Risks, Farmers' Suicides and Agrarian Crisis in India: Is There a Way Out?*

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I

INTRODUCTION

A popular peasant saying that "abundance of water destroys life; paucity of water destroys life" signifies agriculture's link with monsoon. The vagaries of nature have been associated with ups and downs in cultivation. In addition, disease and pests can also affect crops. When the produce is good, a glut in the market can through low prices lead to poor returns from cultivation. Increasing costs can also adversely affect returns. Spurious inputs could also leave the farmer in a quandary. The increasing dependence on inputs from the market has also brought about greater demand for credit, which adds another important dimension to the difficulties. There are multiple risks in agriculture – income, yield, price, input, technology and credit among others.

In recent years, one observes an increasing incidence of farmers' suicides. Suicide being a multifaceted and complex phenomenon, the risks are identified either in the neurobiological or socio-economic domain. The former are predisposing in nature and are internal to the individual whereas the latter are the precipitating ones and are external to the individual. A relatively higher suicide among farmers is indicative of a larger malaise in agriculture. There are twin dimensions to this crisis in agriculture: an agrarian crisis which threatens the livelihood of those dependent on agriculture, particularly the small and marginal farmers and landless agricultural labourers; and an agricultural developmental crisis that manifest through a deceleration of productivity and declining profitability which can be attributed to the neglect in the designing of programmes and in the allocation of resources towards agriculture (Government of India, 2007).

The features of the crisis in agriculture are: First, there has been a decline in the trend growth rate of production as well as productivity for almost all crops from the mid-nineties. Further, the value of output from agriculture has been declining from late nineties. Second, there is an excessive dependence of a large section of the

population on agriculture (in 2004-05 nearly 64 per cent of the rural persons were from households whose members' major activity status was either self-employed in agriculture or agricultural labour). This also indicates that rural non-farm employment opportunities are limited. Third, with declining size-class of holdings and an increasing preponderance of marginal holdings (63 per cent as per 2000-01 agricultural census) along with poor returns from cultivation indicates that the income for farm households is very low. Fourth, the much talked about green revolution had a greater focus on rice and wheat under irrigated condition bypassing crops and regions under rainfed or dry land conditions (which is three-fifths of the 141 million hectares of net sown area in the country during 2003-04). There has been a failure to capitalise on the vast network of institutes to provide and regulate new technology (including the usage of biotechnology), and a virtual absence of extension service. Fifth, the neglect of agriculture in plan resource allocation has led to a decline of public investments in irrigation and other related infrastructure. Sixth, supply of credit from formal sources to the agricultural sector is inadequate leading to greater reliance on informal sources at higher interest burden. Last, but not the least, with changing technology and market conditions the farmer is increasingly being exposed to the uncertainties of the product as well as factor markets.

II

POOR RETURNS TO CULTIVATION

On an average, returns to cultivation per farmer household is Rs. 11,259/- in 2002-03 (Table 1). To account for the drought in the said year even if one increases the returns by one-third then also it would be less than Rs. 15,000/-, which given a family size of 5.5 turns out to be less than eight rupees per capita per day. This means that the other sources of income would become necessary if the farmer household has to stay above the poverty line. About 60 per cent and 10 per cent of farmer households obtain some returns from farm animals and non-farm business respectively and per farmer household monthly returns from these are Rs. 85/- and Rs. 236/- respectively. In addition, farmer households also get income from wages and salaries. As expected, returns per household increase with land size. Average family size also increases with land size indicating that the increase in per capita returns would not be as large. Across caste groups, scheduled castes (SCs, who generally own the marginal lands) have the least returns and above them are scheduled tribes (STs) and from both these groups, the other backward classes (OBCs) fare better, but the returns for all these three groups is lower than the total average. Almost two-fifths of the farmers indicated that they do not like farming as a profession. This group, on an average, fares worse than those who like farming as a profession.

TABLE 1. RETURNS TO CULTIVATION, FARM ANIMALS AND NON-FARM BUSINESS FOR
FARMER HOUSEHOLDS, 2002-03

Sub-groups (1)		Proportion of farmer HHs (per cent) (2)	Returns from *kharif* per annum, (Rs.) (3)	Returns from *rabi* per annum, (Rs.) (4)	Returns from farm animals (30 days), (Rs.) (5)	Returns from non-farm business (30 days), (Rs.) (6)	Average family size (7)
Land Size	Near landless	9.9	367	462	125	339	5.0
	Marginal	55.6	3243	2667	88	223	5.2
	Small	18.1	8098	5922	100	181	5.7
	Semi-Medium	10.6	13880	10596	69	188	6.2
	Medium	4.8	22841	20940	75	422	6.9
	Large	0.9	33494	34600	122	507	7.5
Caste	Scheduled Castes	17.4	3123	2693	23	213	5.4
	Scheduled Tribes	13.3	6256	2746	79	138	5.3
	Other Backward classes	41.5	5237	5044	92	238	5.6
	Others	27.6	9559	7695	140	293	5.5
Like	No	40.1	4156	3337	71	263	5.5
	Yes	59.5	7606	6237	103	213	5.5
Total		100.0	6200	5059	85	236	5.5

Source: Calculated from unit level data using 33rd schedule, 59th Round of National Sample Survey (NSS) on *Situation Assessment Survey of Farmers;* first indicated in Mishra (2007a).

