non-ZBNF. However, the yield of Paddy crop is higher under non-ZBNF over ZBNF).

- There is a substantial reduction in paid out costs per hectare under ZBNF compared to non-ZBNF in case of all the crops, though the quantum and percentage of reduction varied across crops.
- ZBNF has fetched higher net income per hectare (gross returns that include value of main product and by-product minus total paid-out cost) to farmers compared to those under non-ZBNF across all the crops due to substantial reduction in the paid out cost

Table 1 Yields, Paid-out Cost and Net returns Under ZBNF and Non-ZBNF for Different Crops in Rabi Season of 2018-19

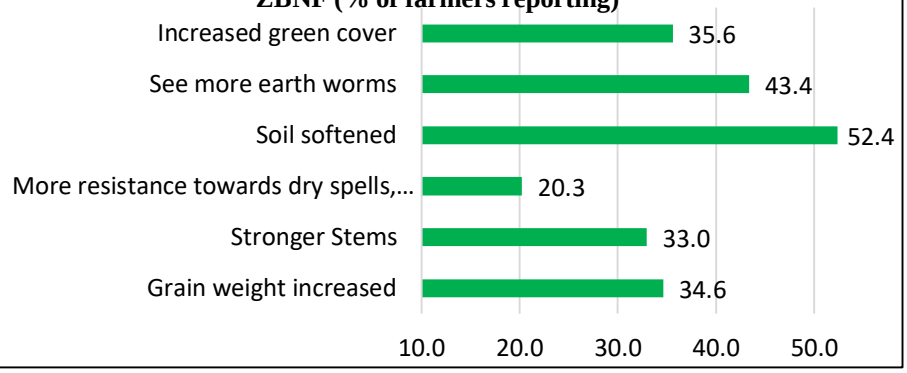
Description of crop	Yields Per Hectare			Paid out Cost Per Hectare			Net Income Per Hectare		
	Yields of ZBNF(in quintals)	Yields of Non-ZBNF (in quintals)	%Change over Non-ZBNF	Paid out cost under ZBNF(in Rs)	Paid out cost under Non-ZBNF(in Rs)	%change over Non-ZBNF	Net returns of ZBNF(inRs)	Net returns of non-ZBNF(inRs)	% Change over non ZBNF
Paddy	49.7	48.5	2.3	34346	48209	-28.8	49645	33637	47.6
Maize	63.2	63.9	-1.1	36493	50630	-27.9	89577	79120	13.2
Groundnut	16.3	15.4	6.3	36956	38288	-3.5	47489	35695	33.0
Bengal gram	11.9	9.3	28.1	16464	26693	-38.3	35627	15277	133.2
Jowar	16.1	17.4	-7.4	19779	28036	-29.5	14915	8288	80.0
Black gram	4.8	4.2	13.8	9781	12294	-20.4	14706	8005	83.7
Green gram	3.8	3.4	12.1	6081	7304	-16.7	12606	9360	34.7
Sesamum	3.9	3.4	15.3	8354	8632	-3.2	28707	23403	22.7
Banana	391.0	282.7	38.3	92287	92637	-0.4	173381	96546	79.6
Sugarcane	790.9	756.1	4.6	86757	88093	-1.5	110981	100928	10.0

Source: CESS survey 2018-19

Eco-System Services (Figure 1)

- 52 per cent of ZBNF farmers have reported that their soil got softened due to practice of ZBNF.
- Around one third of the farmers reported that the green cover in their fields has increased.
- Farmers reported increased grain weight and stronger stems of crops due to ZBNF.
- One fifths of the ZBNF farmers have reported that crops grown under ZBNF are more resilient to dry spells and wind.

Figure 1 Experience of farmers on ZBNF compared to non-ZBNF (% of farmers reporting)



Thus, ZBNF has increased the crop incomes of farmers at the lower cost of production besides providing eco-system services to agriculture.

CHAPTER 1

Context, Objectives and Methodology

1.0 Context

The Government of Andhra Pradesh has introduced Zero Budget Natural Farming (ZBNF) in 2016 as an alternative to chemical-based and capital intensive agriculture.The main objective of the ZBNF is to make agriculture economically viable, agrarian livelihoods profitable and climate-resilient. ZBNF aims to reduce cost of cultivation, enhance soil fertility, enhance yields, reduce risks, and protect from uncertainties of climate change by promoting the adoption of an agro-ecology framework. Extension support is led by farmers (including women) through a process of farmer-to-farmer learning. The programme aims to reach all farmers in the state and stay engaged with them to achieve a 100% chemical-free agriculture. ZBNF also aims to create the human and social capital necessary for vibrant and inclusive agricultural production.

1.1 Research Questions

In the above backdrop, the study addresses itself to the following research questions:

1. What is the impact of ZBNF on the levels and composition of input use for growing crops?
2. How far the input use of ZBNF has contributed to the cost of production of crops?
3. How far the ZBNF inputs have impacted yield of crops?
4. What is the impact of ZBNF on incomes of farmers?
5. What are the benefits accrued to farming and farmers beyond costs and returns?

1.2 The Methodology

The detail narration of methodology adopted for the study is in order.

