

FARMER DISTRESS

Analysis of interventions addressing farmer distress in Andhra Pradesh

Cost-Benefit Analysis



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Analysis of interventions addressing farmer distress in Andhra Pradesh

Andhra Pradesh Priorities An India Consensus Prioritization Project

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ABSTRACT

The Problem

During the fiscal year 2016-2017, the contribution of the agricultural and related sectors was 14% of Gross Domestic Product (GDP), even though 58% of the population are dependent on the sectors for their livelihood. India has around 260 million people living in poverty and 80% of them live in the countryside. The median annual wage for a farmer in India is INR 18,850 (including the implied value of the food they consume). This is equivalent to two months' minimum wage in Mumbai – the commercial capital of India. It is therefore unsurprising that there was a spike in farmer protests during 2017-18 in various parts of the country.

There is wide recognition that the agricultural sector in India is in a state of distress. There are several factors which have contributed to this distress. Agriculture is characterized by instability due to a variety of risks associated with production, prices and markets. An additional factor which aggravates the situation, is that about 72% of land holdings are small and marginal (less than 2 hectares) and farmers cannot reap benefits from economies of scale.¹ Since 1960, the real agriculture growth rate in India has been an average of 2.8 percent. Before the Green Revolution the average growth rate was less than 2 percent; the period following the Green Revolution, until 2004, witnessed agriculture growth of 3 percent; in the subsequent years after the global agriculture commodity surge, growth in the sector increased to 3.6 percent.² The volatility in agriculture continues, although it has declined substantially from a standard deviation of 6.3 percent between 1960 and 2004, to 2.9 percent since 2004.³ Furthermore, approximately 52% (73.2 million hectares out of 141.4 million hectares) of the net sown area is still rainfed and not yet irrigated.⁴ The most striking impact of such levels of distress on Indian farmers is the increasing number of farmer suicides. Between 1995 and 2012, a total of 28,4673 farmers committed suicide in India.

It is in this context that it becomes important to research the reasons for the unviability of small and marginal farmers in India and the reasons for farmer suicides. Some of the common factors cited are crop failures, low farm productivity, an inability to achieve market prices, inefficient cold chain management resulting in wastage of agricultural produce from inadequate storage, lack of irrigation

¹<http://www.thehindu.com/news/national/why-are-farmers-distressed-across-india/article22267501.ece>

²[Economic Survey 2017-18, Department of Economic Affairs, Ministry of Finance, Government of India.](#)

³ibid

⁴<http://www.thehindu.com/opinion/op-ed/stemming-the-tide-of-agrarian-distress/article22859916.ece>

facilities, and insurmountable debt. However, the increasing numbers of farmer protests and suicides call for reconsideration of the policy interventions in the agricultural sector. There have been various initiatives undertaken by the Government, including – farm loan waiver schemes, higher minimum support price (MSP), reforms in the Agriculture Produce Market Committee (APMC) Act so that farmers can sell directly to end users, fertilizer subsidies, tax free agricultural income, and spending on rural infrastructure such as electrification and building canals. While each one of these interventions is expected to yield some benefits to the farmers, there are costs involved in undertaking them. Budgetary allocation of Union and State Governments are an indication of the priorities of Government. Knowing that financial resources are limited and judiciously allocating money amongst various sectors and inter-sector prioritizing the initiatives is the need of the hour.

This paper focuses on the reasons for farmer distress in the state of Andhra Pradesh (AP), and evaluates several interventions which claim to alleviate the distress. The three interventions which this paper analyzes are: farm loan waivers, expanding end-to-end cold chain infrastructure, and setting-up more food processing units.

Intervention 1: Farm Loan Waivers

Overview

This intervention assumes a hypothetical farmer loan waiver scheme that waives all formal sector loans of individuals with land holding sizes less than 2ha. This intervention is similar to relief schemes implemented or announced across India in the past, for example:

- a) The 2008 Agricultural Debt Waiver and Debt Relief Scheme - INR 600 billion (approximately \$12 billion) loan waiver package for 30 million small and marginal farmers and a one-time settlement for another 10 million farmers. The amount of loans waived was equivalent to 1% of India's GDP in 2007-08.
- b) Large-scale farm debt waivers enacted during 2017 by three major states – Uttar Pradesh, Maharashtra and Punjab. The total amount of debt relief announced by these three states amount to INR 77,000 crore (approximately \$12 billion) or 0.5% of India's GDP in 2016-17.
- c) A loan waiver scheme of INR 24000 crore, announced by the State Government of Andhra Pradesh⁵.

⁵ <http://www.thehindu.com/todays-paper/tp-national/tp-andhrapradesh/third-tranche-of-farm-loan-waiver-released/article19832020.ece>

It is important to note that the loan waiver scheme analysed in this paper is most similar to the 2008 Agricultural Debt Waiver and Debt Relief Scheme, since the effects of that scheme have been well studied by academia. Nevertheless it is likely that schemes with slightly different parameters will have similar effects, benefits and costs.

Costs and Benefits

Costs

- The most significant cost is the loan waiver itself. Using latest data on farm size and formal debt holdings by size, we estimate a cost of 23300 crore for the loan waiver.
- Academic evidence regarding the effects of the 2008 Agricultural Debt Waiver and Debt Relief Scheme shows a reduction in lending to small farmers for up to four years after bailout (Gine and Kanz, 2017). In AP the estimated impact on livelihoods following the farm loan waiver and subsequent reduced lending, is a loss of INR 815 per year for *marginal* farmers (< 1ha) and INR 2483 per year for *small* farmers (1-2ha).
- The reduction in formal loans available to small and marginal farmers results in a drop in production. The small and marginal farmers lose INR 803 crore annually.
- The anticipation of a loan waiver causes smallholder farmers to reduce their credit discipline, and academic evidence (Gine and Kanz, 2017) suggests that bailouts lead to an increase in non-performing loans and greater sensitivity of defaults to the electoral cycle. The welfare impact of this moral hazard is not straightforward to calculate, and is probably partially reflected in the credit restriction experienced by small and marginal farmers after a bailout. Any additional costs, for example to the wider credit environment, are not included in the calculations and this suggests the benefit-cost ratio would be even smaller than the one reported.