Note: Like indicates like farming as a profession. HHs=Households, Rs=Indian Rupees. Near landless=0-0.099 hectares (ha), Marginal=0.1-1 ha, Small=1.001-2, Semi-Medium=2.001-4 ha, Medium=4.001-10 ha, Large>10 ha. Information on caste and whether they like farming as a profession was not available for 0.1 per cent and 0.4 per cent respectively. Returns to *kharif* and Rabi are calculated by subtracting paid out expenses from the value of output, which includes by-products. It does not include family labour or rent for own land. Returns from farm animals and non-farm business are calculated based on 30 day recall. The farmer households will also have other sources of income like wages and salaries.

Overall, there is not much diversification and the income of an average farmer household from cultivation would hardly suffice to meet some basic day-to-day requirements. The *Situation Assessment Survey of Farmers, 2003* (SAS) indicates that the monthly per capita income to a farmer household is much lower than the monthly per capita consumption expenditure (Table 2). This holds for near landless, lower marginal, upper marginal, small and semi-medium farmers. Only medium and large farmers have income higher than their consumption expenditure. The nominal farm business income per hectare of gross cropped area deflated by Consumer Price Index for Agricultural Labour (CPIAL) seems to be slowly declining with wide fluctuation during 1993-94 to 1999-2000 (Figure 1).

TABLE 2. MONTHLY PER CAPITA INCOME AND CONSUMPTION BY SIZE-CLASS OF HOLDINGS, 2003

Size-class (hectares) (1)	Income (Rs.) (2)	Consumption (Rs.) (3)
< 0.01	1380	2297
0.01 -0.40	1663	2390
0.41 –1.00	1809	2672
1.01 –2.00	2493	3148
2.01 –4.00	3589	3685
4.01 –10.00	5681	4626
>10.00	9667	6418
All Sizes	2115	2770

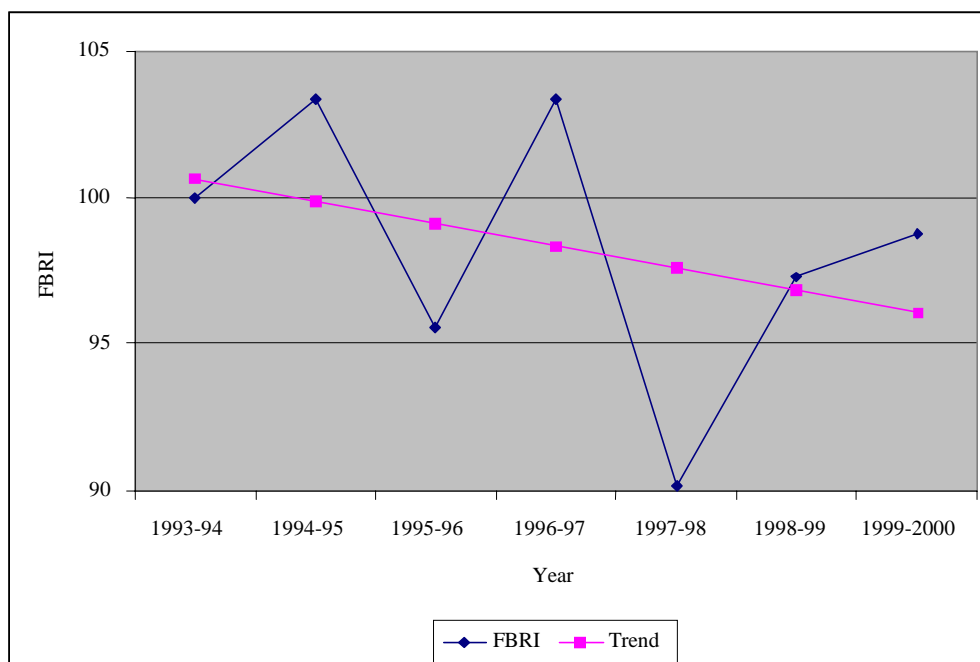*Source*: National Sample Survey Organisation (2005).

Figure 1.Farm Business Real Income (FBRI) Deflated by Consumer Price Index for Agricultural Labour (CPIAL): 1993-94 to 1999-2000.

Source: Calculated using information given in Sen and Bhatia (2004).

At a time, when the Indian economy is growing at about eight to nine per cent per annum and edging towards the double-digit figure the rural/agrarian scenario is not doing well. At 1999-2000 prices, the share of agriculture in gross domestic product is at 20 per cent in 2004-05, down from 41 per cent in 1972-73; whereas during the same period the share of employment in agriculture using usual principal and subsidiary status declined at a much slower pace from 74 per cent to 57 per cent only. The ratio of worker productivity in agriculture to worker productivity in non-agriculture is about one-fifth. The agrarian/rural sector is lagging behind but it continues to employ a large proportion of the workforce.

III

FARMERS' SUICIDES

Poor agricultural income and absence of non-farm avenues of income is indicative of the larger malaise in the rural economy of India. One manifestation of this has been the increasing incidence of farmers' suicides. The suicide mortality rate (SMR, suicide death for 100,000 persons) for male farmers in India increased from 12.3 in 1996 to 19.2 in 2004 and then reduced to 18.2 in 2005 whereas SMR for male