1.3.1 The Basic Approach

The evaluation methodology is based on what is known as “with and without” approach wherein outcomes of a random sample of ZBNF farmers cultivating a particular crop are compared with the outcomes of a random sample of farmers cultivating the same crop using chemicals. The study has deployed both quantitative and qualitative methods. Listing Survey and Household Survey have been conducted to collect quantitative data from the households. Crop cutting experiments (CCEs) are conducted to assess the yield apart from collecting farmer reported yields. Focussed Group Discussions (FGDs) with farmers, Case Studies of farmers and ZBNF villages and Strategic Interviews with RySS officials at the district level

have been conducted to obtain qualitative data. It is a mandate of the study is to collect yield data through Crop Cutting Experiments (CCEs). The study has utilized the services of retired personnel from NSSO for the purpose that has vast experience in CCEs. The study has conducted CCEs for several crops even though the crop was not listed as district specific crop. In all, the study has conducted 1789 CCEs and the district wise number of CCEs conducted is given in Table 2.1.

Table 2 .1 Number of CCEs Conducted in Rabi Season of 2018-19 Across Districts

District	No. of CCEs
Srikakulam	149
Vizianagaram	146
Visakhapatnam	159
East Godavari	142
West Godavari	141
Krishna	123
Guntur	120
Prakasam	146
Nellore	175
YSR Kadapa	138
Kurnool	112
Ananthapuramu	111
Chittoor	127
All Districts	**1789**

Source: CESS survey 2018-19

CCE yields per hectare for different crops are presented in Table 2.3. As per the procedure, CCEs are conducted in 5*5 meters; and 10*10 meters size in the selected plots for the respective field crops. After getting the CCE plot output, it is converted in to yield per hectare of land in quintals. Care was taken to present those crops which have reasonable number of CCEs to get a meaningful average. In case of Banana, in a given parcel, output of 10 trees was collected and then arrived per hectare yield. As per the information collected, on an average, 1200 plants of Banana are grown in one hectare of land and the yield per hectare is arrived based on this number.

1.3.2 The Sample Design

A stratified multi-stage sample design is adopted for the survey. All the ZBNF farmers are divided into 13 strata, where each stratum is co-terminus with each district. Thus the study is conducted in all the districts of the state. In the first stage, a random sample of 5 villages was selected from the list of villages, with presence of a minimum of 10 ZBNF farmers growing at least one of the three identified district specific major crops during the year 2017-18, from each district. In second stage, a sample of 10 ZBNF and 10 non-ZBNF farmers are selected

from each sample village using stratified random sampling method. For this purpose, in each village, all the ZBNF and non-ZBNF cultivators were listed and stratified into four strata based on land owned: 1) Landless, 2) Owning 0 Less than 2.5 acres, 3) Owning 2.51 to 5 acres,4) other large farmers. This list of farmers is used as the sample frame for each village, from which the samples of farmers are drawn. The sample of 10 ZBNF farmers was distributed across the strata as: 2 from stratum 1, 3 from stratum 2, 3 from stratum 3 and 2 from stratum 4.The same procedure is followed for the distribution of 10 non-ZBNF farmers. After selecting the farmer, the parcel of land, where the farmer is growing the major crop, was identified. From this parcel of land, a plot of *size as required by the procedure* has been selected at random for estimating yield through Crop Cutting Experiments (CCEs). It is to be noted that the study adopted standard methodology of Indian Agricultural Statistical Research Institute (IASRI) followed by Directorate of Economics and Statistics of Andhra Pradesh for conducting CCE.

Given the experience in Kharif results, it was decided to drop self-control farmers in Rabi analysis. Thus the Rabi report covers 190 pure ZBNF and 196 pure non-ZBNF farmers. CCEs are used to assess the changes in yield of crops. As changes in farm practices and processes are part of the impacts, they are captured by visiting the sample farmers three to four times in the season to minimise the memory lapses in recall by farmers. Costs and returns are estimated adopting the tools of farm management studies, i.e., cost of cultivation scheme under the Ministry of Agriculture and Cooperation, Government of India. CCEs are done following the methodology suggested by NSSO and adopted by the State Directorate of Economics and Statistics. The expertise of the personnel associated with these institutions has been utilised for finalising the methodology. The entire data is captured on mobile so that there is no need for manual entry of data other than qualitative information. The system is supported by videos for all important activities.

1.3.3 The Data Gathering and Data Management

The data required in this regard have been collected from the sample households through structured schedule. Data on land use pattern and cropping pattern, input use, cost of production and yield of crops, and incomes accrued to farmers through crops. Data on health status of soils and crops, and resilience of crops to weather variability has been collected from households to assess the impact of ZBNF on eco-system services. Crop Cutting Experiments (CCEs) have been organised for estimating and comparing the yields of crops grown under ZBNF with those grown under non-ZBNF. This is in addition to the data on

yields reported by farmers in the household survey. The analysis of household survey alone may not be adequate enough to identify all the key challenges involved in realising the potential benefits from ZBNF. Focussed Group Discussions (FGDs) of farmers have been organised in two/three villages from each district, to capture the key challenges to be addressed for realizing potential benefits of ZBNF. Strategic Interviews with the District Project Managers (DPMs) have been organised to capture the strategies they adopted to take ZBNF to farmers in realising potential benefits of ZBNF.