Benefits

- There is an immediate, one-time benefit to small and marginal farmers. They will not have to pay back outstanding loans (principal plus interest amount) which they owe to the banks. This value is INR 23300 crore, exactly equivalent to the cost of the loan waiver.
- In the medium-run, large farmers (those with more than 2ha) experience an expansion of available formal credit. This allows them to pay down informal credit and increase production. It may also increase the efficiency of credit allocated in the state, since fewer funds are given to riskier small

holder farmers and a higher proportion of funds are allocated to larger farm households. Estimates suggest that farmers with larger land holdings will gain INR 733 crore, annually.

Intervention 2: Managing cold supply chain logistics

Overview

- This intervention assumes the cold chain infrastructure requirements as estimated by The National Centre for Cold Chain Development (NCCD) are built within the state of AP, as well as all supporting requirements like manpower, maintenance and transportation. The intervention time horizon is 10 years.
- Fruits, vegetables, and milk command a higher market price in comparison to staple crops such as rice, wheat and pulses. One thing that differentiates fruits, vegetables, and milk from staple crops is that they are perishable by nature, and without proper storage and refrigeration wastage is high.
- Milk and horticulture items command a high price in international markets and are in demand by corporate buyers in the food processing industry. However, the majority of small farmers do not risk growing these crops, partly because of inadequate post-harvest management.
- The absence of cold chain, an environment-controlled logistics chain that preserves the essential characteristics of the products handled, leads to several challenges for farmers and the agricultural sector in general. First, it leads to wastage of fruits, vegetables, and milk. Second, as there is no mechanism for farmers to store their produce until they can optimise the price they obtain on the market, farmers will often resort to quick selling of the products. This reduces their potential earnings and affects their livelihoods. Finally, the absence of cold chain, discourages farmers from further growing these higher value commodities.

Costs and Benefits

Costs

The National Centre for Cold Chain Development (NCCD) has estimated the cold storage and warehouse related infrastructure requirements for India, including AP. Based on NCCD data and our analysis, the current total storage requirement for storing milk, fruits and vegetables stands at 744650 MT. The total number of pack houses required is 4382. The total number of ripening chambers required is 5708. The total number of specialised trucks required for transporting fruits, vegetables and milk is 1312. About 90% of the storage requirement already exists within the state, but the remaining infrastructure needs are almost non-existent. To fill this gap requires a one-off

investment of INR 2686 crore, plus additional investments over the following 9 years averaging approximately 20% of this value per year to meet expected growth in the horticulture and dairy sectors.

Additionally, at the outset an additional 1261 employees would be required to run the storage facilities, 9567 employees to run pack houses and ripening chambers, and 3418 workers (including drivers and helpers) to operate the trucks. This requirement increases over the years to meet growth. The average annual workforce costs is INR 146 crore over the 10 years. Lastly, we include operations and maintenance cost of 10% of invested capital which averages INR 518 crore per year.

Benefits

- The benefit from a better post-harvest management is that fruits, vegetable items, and milk will not be wasted. Loss in vegetables and fruit items because of lack of storage has been estimated at between 5% to 30%.
- For milk, data shows the amount of loss can be as high 40% and two-thirds of this loss happens during storage.
- In the first year of this intervention, the total benefit from putting cold chain logistics in place is estimated at INR 997,854 lakh. The value of milk that can be saved by using cold storage represents 48% of the total benefit, and the value of fruits and vegetables that can be saved is 52% of the total benefit. The annual benefit increases by 6-7% per year in line with the expected rate of growth in the horticulture and dairy sectors.
- In India, 83% of the farmers are small and marginal farmers. The majority of these farmers cultivate mainly low value, subsistence crops. This intervention will have implications particularly on the livelihoods of small and marginal farmers who would then be able to undertake the cultivation of high return crops which are in demand in global markets. Overall, the implications are that there would be an increase in agricultural productivity and it could liberate small and marginal farmers from a cycle of poverty and distress. The option value of this benefit is not included in the calculations, though we note that to take advantage of the option to grow higher value produce, would itself require more costs at the farm-level.

Intervention 3: Local Food Processing Units

Overview

- The third intervention is about expanding local, small-scale food-processing units in Andhra Pradesh. AP has bountiful production when it comes to agriculture and livestock. The state ranks

second in India in production of paddy, ground nut and maize. It is one of the leading states in horticulture produce, having nearly 2 million hectare with different types of fruit crops. AP ranks first in India in the production of Mango, Papaya, Lemon, Chili, Turmeric, and Tomato. The state ranks first in terms of egg production and has a strong presence in terms of meat and milk products.

- The analysis for this intervention is based on the results of two case studies from the neighboring states of Karnataka and Tamil Nadu. Since the two states are proximate to AP it is assumed they will have a similar cost structure and access to technology when it comes to setting up food processing units.
- In reality, the size and type of food processing unit should be tailored to reflect the local conditions and food availability, and we note this analysis only aims to identify the ballpark benefit-cost ratio of a typical food processing unit.

Costs and Benefits

- The benefits refer to additional incremental revenue food processing units. The costs are incurred in setting up the food processing units, and the cost of actual processing such as labour and food.
- The two studies from India indicate that the rice processing has a benefit cost ratio around 1. Turmeric processing has a benefit cost ratio around 4.
- International experience from food processing units in other developing countries suggests similar benefit-cost ratios.

Conclusion

The results from analysis indicate that, for intervention 1, the farm loan waiver scheme, the economic cost is higher than the benefit. If the objective of the loan waiver is to help the smallest farmers, then the farm loan waiver scheme does not fulfil that objective. This is because only 15% of the smallest farmers have access to institutional credit (formal credit), and loan waiver necessarily caters to farmers who have been able to access formal loans. Even for those with 2.0 ha or less, roughly 50% of them access formal credit. Moreover, studies have shown that the long-term impact of loan waiver programmes results in a fall in agricultural output and a reduction in the availability of formal loans to small and marginal farmers subsequent to the loan bailout. Also, it is a significant cost to the national exchequer, resulting in a higher fiscal deficit or curtailing of other development programs.

Regarding the second intervention, building more cold storage facilities and investing in reefer vehicles, the analysis shows that it is a beneficial intervention. Investing in cold chain infrastructure with the aim of improving post-harvest management results in socio-economic benefits that far outweigh the economic costs. Improper post-harvest management not only leads to huge wastage of crops, but also discourages small and marginal farmers from growing these high-value items. These items are in high demand in international markets and by the corporations with a large presence in the food processing industry. However, small farmers often do not want to venture into growing these perishable items as the lack of cold chain management either leads to crops being wasted, or degraded to a standard which is not internationally accepted.

