

## **Impact of Loan Waiver Scheme on Indian States Fiscal Position with Reference to Uttar Pradesh: A System Dynamic Analysis**

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### **Abstract**

This paper is an attempt to evaluate the farm loan waiver scheme so far implemented in Uttar Pradesh's agricultural and rural debt relief scheme of 2017 based on the secondary data collected from different official sources. The state government's loan waiver scheme was valid only to loans taken by small and marginal farmers. The analysis is done using systems analysis using causal loops, stock flow diagram and simulation is done on the basis of available information. An exploratory model is developed with realistic assumptions based on generally practiced policies. It reveals that the scheme besides benefitting the relatively households, agricultural revenue of the government, GSDP and also had negative impact on the repayment behavior of the borrowers which affects the Debt. Also two extreme situations that is pessimistic and optimistic systems behavior have been identified to see the impact on variables.

### **Keywords**

Agricultural loan waiver, Small and Marginal farmer's, Agricultural loans, Gross State Domestic Product (GSDP), and System dynamics.

### **1. Introduction**

The frequently announced loan waivers with the reason of reducing the farm debt burden have drawn criticism both on the ground of benefits and its harmful effects on working of the rural credit system. In this regard, loan waivers have brought forward the perseverance of designing permanent solutions to the structural condition that affects Indian agriculture. Also, there are distresses about financial and macroeconomic implications, how long they will continue to impact the economy, the possible biases that they could confront public policies with, and the

ultimate incidence of the financial burden. The foremost impact of any waiver scheme is on the balance sheet of financial institutions, be formal or informal. This is essential in the predictable lags in the timing of waves and the arrival of payment from the government. In this lag, the quality of assets depreciates and budgetary provisions crowd out new loans. In the second round, waivers impact the public finances in the form of budgeted revenue expenditure. This, in turn, has to be funded by additional market borrowings which increase interest rates, not only for the States but for the whole economy. Even if the loan waiver is included within budgetary provisions, it will force a drop in other heads of expenditure. Experience showed that capital expenditure is a risky category. In turn, this will involve weakening in the quality of expenditure and in turn will lead to severe consequences for productivity as asset forming investment, including for the sector itself. If, budgetary provisions are exceeded, higher spending and broadening of the fiscal deficit as experience has shown, inflationary consequences, and possible spillovers that could challenge external viability (the twin deficit argument).

Debt relief is just a Band-Aid for rural distress. These measures will buy time, but the real solution is to shift the underemployed population in agriculture to more productive urban employment. Uttar Pradesh's Rs. 36,400 crores debt waiver is correspondent to one-fourth of the total expected farm debt in the state. While the effect of increased public liability will go up over the long run, the increased interest burden because of higher debt will hit state finances.

## **2. Objectives of the Study**

1. To develop a System Dynamics based exploratory model to study the impact of agricultural loan waiver scheme 2017 on state fiscal position.
2. To understand the impact of the key factors of loan waiver scheme on state capital through simulation of various meaningful scenarios.
3. To provide recommendations to enhance government effectiveness for the growth of agriculture sector using the System Dynamic model based simulation scenarios Research Methodology.

### **3. Review of Literature**

A review of literature was performed to understand the broad concept of the impact of the loan waiver scheme on Indian state's fiscal position. Unrestricted debt relief leads to significant allocating of new credit to the receivers of the program and no significant improvement in the loan repayment behavior as measured by loan default rate (de and tantri, 2016). Empirical research on agricultural debt waivers in India are generally focused around the Debt Relief Scheme (ADWDRS) 2008 and Agricultural debt Waiver of the Government of India (GoI), under which 525.16 billion of agricultural debt issued by commercial and cooperative banks were waived. Past research found mixed evidence of the impact of ADWDRS on agricultural households.

On the borrower's side, while debt relief was found to help reduce the overall household debt (Giné and Kanz, 2017; Kanz, 2016) there appears to be a differential impact on distressed beneficiaries who benefit from it compared to non-distressed beneficiaries whose loan performance degrades after the waiver (Mukherjee et al., 2017).

