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Zero Budget Natural Farming: Are This and Similar Practices The Answers

Srijit Mishra

Nabakrushna Choudhury Centre for Development Studies
(an ICSSR institute in collaboration with Government of Odisha)
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Are This and Similar Practices The Answers?[1]

Srijit Mishra[2]

Abstract

It has been a matter of concern that the smallholders (includes marginal and small farmers) who have been efficient are also the ones bearing the greater burden because the low levels of absolute return questions their livelihood sustainability. It is time that policy initiatives show urgency on the fact that smallholders lives matter. The twin dimensions of the crisis in Indian agriculture - the agrarian and the agricultural need to be addressed and the call of the day is to reduce costs, reduce risks and increase returns. Zero Based Natural Farming, which is in synch with the principles of agroecology as also other knowledge systems, seem to show a way out through its application by farmers' initiatives in Karnataka and the involvement of the state in Andhra Pradesh. This need not come in the way of other similar approaches nor should it come in the way of other initiatives required to make smallholders lives matter.

Keywords: Agriculture, crisis, smallholders,

JEL codes: O13, Q10, Q18

[1] This is a revised version of a paper submitted to the Indian Council of Social Science Research (ICSSR), which itself was a request from Ministry of Human Resource Development, Government of India, to address a query by the National Institution for Transforming India (NITI Aayog). Some aspects in the paper were presented as a lecture on 'India's Agricultural Sector: Issues and Perspective', Reserve Bank of India, Kolkata, 3 May 2017, and at the national workshop on 'Enhancing Farmers Income and Welfare', Institute for Social and Economic Change, Bengaluru, 24-25 June 2017 and benefitted from the questions and comments from the participants. The views expressed in the paper are that of the author and not to be attributed to the institution/organisation that the author is affiliated to or is associated with.

[2] Director, Nabakrushna Coudhury Centre for Development Studies (NCDS), Bhubaneswar.

1 Introduction

In the months of March and April of 2017, for about 40 days, farmers from Tamil Nadu protested at *Jantar Mantar*, New Delhi, through a number of non-violent, and ingenious methods.[3] They danced naked, drank their urine, ate mice, and what not. But, neither did this arouse media attention nor did it lead to a social media explosion, as the cause of *jallikattu*, espousing the case of the 'Tamil farmer', did a few months earlier. It did not even evince the interest of other farmers' organisations in and around the national capital who can come in tractor loads to show solidarity with their brethren, but could not identify with the Tamil farmer as one of their own. It did not even matter that the 'bulls', saved through the return of *jallikattu*, along with other livestock are now under the throes of death in Tamil Nadu and elsewhere because of two consecutive droughts and because of the coming of an early summer without the advent of spring in 2017. The relevance of livestock in general and that of the indigenous breed in particular, as an important constitutive components of the 'Zero Budget Natural Farming (ZBNF)' will be discussed later. However, before that we will briefly discuss the crisis in Indian Agriculture.

2 The Crisis in Indian Agriculture[4]

It is important to note that the crisis in Indian agriculture, on the one hand, is about our disconnect with the farmer and their plight, and about the absence of empathy, and, on the other hand, is also about the disconnect of policies from the farm (a policy paralysis), and about the withdrawal, if not the absence, of the state. The two hands of the crisis are referred to as agrarian, and agricultural, respectively. The two hands are interrelated like the minute hand and the hour hand of the clock and the separation is only analytical.

2.1 Agrarian Crisis

This is about those dependent on agriculture - the farmer, the agricultural labourer and their household members among others. This is about the livelihood of those dependent on agriculture, and is also about the dignity of their profession. Equally important concerns, as posed by Agarwal and Agrawal (2017), is whether the Indian farmer likes farming; or, as discussed by Gaurav and Mishra (2015), on the fact that the smallholders returns are efficient, but their low absolute returns raise questions on the sustainability of their livelihood. Some additional concerns are as follows.

2.1.1 Declining share of pie

Comparing the share of agriculture and allied activities in Gross Domestic Product (GDP) and in employment shows that the former has declined relatively faster till 2009–10 (Table 1). The trend seems to have changed between 2009–10 and 2011–12, the percentage point decline was relatively more for employment. Is this a tipping point? Rather, the declining share of the pie, which would get

[3] The concerns with regard to protest by the Tamil Nadu Farmers have been echoed by Devinder Sharma in his facebook post, and also during an interaction when he visited Bhubaneswar in April 2017.

[4] This section will be largely based on the author's earlier work on this theme. In particular, Mishra (2008, 2015), Mishra and Reddy (2011), and Reddy and Mishra (2009b) among others. Also see Government of India (2007). So other work on the theme are that by Deshpande and Arora (2010) and Vasavi (2012) among others.

further accentuated with relatively lower agricultural growth rates when compared to non-agricultural growth rates that would be discussed later under agricultural crisis, along with the concerns of farmer wanting to leave farming and the sustainability of the farmers' livelihood, as discussed earlier, as also meagre farm incomes that we will elaborate below. Field level observations also corroborate that the median age of those working in agriculture is increasing and that younger people prefer to move out of agriculture in search of better avenues. This turnaround is likely to continue and it will have important implications for Indian agriculture.

Table 1: Share of Agriculture & Allied Activities in GDP and Employment

Period	Share of Agriculture & Allied in GDP, 2004–05 prices, (%age change)	Share of Agriculture & Allied in Employment, UPSS, (%age change)
1972–73	38.6	73.9
1993–94	28.2 (10.4)	63.9 (10.0)
1999–00	23.2 (5.0)	60.2 (3.7)
2004–05	19.0 (4.2)	56.5 (3.7)
2009–10	14.6 (4.4)	53.2 (3.3)
2011–12	14.4 (0.2)	48.9 (4.3)

Note: GDP denotes Gross Domestic Product and UPSS denote usual principal and subsidiary status.
Source: Mishra (2015), based on Reserve Bank of India (RBI, 2014b), Government of India (GOI, 2007), and National Sample Survey Organisation (NSSO, 2011, 2014a).