Intervention 3 is about local food processing units. As mentioned in the section above, the state of Andhra Pradesh performs well when it comes to the production of agricultural, livestock and horticultural crops. This intervention further seeks to add value to the primary product and derive benefits from the same. Based on our literature survey we find, in general, that the benefit-cost ratio from setting up local food processing units lay between 1 and 4.

Summary of costs and benefits of interventions. Note all benefits and costs assume 5% discount rate

Intervention	BCR	Benefit (INR crore)	Costs (INR crore)	Time Horizon of analysis	Quality of Evidence
Farm Loan Waiver	0.99	24,629	24,860	5 years	Strong
Cold chain infrastructure	8.8	101,451	11,482	10 years	Medium
Local food processing units	Approximate range of 1-4	Depends on local conditions and type of processing	Depends on local conditions and type of processing	1-3 years	Medium

Introduction

During the fiscal year 2016-2017, the contribution of the agricultural and allied sectors was 14% of Gross Domestic Product (GDP), despite 58% of the Indian population relying on this sector for livelihood (Central Statistics Office, Government of India, 2016).⁶ Although there has been a steep reduction in terms of its contribution to the GDP, still roughly half of the workforce depends on agriculture as a source of livelihood.⁷ India has around 260 million people living in poverty and 80% of them live in the countryside (World Bank, 2016). The median annual wage for a farmer in India is INR 18,850 (or \$ 290)⁸ (including the implied value of the food they consume) which is equal to two months' minimum wage in Mumbai – the commercial capital of India (The Economist, 2016).

There is wide recognition that the agricultural sector in India is in a state of distress. There are several factors which have contributed to this distress. Agriculture is characterized by instability due to a variety of risks associated with production, prices and markets. An additional factor which aggravates the situation, is that about 72% of land holdings are small and marginal (less than 2 hectares) and farmers cannot reap benefits from economies of scale.⁹ Since 1960, the real agriculture growth rate in India has been an average of 2.8 percent. Before the Green Revolution the average growth rate was less than 2 percent; the period following the Green Revolution, until 2004, witnessed agriculture growth of 3 percent; in the subsequent years after the global agriculture commodity surge, growth in the sector increased to 3.6 percent.¹⁰ The volatility in agriculture continues, although it has declined substantially from a standard deviation of 6.3 percent between 1960 and 2004, to 2.9 percent since 2004.¹¹ Furthermore, approximately 52% (73.2 million hectares out of 141.4 million hectares) of the net sown area is still rainfed and not yet irrigated.¹² The most striking impact of such levels of distress on Indian farmers is the increasing number of farmer suicides.

Between 1995 and 2012, a total of 28,4673 farmers committed suicides in India (Mishra, 2014).¹³ Reddy and Mishra (2010) argue that the liberalization of the agricultural sector in the early-1990s led to an agrarian crisis, and consequently farmers with certain socioeconomic characteristics, such as cash crops cultivators and small farmers with debts, are at risk of committing suicide. World Bank

⁶Year refers to the fiscal year, starting from April for any particular year and ending on March, next year.

⁷

http://niti.gov.in/writereaddata/files/document_publication/Raising%20Agricultural%20Productivity%20and%20Making%20Farming%20Remunerative%20for%20Farmers.pdf

⁸Henceforth, for the dollar-indian rupee conversion rate we use INR 65 = \$1.

⁹<http://www.thehindu.com/news/national/why-are-farmers-distressed-across-india/article22267501.ece>

¹⁰Economic Survey 2017-18, Department of Economic Affairs, Ministry of Finance, Government of India.

¹¹ibid

¹²<http://www.thehindu.com/opinion/op-ed/stemming-the-tide-of-agrarian-distress/article22859916.ece>

¹³Between 1995 and 2012, farm suicides as a percent of all suicides in India was 14%.

data shows only 35% of India's agricultural land is irrigated (artificial application of water to land or soil).¹⁴ Banik and Stevens (2016) find that uncertain weather conditions, leading to volatile agricultural output, is a primary cause of farmer suicides. According to Chand et al., (2015) growth in farm income has fallen to around 1% and this is an important reason for the sudden rise in agrarian distress in recent years. The study reported that in 2013 small farmers (with landholding size less than 1 hectare¹⁵) had a higher monthly consumption than their monthly income.¹⁶

Among all the states, Andhra Pradesh (AP, hereafter) has one of the highest rates of farmer suicide. Between 2010 and 2012, there were 47 farm suicides per 100,000 population. The corresponding figure for all India during the same period was 15 per 100,000 population (Mishra, 2014). Some of the most common contributing factors are crop failures, low farm productivity, an inability to achieve market price, inefficient cold chain management resulting in wastage of agricultural produce, lack of irrigation facilities, and insurmountable debt.

Based on a study of 22 suicides cases in Anantapur district in AP, Kumar (2016) argues that while crop failure is a significant factor, the role of other socio-cultural forces should not be discounted. Anantapur district, historically an agriculturally backward region, has seen more "farmers' suicides" than other regions in AP - a State which along with Karnataka, Maharashtra and Gujarat have recorded more suicides than elsewhere. For Anantapur district as a whole, farmers owning less than 5 acres account for over half the suicide cases, while those holding between 5 and 10 acres account for another third. Kumar (2016) finds commercialisation of agriculture is leading to break-up of joint families, tensions over sharing of roles within families, and a challenge to the authority of the family patriarch in decision-making. The clash between the old and the young leads to wounded egos, more so among men; as such, farmers' suicide becomes as much an assertion of patriarchal honour. For instance, although the head of the family opposes growing high risk crops such as citrus, the younger generation are more aspirational and prone to risky decision making, and when crop output fails because of volatile weather conditions, they may commit suicide.

However, the increasing number of farmer protests, as well as the high incidence of suicide, calls for a closer look at the policy interventions in the agriculture sector. There have been various initiatives

¹⁴Available at: <http://data.worldbank.org/indicator/AG.LND.IRIG.AG.ZS/countries>. Accessed on 09/12/2017.

¹⁵A hectare is roughly equal to 2.47 acres.