non-farmers increased from 11.9 in 1996 to a peak of 14.2 in 2000 and thereafter declined to 13.4 in 2005 (Figure 2). During 2001-05, there were 86,922 farmers' suicides, of which, 86 per cent were males. Across major states, the states where SMR for male farmers is higher than that of the national average of 17.5 and SMR for male non-farmers are Kerala, Maharashtra, Chhattisgarh, Karnataka, Tamil Nadu and Andhra Pradesh (Figure 3). Among smaller states/union territories the incidences are high in Pondicherry, Dadra and Nager Haveli, Delhi, Goa and Sikkim.
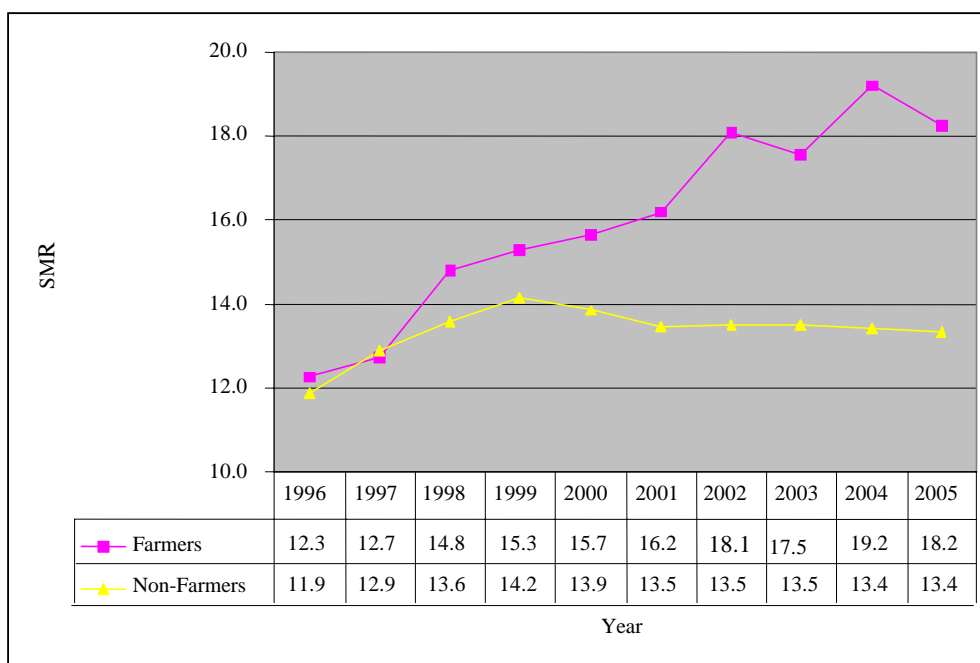

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Farmers	12.3	12.7	14.8	15.3	15.7	16.2	18.1	17.5	19.2	18.2
Non-Farmers	11.9	12.9	13.6	14.2	13.9	13.5	13.5	13.5	13.4	13.4

Figure 2. Suicide Mortality Rate (SMR) for Male Farmers and Male
Non-Farmers in India: 1996-2005.

Note and Source: Calculations are based on suicides data from National Crime Records Bureau (Various Years) and interpolated/extrapolated 5+ years cultivators and non-cultivators population for males using *Census of India, 1991* and *2001*. For details of the method of calculation see Mishra (2006c).

Public policy and media attention have already highlighted the farmers' suicides in parts of Kerala, Maharashtra, Karnataka and Andhra Pradesh. In selected districts of these states, the central government and the respective state governments have announced measures to deal with distress. What is intriguing is that the relatively higher incidence of farmers' suicides in Chhattisgarh and Tamil Nadu seems to have gone unnoticed. Chhattisgarh scenario is worrying because cultivators form nearly 45 per cent of its workers, as per 2001 census. Tamil Nadu situation is serious because some recent studies based on verbal autopsies point out that suicides as per police
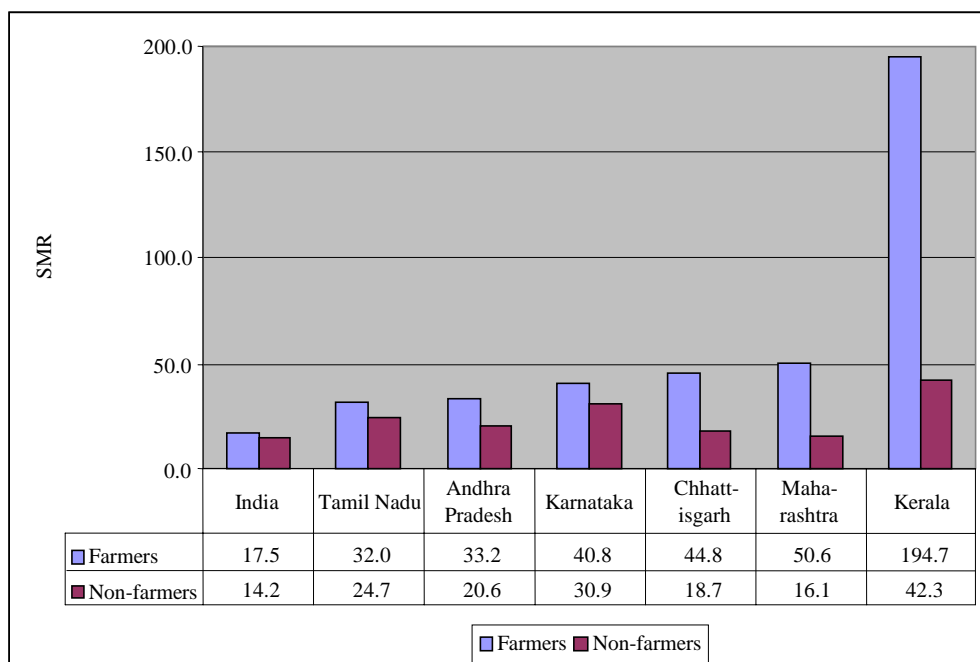
	India	Tamil Nadu	Andhra Pradesh	Karnataka	Chhatt-isgarh	Maha-rashtra	Kerala
Farmers	17.5	32.0	33.2	40.8	44.8	50.6	194.7
Non-farmers	14.2	24.7	20.6	30.9	18.7	16.1	42.3

Figure 3. Suicide Mortality Rate (SMR) for Male Farmers and Male
Non-Farmers in Selected States: 2001-05.