2.1.2 Farmer Income

The average monthly income, consumption and net saving for farmer households for 2002-03 and 2012-13 are given in Table 2.[5] The consumption expenditure have been higher than their income for the lower farm size groups - for five farm sizes with less than 4 hectares (ha) in 2002-03, and for three farm sizes with less than 1 ha in 2012-13. These constituted more than 95 per cent of the farmer households in 2002-03 and nearly 70 per cent of the farmer households in 2012-13 (Table 3). The income of the large farm sizes (10+ ha) in 2012-13 at ₹41,388 would be lower than that of a government employee's January 2013 salary in pay band II with grade pay of ₹4,600, which is much lower in the pecking order. The relatively lower income of the farmer households in general and the persistence of shortfalls in income among smallholders, in spite of they being efficient (Gaurav and Mishra, 2015), may explain the problem of indebtedness in Indian agriculture (Government of India, hereafter, GOI, 2007, 2009); Reserve Bank of India, hereafter, RBI, 2006) and why the farmers want to move out of farming (Agarwal and Agrawal, 2017). Notwithstanding the concerns of comparability over the two surveys, one observes that the absolute number of households have decreased for near landless, lower marginal and large farmer households (Table 3). This also resonates with the decline in the share of people employed in agriculture and allied activities in recent times (2009-10 to 2011-12, Table 1).

[5] The data are based on National Sample Survey of 59th round (2003, for the agricultural year of 2002-03) and 70th round (2013, for the period July 2012-June 2013). The households surveyed were referred to as farmers in the 59th round and as agricultural in the 70th round, as there were some differences in coverage and one should be cautious while comparing. While acknowledging the difference, we will refer to them as farmer households.

Table 2: Average Monthly Income, Consumption, and Net Saving for Farmer Households across Farm Sizes in 2002-03 and 2012-13						
Farm size (hectares)	2002-03 (in ₹, current prices)			2012-13 (in ₹, current prices)		
	Income	Consumption	Net Saving	Income	Consumption	Net Saving
<0.01 (near landless)	1380	2297	-917	4561	5108	-547
0.01-0.4 (lower marginal	1633	2390	-757	4152	5401	-1249
0.41-1.0 (upper marginal)	1809	2672	-863	5247	6020	-773
1.01-2.0 (small)	2493	3148	-655	7348	6457	891
2.01-4.0 (semi-medium)	3589	3685	-96	10730	7786	2944
4.01-10.0 (medium)	5681	4626	1055	19637	10104	9533
10+ (large)	9667	6418	3249	41388	14447	26941
All sizes	2115	2770	-655	6426	6223	203
Source: NSSO (2005, 2014c)						

Table 3: Number of Farmer Households and their share across Farm Sizes in 2002-03 and 2012-13						
Farm size (hectares)	2002-03			2012-13		
	Farmer Households (lakh)	Share (%)	Cumulative Share (%)	Farmer Households (lakh)	Share (%)	Cumulative Share (%)
<0.01 (near landless)	103.9	11.6	11.6	23.9	2.6	2.6
0.01-0.4 (lower marginal	303.5	34.0	45.6	287.4	31.9	34.5
0.41-1.0 (upper marginal)	246.5	27.6	73.2	315.0	34.9	69.4
1.01-2.0 (small)	134.8	15.1	88.3	154.8	17.2	86.6
2.01-4.0 (semi-medium)	70.3	7.9	96.1	84.0	9.3	95.9
4.01-10.0 (medium)	29.8	3.3	99.4	33.5	3.7	99.6
10+ (large)	4.9	0.6	100.0	3.5	0.4	100.0
All sizes	893.7	100.0		902.0	100.0	
Source: NSSO (2005, 2014c)						

Details of value of output, expenses, and net returns from crop production across farm sizes for farmer households involved in that activity for 2002-03 and 2012-13 is given in Table 4. After converting the available data to annual 2012-13 prices using consumer price index for agricultural labourers (CPI-AL) the growth rate for net returns is 5.1 per cent. This is likely to be an overestimate because 2002-03 being a drought year has a lower base and that would increase the growth rates.[6]

[6] In an earlier version, the estimated growth rate was much lower because in 2012-13 it included an additional 50 per cent to paid out expenses. This has been done away with in the current version because the 2002-03 expenses also were limited to those that have been paid out only. A similar correction has also been done in Table 5.

Table 4: Output, Expenses, and Net Returns from Crop Production for Farmer Households involved in the activity across Farm Sizes in 2002-03 and 2012-13 and Growth of Net Returns							
Farm size (hectares)	2002-03 (in ₹, 2012-13 prices)			2012-13 (in ₹)			Growth of Net Returns
	Output	Expenses	Net Returns	Output	Expenses	Net Returns	
<0.01 (near landless)	2947	1184	1763	13310	8103	5207	11.4
0.01-0.4 (lower marginal	11172	4794	6377	17459	7775	9685	4.3
0.41-1.0 (upper marginal)	29298	12701	16597	44092	17459	26633	4.8
1.01-2.0 (small)	53976	23002	30974	84485	32266	52219	5.4
2.01-4.0 (semi-medium)	93146	38968	54177	149747	59118	90630	5.3
4.01-10.0 (medium)	176257	78698	97558	308656	119647	189009	6.8
10+ (large)	313417	146811	166606	773958	315628	458331	10.6
<0.01 (near landless)	43578	18858	24720	67428	26669	40758	5.1
Notes: Consumer Price Index of Agricultural Labourers (CPI-AL), particularly weighted averages from month wise data for the relevant period for 2002-03 and 2012-13, have been used to convert 2002-03 figures to 2012-13 prices. The 2012-13 annual (365 days) figures have been obtained from monthly (30 days) reported figures. With 2002-03 being a drought year, the base year values would be lower and that would inflate the growth rates. Source: CACP (2015), Labour Bureau (2017), NSSO (2005, 2014c)							

Table 5: Compound Annual Growth Rate of Total Income of Farmer Households across Farm Sizes between 2002-03 and 2012-13 (at 2012-13 prices)					
Farm Sizes (hectares)	Wages/ Salaries	Crop Production	Animal Farming	Non-Farm Business	Total Income
<0.01 (near landless)	2.3	2.4	24.0	-1.0	4.4
0.01-0.4 (lower marginal	1.3	0.8	11.9	-2.3	1.7
0.41-1.0 (upper marginal)	2.7	2.5	10.1	1.1	3.1
1.01-2.0 (small)	2.4	2.2	14.1	4.5	3.2
2.01-4.0 (semi-medium)	1.9	2.5	25.2	2.1	3.4
4.01-10.0 (medium)	6.9	4.3	50.2	-2.3	4.9
10+ (large)	0.9	7.2	26.9	2.0	7.2
All sizes	1.7	4.0	14.6	0.1	3.5
Note: CPI-AL data was used to convert 202-03 data to 2012-13 prices. The growth rate for crop production in Table 4 is different as that was for those involved in the activity. With 2002-03 being a drought year, the base year values would be lower and that would inflate the growth rates. Source: CACP (2015), Labour Bureau (2017), NSSO (2005, 2014c)					