The field instruments prepared have inbuilt checks with appropriate skip patterns besides supportive manual of instructions for all the questionnaires. Before finalizing the field instruments, the team leader has convened a daylong brain storming session with experienced personnel in the field and incorporated their suggestions. A pilot was conducted on all the field instruments within-house Research Associates/Research Assistants to check the consistency of the questions and flow of the questions and the feedback session with the team members helped in refining the questionnaire.

In-house field Supervisors are also involved in the preparation of questionnaire along with core team members. The teams that were engaged in the collection of data in Kharif survey have been deployed with two day training in the headquarters for carrying out field survey in rabi season. Senior Statisticians in the team explained on the sample design and on the selection of farm households. Senior experts drawn for conducting Case Studies, and personnel selected to lead the CCEs have participated in the two days of training. On reaching the field, respective Supervisors have conducted on-field training in the neighbouring villages. Actual field survey was commenced in December 2018 only after all the Investigators getting command on the questionnaire. All the Supervisors are instructed to send the filled in schedules after completion of a village and after filling the schedule completely i.e. completion of harvesting and winnowing etc.

The study entrusted a senior research Associate to monitor the receipt of filled-in schedules and to look after the entry work done by 4 entry operators. The entry programme was written in CSPro by one of the core team members with inbuilt checks and tested the package for four days by entering dummy data and the package was rectified and refined based on the feedback of the entry operators. Any discrepancies noticed in the data entry, Research Associate / Data Manager have cross checked with concerned field Supervisors and the correctness of the information had been passed on to the entry operators. While generating

the result tables, the outliers identified are cross checked with original schedule and with the concerned Supervisors and final result tables are generated only after following the data quality checks.

1.4 Structure of the Report

The report is organised in to three chapters. The context, objectives and methodology of the study have been presented in chapter1.Chapter 2 deals with the analysis of the impact of ZBNF on cost of cultivation and yield of crops and farmers' incomes. Summary, conclusions and policy implications of the analysis are presented in Chapter 3.

CHAPTER 2

Impact of Zero Budget Natural Farming on Costs and Returns of Crops and Beyond

2.0 Introduction

This chapter is an attempt to assess the impact of ZBNF on the costs and returns of crops. It also assess the impact on health of soils, quality of crop outputs, resilience of crops to weather variability, financial empowerment of farmers and their attitude towards ZBNF.The analysis is in order.

2.1 Yields through Crop Cutting Experiments of Different Crops and ZBNF

Crops considered for the analysis of costs and returns of crops in Rabi season during 2018-19 include Paddy, Maize, Groundnut, Bengal gram, Jowar, Black gram, Green gram, Sesamum, Banana and Sugarcane. The data on costs and returns has been collected for some more crops also. But, these crops are not considered for the analysis as they are with insufficient sample of farmers to arrive at a meaningful average. The entire forthcoming analysis has been conducted at the state level only.

A comparison of yields obtained through CCEs for different crops grown under ZBNF and non-ZBNF has revealed that there is no statistically significant difference in yields between ZBNF and non-ZBNF in case majority of crops considered for the analysis. As a matter of fact, the yields of crops like maize, Sesamum, Sugarcane and Sunflower under ZBNF are significantly higher than those under non-ZBNF But, the yield of Paddy crop is higher under non-ZBNF over ZBNF(Table 2.1 and Figure 2.1)The disaggregated yields for delta districts (East Godavari, West Godavari, Krishna and Guntur) and non-delta districts (all the remaining) may reveal that this is true only in delta districts. We have not adequate sample for conducting this disaggregated analysis. But the evidence from Kharif season provides support to this inference.