Source: National Crime Records Bureau (Various Years) and *Census of India, 2001*.

records are underestimates (Gajalakshmi and Peto, 2007; Joseph *et al*., 2003). Further probing is required in these states. Studies in the other four states have identified multiple risk factors that co-exist and reinforce each other. The distribution of the risk factors based on a study in Western Vidarbha, Maharashtra is given in Figure 4.

The most common thing was indebtedness (96 out of 111 cases, 87 per cent). From all those indebted, 44 per cent were harassed for repayment of loan and in 33 per cent of cases the creditor insisted on immediate repayment. Next in importance is fall in economic position (74 per cent). Indebtedness per se need not lead to economic downfall, but when repayment is difficult and the household may resort to sale of assets. Similarly, a fall in the economic position can also lead to greater reliance on credit, and thereby increase the debt burden. Not discussing one's problem with others (55 per cent) leads to closing an avenue for letting out ones pent up feelings and frustration.
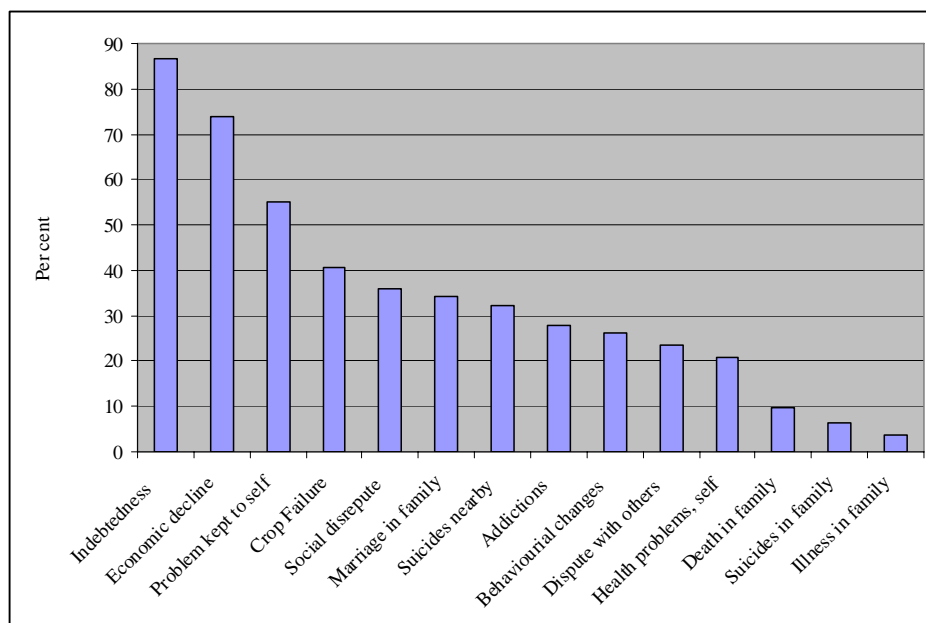
Figure 4. Distribution of Risk Factors Identified with Suicide Households in
Western Vidarbha, Maharashtra: 2004

Source: Mishra (2006a); for a shorter version of this study see Mishra (2006b).

Note: The risk factors are not mutually exclusive, and hence, will be more than 100 per cent. They add up to 476 per cent indicating on an average nearly 4.8 risk factors per suicide household.

Crop failure is mentioned in 40 per cent of the cases and most of these also mentioned about loss in second or third sowing due to delay in rainfall. There were a few cases which mention fire or theft. Crop loss can also happen due to excessive untimely rain, say, during the time of harvest. Crop failure can lead to economic downfall and make it difficult to repay the existing loans. This will also increase the need for additional credit. Crop failure leading to fall in economic position is quite straightforward, but the causal links can also be the other way round. A house that had some fall in economic position or was heavily indebted could not take additional loans for investing in agriculture (say, during a pest attack) and this can lead to a reduction in yield or total crop failure. Incidentally, during the year of survey when pockets witnessed crop loss, the overall scenario was a glut in the market and as a result many individuals faced yield and price shock simultaneously.

Change in social status was identified in 36 per cent of the cases. This can be associated with a fall in economic position. Harassment by creditors or their agents due to non-payment of loans can also lead to a loss of face in the community. Crop failure due to unsuccessful experimentation by a farmer who was recognised as successful entrepreneur may find a change in his social status – people who earlier came for advice now provide solace.

A socially important role of a brother/father is to get one's sister/daughter married. Communities have norms in terms of age and expenditure. A farmer is largely dependent on a good return from his produce to fulfill this obligation. Thus, crop failure, greater credit burden or a fall in his economic position can come in his way of fulfilling this obligation. Inability to conduct sister's/daughter's marriage can be socially humiliating. It can also increase intra-household conflicts. To complete this social obligation a farmer may also take loans thinking that he can repay the amount after the harvest. Recent marriage of a sister/daughter or inability to get one's sister/daughter married has been identified as a risk factor in 34 per cent of the cases.