#### **Agriculture Waiver and Debt Relief Scheme, 2008**

The scheme required diminishing the anguish of the farming community specifically, and small farmers, to de-clog institutional lending channels, to increase the flow of credit to agriculture to boost production and productivity of agricultural products. The scheme distinguishes between loans taken by small farmers. In the case of small farmers, the scheme covers their short-range production loans and installments of loans that were outstanding. However, in the case of various other farmers, the scheme offered facility of one-time settlement, if the farmer repaid 75 percent of the balance in three installments, a cash rebate of 25 percent of the eligible amount was given on this condition.

Interest payments of Indian states are at present high, and often hide their spending on various infrastructure areas such as roads and irrigation.

### **4. Research Methodology**

In this article, Systems Dynamic modeling is the approach that is used for studying the behavior of Agriculture output with respect to the loan waiving and other-related variables. The reasons for the choice of Systems Dynamic modeling to study the implications are as follows:

1. It is based on a non-linear complex system, consisting of the quality of government-related variables linked to agriculture growth with a number of feedback control loops.
2. The interactive interdependent governance-related variables make long-term impacts on agri output. To comprehensively study this dynamic behavior of the system, the application of the stock flow diagram becomes very relevant.

The CLD is used for mapping the feedback loops structures of the system. The causal relation between loan waiving and state fiscal position related variables has been evolved. Significant feedback factors have been well-defined through five reinforcing and four balancing loops. The SFD has been developed using Stella software (version 9.1.3) of System Dynamic to holistically understand the system behaviors by studying various relevant simulation scenarios.

#### **Application of the System Dynamics Model**

A Systems Dynamic-based model is developed with an objective of studying the long-term impact of dynamic forces of the key elements of loan waiver on agriculture output revenue. An exploratory model is developed with realistic assumptions based on generally practiced policies. The key variables used in the model are summarized in the Table 1.

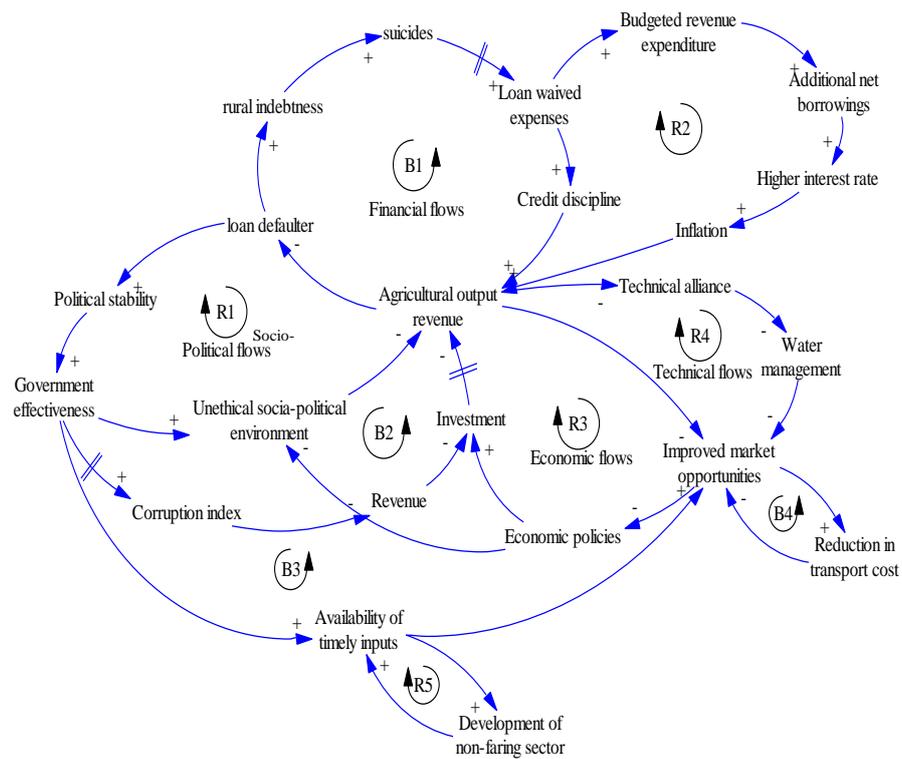
**Table 1: Key Variable used in the Model**