¹⁶ National Sample Survey Organization (NSSO), Government of India, defines an agricultural household as a household receiving some value of produce more than INR 3000 from agricultural activities (e.g. cultivation of field crops, horticulture crops, fodder crops, plantation, animal husbandry, poultry, fishery, piggery, bee-keeping, vermiculture, sericulture, etc.) and have atleast one member self-employed in agriculture in the principle status during last 365 days.

undertaken by the Government in the agricultural sector, including farm loan waiver schemes, higher minimum support price (MSP),¹⁷ reforms in the Agriculture Produce Market Committee (APMC) Act so that farmers can sell directly to the end users, fertilizer subsidies, tax free agricultural income, and spending on rural infrastructure such as electrification and building canals. While each one of these interventions is expected to yield some benefits to the farmers, there are costs involved in undertaking them. All governments operate within budgetary constraints, and assessing which policies for alleviating farm distress have the greatest benefit for the amount spent can help improve policy making on this critical issue.

This paper analyses three interventions which are particularly relevant to AP - farm loan waivers, expanding end-to-end cold chain infrastructure, and setting up more local, small-scale food processing units.¹⁸

AP has a total cultivation area of 63.54 lakh hectare (ha) covering rice, oilseeds, pulses, cotton, maize, tobacco, vegetables, fruits, oil palm and other crops (Government of Andhra Pradesh, 2015). The state is also endowed with a long coastal line (974 km), making fish production and fish exports an important part of the farming industry in the state. Agriculture is the largest contributor to the primary agricultural sector, accounting for 27%. This is followed by livestock at 26%, horticulture at 25% and fisheries at 15%.¹⁹ The sector provides employment to 46 lakh farm families or around 62% of the state's population. Irrigated areas cover 50.38% of the total area sown.

Per-capita agricultural income in AP is low in comparison to manufacturing and services, leading to a demand for policies which help to raise farm incomes. In order to increase per-capita farm income, there is a need to venture into high-return crops such as fruits and vegetables. With a wide variety of fruits, vegetables and spices cultivated in the state, there is considerable scope to develop a food processing industry. The growth of the agriculture and food processing sectors would generate income opportunities for farmers, women and youth led agrobusiness, and would have an important impact in alleviating rural poverty. However, considerable amounts of food are wasted because of the lack of cold storage and warehouse facilities. As government may run short of funds for building

¹⁷MSP is the minimum price for a product established by the government and supported by payments to producers in the event of the market price falling below the specified minimum. The Cabinet Committee of Economic Affairs announces MSP for various crops at the beginning of each sowing season based on the recommendations of the Commission for Agricultural Costs and Prices (CACP). The CACP takes into account demand and supply, the cost of production and price trends in the market among other things when fixing MSPs.

¹⁸Based on focus group discussion with farmers, government officials, and NGOs working in the area

¹⁹For more on this see, Primary Sector Development: Status, Strategy and Action Plan, Government of Andhra Pradesh (2015).

warehouses/cold storages, there is a need to encourage public-private partnership that will tap into private sector funding. Big corporate houses with considerable interest in manufacturing farm equipment have a large presence in the state, and may be interested in investing in cold chain infrastructure.

Intervention 1: Farm Loan Waiver

Farm loan waiver policies have been popular across India as a way of helping to alleviate the problems of agriculture distress. The Government of AP also announced a loan waiver of INR 24,000 crore (Rao, 2017). Farm loan waivers are granted to small and marginal farmers with landholding of less than 2 ha. In India, 83% of the farmers are smallholders, with less than 1 ha of land (Chand et al, 2011). The focus on farmer loan waivers is motivated by the large amount of money typically required to enable a broad-based farmer loan waiver scheme.

Costs and Benefits of Farm Loan Waiver Scheme

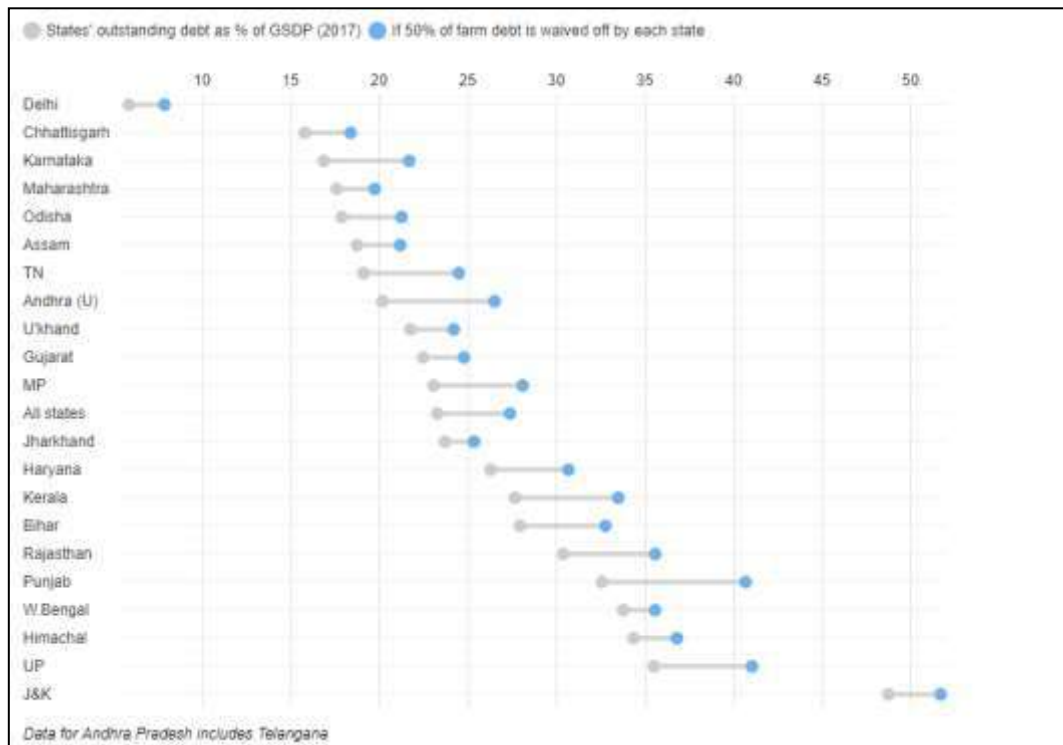
Benefit cost analysis estimates the total equivalent monetary value of the benefits and costs to society when implementing this intervention. If the Benefit Cost Ratio (BCR) for a specific intervention is greater than one, then society gains from the intervention²⁰. At a policy level, it is therefore rational to at least consider implementing the intervention. In this paper we consider three rates of discount - 3%, 5%, and 8%, when computing BCRs.