Recent suicides in a nearby village are identified as an additional risk factor (32 per cent). There could be an imitation effect because an individual who is facing some similar socio-economic problem can relate to the earlier incident and contemplate suicide. Under addiction (28 per cent – mostly alcohol) an individual may indulge in an act of self-harm without being aware of the consequences. Alternatively, getting intoxicated could be a reaction to get out of depression that can be associated with some socio-economic problem. Change in the individual's behaviour (26 per cent) including disputes with neighbours/others (24 per cent) could be indicating the need for some psychosocial help.

Personal health problem of the deceased was identified in 21 per cent of the cases. From these, 26 per cent (6 cases) were those with some mental health problem. Illness gets aggravated due to poor economic condition because it makes care seeking difficult. Similarly, ill health can lead to a loan to meet medical expenses and also reduce the ability to work aggravating the economic condition. If the sick person is some other member (3 per cent of the cases) then the breadwinner has the added frustration and helplessness in not being able to provide appropriate care for an ailing parent/spouse/child.

Death of another member in the family before the incident was identified in 10 per cent of the cases. The near ones death could have been because of not receiving appropriate health care. Inability to provide care is largely because of the poor economic condition rooted in the larger agrarian crisis. Suicide history in the family could be identified in 6 per cent of the cases. This could be indicative of a genetic factor. However, as mentioned earlier such individual factors are predisposing in nature and they can be intensified with some additional risk factors. On an average, 4.8 risk factors were identified.

In the study on Western Vidarbha, a step-wise logistic regression was also done to compare the suicide case with non-suicide control households. The independent variables are outstanding debt in rupees (X1), outstanding debt per acre of land owned in rupees (X2), a yes/no binary variable on ownership of bullocks (X3) and family size (X4). First, the results are estimated for all complete case-control analysis of 136 observations from 68 villages. This gives the outstanding debt and absence of bullocks as statistically significant variables. If outstanding debt increases by Rs.1,000 then the odds that the household is one with a suicide victim increases by

6 per cent and if the household owns bullocks then the odds that it is a household with a suicide victim decreases by 65 per cent. Absence of bullocks may actually be a reflection of hardship that the household has been facing. It also increases the costs on hired animal labour. The relevance of bullocks as a productive asset in Indian agriculture has been discussed in Jodha (1978), Rosenzweig and Wolpin (1993) and Vaidyanthan (1988). Second, we estimate by controlling for land size (the land size of non-suicide control household not differing from the suicide case household by more than 25 per cent). The estimation for 55 pairs of observations shows that only outstanding debt per acre of land is statistically significant - if the outstanding debt per acre of land owned increased by Rs.1000 then the odds that the household is one with a suicide victim increases by 33 per cent. Third, we control for caste and estimate for 35 pairs of observations. Here, ownership of bullocks and family size are statistically significant. If the household owns bullocks then the odds that it is a household with a suicide victim decreases by 79 per cent and if the family size increases by one member then the odds that the household is one with a suicide victim increases by 35 per cent.

TABLE 3. RESULTS (ODDS RATIO) OF STEPWISE LOGISTIC REGRESSION ANALYSIS

(1)	Complete Case-Control Analysis (2)	Similar land size (3)	Same caste (4)
N	136	110	70
Debt	1.000061 (.0000138) [0.000]		
Own bullocks	.3462934 (.1403603) [0.009]		.2092665 (.1139936) [0.004]
Debt per acre		1.000325 (.0000776) [0.000]	
Family size			1.352608 (.2021914) [0.043]
Log-likelihood	-74.6497	-61.682649	-42.619212
LR Chi2	39.24	29.13	11.80
Prob >Chi2	0.0000	0.0000	0.0027
PseudoR2	0.2081	0.1910	0.1216

Source: Mishra (2006a,b).

Note: Logistic regression is $\ln(p/(1-p))=a+b_iX_i+u$. The overall odds ratio $(p/(1-p))=e^{(a+biXi+u)}$. For each coefficient associated with a variable, odds ratio is e^{bi}. Thus, if b_i is positive then odds ratio>1, whereas if b_i is negative then 0<odds ratio<1. Round brackets give standard error, square brackets give prob > |z|. The variables are indicated in the order in which they were selected in the step-wise logistic regression.

Suicide is a rare event. Under duress, some farmers end up committing suicide. Closer probing does point to some idiosyncratic factors. However, they do not occur in isolation. Systemic factors also have their role. For every farmer who commits

suicide, there are many in distress. The larger agrarian crisis is much more widespread and not only confined to regions witnessing farmers' suicides.

IV

ISSUES IN AGRARIAN CRISIS[1]

In addition to the weather related uncertainties, the farmer is also faced with market, spurious inputs, technology and credit related vulnerabilities among others. Some of these are summarised in Table 4.