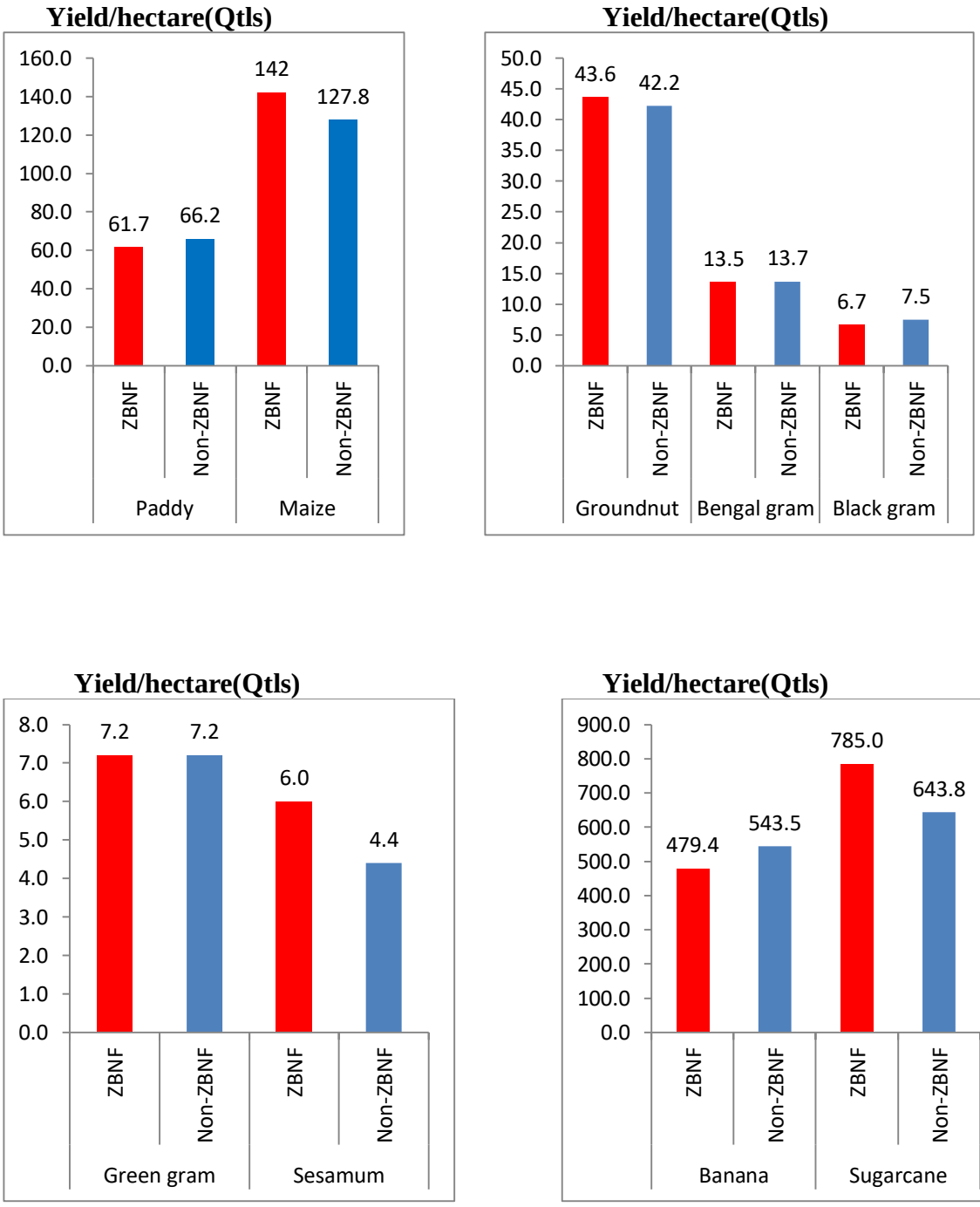
Table 2.1 Yields Obtained through CCEs in Rabi Season of 2018-2019 for Different Crops

Description of Crop	Average Yield/hectare (qtls)			Number of CCEs	
	ZBNF	Non-ZBNF	Difference in Yields	ZBNF	Non-ZBNF
Banana	479.41	543.45	Not-Significant	12	7
Bengal gram	13.53	13.70	Not-Significant	33	33
Black Gram	6.65	7.48	Not-Significant	85	67
Cashew nut	21.57	16.77	Not-Significant	32	41
Chillies	52.84	57.28	Not-Significant	52	45
Citrus	75.70	89.00	Significant at 10% level	46	40
Cotton	9.51	8.92	Not-Significant	13	11
Flowers	11.02	2.93	Not-Significant	13	11
Green gram	7.20	7.23	Not-Significant	55	54
Groundnut	13.24	12.82	Not-Significant	106	91
Maize	57.45	51.70	Significant at 5% level	87	106
Mango	68.63	60.09	Not-Significant	22	24
Other Vegetables	65.10	55.81	Not-Significant	19	12
Paddy	61.65	66.17	Significant at 1% level	186	181
Ragi	21.99	22.68	Not-Significant	7	13
Red gram	4.75	4.46	Not-Significant	7	5
Sesamum	6.04	4.39	Significant at 5% level	29	49
Sugarcane	785.01	643.76	Significant at 5% level	28	31
Sunflower	26.02	23.48	Significant at 10% level	14	24

Source: CESS field survey 2018-19

The farmers reported yields per hectare of majority of the crops are higher under ZBNF compared to non-ZBNF. It is interesting to note that the yields captured through the CCEs are higher than those reported by the farmers in case of all the crops except the sugarcane.