Further, the compound annual growth rate in income for all farmer households from all sources taken together turns out to be 3.5 per cent (Table 5). The growth from crop production at 4 per cent differs from Table 4 because that included only those involved in that activity whereas this includes all households. For all farmer households, growth has been the best from animal farming (14.6 per cent per annum) and much lower from wages and salaries (1.7 per cent per annum) and non-farm business (0.1 per cent per annum). The overall growth rate of 3.5 per cent for farmer households is much less than the overall growth rate of the economy during that period, which on an average would be more than 8.0 per cent per annum. The relatively lower returns to farmer households also resonate with our earlier observation regarding sustainability of livelihood concerns and the inability of smallholders to continue in farming. Now, we turn our attention to food and nutritional security.

2.1.3 Food and Nutritional Insecurity

The National Family Health Survey 2015-16 (NFHS-4) indicates that from among under five children, 38 per cent are stunted, 21 per cent are wasted, and 36 per cent are underweight; from adults, 23 per cent males and 20 per cent females had Body Mass Index (BMI) that was below normal, and 21 per cent males and 19 per cent females had BMI that made them overweight or obese (International Institute for Population Science, IIPS, 2016). It is an irony that 195 million Indians are undernourished constituting about one-fourth of the World's undernourished as per a recent publication on food insecurity in the world by Food and Agriculture Organization, International Fund for Agricultural Development, and World Food Programme (FAO, IFAD and WFP, 2015). Using the dietary norms for Indians by the National Institute of Nutrition (NIN, 2010), one observes that in 2011-12 "the proportion of calorie, protein, and fat-poor in India are 61 per cent, 36 per cent, and 23 per cent, respectively" (Mishra, 2015). Having discussed three concerns with regard to the agrarian crisis,[7] namely, declining share of pie, poor returns to farmers, and food and nutritional security, we will now briefly elucidate some concerns of the agricultural crisis.

2.2 Agricultural Crisis

2.2.1 Agricultural Production

The annual average growth rate of the index of agricultural production for foodgrains, non-foodgrains, and all crops for different sub-periods between 1981 and 2016 is (Table 6) convey the following. In the 1980s (1981-82 to 1993-94), there was a shift in area from foodgrains to non-foodgrains, but the growth of production has been more than 3 per cent per annum for both foodgrains and non-foodgrains;- the yield increases for foodgrains as also for non-foodgrains contributed to this and this is explained in terms of success of the 'green revolution'. In the 1990s (1993-94 to 2004-05), the shift in area from foodgrains to non-foodgrains continued, but the growth in production has been much lower than that of the 1980s and the growth in yield was even negative for non-foodgrains. This was the period when the crisis in Indian agriculture was first noticed. In the subsequent three years (2005-06 to 2007-08) there was a revival in Indian agriculture. This also coincided with interventions by the government to revive the agricultural sector. The efforts in the revival, was toned down but continued for some additional years (2007-08 to 2013-14). The two consecutive droughts in 2014-15 and 2015-16 reiterates the focus on the crisis in Indian agriculture and the vulnerability of the agricultural sector.

[7] Another important dimension of agrarian crisis is farmers' suicides. See Deshpande and Arora (2010), Mishra (2006a, 2006b, 2008, 2014), Mohanty (2005), Nagaraj (2008), Reddy and Mishra (2009a), and Vasavi (2012) among others and references therein.

Table 6: Average Annual Growth Rate of Index of Agricultural Area, Production and Yield									
Periods	Foodgrains			Non-foodgrains			All crops		
	A	P	Y	A	P	Y	A	P	Y
1981–82 to 1993–94†	-0.36	3.15	2.88	1.75	3.71	1.98	0.18	3.31	2.44
1993–94 to 2004–05‡	-0.12	1.16	1.05	0.99	0.26	-0.51	0.18	0.77	0.52
2004-05 to 2007–08‡	1.09	5.35	4.24	1.61	12.37	10.59	1.36	9.83	8.36
2007–08 to 2013–14§	0.09	2.50	2.35	2.41	2.22	0.29	0.87	2.33	1.76
2013–14 to 2015–16§	-0.99	-2.43	-1.22	-5.49	-1.97	1.94	-2.67	-2.12	-0.83
Note: Calculation of growth rates are based on index data. A, P, and Y denote Area, Production, and Yield respectively; †, ‡ and § denote that the base year for the index was triennium ending 1981–82, 1993–94, and 2007–08, respectively. Source: RBI (2017)									

2.2.2 Widening Gap Between Agricultural and Non-Agricultural Sectors

The growth rates for Agricultural Gross Domestic Product (AgGDP) has always been lower than that of the overall Gross Domestic Product (GDP), as is the case in recent times (Table 7). Further, drought and other natural calamities can lead to the growth in AgGDP being negative. This also explains a widening income gap between agricultural and non-agricultural sector. In fact, a recent working paper by the International Monetary Fund also points out about growing economic inequality in India (Jain-Chandra et al, 2016). What is more, the difficulty that agriculture is in also raises questions on serviceability of agricultural credit.

Table 7: Annual Growth rate of Gross Domestic Product and Agriculture, Forestry and Fishing in 2011–12 prices		
Period	Gross Domestic Product	Agriculture, Forestry and Fishing
2012–13	5.45	1.50
2013–14	6.21	5.55
2014-15	6.94	-0.30
2015-16	7.83	0.76
2016-17	6.67	4.37
Source: RBI (2017)		

2.2.3 Agricultural Credit

Agricultural credit, as designed in India, is needed by the farmer to do the same thing again and again - take loan, produce, sell, and repay, and then the cycle gets repeated every season/year. This limits the scope for either a horizontal or vertical growth. This in essence explains why under some duress (natural or accidental) agricultural credit becomes non-serviceable and the default, if any, is not wilful.

As conveyed in Shetty (2009), the period of the 1990s, associated with deceleration in agricultural production, is also the period when rural bank branches closed down, small borrowal accounts reduced, and disbursement to agricultural credit was much lower than the priority sector lending requirement. There were some initiatives in the first decade of 2000s like doubling of credit and debt waiver among others. These initiatives are also reflected in the trends in the ratio of share of credit disbursed to share of area operated across farm sizes, and the ratio of share of number of borrowal accounts to the share of the number of operational holdings across farm sizes that show a reversal in

2012-13 (Table 8). However, the fact that among marginal farmers, the first ratio is closer to unity and the second ratio is closer to half implies that a smaller proportion of marginal farmers have a greater share of credit. This anomaly is an independent matter that needs further investigation and beyond the scope of the current exercise.