Costs

Typically, the debt loan waivers packages are aimed at fulfilling election promises made by the political parties. For instance, in 2017, three major states - Uttar Pradesh, Maharashtra and Punjab - undertook large-scale farm debt waivers. The total amount of debt relief announced by these three states amounted to INR 77,000 crore (roughly, \$ 12,000 million) or 0.5% of India's GDP in 2016-17 (Kundu, 2017). If all the states in India were to waive 50% of their farm debt, it would cost 1% of India's GDP. Therefore, the farm loan waiver programme has a potentially huge cost on the national exchequer (See, Figure 1).

²⁰From the perspective of private return, any investment decision is viable if the Internal Rate of Return (IRR) is higher than the bank's rate of interest.

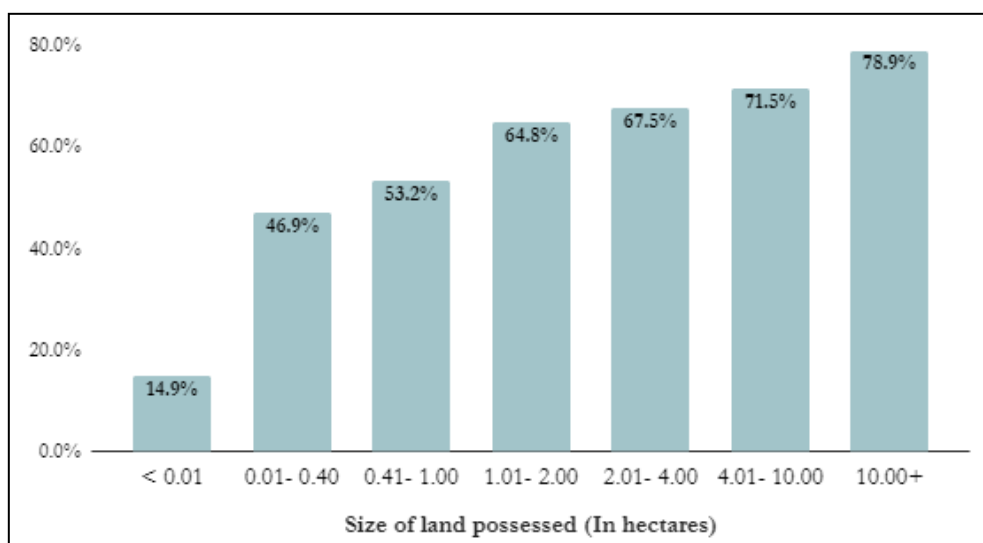
Figure 1: States' debt to GDP ratio will worsen by 4%, if 50% of farm debt is waived off by each state



Source: Rajya Sabha (Upper House of Indian Parliament) and RBI Handbook of Statistics, Reserve Bank of India

In fact, from the perspective of enhancing the livelihood of small and marginal farmers, loan waiver programmes do not make much economic sense. If the objective of the loan waiver is to help small and marginal farmers, the objective is achieved in a limited way. This is because only 15% of smallest farmers have access to institutional credit (formal credit), and loan waiver schemes typically cater to farmers who have taken out formal loans. (See, Figure 2).

Figure 2: Farmers with access to institutional credit (in %)



Source: National Sample Survey Office's 2013 situation assessment survey of farm households, Government of India.

On the contrary, loan waivers may create to a problem of moral hazard, whereby more productive farmers who can pay-off their loan, deliberately default, thereby resulting in lower loan availability during the next cycle. Analysing the loan waiver program announced by Uttar Pradesh government in 2011, Chakraborti and Gupta (2017) find that eligible households in districts that received the waiver had higher consumption expenditure, by approximately INR 8,000 per year, compared to non-eligible households. What is of greater concern is that eligible households also tend to spend significantly more on social events such as weddings, family occasions, and so on. This study also points out that within the same district, households who received a loan waiver had no significant productivity difference when compared with households who were not eligible for the waiver. Specifically, debt forgiveness is likely to disincentivize households from using loans for productive investments, which would be required for repayment. Households expect governments to intervene so that credit institutions do not seize their collateral in case of default. The expectation that they can avoid any penalty for non-repayment of a loan is likely to affect household decisions regarding the utilization of loans.

At a macro level, loan waiver programs can be so costly, that they can impinge upon other development activities. For example, after the Maharashtra government announced the INR 34,000 crore loan waiver program in 2017, finance officials indicated that a paucity of funds in the state exchequer was making it difficult to honor tax refunds intended for industry (Thevar, 2018). Similarly, because of the Uttar Pradesh loan waiver program, the state's budget deficit shot up to 4.45% of the

gross state domestic product (GSDP). This was significantly higher than the average level of fiscal deficit for all states, which stood at 2.5% of GSDP. It also left less money available to undertake the capital expenditure allocated for infrastructure (Kumar, 2017).

Analysis of the loan waiver intervention

The intervention provides all farmers with less than 2ha unconditional relief on outstanding formal credit. To undertake a cost-benefit analysis, we rely on two papers, Giné and Kanz (2017) and Kanz (2016) which estimate the effects of a 2008 farmer loan waiver enacted by the Union government in response to the global financial crisis. Results indicate that the benefit to cost ratio is below 1 i.e. the intervention does not create value for society in AP.

Data

Using data from the Agricultural Census 2011-2012 as well as the National Sample Survey (NSS) 70th round, 2013-2014 information was gathered relating to: the total number of land holdings by district, the average formal and informal credit at the level of farm, and the average farm level revenue and costs. These fields are presented as totals for each state as well as stratified by farm size: marginal (0-1 ha), small (1-2 ha), semi-medium (2-4 ha), medium (4-10ha) and large (10+ha). Based on these categorizations, the intervention is therefore targeted at *marginal* and *small* farmers.

Table 1 - Summary statistics

		MARGINAL	SMALL	SEMIMEDIUM	MEDIUM	LARGE	ALL SIZES
		(0-1 Hectare)	(1-2 Hectare)	(2-4 Hectare)	(4-10 Hectare)	(10 & more Hectare)	
AP	Number of land holdings	8,424,698	2,918,374	1,399,123	397,252	35,653	13,175,100
	Total outstanding credit per household (INR)	90,073	104,900	162,300	350,000	249,400	70,500
	Total outstanding formal credit per HH (INR)	29,096	55,073	74,496	187,950	141,659	30,809
	Total outstanding informal credit per HH (INR)	60,977	49,828	87,804	162,050	107,741	39,692
	Total farm level costs (INR) per month	2542	5565	10576	14949	20892	6191
	Total farm level revenue (INR) per month	3420	7716	13570	24323	31846	8482

Source: Agricultural Census 2011-2012, NSSO 2013-2014

This data is used to calculate the amount of formal and informal credit held by farmers with different size holdings for each district. We then calculate a hypothetical exposure to bailout in each district similar in concept to the one calculated in Giné and Kanz (2017)²¹.