<b>S No.</b>	<b>Key variable</b>	<b>Description</b>	<b>Unit</b>
1	Agricultural output revenue	Money earned after selling the agriculture produce in a year	INR
2	Loan defaulter	Number of the person who were unable to pay loan amount	Numbers
3	Rural indebttness	Amount of debt in rural areas	INR
4	Suicides	Farmers who suicide	Numbers
5	Loan waive expenses	Government spending on loan waiving	INR
6	Growth rate	The Growth in agricultural Output with improving rural development and irrigation and allocation rate	Allocation rate *expenditure + rural dev.+ irrigation

7	Budgeted revenue expenditure	The Government budgeted expenditure set for a year	INR
8	Additional net borrowings	The amount to be borrowed due to loan waiving	INR
9	Higher interest rates	Rise in the interest rate due to fiscal deficit	Fraction w.r.t borrowings
10	Inflation	The rate of inflation in the respected year	Fraction w.r.t fiscal deficit
11	Technical alliance	Government collaborating with tech companies to modernize agricultural inputs	
12	Water management	The irrigation facilities are given by the state	
13	Improved market opportunities	Development of market due to other agricultural schemes	Fraction <_1
14	Reduction in transport cost	Improvement in roads of rural areas which lowers the transport cost	INR
15	Economic policies	Decisions made about government spending's and borrowings	INR
16	Investment	Quantum of investments from reserve to the agriculture sector	INR
17	Revenue	Amount collected from tax (direct or indirect)	INR
18	Availability of timely inputs	Irrigation, seeds, pesticides, and godown facilities availability	
19	Development of non-farming sector	Development in other sectors like transport	
20	Corruption index	Unwarranted expense to offices made in sector	Fraction <_1

**Causal Loop Diagram (CLD)**

To map the impact of loan waive expenses on the growth of agriculture sector, a CLD represents causal relationships and interdependencies as well as feedback processes of the model. Figure 1 shows nine feedback loops that consist of four balancing and five reinforcing loops. The CLD indicates the existence of variables that can be categorized into four major flows: political, economic, financial, and technological.



**Figure 1: Causal Loop Diagram-Causality between Variables of Agriculture Revenue, Loan Waiver Scheme and its Implications**

**Table 2: Causal Loop Explained**

S No.	Loop Name	Loop Variables	Explanation
1	R1 (Political flows)	Agricultural revenue	When the agricultural revenue decreases the loan defaulter increases which causes political instability as the government seeks to waive loan for vote bank, which creates moral hazards and unethical political as a well as social environment
		Loan defaulter	
		Political stability	
		Government effectiveness	
		Unethical socio political environment	
2	B1(Financial flows)	Loan defaulter	With the low agriculture revenue, the loan defaulters will increase which in turn will lead to rural indebtedness, which will increase the number of suicides due to loan repayment, which forces the government to announce loan waive schemes. Such schemes gives a reinforcing results as the results tend to accumulate its effects
		Rural indebtedness	
		Suicides	
		Loan waived expenses	
		Moral hazards	
		Agri output revenue	
3	B2	Political stability	The government ineffectiveness causes corruption as in name of loan waiving the funds are distributed amongst the party members and none is distributed to farmers which affects the revenue and investments
		Government effectiveness	
		Corruption index	

		Revenue	in agriculture sector from. FDI or internally
		Investment	
4	R2	Expenditure	As the loan waive expenses lead to increase in the budgeted revenue expenditure of the state government found in one of the literature, which thus affects the additional borrowing capacity, to higher interest rates and then leading to inflation and this loan waiving scheme makes farmers cutoff to access credit in future, as banks list them as defaulters thus giving shift to informal source of finance and this circle of debt continues
		Rate of borrowing	
		Higher interest rates	
		Inflation	
5	R3 (Economic flows)	Improved market opportunities	If market opportunities are increased there will be better scope for economic policies and investment in this sector
		Economic policies	
		Investment	
6	B4	Reduction in transport cost	This is related to the development of roads which will decrease the cost and can be utilized in farming inputs
		Availability of timely inputs	
7	R5	Development of non-farming sector	Other sector needs to be developed so that cost is minimized for better output
		Improved market opportunities	