Table 8: Ratio of share of credit to share of area and ratio of share of borrowal accounts to share of operational holding across farm sizes

Year	Ratio of the share of credit disbursed to the share of area operated			Ratio of the share of the number of borrowal accounts to the share of the number of operational holdings		
	Marginal	Small	Other	Marginal	Small	Other
1981–82	2.41	1.24	0.72	0.90	1.28	1.01
1991–92	1.84	1.33	0.71	0.72	1.77	1.19
2002–03	0.96	1.25	0.93	0.49	2.79	3.25
2012–13†	1.11	1.30	0.78	0.54	3.28	3.09

Notes: Marginal, small and other refer to <1 hectare, 1–2 hectares and >2 hectares for area operated and operational holdings and are superimposed on <2.5 acres, 2.5–5.0 acres and >5 acres for credit and borrowal accounts. † Credit data is for 2011–12, the latest available.
Sources: Mishra (2015), based on NSSO (c.1993, 2014b), RBI (2014b); the acronym NSSO for c.1993 refers to National Sample Survey Office, the earlier name of the National Sample Survey Organization.

The reliance on non-institutional sources is greater for smaller sizes and they also have a greater interest burden, as per the Situation Assessment Survey (SAS) from National Sample Survey in their 59th and 70th rounds providing indebtedness figures for 2002 and 2012, respectively. Further, as per SAS, nearly 69 per cent of the non-institutional loans have an interest rate of more than 20 per cent and nearly half of these have an interest rate of more than 30 per cent. All these also explain that debt, besides being non-serviceable, is also perhaps not timely and/or not adequate.

2.2.4 Increased Risk and Vulnerability

The two consecutive droughts, the widening gaps between agricultural and non-agricultural sectors, as also untimely, inadequate and non-serviceable are not the only reasons to explain the increasing vulnerability of the agricultural sector. The multitude of technological and financial interventions envisioned to reduce risk can actually end up increasing it. This design flaw can be explained by borrowing a stylized representation through a fictitious example taken verbatim from Mishra (2015).[8]

> In Table 9, cultivation under a traditional scenario uses 1 unit of input and gives an output of 3 units in a normal year. The net return (output minus input) from this is 2 units. Out of this, the household consumes 65 per cent (1.3 units) and saves the remaining amount (0.7 units). If this normal situation prevails for three years then the household has cumulative savings of 2.1 units at the end of the third year. Now, if there is a calamity and the household gets no output in the fourth year, it uses the cumulative savings to pay for the input costs and reduces its consumption to 1.1 units.

[8] Similar exposition can be found in other related work by the author; also see Mishra et al (2013).

Table 9: Risk Mitigation under Different Stylized Scenarios						
Scenarios	Year	Input	Output	Net Return	Consum -ption	Cumulative Savings
Traditional	1	1.0	3.0	2.0	1.3	0.7
	2	1.0	3.0	2.0	1.3	1.4
	3	1.0	3.0	2.0	1.3	2.1
	4	1.0	0.0	-1.0	1.1	0.0
Input Intensive	1	3.0	6.0	3.0	1.8	1.2
	2	3.0	6.0	3.0	1.8	2.4
	3	3.0	6.0	3.0	1.8	3.6
	4	3.0	0.0	-3.0	0.6	0.0
Sustainable, Zero Budget Natural Farming (ZBNF)	1	1.5	4.5	3.0	1.5	1.5
	2	1.5	4.5	3.0	1.5	3.0
	3	1.5	4.5	3.0	1.5	4.5
	4	1.5	0.0	-1.5	1.2	1.8
Source: Mishra (2015) , based on earlier related work by the author.						

The second scenario in Table 9 represents an input-intensive case. One can associate this with the green revolution that saved us from a ship-to-mouth existence, and in the current context, with financial interventions (say, in the form of credit and insurance products) that are part of the input structure designed for the input-intensive scenario. This is indeed laudable, as it is seen to have doubled the overall output. . However, in purely numerical terms, in a normal year, input is 3 units, output is 6 units and net return is 3 units; consumption is 60 per cent (1.8) units and savings is 1.2 units. At the end of three normal years, the cumulative saving is 3.6 units. Now, as in the earlier scenario, calamity strikes in the fourth year. The household uses the cumulative savings to pay for the input and ends up at a consumption level of 0.6 units. Compared to the traditional scenario, this has a lower consumption in the fourth year indicating a greater risk. Today, the Indian farmer is in such a situation. To address this, if one comes up with additional interventions (technological or financial) then this will further add to the input cost, when the need of the hour is to reduce that.

This raises questions on alternative methods of agriculture that would require less credit while also addressing other concerns on the agricultural crisis as also the agrarian crisis. It is in this context that we propose to discuss Zero Budget Natural Farming.

3 What is Zero Budget Natural Farming?[9]

This is a form of low external input sustainable agriculture (LEISA). Rather, an extreme form that does not shy away from suggesting that there is no need to use any external inputs. All inputs are to be locally resourced from in and around the village (or perhaps within the farm) in a symbiotic way. This is a dynamic system wherein outputs are likely to be inputs to at least one of the other outputs. More importantly, as none of the inputs are sourced from outside the system then there is no cost, and it is this that is referred to as zero budget natural farming (ZBNF).

The logic of the system is simple. If rainforests can have lush growth and also sustain animals then why cannot we propagate agriculture through lessons from nature without recourse to any chemicals and fertilizers. A call to nature where no external inputs need to be purchased is referred to as zero budget natural farming or *naisargik sheti* or *jaivik kheti*.

3.1 The Man Behind: Mr Subhash Palekar

This form of agriculture is being propounded by Mr Subhash Palekar who was trained as an agricultural scientist and did begin his career with an emphasis on input-intensive cultivation that relied on chemicals and fertilizers. However, declining yield after its use for more than a decade made him question the method. This led him to examine in detail and he started experimenting in his own farm where he learnt that the reliance on external inputs can be reduced. He also started sharing his knowledge with other farmers.