Exposure to bailout in district i = Formal credit outstanding to farmers < 2ha in district i / total formal credit in district i

Table 2: Exposure to bailout

	<i>Andhra Pradesh districts (n=13)</i>	<i>All India districts, Giné and Kanz (n=489)</i>
<i>Mean</i>	0.671	0.326
<i>Median</i>	0.702	0.284
<i>Standard Deviation</i>	0.106	0.224
<i>Min</i>	0.456	0.002
<i>Max</i>	0.825	0.991

Source: Calculation by the authors

Note: AP represent a hypothetical bailout exposure based on data from NSSO 70. Giné and Kanz represent actual bailout exposure from 2008 government bailout.

Method

Estimating the cost of the bailout

To estimate the cost of the bailout we simply identify the average amount of all formal credit held by marginal and small farmers, and multiply by the number of households (see Table 1). This amounts to INR 23,300 crore.

Estimating the post-bailout distribution of formal credit

Using the exposure to bailout variable, we estimate the amount of formal credit expansion or contraction following Giné and Kanz. That papers suggests a one standard deviation increase (decrease) in bailout exposure leads to a 25% reduction (increase) in formal credit allocated to that district, post-bailout.

²¹The exposure variable in Giné and Kanz, differs in that it accounts for borrowers in default and also partial waiving of loans for those with landholdings greater than 2ha. This reflects the specifications of the 2008 loan waiver studied in that paper which only granted relief to farmers in default, and provided for relief for 25% of loans for those with landholdings greater than 2ha. Because we assume an intervention that waives loans regardless of default status (as seems to be the case for loan waivers in India since 2008), and is confined to farmers with holdings less than 2ha, we require a simplified version of the exposure variable.

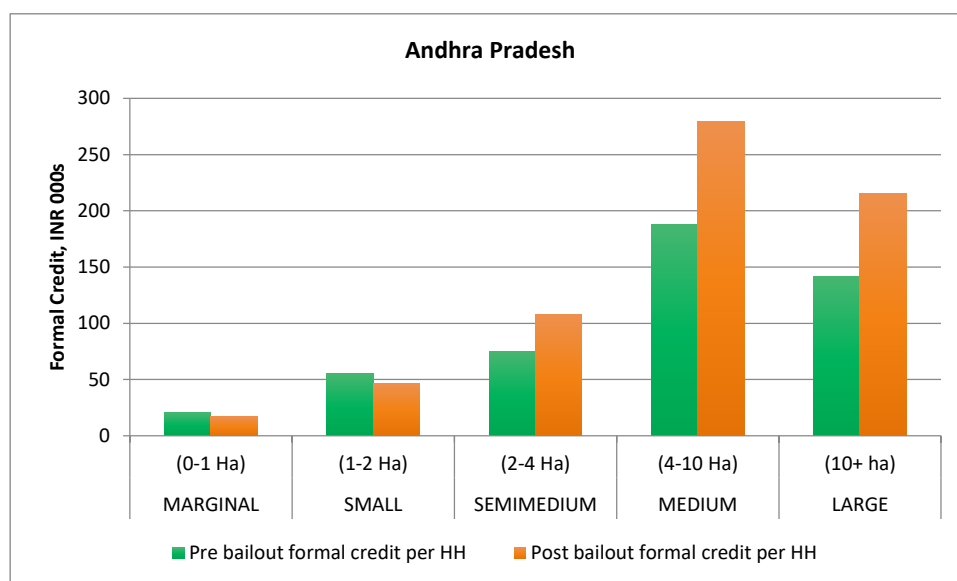
We then assess how this credit contraction or expansion is distributed across different farm sizes within a district. In doing so we attempt to reconcile the findings of Giné and Kanz, which suggests overall formal lending increases after the bailout, and Kanz (2016), which suggests that farmers below the 2ha cut-off experience an 8-percentage point reduction in formal lending post-bailout. The implication of these two findings is that farmers with more than 2ha receive more credit after the bailout.

We apply Kanz (2016) 8-percentage point effect to *small* farmers (i.e. 1-2ha) to estimate their post-waiver formal credit allocation. However, we do not apply the same percentage point reduction for *marginal* farmers since they hold a lower share in formal credit than *small* farmers, and an 8-percentage point reduction would represent a very significant percentage reduction in their share. Instead of that it is assumed that *marginal* farmers experience the same percentage reduction in their share of formal credit as *small* farmers do and calculate this effect size by dividing the estimate percentage point reduction 7.95 from Kanz (2016) by the average share of formal credit held by *small* farmers in the entire state (52.5% for AP). This implies a 15% reduction in formal credit for *small and marginal* farmers in AP. The above calculations are initially done at a district level and then summed up to identify the total contraction for *small* and *marginal* farmers across the state.

For farmers with greater than 2ha, the assumption is that they attract a quantum of formal credit that satisfies the formal credit contraction or expansion at the district level that was calculated using the Giné and Kanz finding. Sometimes this quantum is negative, i.e. farmers with land greater than 2ha receive less formal credit in a given district.²² However, when summed across the state, farmers with greater than 2ha receive more formal lending *overall*, while farmers with less than 2ha attract less formal lending *overall*. Results of this reallocation are presented in Figure 3, below.

²² The findings of the two papers do not indicate whether the rule that overall lending to farmers with greater than 2ha needs to hold at the district level, or merely overall at the state level. As such, we also test the effects of a distribution formula that assumes farmers with land greater than 2ha always receive more formal credit or zero, whichever is higher, and that the necessary contraction that would make the Giné and Kanz relationship hold for a given district is attributed to small and marginal farmers instead. The results are similar to the ones presented.

Figure 3: Average formal credit allocation before and after bailout per Household - AP



Estimating the post-bailout effects of redistribution

We estimate two effects of the credit redistribution: i) credit contraction for small and marginal farmers and ii) credit expansion for larger farmers

The effect of credit contraction on small and marginal farmers

Kanz (2016) shows that smallholder farmers reduce investment in agricultural inputs by 15% relative to a control group. This leads to a 13.5% reduction in farm revenue. These effects are applied to the cost and revenue data for marginal and small farmers. Since all classes of farmers are profitable, an almost equal percentage reduction in revenue and costs leads to a reduction in profits. For AP this is INR 815 per year for *marginal* farmers and INR 2,483 per year for *small* farmers. The total cost per year in reduced farm profit for these classes of farmers is therefore INR 800 crore.