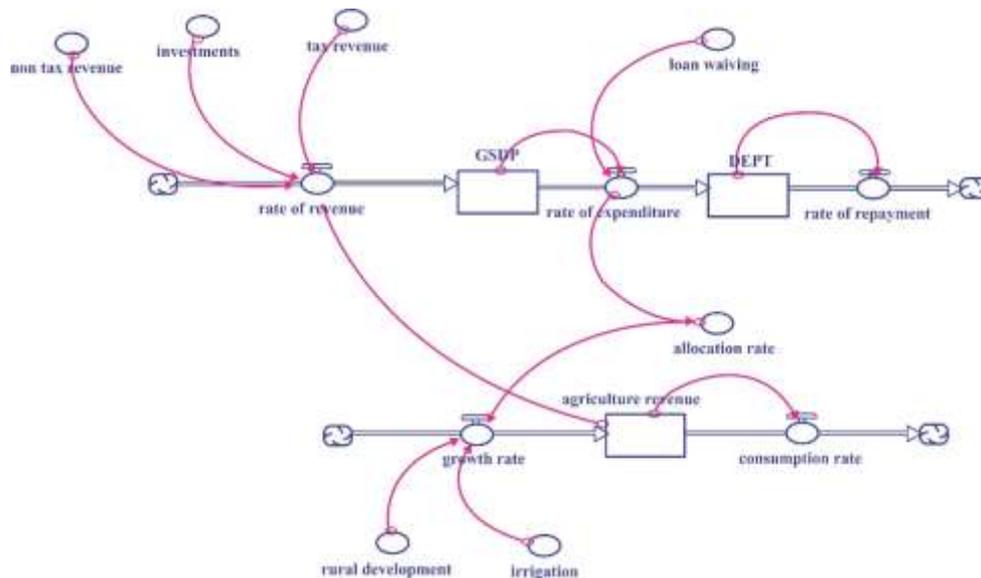
8	R4 (Technical flows)	Technical alliance	If we have proper technical alliance which will give proper irrigation facilities to the farmers for better output
		Water management	
		Improved market opportunities	
9	B3	Political stability	If agriculture revenue is lower, the need for loan waiving arises which does not give timely inputs to the sector and there is no scope of improved opportunities, thus creating an unethical socio-political environment
		Govt. effectiveness	
		Availability of timely inputs	
		Improved opportunities	
		Unethical socio-political environment	

**Stock and Flow Diagram (SFD)**

The CLD provides the causal relationships amongst factors and is not able to capture the stock and flow structure of systems; the need for SFD becomes necessary. The three significant stocks identified in the linkage between agricultural output revenue and loan waive expenses are Debt (accumulation in INR), GSDP (accumulation in INR), and Agricultural output revenue (accumulation in INR) as presented in Figure 2.

The SFD also indicates the accumulations and flow-related relationships between different endogenous variables- a rate of revenue and rate of expenditure and rate of repayment, growth rate and consumption rate and auxiliary variables non-tax revenue, investments, tax revenues, loan waiving, allocation rate, rural development and irrigation indicated in the in Figure 2.

The inputs for creating the SFD were obtained from the academic experts who provided the relations between variables as well as behavior trends and values of variables. The model was developed for performing number of Systems Dynamic-based simulations with the application of the software, Stella V 9.1.3.



**Figure 2: Stock Flow Diagram Linking Loan Waiving with Agriculture Output Revenue**

### 3. Model Validation

The Systems Dynamic model developed was validated using six standard tests—boundary adequacy, structure assessment, dimensional consistency, behavior reproduction, parameter assessment, and extreme condition.

The boundary adequacy test ensures the appropriateness of the model boundaries. Identification, development, and clearly defining the 23 relevant system variables in the model developed defined the boundaries. Further, the 9 feedback loops to define the inter-relationships among variables to develop the CLD ensured the completeness of the boundary adequacy test. The inputs received from the academic and industry experts for the systems dynamic model development process, coupled with the real system behavior outputs obtained from the SFD, ensured the model's consistency. This confirms the validation through the structure

assessment test of the model. The units of measure were allocated to the 13 variables used in the SFD (accumulation in INR and fraction).

The consistency in dimensioning the 13 variables was checked in the SFD developed using the system dynamic software, Stella V 9.1.3. This ensured the completeness of the dimensional consistency test. The parameter values of the agriculture output revenue were taken from the Indian agriculture sector context. The values for the other two variables — GSDP and Public debt — were based on CAG reports final accounts. Therefore, the parameter assessment test can be considered to have been completed.