A popular incident is his interaction with farmers (women self-help group members) almost 10 to 15 years earlier (circa 2005) as part of Velugu initiative under Society for Elimination of Rural Poverty. The two sides did not understand each other's language (Mr Palekar spoke Marathi, Hindi or English) and the women SHG members understood only Telegu), but a common medium for them was agriculture that they both understood and the event was was appreciated. One of the participants went back home and had a discussion (rather, argument) with her husband of trying this method of agriculture without use of pesticides and fertilizers. The husband was furious, but finally they agreed that the wife can try the alternative method in half a plot while in the other half the husband would continue with his application of fertilizer and pesticides. The outcome was that the yield was not much different between the two approaches, but the wife's approach had a much lower cost. In the next season the couple used this zero budget natural farming approach in all their plots and now the whole village was watching and they all shifted to this approach in the third season (Mishra and Reddy, 2011). This is a classic case of a real life application of the case-control method.

[9] The content of this is largely based on our understanding of what is available in the website on Zero Budget Spiritual Farming (Palekar, undated), but also draws on GOAP (2017), Khadse et al (2017), and La Via Campesina (2016), as also on notes by Babu (undated) and Ravishankar (undated), and also interaction/communication with Advisor (former Special Chief Secretary), Agriculture, Government of Andhra Pradesh among others. These are largely paraphrased and sometimes close to being quoted. Also see Münster (2016, 2017).

3.2 Four pillars of ZBNF

3.2.1 *Jeevamrutha/Jivamrita*:

This is a fermented microbial culture prepared from locally available natural resources for the purpose of being applied to the soils/plants at different stages of their growth. It is a form of bio-fertilizer, a catalytic agent, promoting microorganism and earthworm activity in the soil. The 48 hour fermentation process multiplies aerobic and anaerobic bacteria present in the cow dung and urine, as they eat up organic ingredients, and a handful of undisturbed soil acts as inoculate of native species of microbes and organisms. Its application acts as a preventive measure against fungal and bacterial diseases. It can be applied through irrigation water or through foliar spray. While transiting from conventional input-intensive agriculture, the application of *Jeevamrutha* to the soils and plants is required only for the first three years because after that the system becomes self-sustaining.

3.2.2 *Beejamrutha/Bijamrita*:

This is a concoction prepared from locally available natural resources for the propose of treatment for seeds, seedlings or any planting material. It reduces the possibility of seed infestation by pests and protects young roots from fungus, soil-borne diseases, and seed-borne diseases that generally affect the plants after monsoon. In the ingredients, the dung and urine from the indigenous breed cow act as a powerful fungicide, and anti-bacterial agent, respectively.

3.2.3 *Acchadana*/Mulching:

There are three types of mulching.

- Soil mulching: It protects topsoil by avoiding tilling. It facilitates aeration, and promotes water retention. If not zero tillage, avoid deep ploughing.
- Straw/Biomass mulching: Application of dry organic matter (dead material of any living being) along with *Jeevamrutha* will lead to decomposition and humus formation that will improve soil fertility.
- Live mulching: This suggests inter-cropping or mixed-cropping by combining monocots (those seedlings with one seed leaf like rice and wheat) with dicots (those seedlings with two seed leaves like legumes) in the same plot of land. This will create a symbiotic relationship because monocots will supply elements like potash, phosphate, and sulphur, while dicots will work towards nitrogen-fixation.

3.2.4 *Whapasa*/Moisture:

This calls for an appropriate mix of water and air in the soil or the relevance of soil moisture. It questions the thinking that plants need more water and irrigation is the way out. Rather, it calls for a reduction in water usage and resonates with the saying "more crop per drop."

3.2.5 Other principles of ZBNF:

Some of the other important principles of ZBNF are intercropping where in addition to combining monocot and dicot crops in a single plot of land it also articulates the relevance of crop-tree association (and that will add to income from additional sources), the role of contours and bunds to preserve rainwater and promote maximum efficacy for different crops, the need to revive the local deep soil earthworms and not to rely on vermicompost (in particular, the *Eisinea feotida* worm, exotic to India should be avoided), and to use the indigenous humped cow (*Bos Indicus*) for their dung and urine because they have a greater concentration of micro-organisms. Further, depending on the nature and type of insect/pest attack, zero budget natural farming has come up with different formulations (*neemastra*, *agniastra*, and *bramhastra* among others) from locally available resources that work as bio-pesticides. Before exploring the application of ZBNF in Karnataka and Andhra Pradesh, we will briefly discuss the links of ZBNF with agroecology and articulate its risk reducing ability.

3.3 ZBNF, Agroecology and More

Without getting into the politics of labelling, La Via Campesina is of the view that "ZBNF exemplifies agroecological principles" where the emphasis is on "enhanced biomass recycling; strengthened 'immune system' of systems through enhanced functional biodiversity; enhanced soil conditions by managing organic matter and soil biological activity; minimized loss of energy, water, and nutrients; diversification of genetic resources; and enhanced beneficial biological interactions" (Khadse et al, 2017: 10).

Silici (2014) points out that agroecology has three facets: it a scientific discipline studying the complex interaction between different components of the agro economic system, it is a set of practices that seeks to achieve sustainable farming, and it is a social movement forging a relationship between agriculture and society. In a recent paper, Foran et al (2014) argue out that there are synergies from diverse approaches (agroecology, agriculture innovation systems, social-ecological systems, and political ecology) and that there are nontrivial differences among them that can complement and supplement each other. In fact, the emergence and evolution of agroecology through La Via Campesina, a network of 164 local and international organizations spread across 73 countries, is itself a process of 'dialog among different knowledges and ways of knowing' (or, *diálogo de saberes* in Spanish), as pointed out by Martínez-Torres and Rosset (2014).

It would be worthwhile how different approaches have influenced the application of ZBNF in Karnataka and Andhra Pradesh. However, before that, by invoking *diálogo de saberes* we would like to discuss the relevance of risk reduction.

3.4 Risk Reduction under ZBNF

Given that the resources are locally used, an important claim is that this would reduce costs, and hence, risks. This can be explained by taking recourse to the sustainable scenario in Table 9. Based on Mishra (2015), one can state that it has an input of 1.5 units—higher than that in the traditional scenario but much lower than that in the input-intensive scenario—and an output of 4.5 units (lower than that in the input-intensive scenario). However, from the farmer's point of view net return under this scenario is the same as that under the input-intensive scenario. Now, if his consumption and

saving behaviour are similar to the input-intensive scenario (this situation has not been given in Table 9) then, when calamity strikes in the fourth year, after paying for the input costs (1.5 units) and having reduced consumption to 1.5 units, the household will still be left with saving of 0.6 units. However, this example postulates relatively austere consumption behaviour that is in keeping with our commonsense understanding of sustainable agriculture (zero budget natural farming). Thus, we impose a consumption level of 50 per cent of net return. The saving that emanates from this has two advantages.