TABLE 4. A MATRIX OF ISSUES

Issues (1)	Demand (2)	Supply (3)
Output/ Price/ Income	• Yield risk because of weather, water and power unavailability, pests, and spurious quality of inputs among others. • Cultivation is not profitable. • Income not sufficient. It is difficult to meet higher education need of wards, medical requirements of family members and other social obligations.	• Increased volatility due to global prices. • Price distortion through subsidies by developed countries. • Low tariff in India. • Minimum support price not always functional. • Futures market – a virtual platform with price volatility being the basis through which hedger/speculator can operate.
Input	• Supplier-induced-demand is on the rise. This is credit-intensive and an important reason for putting the farmer in a quagmire of indebtedness. • There is deskilling. With new technology come new methods of cultivation. Social capital of cultivation knowledge is rendered redundant. A case is the introduction of Bacillus thuringiensis (Bt) Cotton. • Greater investments in assets like bore wells in Andhra Pradesh not only increases cost, but has also led to a tragedy when the investments failed.	• No link between publicly funded research and its extension. This is particularly missing for crops/cultivation in rainfed/dry land areas. • Technological change is substantial and there is an increasing reliance on the unregulated private suppliers. • Inadequate public investment in agriculture (spread of irrigation in arid regions has been a casualty).
Credit	• Formal sources not timely. • Repayment difficult during crop loss and price shocks. • Instead of getting them out of credit, the system draws them into it. • Difficulties in meeting consumption requirements and other social obligations. • An increase in market induced consumerism.	• Formal sources: Decline in the number of branches, decline in agricultural credit/direct finance to agriculture as a percentage of net bank credit, and there is a shift to value addition activities. • Increasing dependence on informal sources – relatively more among smaller farmers.
Other Issues	• Political dominance of moneylender and/or input dealer and output buyer. • Higher family size: more daughters – greater dowry burden. • Lack of social support.	• Interlinked credit, input and output markets. • Non-farm income opportunities limited. • Public health response to occupational health hazards of farming is wanting. • Easy availability of pesticides and other hazardous substances.

Source: Reserve Bank of India (2006).

Production or yield loss is an important risk. Weather, pests and disease of plants, spurious quality of inputs could be the possible reasons. The risk is real because even today crop loss can adversely affect the consumption requirements of many farmer households. Price shocks are also a matter of concern. The conventional argument was that such incidents happened during a good year and the increase in production should compensate the farmer. An implicit assumption in this is that prices are based on local supply and demand. Integration with the global market has led to greater price volatility.

The farmers are price-takers in the product as well as in the input markets. Such a situation could lead to increase in input costs and decrease in output prices, and hence, decline in profitability and returns from cultivation. As indicated earlier, returns from cultivation per farmer household in 2002-03, as per SAS, was Rs. 11,259/- only and the paid out expenses was more than two-fifths of the total value of output. With such low levels of income, it would be difficult to meet day-to-day consumption requirements. The farmer cannot use his own resources for carrying out next year's cultivation or be in a position to use saved resources to tide over any crisis. Saving from these for bad years is impossible. What is more, normal social obligations such as education, marriage and healthcare expenses on account of family members turn out to be burdensome.

Another critical factor is credit. Availability of timely and adequate credit does help the farmer by reducing transaction costs, particularly so when input related expenditure are rising. In 2003, SAS estimates indicate that 58 per cent of the outstanding debt was for agricultural purposes. Further, more than two-fifths of the total outstanding debt is from informal sources. Such debts from moneylenders and input dealers would carry greater interest burden and thereby increasing the cost further. The recent All India Debt and Investment Survey (AIDIS) indicates that from the total non-institutional outstanding debt for cultivator households at end June 2002, nearly three-fourths carried interest rate of 20 per cent or more per annum and more than half of these carried interest rate of 30 per cent or more per annum. A crop failure leading to non-payment would further escalate the interest burden. Thus, inability to repay would further increase the risks.

Other matters of concern are the dominance of the informal credit provider and the possible interlinked nature of contracts that may be extended to the input and output markets. Livelihood opportunities are constrained by the absence of adequate non-farm avenues. Poor public facilities on health and education would further add to the woes.

V

ASPECTS OF RISK MANAGEMENT

To address yield risk, crop insurance is considered to be an answer. In India, a major public sector initiative from *rabi* 1999-2000 is the National Agricultural Insurance Scheme (NAIS), which is currently implemented by the Agricultural

Insurance Company of India Limited (AICIL). Foodgrains and some other major crops are covered under this. From the gross area under major crops, about 17 per cent would be under crop insurance as of 2005-06. The assessments are based on homogenous area aggregated at taluka or higher levels rather than individual approach. The reason given for this is the high covariate risk for agriculture and the difficulty to operate with large number of individuals. Further, shortfall from a threshold level is based on crop cutting experiment that could be an overestimate if the selection of plots would be biased to those with standing crops. The threshold level is defined on a moving average of the recent three-to-five years and this could be low if the productivity has been declining. Indemnity levels could be as low as 60 per cent if there have been wide fluctuations in the yield of the region in the last ten years. This means the regions that have a greater need, the rainfed regions, would have lesser chance of being compensated. At times, a farmer is not aware that he is insured because the premiums are directly deducted from his crop loans. Other matters of concern are charges of uniform premium across all states, delay in claim settlement, high premium rates (eight per cent for cotton and 10 per cent for banana in Andhra Pradesh) and collusion between implementing agencies and farmers in wrongful claims. For 13 seasons (from *rabi* 1999-2000 to *rabi* 2005-06), the premium collected was Rs. 2,333 crore and the total claim was Rs.7,507 crore. For the entire period, the overall claim-premium ratio was 3.22. Across the 13 seasons, it varied from a minimum of 1.42 during *rabi* 1999-2000 to a maximum of 7.66 during *rabi* 2003-04. Moreover, there are significant disparities in insurance coverage across states and across crops. Up to *kharif* 2005, state-wise analysis indicate that Gujarat alone accounts for 26 per cent and the three states of Andhra Pradesh, Karnataka and Maharashtra account for another 41 per cent of the total claims. The analysis of crop-wise claims till *rabi* 2002-03 by Sinha (2003) indicates that groundnut accounted for 36 per cent of claims whereas crops such as maize and jowar accounted for less than two per cent of claims each. In a recent study, Vyas and Singh (2006) suggest that there is scope for improvement in crop insurance.[2]