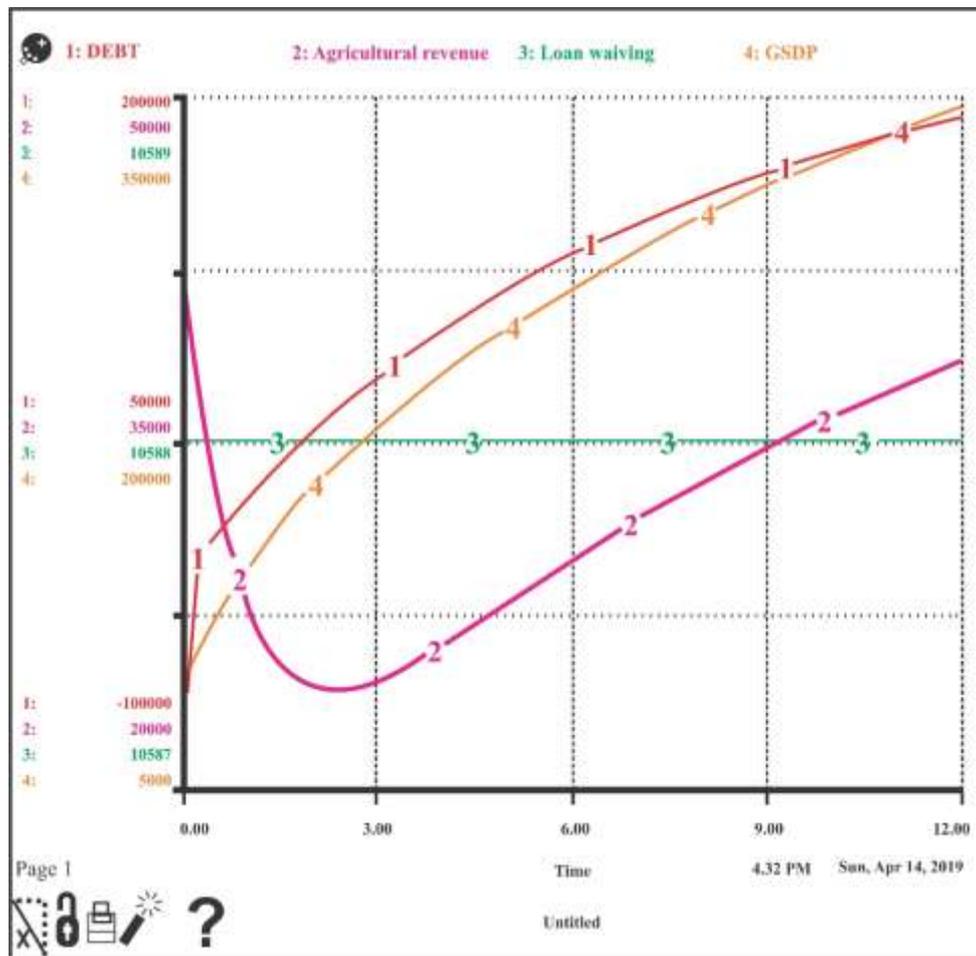
The extreme digits of the three key variables that significantly impact the agriculture output revenue — allocation rate, rate of expenditure and growth rate — were considered for the extreme value test. The extreme values of the allocation rate ensured the extreme values of GSDP and debt. The test outcome, in terms of agriculture output with negligible growth, was realistic in reference to the current real world.

The other end extreme digits have indicated an exponential growth in revenue, which is also consistent with intuition. This ensured the completeness of the extreme value test performed on the systems dynamic model.

## **5. Findings and Suggestions**

The three scenarios simulated from the system dynamic model developed were studied and summarized as follows:

1. The system behavior is the most likely scenario, with a realistic annual loan waiving and the allocation rate to agriculture is 39.3 percent of the total expenditure. All the three stock variables Agriculture revenue, GSDP, and DEBT shows improving trend as presented in the fig 3. The trend graph of agriculture revenue is firstly decreasing due to less revenue but then as loan waiving is done the output increases. After some point as the revenue from agriculture increases the debt reduces and the GSDP tends to increase. The agriculture revenue is the summation of the amount allocated for irrigation facilities, rural development, and the allocation from the expenditure of state government. The debt is the difference between the state revenue and the expenditure, the GSDP is the combination of investment, non-tax revenue, and tax revenue of the government.