> The first and most important is that it increases leverage to address risk. The second is that the farmer can plan for additional investment for expansion.

Having discussed the risk-reducing ability of ZBNF, we now take up some experiences from Karnataka and Andhra Pradesh.

3.5 The Karnataka Experience

It was in 2002 that a senior leader of Karnatka Rajya Raith Sangha (KRRS) invited Mr Subhash Palekar for an interaction leading to a series of workshops and training camps in the method of ZBNF. It is said that about a lakh of farmer households may be practising it in Karnataka and all of them need not be necessarily linked to KRRS. The spread of this initiative has been discussed in La Via Campesina (2016) and Khadse et al (2017).

Further, Khadse et al (2017) survey 97 farmer households who are practising ZBNF and the reasons (not mutually exclusive) that the farmers ascribe to adoption of ZBNF are family health (54 per cent), food self-sufficiency (46 per cent), environmental reasons (42 per cent), reduce cost of production (38 per cent), reduce dependency on corporations (33 per cent), reduce debt (30 per cent), and spiritual reasons (30 per cent) among others.

The study of Khadse et al (2017) points the positive impact on various agroecological indicators from among the farmer households they surveyed (Table 10). Health has increased for all households; soil conservation, seed autonomy, and quality of produce has increased for more than 90 per cent of the households; household food autonomy, and income has increased for more than 85 per cent of the households; yield, and seed diversity has increased for more than 75 per cent of households; and selling price has increased for 58 per cent of households. At the same time pest attack has decreased for 84 per cent of households, production costs decreased for 91 per cent of the households, and need for credit has decreased for 93 per cent of the households.

The impact has been positive and affirms the claims that the method can reduce risk. There is, however, an independent need to evaluate the adverse experiences, even if they are few in number, so as to help us understand the reasons and if possible to address them so that the efficacy of the method can be further improved. There are criticism against ZBNF because to follow that one has to adhere to strict guidelines of do's and don'ts. But, its application in the field points to the existence of different layers of adherence, which implies a process involving *diálogo de saberes*. Now we elucidate the Andhra Pradesh experience.

Table 10: Efficacy of some Agroecological Indicators among Farmers Surveyed, Karnataka, 2012			
Indicators	Increased	Not Changed	Decreased
Health	100.0	0.0	0.0
Soil conservation	93.6	4.3	2.1
Seed autonomy	92.7	4.9	2.4
Quality of produce	91.1	4.4	4.4
Household food autonomy	87.8	7.3	4.9
Income	85.7	9.5	4.8
Yield	78.7	8.5	12.8
Seed diversity	76.9	10.3	12.8
Selling price	57.9	34.2	7.9
Pest attacks	11.4	4.5	84.1
Production costs	6.8	2.3	90.9
Need for credit	3.8	3.8	92.5
Source: Khadse et al (2017)			

3.6 The Andhra Pradesh Experience[10]

The Government of Andhra Pradesh (GOAP) has launched zero based natural farming. In the face of distress/crises in agriculture, the objectives of the programme are "to promote climate resilient, chemical free, ecological agriculture; to provide small and marginal farmers with profitable livelihoods form agriculture, and to cover 500,000 farmers and 500,000 hectares in 1500 villages spread across all agro climatic zones, in half the mandals of the State in all the districts." While the programme was launched in 2015-16 its implementation in the field started in 2016-17 and it has so far covered 704 villages in 131 clusters and there are plans to cover the remaining 796 villages/160 clusters in 2017-18. The programme envisages covering all the targeted farmers by 2019-20. The documentation of the procedure and results from the implementation of the programme in 2017-18 will have important lessons for the rest of the country.

First, the state initiated multi-stakeholder partnerships between the agricultural department, agricultural scientists in Universities, Non-Governmental Organizations, and others. Second, the state invited Mr Subhash Palekar along with volunteers to organize two training camps on ZBNF involving 5000 participants each in January 2016 and September 2016. In these training camps, 85 per cent of the participants were farmers and the remaining were other stakeholders. The camps set the stage as it turned out to be motivational and inspirational. Third, for effective implementation a dedicated team has been set-up at the state, district and cluster level. In each cluster there is one Multi Purpose Extension Officer (MPEO) from the agriculture department and three master farmers. Fourth, the programme is also an exercise in convergence across different schemes, the *Rashtriya Krishi Vikash Yojana* (RKVY), the *Paramparagat Krishi Vikash Yojana* (PKVY), and state plan among others. Finally, it is also exploring funding and other partnership with other non-state and multilateral agencies like the Azim Premji Philanthropic Initiative, the Bill Melinda Gates Foundation and the International Fund for Agricultural Development among others.

[10] This is based on Government of Andhra Pradesh (GOAP, 2017).

In 2016-17, 48565 farmers have been covered as against a target of 39300 farmers. Besides, the intervention has also been with regard to ZBNF input shops, identification of potential master farmers, formation of self-help groups (SHGs), and setting up of farmer field schools.

Table 11: Yield Difference in Crop Cutting Experiment across ZBNF and Non-ZBNF and Net Additional Income for ZBNF in Andhra Pradesh in 2016-17

Crop	ZBNF Yield (Kg/Ha)	Non-ZBNF Yield (Kg/Ha)	Yield Difference (Kg/Ha)	Net Income for Yield Difference (₹/Ha)	Cost Reduction for ZBNF (₹/Ha)	Net Additional Income for ZBNF (₹/Ha)
Paddy	6416	5816	600	9000	5000-20000	14000-29000
Groundnut (Irrigated)	2868	2233	635	30000	10000	40000
Black Gram	1300	1027	173	13500	3000	16500
Chilly	10240	7740	2500	100000	13000	113000
Maize	12844	11856	988	40459	34086	74545

Note: ZBNF denote Zero Budget Natural Farming or intervention plots whereas non-ZBNF are controls.
Source: GOAP (2017)

The Department also conducted crop cutting experiments in ZBNF as also non-ZBNF areas for 2016-17. The results for paddy and other crops along with net additional income from ZBNF given in Table 11 show relatively higher yield and lower cost for the ZBNF method over non-ZBNF method. The twin benefits in a drought year strengthen the proof of concept.