Another potential effect is an increase in interest payments for marginal and small farmers resulting from debt substitution. Kanz (2016) indicates that farmers are able to substitute 75% of the formal credit gap with informal sources of debt. If this were to come from costly moneylenders the extra interest expense would be significant. However, Kanz suggests that the credit gap is mostly filled with loans from friends and relatives. We assume the cost of capital of this source of credit is the same as the cost of capital from bank lending (which is plausible if the money would otherwise be placed into a savings account), hence the net interest expense is zero.

The effect of credit expansion on farmers with larger land holdings

Table 1 indicates that large farmers still require some form of informal credit, though the percentage share is much lower than for *small* and *marginal* farmers. It is assumed that farmers use the expansion of formal credit to reduce their reliance on informal credit, thereby reaping a savings in interest payments. Tripathi (2017) shows that the average rate of interest on formal credit is 11.67%, while for informal credit it is 25.20%. Both of these represent the weighted average of diverse sources of credit, including banks and government (formal) as well as moneylenders, shopkeepers, friends, family, and landlords (informal). The benefit to larger farmers is simply the total formal credit increase multiplied by the interest rate differential, 13.53%. This amounts to INR 733 crore per year.

One could also argue that larger farmers, instead of substituting to informal credit, rather use the windfall credit to increase agricultural investment. Assuming these farmers are freely able to access informal credit in the pre-bailout period, the marginal return on investment should equal the marginal cost of informal credit in equilibrium. The net return of expanding investment would therefore be the return of investment, 25.20%, less the formal interest rate, 11.67%, leading to a benefit calculation identical to the substitution of informal credit.

Cost benefit analysis

In Year 1 the Government pays the loan waiver, and that exact same amount is received as a benefit by small and marginal farmers. In subsequent years beneficiary farmers face a production loss, while non-beneficiary farmers receive a net gain through credit expansion. We assume the effects last for four years as per Giné and Kanz (2017).

Both of the papers examining the effects of the 2008 loan waiver scheme, indicate a costly moral hazard arising from the intervention. Giné and Kanz (2017) show an increase in default in districts with greater exposure to bailout, while Kanz (2016) shows that beneficiary farmers appear less concerned about the reputational effects of defaulting on their loans. The costs of this significant effect is not included fully, though is partially captured by credit restriction to farmers with less than 2ha. Therefore, the results can be considered a conservative commentary on the inefficiency of farmer loan waivers.

For simplicity this paper ignores the effects of natural credit growth, inflation and growth in the agricultural sector. These would not affect the final result significantly since they impact the intervention scenario and the counterfactual scenario in a similar way.

Table 3: Profile of costs and benefits in AP (all figures in INR crore)

COSTS	Year 1	Year 2	Year 3	Year 4	Year 5
Cost of bailout	23,263				
Reduction in farm profits for beneficiary farmers		801	801	801	801
Total Costs	23,263	801	801	801	801
BENEFITS					
Receipt of waiver	23,263				
Benefits of credit expansion for non-beneficiary farmers		733	733	733	733
Total Benefits	23,263	733	733	733	733

Results indicate that for AP the net benefits of the farmer loan waiver is less than 0, and the benefit-to-cost ratio is less than 1. In fact, the BCR would have been even lower, if data showcasing district-wise non-performing assets (NPAs) could have been accounted for. As of June 2017, the total amount of NPAs in Indian banks stood at INR 829,338 crore. As state-wise/district-wise NPA data are not available, it was not possible to account for this when calculating the BCR. However, Gine and Kanz (2017) suggests that a one standard deviation to bailout exposure increases the probability that a given district has a higher share of non-performing loans by 52%.

Table 4: Summary of cost benefit results (all figures in INR crore)

Discount	Benefits	Costs	BCR	Net benefits
3%	25,229	25,476	0.99	(247)
5%	24,629	24,860	0.99	(231)
8%	23,787	23,996	0.99	(210)

Intervention 2: Building more Storage Facilities

In India, usually farmers have two ways to sell their produce. The first is to sell directly to the Government at Minimum Support Price (MSP). The Union Government procures 25 essential food items directly from the farmers via agencies such as the National Agricultural Cooperative Marketing Federation of India Limited (NAFED) and the Food Corporation of India (FCI).²³ Typically, the MSP is higher than the market price, and one would assume that farmers would necessarily sell their produce to the Government and profit every time the government announces the value of the MSP.²⁴ However, in practice, farmers are seldom sell their produce at the MSP. There are multiple reasons for this. Not every village has NAFED or FCI outlets. The FCI currently procures a major portion of paddy and wheat from a few select states; 70% of paddy procurement comes from the states of Punjab, Andhra Pradesh, Chhattisgarh and Uttar Pradesh, while 80% of wheat procurement comes from Punjab, Haryana and Madhya Pradesh. In fact, three states – Punjab, Haryana and Uttar Pradesh – accounted for more than half of the total procurement during 2012-13 (Kishore, 2018).²⁵ Further to that, even if there is an NAFED or FCI outlet, the Government may not purchase the crops if the farmers bring their produce before or after the allotted dates of procurement.

The second option for the farmers is to take their produce to the nearby Government designated mandis (Hindi word for market) where, in front of the state government officers, they can auction their produce to the brokers.²⁶ In this situation, farmers have limited options other than to sell to the middlemen who charge a hefty commission. In a Supply Chain examination study involving trade in potatoes, it was found that middlemen can charge a commission of up to a staggering 70% (Singh 2017). For instance, during June 2017 in the Azadpur and Ghazipur mandis of Delhi, the middlemen were selling common variety of potatoes at INR 5-7 per kilo. If these rates were being offered to farmers they should have realized between INR 250 and 350 for a 50 kilogram sack. However, in

²³In 2017-18, these items were paddy, jowar, bajra, maize, ragi, tur, moong, urad, cotton, groundnut, sunflower seed, soyabean black, sesamum, nigerseed, wheat, barley, gram, masur, mustard, safflower, toria, copra, de-husked coconut, jute, and sugarcane. Some of these items such as safflower, sunflower, etc. are more perishable in nature than others.