In 2003, a pilot project of weather insurance was initiated by a private provider. The product was based on an index constructed by taking into account rainfall as also temperature, wind speed and humidity – the weights for each factor depend on the relative importance during the crop cycle and calculated on the basis of historical data. The project was scaled up to 36 locations spread across six states in 2005. As against crop insurance, such a product allowed for premium claim in three phases – sowing, growing and harvesting. Claims settlement was based on deviation of the weather index from threshold level and not linked with actual yield – the weather data was independently obtained by the provider and to facilitate this, weather stations were being set up at the locations. This product has easier acceptability in the international financial market for reinsurance allowing for risk-sharing at a global level. Similar products have been initiated by AICIL (*Varsha Vima*) as well as by

other private providers. For a detailed discussion of weather insurance see Manuamoron (2007).

The *Report of the Expert Group on Agricultural Indebtedness* has indicated that the crop surveillance mechanism may be facilitated by making use of remote sensing data. At the initial stages of the crop season it can be used as an early-warning for drought management. Such data are shared with some government departments associated with relief. There is a case for disseminating this more widely. More studies are required so that satellite data can be used to compile an index that can predict yield much more effectively and complement the indicators used currently to administer either crop or weather insurance (Government of India 2007).

The Government of India has been providing minimum support prices across 24 major crops. This may reduce the seasonal risk faced by farmers to some extent because they largely sell after harvest when market prices are low. Small and marginal farmers who may find it easier to sell to local traders are also likely to be somewhat cushioned by the minimum support prices. However, as indicated earlier, a matter of increasing concern is the price volatility because of increasing integration with the global market, particularly, for crops like cotton and other commercial crops. Excess international supply of such products at a lower price is also because of direct and indirect subsidies leading to dumping by the developed countries. At this critical juncture, domestic policies can make use of quantitative restrictions and import tariff but by being within the norms specified by World Trade Organisation (WTO).

AICIL has also launched the Farm Income Insurance Scheme (FIIS) on a pilot basis in 20 districts during *rabi* 2003-04 for rice and wheat. The farmer will be paid the difference between actual income (based on the actual yield valued at the prevailing market price) and guaranteed crop income (based on threshold yield valued at the minimum support prices).

For severe calamities, the central government has created a National Calamity Contingency Fund. During such times, the government also considers rescheduling of existing loans, issuing of fresh loans and waiving of interest. The *Report of the Expert Group on Agricultural Indebtedness* suggests that these should be made permanent aspects during natural calamities and also during crop loss in rainfed areas. They also suggest providing of cyclical credit in rainfed areas to address weather uncertainties in a five-to-seven year period. Another suggestion of the report is the formalisation of informal loans through a one-time measure of providing long-term loans by banks to farmers to enable them to repay their debts to the moneylenders. The local Panchayati Raj Institutions and non-governmental organisations should be facilitators of this process. The management of the larger agrarian crisis has to go beyond credit. In the long run, risk prevention and that too in a cost effective manner has to be the basis. It requires better water supplies, reducing groundwater stress, initiating drought management through effective use of satellite data and income diversification. Another important recommendation is sprucing up of the institutional vacuum through a federation of Farmers' Self-Help Groups (SHGs)

that would be aggregated at the various levels - village, taluka, district or state – depending on the nature of activities (Government of India, 2007).

Ramaswami *et al.* (2004) discuss the issue of risk management in agriculture in a comprehensive manner. Among other aspects they also discuss the risk mitigation strategies at the farmers and community level that can help households tide over difficulties as a result of a bad year. Some of the risk-reducing strategies at the farmers' level have been crop diversification, inter-cropping, farm fragmentation and non-farm income. Various tenancy arrangements also lead to risk sharing arrangements between the tenant and the land owner. Under sharecropping, the risk-sharing is explicit. Once losses occur, coping mechanism by the farmer household could be in the form of new loans, sale of assets or seasonal migration. At the community level, informal interest-free credit or social institutions that forged co-operative behaviour both within the villages as well as among relatives spread across villages are of help.

On technological intervention, we have been successful in some cases to increase production and also productivity, but at the same time also added to the risk. Success of alternative production methods, including risk mitigation, should be subject to scrutiny of the alternative choice of techniques, a la Amartya Sen (1960). A technique, T_i is one where inputs X_i lead to output Y_i; where i=0,1 indicates two possible techniques. We would consider T_1 as an improvement over T_0 if either $X_1<X_0$ or $Y_1>Y_0$. A method would be preferred over another if either it is input-saving (uses les inputs for giving the same output) or output-enhancing (uses same inputs to give more output). The innovations in agriculture has by and large followed a pattern where $Y_1>Y_0$ but at the same time $X_1>X_0$. There has been more production, but the techniques use more inputs to give more output. It so happens that the net returns are higher $(Y_1-X_1)>(Y_0-X_0)$ but the rate of increase in output is lower than the rate of increase in input $(Y_1/Y_0)<(X_1/X_0)$ and this can make risk mitigation much more difficult.