The benefits of ZBNF are little or no cost; zero chemical usage (will restore soil organic matter and soil carbon and thereby facilitate greater productivity); use local seeds (less costly, resilient to climate change compared to hybrids); less water requirement (more crop per drop); zero budget (through poly crop and trees) facilitate income throughout the year and reduces risk; for the ultra poor (poorest 20 per cent) a five-tiered cropping model in 1100 square feet (2.5 cents) of land can improve food and nutritional security and add to the family income by ₹1000 to ₹1250 per month; withstand longer dry spells better and also recover to a wet spell after a long dry spell (or, through protective irrigation) better; climate friendly and carbon neutral agriculture; and increases consumer access to healthy food among others.

The unique selling proposition for the programme in Andhra Pradesh are the master farmers (selected from among the best practising farmers of the cluster) who work as a catalytic agents for quick and successful adoption by new farmers; video dissemination of short duration pictures on ZBNF package of practices; farmer friendly content and package of practices that include workbook, primers and crop cards with timelines; strong ownership of agriculture department and thrust on capacity building by creating dedicated resource pool at the state, district and cluster level; accessibility of ZBNF inputs by establishing ZBNF input shops in each village by a ZBNF practitioner, and there are plans to set up at least one custom hiring centre in each cluster; farmers institutions like self-help groups, village- and cluster-level federations, and farmer producer organizations; and a comprehensive Information and Communication Technology (ICT) support to create database, facilitate e-tracking, enable traceability for certification, provide platform for e-marketing, and dissemination of knowledge through a dedicated YouTube channel among others.

It has already been mentioned that ZBNF exemplifies agroecology. The ownership of the programme by the agriculture department that required systemic changes exemplifies synergy with agricultural innovation systems, the recourse of use to locally available resources with emphasis on resilience as also reduction of costs do show synergy with social-ecological systems, and the focus on the ultra poor in the programme along with cost reduction and implication on food self-sufficiency provide synergy with political ecology.

The preliminary successes in Andhra Pradesh is encouraging. This, however, should not mean that this can happen overnight. This required a change in paradigm shift in the way the agriculture department of Andhra Pradesh has been functioning. More importantly, it requires investment to an idea. An idea that questions the conventional input-subsidy linkages, and calls for investing in a knowledge systems. Now, we provide our concluding remarks.

4 Concluding Remarks

The silence over farmers protest (nay, their plight) is, to say the least, disheartening. It questions the collective conscience and lays bare the hundreds of thousands of farmers who took their lives on account of a helplessness that we as a society fail to visualize and respond. Let us not be in any denial about the crisis in Indian agriculture. The twin dimensions of the crisis - agrarian (declining share of pie to the farmer, poor returns to the farmer, and food and nutritional insecurity of the farmer among others), and agricultural (poor agricultural production, widening gap between agricultural and non-agricultural sector, agricultural debt being non-serviceable as also being inadequate and untimely, increasing risk and vulnerability) is real. It is under this that the Zero Based Natural Farming that resonate with principles of agroecology and addresses the concerns of the twin-dimensions of the risk that one sees a way out. Having said that, we need not restrict ourselves to the labelling of ZBNF. There can be many other initiatives that use local resources, reduce costs, address risk and vulnerability, are relevant under rainfed conditions, are resilient to climate change, and ensure healthy food among others. All such initiatives ought to fit our search for an alternative. Lessons from Andhra Pradesh point out that to make such alternatives work, there has to be a paradigm shift in the way the agricultural department visualizes and addresses the problem - business as usual will not work. The experience of Andhra Pradesh also paves the path for synergey between different knowledge systems - agroecology, agricultural innovation systems, socio-ecological systems, and political ecology among others. This also requires a concerted effort where government, communities and science come together.[11]

[11] As an aside, one is tempted to state that while all these would be necessary and welcome, they may still fall short of the doubling of income envisaged for the farmer. In fact, Andhra Pradesh envisages a 25 per cent increase in income along with other non-income benefits by 2022. Given this, a case for livelihood sustenance of those involved in agricultural needs an independent discussion.

References:

Agarwal, Bina; Agrawal, Ankush (2017) Do Farmers really like Farming? Indian Farmers in Transition, *Oxford Development Studies*, http://dx.doi.org/10.1080/13600818.2017.1283010.

Babu, AY (undated), *Action Research Report on Subhash Palekar's Zero Budget Natural Farming*, http://www.atimysore.gov.in/pdf/action_research.pdf (accessed 23 September 2016).

CACP (2015), *Price Policy for Kharif Crops: The Marketing Season 2015-16*, Ministry of Agriculture, Government of India.

Deshpande, RS; Arora, S (eds.) (2010): *Agrarian Crisis and Farmers' Suicides*, Sage, New Delhi.

FAO, IFAD, and WFP (2015) *The State of Food Insecurity in the World 2015: Meeting the 2015 International Hunger Targets: Taking Stock of Uneven Progress,* FAO, Rome.

Foran, T; Butler, JRA; Williams LJ; Wanjura, WA; Hall, A; Carter, L; Carberry, PS (2014) Taking Complexity in Food Systems Seriously: An Interdisciplinary Analysis, *World Development*, 61, pp. 85-101.

Gaurav, Sarthak; Mishra, Srijit (2015) Farm Size and Returns to Cultivation in India: Revisiting an Old Debate, *Oxford Development Studies*, 43 (2), pp.165-193.

GOAP (2017) Status Note on Zero Budget Natural Farming (ZBNF) in A.P. (mimeo), personal communication.

GOI (2007) *Report of the Expert Group on Agricultural Indebtedness* (Chair: R Radhakrisha), Ministry of Finance, New Delhi.

GOI (2009) *Report of the Task Force on Credit Related Issues of Farmers* (Chair: U Sarangi), Ministry of Agriculture, New Delhi.

IIPS (2016) India Fact Sheet, National Family Health Survey 2015-16 (NFHS-4), Ministry of Health and Family Welfare, GOI.

Jain-Chandra, Sonali; Kinda, Tidiane; Kochhar, Kalpana; Piao, Shi; Schauer, Johanna (2016) Sharing the Growth Dividend: Analysis of Inequality in Asia, IMF Working Paper WP/16/48.

Khadse, Ashlesha; Rosset, Peter Michael; Morales, Helda; Ferguson, Bruce G (2017) Taking Agroecology to Scale: the Zero Budget Natural Farming peasant movement in Karnataka, India, *Journal of Peasant Studies*, DOI: 10.1080/03066150.2016.1276450.