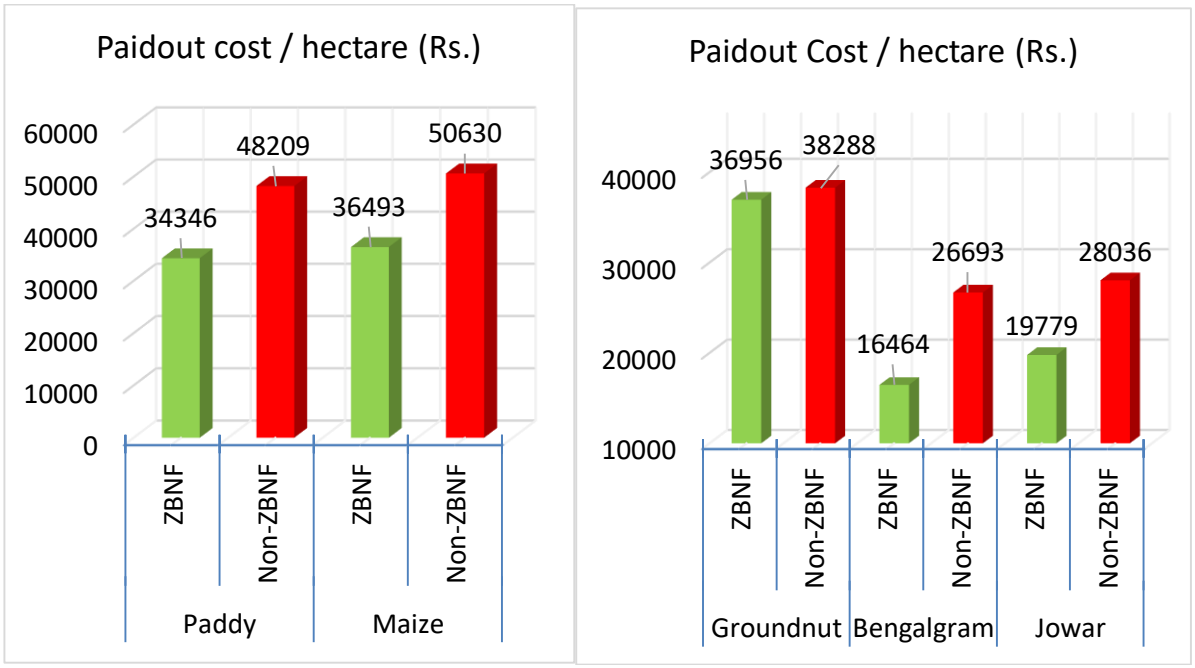
Figure 2.1 Yields of Crops under ZBNF and Non-ZBNF for Different Crops Grown in Rabi Season

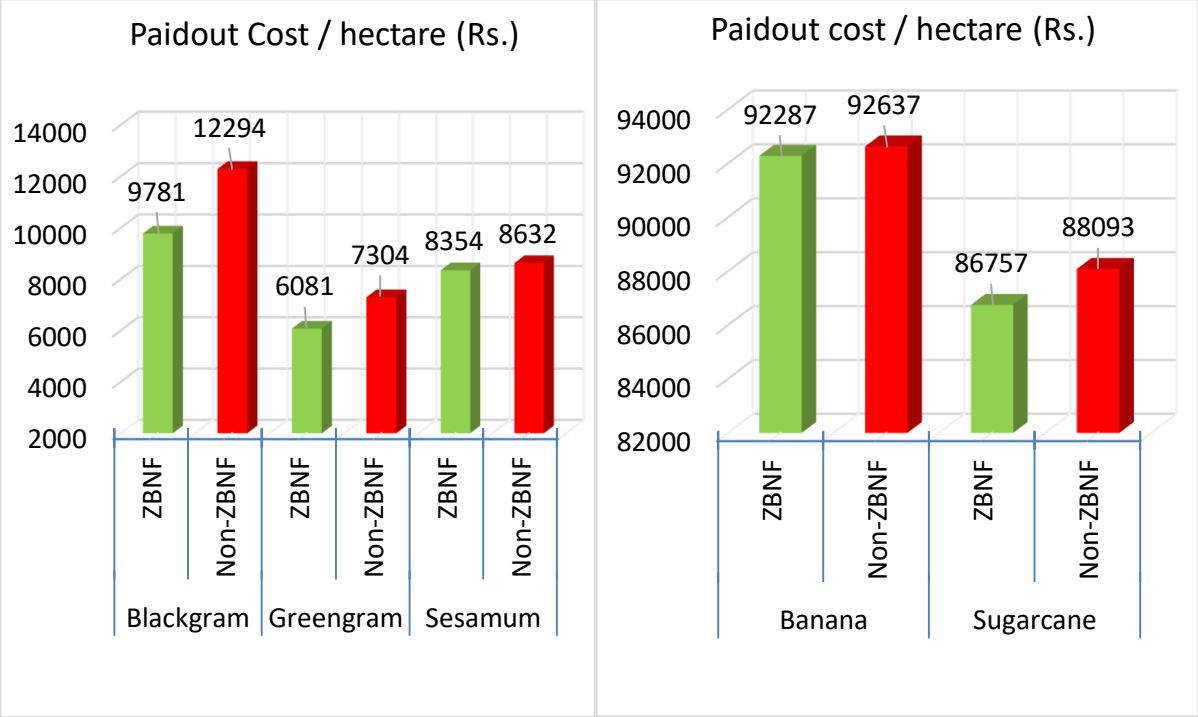


2.2 Costs of Production of Crops and ZBNF

It is evident from the data that there is a substantial reduction in paid out costs per hectare under ZBNF compared to non-ZBNF. This is true for all the crops, though the quantum and percentage of reduction varied across crops. The reduction in the costs is considerably higher for Paddy, Maize, Bengal gram, Jowar, Black gram and Green gram, among the crops considered for the analysis. Thus it is clear that huge reduction in paid out cost of cultivation of crops is found to be higher among foodgrains (Figure 2.2).The percentage of reduction in the paid out costs per hectare for growing crops has varied across the crops. It varies between -0.4 for Banana and -38.3 for Bengal gram. Among all the crops, Paddy, Maize, Jowar and Pulses have experienced higher rate of decline in costs due to ZBNF.