**Figure 3: System Behaviour Scenario 1**

- The system behavior in the optimistic scenario with reference to assumed figures is a high annual loan waiving and the allocation rate to agriculture is 70 percent of the total expenditure. All the three stock variables Agriculture revenue, GSDP, and DEBT shows high a improving trend as displayed in fig 4. The trend graph of agriculture revenue is increasing with that of debt and SDP. This is the over riding impact of the allocation rate of the agriculture sector. Which is higher than the scenario 1 (most likely) and the trend which GSDP and DEBT showed is lower than that of scenario 1 as the allocation rate of the agriculture sector increased from 40 percent to 70.

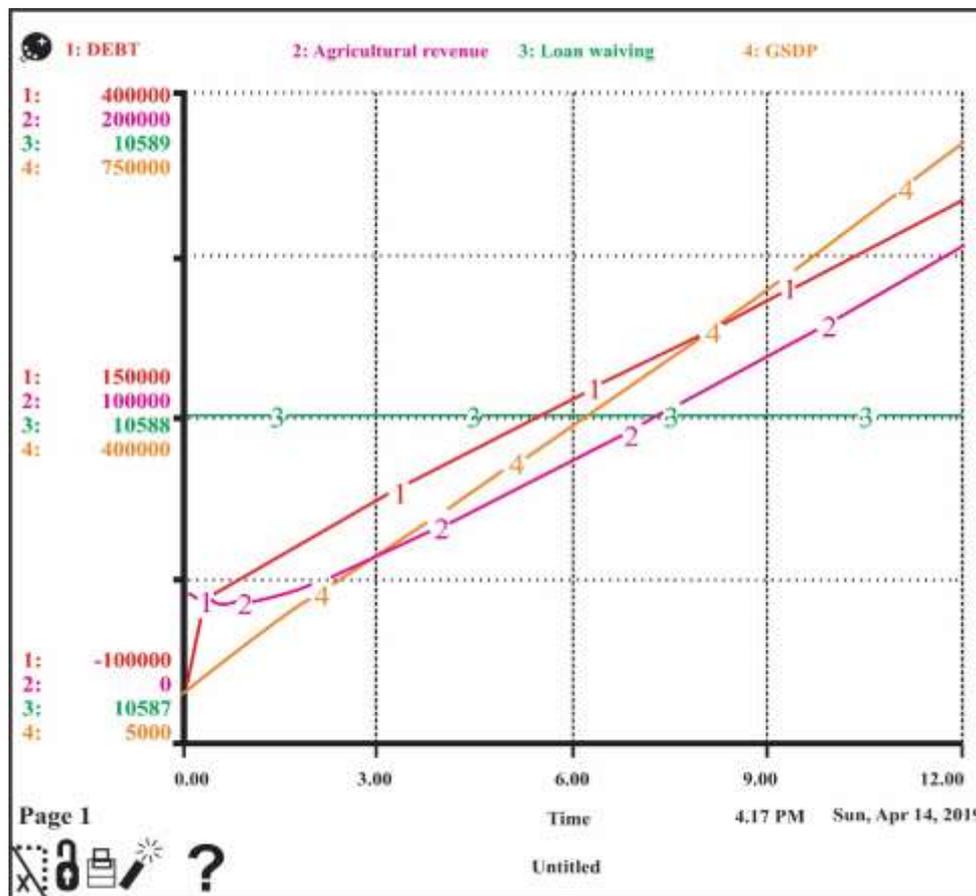


Figure 4: System Behaviour Scenario 2

- The system behavior in the pessimistic scenario with a very low allocation rate with most likely loan waiving to agriculture is 10 percent of the expenditure of the state. All the three stock variables Agriculture revenue, GSDP, and DEBT shows a low improving trend as revealed in fig 5. The trend graph of agriculture revenue is firstly decreased due to low allocation rate and then it is constant. This is the overriding impact of the allocation rate given to the agriculture sector. Which is much lesser than scenario 1 (most likely) and the trend which GSDP and DEBT showed is higher than that of the scenario 1 as the allocation rate of the agriculture sector is decreased from 40 percent to 10.