Labour Bureau (2017) Consumer Price Index for Agricultural Labourers, http://labourbureaunew.gov.in/ (Index Numbers - Archived, CPI - (AL/RL), All India General Index, accessed 13 May 2017).

La Via Campesina (2016) Zero Budget Natural Farming in India, www.fao.org/3/a-bl990e.pdf (accessed 13 May 2017).

Martínez-Torres, María Elena; Rosset, Peter M (2014) Diálogo de saberes in La Vía Campesina: food sovereignty and agroecology, *Journal of Peasant Studies*, DOI: 10.1080/03066150.2013.872632.

Mishra, Srijit (2006a) *Suicide of Farmers in Maharashtra*, Indira Gandhi Institute of Development Research, Mumbai.

Mishra, Srijit (2006b) Farmers' suicides in Maharashtra, *Economic and Political Weekly*, 41 (16), pp.1538-1545.

Mishra, Srijit (2008), Risks, Farmers' Suicides and Agrarian Crisis in India: Is There a Way Out? *Indian Journal of Agricultural Economics*, 63 (1), pp. 38-54.

Mishra, Srijit (2014) Farmers Suicides in India, 1995–2012: Measurement and Interpretation, Asia Research Centre Working Paper 62, London School of Economics and Political Science, London.

Mishra, Srijit (2015) *Nature, Extent, Causes and Issues in Agricultural Distress*, Foundation Day Seminar, National Bank for Agriculture and Rural Development, Mumbai.

Mishra, Srijit; Ravindra, A; Hesse, Ced (2013), *Rainfed agriculture: for an inclusive, sustainable and food secure India*, IIED Briefing Paper 10041IIED.

Mishra, Srijit; Reddy, D Narasimha (2011) Persistence of Crisis in Indian Agriculture: Need for Technological and Institutional Alternatives, in Dilip M. Nachane (ed) *India Development Report 2011*, Oxford University Press, New Delhi, pp.48-58.

Mohanty, BB (2005) 'We are like the Living Dead': Farmer Suicides in Maharashtra, Western India, *Journal of Peasant Studies*, 32 (2), pp. 243-276.

Münster, D (2016) Agro-ecological Double Movements? Zero Budget Natural Farming and Alternative Agricultures after the Neoliberal Crisis in Kerala, in BB Mohanty edited *Critical Perspectives on Agrarian Transition: India in the Global Debate*, Routledge, New Delhi, pp. 222-244.

Münster, D (2017) Zero Budget Natural Farming and Bovine Entanglements in South India, *RCC Perspectives: Transformations in Environment and Society*, 1, pp.25–32.

Nagaraj, K (2008) *Farmers' Suicides in India: Magnitudes, Trends and Spatial Patterns*, Bharathi Puthakalayam, Chennai.

NIN (2010) Dietary Guidelines of Indians: A Manual, NIN, Hyderabad.

NSSO (c.1993) *Operational Land Holdings in India, 1991–92: Salient Features*, (Land and Livestock Holding Survey, NSS Forty-Eighth Round, January–December 1992),Report No.407, Ministry of Planning & Programme Implementation, New Delhi.

NSSO (2011) *Employment and Unemployment Situation in India 2009–10, NSS 66th Round, July 2009–June 2010*, Report No.537 (68/10/1), Ministry of Statistics & Programme Implementation, New Delhi.

NSSO (2014a) *Employment and Unemployment Situation in India 2010–11, NSS 68th Round, July 2011–June 2012*, Report No.554 (68/10/1), Ministry of Statistics & Programme Implementation, New Delhi.

NSSO (2014b) *Key Indicators of Land and Livestock Holding of India, NSS 70th Round, January–December 2013*, NSS KI (70/18.1), Ministry of Statistics & Programme Implementation, New Delhi.

NSSO (2014c) *Key Indicators of Situation of Agricultural Households in India, NSS 70th Round, January–December 2013*, NSS KI (70/33), Ministry of Statistics & Programme Implementation, New Delhi.

Palekar, Subhash (undated) *Zero Budget Spiritual Farming*, http://www.palekarzerobudgetspiritualfarming.org/home.aspx (accessed 23 Sept.2016).

Ravishankar, Shri (undated), *Indian Rural Development through sustainable form of Agriculture By Zero Budget Natural Farming Of Sri Subhash Palekar*, http://www.indiawaterportal.org/sites/indiawaterportal.org/files/RD%20through%20ZBNF.pdf (accessed 23 September 2016)

RBI (2006) *Report of the Working Group to Suggest Measures to Assist Distressed Farmers* (Chair: SS Johl), RBI, Mumbai.

RBI (2014a) *Annual Report 2013–14*, RBI, Mumbai.

RBI (2014b) *Handbook of Statistics on the Indian Economy 2013–14*, RBI, Mumbai.

RBI (2017) *Real time Handbook of Statistics on the Indian Economy*, RBI, Mumbai, accessed 8 May 2017.

Reddy, D Narasimha; Mishra, Srijit (eds.) (2009a) *Agrarian Crisis in India*, Oxford University Press, New Delhi.

Reddy, D Narasimha; Mishra, Srijit (2009b) 'Agriculture in the Reforms Regime,' in D Narasimha Reddy and Srijit Mishra (eds.), *Agrarian Crisis in India*, Oxford University Press, New Delhi, pp.3–43.

Shetty, SL (2009) 'Agricultural Credit and Indebtedness: Ground Realities and Policy Perspective,' in D Narasimha Reddy and Srijit Mishra (eds.), *Agrarian Crisis in India*, Oxford University Press, New Delhi, p.61–86.

Silici, Laura (2014) *Agroecology - What It Is and What It Has To Offer*, Issue Paper 14629IIED, International Institute for Environment and Development, London.

Vasavi, AR (2012) *Shadow Space: Suicides and the Predicament of Rural India*, Three Essays Collective, New Delhi.

Nabakrushna Choudhury Centre for Development Studies (NCDS)
(an Indian Council of Social Science Research (ICSSR) institute
in collaboration with Government of Odisha)
Bhubaneswar - 751013
Odisha, India

Phone: +91-674-2301094, 2300471
Email: ncds_bbsr@dataone.in
Web: http://ncds.nic.in
Facebook: @ncdsbhubaneswar
Twitter Handle: @ncds_bbsr
Google Maps: NCDS Bhubaneswar

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