Figure 2.2 Paid-out Cost under ZBNF and Non-ZBNF in Rabi Season of 2018-19 for Different Crops





Source: CESS field survey 2018-19

A comparison of cost of biological inputs of ZBNF in relation to chemical inputs of non-ZBNF in absolute terms has revealed that the extent of reduction in the costs of biological inputs of ZBNF over the chemical inputs is incredible across all the crops. It has varied between 54.6 per cent in Sesamum to 89 per cent in Maize, baring the Sugarcane crop. On the whole, the share of cost of biological inputs is less than or around 10 per cent in the total paid-out cost for all the crops except in case of Bengal gram, while the cost of chemical inputs has constituted dominant share for all the crops with the exception of Sugarcane in case of non-ZBNF.

It is striking to note that the yields under ZBNF are on par with those under non-ZBNF, as noted earlier, despite the lower input use of biological inputs in the production of crops under ZBNF. Thus it is evident that that the substitution of biological inputs for chemical inputs has led to remarkable reduction in the costs of inputs of crop production without affecting crop yields (Table 2.3).

Table 2.3 Cost of Biological Inputs and Chemical Inputs per Hectare for Different Crops Grown in Rabi Season of 2018-19

Description of Crops	Cost of biological inputs (Rs)	Cost chemical inputs (Rs)	Difference over chemical input cost (Rs)	% reduction over chemical input cost
Paddy	2510(7.3)	19040(39.5)	-16530.0	-86.8
Maize	2567(7.0)	23301(46.0)	-20733.5	-89.0
Groundnut	1587(4.3)	8846(23.1)	-7259.1	-82.1
Bengal gram	3071(18.7)	12401(46.5)	-9330.4	-75.2
Jowar	1686(8.5)	12072(43.1)	-10385.8	-86.0
Black gram	724(7.4)	5459(44.4)	-4735.8	-86.7
Green gram	622(10.2)	1839(25.2)	-1217.4	-66.2
Sesamum	828(9.9)	1826(21.2)	-997.8	-54.6
Banana	7555(8.2)	20353(22.0)	-12798.7	-62.9
Sugarcane	2763(3.2)	3258(3.7)	-495.7	-15.2

Source: CESS field survey 2018-19

Note: Figures in Parentheses indicate percentage in the total paid out costs per hectare of crops

2.3 Net Income from Different Crops and ZBNF

Sustainability of any economic activity depends upon the net returns accrued from that activity. This is equally applicable to agricultural activity also. The analysis of the net returns/income (gross value of output and by-product of crop minus the paid-out costs) to farmers from different crops enables to throw light on the contribution of ZBNF in developing interest for the continuation of agricultural activity by farmers. .

It is very clear from the data that ZBNF method of cultivation has fetched higher net returns to farmers compared to those under non-ZBNF method of cultivation. It is true in all the crops. Banana crop fetched highest net income per hectare under ZBNF method i.e. Rs. 173382as against Rs.96546 under non-ZBNF method. Sugarcane, an annual crop, fetched Rs.110979 per hectare under ZBNF followed by Maize (Rs.89577) and Paddy (Rs.49644). In all the crops, net returns from crops grown under non-ZBNF method are comparatively low (Figure2.3).

Figure 2.3 Net returns from Crops under ZBNF and non-ZBNF in Rabi Season of 2018-19 for different crops

Source: CESS survey 2018-19

It is evident from the data that the extent of increase in net incomes of the farmers due to ZBNF across the crops considered for the analysis is remarkably higher. Baring Maize and Sugarcane, the percentage of increase in net incomes has ranged from 23 for sesamum crop to 133 for Bengal gram. The increase is pronounced among pulse crops and Banana. Thus,

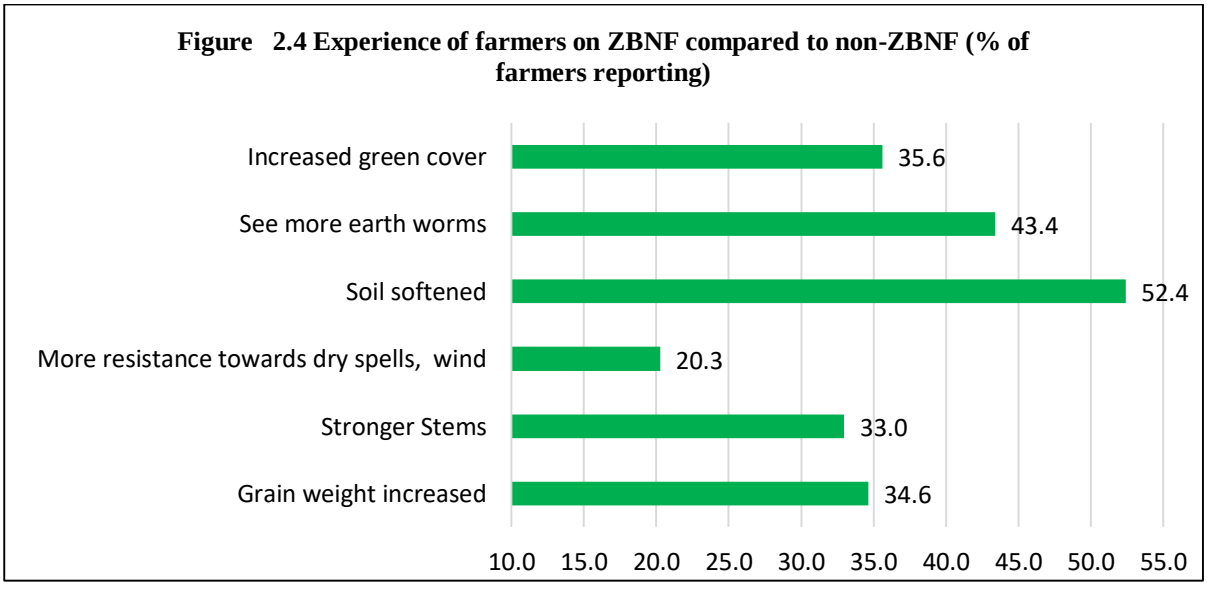
ZBNF method of cultivation realizes considerably higher net returns over non-ZBNF method from all the crops, more so from fruit crops such as Banana.