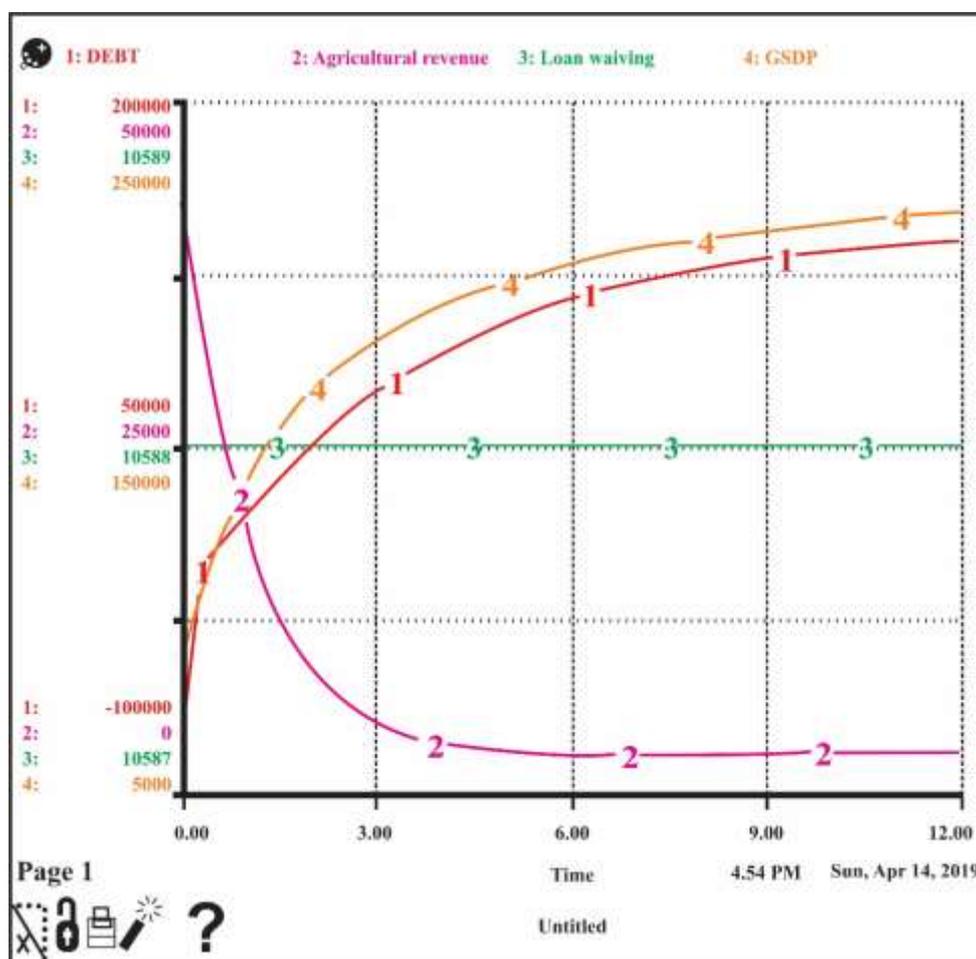


Figure 5: System Behaviour Scenario 3

## 6. Conclusions

Based on the insights obtained from the system dynamic simulation model and its analysis, few recommendations are made as a collected pile of evidence from the economic stream that suggests that farm waivers have not been particularly beneficial even to the intended beneficiaries of the scheme. This leads to a captivating puzzle as to why policy-makers continue to announce loan waivers. Through this paper, I attempted to make a beginning towards disentanglement of the roots of the policy. I find a mismatch between the public rationale for the scheme and its actual implementation. Another I observed that prior to 2016 policy-makers were generally conscious of the fiscal position of their state but this sense

of fiscal responsibility seems to be declining in recent years. The economic stream evidence so far suggests that waivers have not even worked as an effective measure, which means that we need to be more creative even with designing the immediate relief measures. While the search is on for an alternate policy the best that can be done right now is to work on the design and implementation of waivers so as to target benefits to the most vulnerable farmers. To a limited extent, the state government's waiver scheme has aided to reduce the rural indebtedness of small farmers. However, the overall indebtedness of farmers continues to remain high in the case of formal as well as informal sectors. Thus, the debt waivers scheme is not a lasting solution for rural indebtedness it can only improve the problems faced by farmers which is temporary relief.

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