An illustration is given in Table 5. Under the old technology, the per annum value of input is 1 unit and output is 3 units giving a net return of 2 units and from this consumption is of 1.3 units and savings is 0.7 unit. The cumulative savings at the end of three years would be good enough to compensate for input costs and provide for consumption at slightly reduced level in case of crop failure in the fourth year. As against this, in the new technology the per annum value of input is 3 units and the output is 6 units giving a net return of 3 units. As a result of enhanced returns, if consumption increases to 1.8 units then there is a savings of 1.2 units. It is to be noted that there is a decrease in the marginal propensity to consume, as it is only 50 per cent of the incremental increase in net returns compared to 65 per cent earlier, indicating that the individual is willing to save more in the spirit of the enterprise that in the first place led the farmer to adopt the new technology. However, in the new scenario, the cumulative savings at the end of the third year can compensate for input costs and consumption at a much lower level – lower than what would have been the

case under the old technology. Thus, what seems to be giving a relatively higher net return in a normal year lowers the capacity to smoothen consumption in a bad year.

TABLE 5. COMPARING OLD VERSUS NEW TECHNOLOGY: AN ILLUSTRATION

	Old Technology, T_0					New Technology, T_1				
Year (1)	Input (2)	Output (3)	Net Return (4)	Con-sumption (5)	Cum. Savings (6)	Input (7)	Output (8)	Net Return (9)	Con-sumption (10)	Cum. Savings (12)
	X_0	Y_0	R_0	C_0	S_0	X_1	Y_1	R_1	C_1	S_1
1	1	3	2	1.3	0.7	3	6	3	1.8	1.2
2	1	3	2	1.3	1.4	3	6	3	1.8	2.4
3	1	0	2	1.3	2.1	3	6	3	1.8	3.6
3	1	0	-1	1.1	0.0	3	0	-3	0.6	0.0

Reduction of risk mitigation capacity uses the notion of technology at a broader level. It does refer to changes in agricultural production, it could be innovations in market structures that affect relative prices, or it could even be on account of innovation in the credit or insurance related instruments. An example would suffice. A study by Singh and Asokan (2005) on returns from cultivation for gherkin (Trellised) and gherkin indicates that the net returns per acre was greater in the former by 46 per cent (Rs. 5,720/- over Rs. 3,930/-) but the total costs was also greater by 106 per cent (Rs. 27,600/- over Rs. 13,410/-). In case of crop failure, there should be risk mitigation strategies that compensates for net returns over and above the costs. This would be difficult, as costs are 4.8 times that of net returns in the former case and 3.4 times of net returns in the latter case. Further, a crop insurance scheme used to address yield loss may add to the cost rather than reduce risk. Suppose on an actuarial basis one arrives at a premium amount equivalent to 5 per cent of gross returns for gherkin (Trellised) and that there will be some compensation if crop loss is below 80 per cent. This means that at a crop yield of 85 per cent, after including the insurance payments of Rs. 1,666/-, the net returns turn out to be negative. Further, if yield loss has had an adverse impact on quality, and hence, value of produce then this would also not be compensated by insurance.

Some quarters suggest that futures market can be used to hedge risk, particularly those arising out of price shocks. It may sound promising, but the ground realities are different. Futures are a virtual trading platform and may not have much to do with actual physical deliveries. Nevertheless, if one uses this method prior to actual production then a crop loss or production below some specified quality will have an additional risk that ought to be borne by the farmer. An individual who trades in this has to do with some minimum lots, which is not possible for small and marginal farmers. Aggregators can address this, but this will also have a cost dimension which again the farmer has to bear.

The point is that various interventions that are thought to address a part of the risk will also have a cost dimension and it is in this that instead of reducing one ends up adding to the risk. Given the low levels of income that the farmer gets from cultivation, the call of the hour is to bring about an intervention or a mix of products where costs should reduce and returns should increase. Otherwise, we will end up adding to the risk.

VI

CONCLUDING REMARKS

The policy implication from the above discussion calls for an emphasis on the larger crisis; that of low returns and declining profitability from agriculture and that of poor non-farm opportunities. Risk management in agriculture should address yield, price, credit, income or weather related uncertainties among others. Improving water availability will facilitate diversification of cropping pattern, but this should go hand in hand with policies that increase non-farm employment. Improving agricultural extension that addresses deskilling because of technological changes and also facilitate appropriate technical know-how for alternative forms of cultivation such as organic farming will be of help. Availability of affordable credit requires revitalisation of the rural credit market. There is also a strong case for regulating private credit and input markets. A challenge for the technological and financial gurus is to provide innovative products that reduce costs while increasing returns. Organising farmers through a federation of self-help groups (SHGs) with government, banks and other stakeholders playing a pro-active role would be welcome. Besides, public institutions, there is need for a greater involvement from the civil society.

NOTES

1. Some papers/reports in recent years on this issue are Government of India (2007), Mishra (2007a,b), Rao (2007), Reddy and Mishra (2006), Reserve Bank of India (2006) Singh, J.P. (2006), Singh, S.P. (2006) Vaidyanathan (2006) and Vyas (2004) among others.

2. They point out that it should be made a permanent feature of agricultural policy, it should not be combined with income or asset insurance, its coverage be increased to include all loanee small/marginal farmers and all loanee farmers growing foodgrains, priority should be accorded to consolidate the coverage of existing crops, the possibility of moral hazard due to adverse selection by non-loanee farmers should be examined, regional specificities in cropping pattern and planting pattern be taken into consideration while calculating premium and on deciding the cut-off date for taking a policy, threshold level of yield should be calculated on long term yield rather than three-to-five year moving average, allowing insurance from threshold to 150 per cent of average yield on actuarial basis, and that the state governments and banks should have a more proactive role.

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