2.4 Impact of ZBNF beyond Costs and Returns

In this section, an attempt is made to assess benefits accrued to farmers beyond costs and returns of crops. The data clearly indicate that 78.4 per cent of farmers plasticised ZBNF have managed their working capital through their savings as against 60% of the non-ZBNF farmers. It implies that ZBNF has the potential of reducing chances of farmers falling into indebtedness are remote.

As high as 52 per cent of farmers reported that their soil softened due to practice of ZBNF and 43 per cent of farmers have observed that they are now seeing earth worms in their fields Around one third of the farmers have reported that there is increase in the green cover in the fields and grain weight due to ZBNF. Strong stems of crops of ZBNF compared to crops grown under non-ZBNF have been reported by the farmers. One fifths of the respondents experienced that crops grown under ZBNF are more resilient towards weather abnormalities like dry spells and wind. Thus farmers are more positive towards ZBNF (Figure2.4).The increase in the absolute as well as the proportion the total cropped area under ZBNF crops in both Kharif and Rabi under ZBNF provides substantial testimony to this(Figures 2.5& 2.6).Further, one fourth of the farmers practicing ZBNF have grown crops under ZBNF in their entire cropped area and 96of the ZBNF farmers expressed t that they will continue practicing ZBNF.This also provide evidence to the positive attitudes of farmers towards ZBNF.

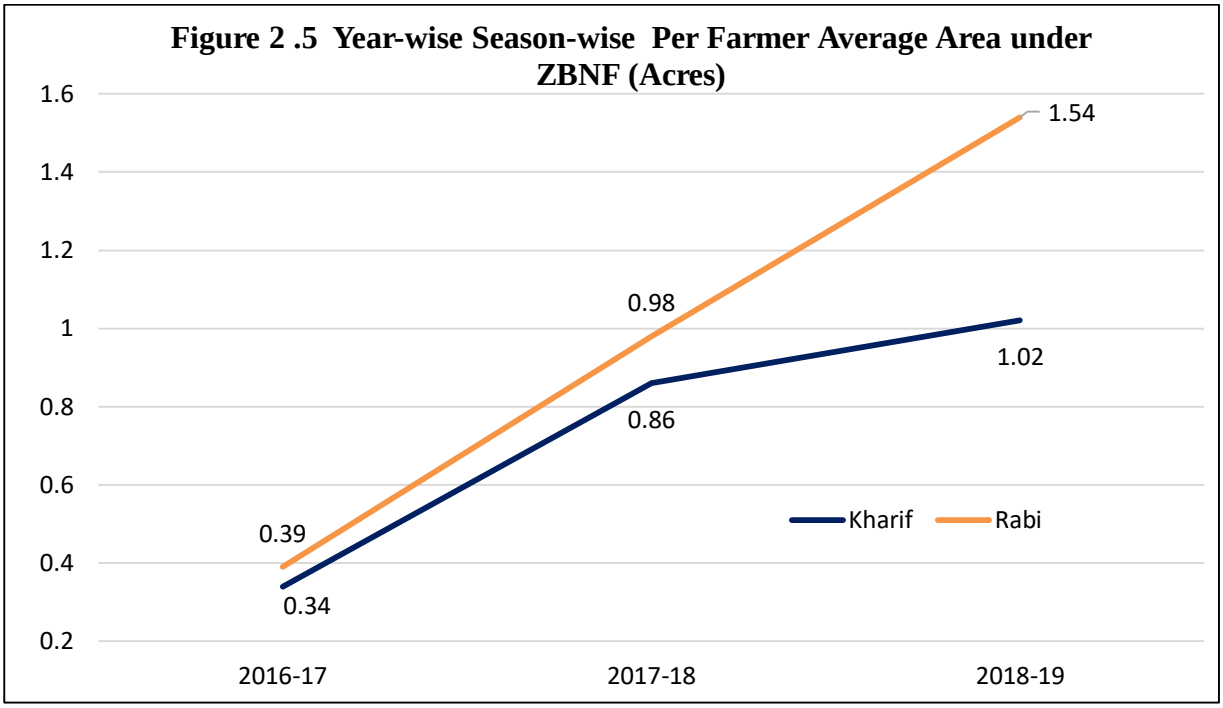
Figure 2.4 Experience of farmers on ZBNF compared to non-ZBNF (% of farmers reporting)



Source: CESS survey 2018-19

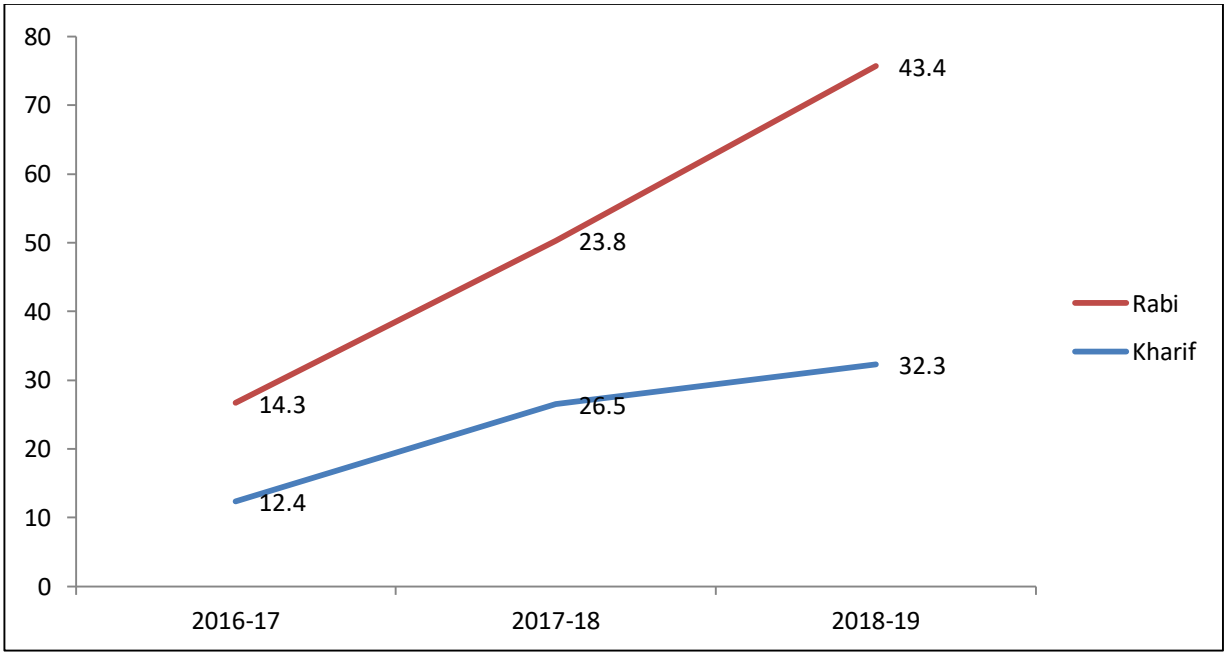
The expansion of larger cropped area under ZBNF in Rabi over Kharif season probably indicates that farmers have expanded cropped area under ZBNF in rabi season after convincing themselves through their experience in Kharif season with ZBNF.

Figure 2 .5 Year-wise Season-wise Per Farmer Average Area under ZBNF (Acres)



Source: CESS survey 2018-19

Figure 2.6 Year wise Season wise Percentage of Area under ZBNF in Total Cropped Area (on average)



CHAPTER 3
Conclusions and Policy Implications

3.0 Introduction

In this chapter, the conclusions of the analysis conducted in the previous chapter and the policy implications of the analysis are presented.

3.1. Conclusions

Two broad conclusions have emerged from the analysis. They are in order.

- The net income per hectare accrued to farmers from different crops is substantially higher under ZBNF over that under non-ZBNF.
- This is purely due to considerable reduction in the paid cost incurred for the production of crops. This is because of the fact that the yields of the crops under ZBNF as well as non-ZBNF have remained more or less the same.
- Thus, crop income of farmers of ZBNF has increased at lower costs of production.
- It is very pertinent to consider two important costs in this context. They include interest on working capital and subsidies on the chemical inputs.
- The costs are: farmers of ZBNF have also saved on the interest payments towards working capital since working capital required for growing crops under ZBNF is lower over that under non-ZBNF, since the paid costs per hectare across all the crops are lower under ZBNF.
- Moreover, the chemical inputs used under non-ZBNF are highly subsidised. Had the cost of chemical inputs valued at market prices, the paid-out costs under non-ZBNF would have been much higher than the present costs under non-ZBNF.The inclusion of these costs in the comparison of total paid-out cost between ZBNF and non-ZBNF would lead to further remarkable reduction in the costs of growing crops due to ZBNF.
- This would lead to further increase in the net incomes of crops to the farmers
- ZBNF has contributed to the eco-system services like improvement in soil health, enhancement in the quality of output and increase in the resilience of crops to withstand against dry spells and wind.

3.2 Policy Implications

- The market support for ZBNF crop outputs enhances further the net incomes of farmers.
- The market support also induces farmers to adopt and expand area under ZBNF.
- The timely availability of extension services to the farmers encourages farmers to adopt ZBNF
- The supply of biological inputs of ZBNF through NPM shops in the villages reduces the cost of labour in preparing inputs due to economies of production experienced by the NPM shop owners in preparing inputs.
- The transparency in assessing the yield of the crops through CCEs builds confidence in ZBNF