²⁴ MSP is determined by Commission for Agricultural Costs and Prices (CACP), Ministry of Agriculture and Farmers Welfare, Government of India. CACP gives three definitions of production costs: A2, A2+FL, and C2. A2 costs cover actual paid-out expenses incurred by farmers – both in cash and in kind – on seeds, fertilizers pesticides, hired labor, fuel, irrigation, etc. A2+FL includes A2 plus an imputed value of unpaid family labor. C2 costs are more comprehensive, accounting for the rentals or interest foregone on owned land and fixed capital assets, on top of A2+FL. Farmers complain if the government were to fix MSP on the basis of first two definitions of production cost, they actually make a loss.

²⁵India's farmers need a new deal beyond cliched MSP Politics, Hindustan Times (15th February 2018).

²⁶ Mandis refer to markets in smaller towns and cities to which farmers from nearby villages bring their agricultural produce to sell. There are around 7700 government designated mandis spread across India.

reality, the maximum price the farmers were offered was INR 100 for a 50 kilogram sack. Hence, most often farmers do not know the actual market prices of the commodities and it is the middlemen who siphon off most of the profits.

Inefficient supply chain management affects the small and marginal farmers (land holding of less than 2 ha). In India, the majority of farmers can be categorised in this way. They do not have access to cold storage and warehouse facilities. To store their items in cold storage and warehouses, a farmer need to book a minimum capacity of 50,000 quintals for their produce.²⁷ However these small farmers do not have the ability to grow 50,000 quintals of good quality produce,²⁸ nor do they have access to the finance needed to keep these items in storage. The only option for them is to sell their produce to middlemen or traders at a price cheaper than the MSP and/or the market price.

In fact, the importance of access to cold storage and warehousing become more pronounced for perishable produce such as fruits, vegetables, and milk. Although returns from growing fruits and vegetables are higher, the majority of small farmers do not grow these crops. Birthal et al., (2015) point out that only 22.22% of marginal famers (with less than 1 ha of landholding size) and 23.61% of small farmers (between 1 and 2 ha of landholding size) grow any high value crops, such as fruits, vegetables, spices, flowers, plantation and medicinal plants. Analysing data from the National Sample Survey Organization (2005), this study finds small and marginal farmers are likely to gain from shifting to high value crops: the likelihood of a farmer being poor is 3–7% less, if he grows high value crops. However, partly because of the lack of storage and warehouse facilities, the majority of small and marginal farmers shy away from growing these high value crops.

Apart from its ability to reduce poverty (as is evident from the the example of growing high value crops), the absence of cold chain and warehouses also lead to wastage of fruits, vegetables, and milk. A reduction in food wastage also improves food security by increasing the real income for all the consumers. Wasting crops does not only reduce the food available for human consumption, but also causes negative externalities to society through the costs of waste management, greenhouse gas production, and the loss of scarce resources used in their production (Gustavsson, et al., 2011). Moreover, quality (nutrient contents) of fresh foods continue to deteriorate throughout their shelf life, from harvest or slaughter, through packing, distribution, marketing and sale (Kitinoja, 2013).

²⁷ See, Project Report on Cool Chamber, National Informatic Centre, Government of India. Available at:<http://odihort.nic.in/sites/default/files/10MT-Cold-Room.pdf>.

²⁸ A sizeable portion of the crop gets lost because of weeds and pest insects.

Table 5: Importance of Cold Storage Management

Variable	Global	Developed Countries	Developing Countries
Population in 2009 (in billions of inhabitants)	6.83	1.23	5.60
Population in 2050 (forecast, in billions of inhabitants)	9.15	1.28	7.87
Refrigerated storage capacity (m ³ /1000 inhabitants)	52	200	19
Food losses (all products)	25%	10%	28%
Losses of fruits and vegetables	35%	15%	40%
Losses of perishable foodstuffs due to lack of refrigeration	20%	9%	23%

Source: Lisa Kitinoja (2013), pp. 2.

According to an estimate prepared by ICAR-CIPHET study, the harvest and post-harvest losses for major food commodities covering crops, livestock and fish was INR 92,651 crore during the year 2013-2014. For the entire food sector this loss comes to INR 107,994 crore. These estimates reveal that 5.8% of food output is lost during harvest and transit. Around 18% of the country's food and vegetables are wasted annually because of lack of proper storage (ICAR-CIPHET, 2015).²⁹

There are several constituent elements in cold chain logistics (an environment-controlled logistics chain aimed at preserving the essential characteristics of the products handled):

- (i) Pack-house - Pack-house are equipped with conveyer belt systems for sorting, grading, washing, drying, weighing, and packaging fruits and vegetables.
- (ii) Storage - Static infrastructure designed with insulated and refrigerated chambers for long term or transient storage of whole fresh, ready-to-retail, or processed forms of perishable products.

²⁹ Also see, Bhosale (2013).

(iii) Cold Storage (Bulk) - Environment controlled warehousing space with multiple chambers intended for the bulk storage of perishable produce. Designed for extended duration storage of produce so as to build an inventory buffer.

(iv) Cold Storage (Hubs): Environment controlled warehousing space with multiple temperature zones which functions as a distribution hub. Designed for short term handling of products so as to serve as a distribution logistics platform for market ready packaged produce and ready to retail products.

(v) Ripening Chambers: As the name suggests, these chambers are used for organically ripening fruits and vegetables.

And, (vi) Reefer Vehicles: These are refrigerated transport vehicles, with an insulated carrier and equipped with active refrigeration, designed for temperature-controlled carriage of perishable products.

In cold chain logistics, cold storage (bulk and hubs) make up about 30%. The remaining 70% comprise pack-houses, storage, ripening chambers and reefer vehicles. According to estimates by the National Centre for Cold Chain Development (NCCD), the Ministry of Agriculture and Farmers Welfare, Government of India, during 2012, there was an additional requirement for cold chain logistics that can accommodate about 40 million metric tonnes of perishable items.

Costs and Benefit Analysis

Data

State-wide data relating to the value of fruits and vegetables produced are sourced from the Ministry of Statistics and Programme Implementation, Government of India.³⁰Data on storage capacity and reefer vehicles are sourced from the NCCD report (2015). Data on the cost of building storage is also sourced from the NCCD report. As per estimates, on a per ton basis, the average cost for building multiproduct storage along with land and other infrastructure is INR 8,255. Further investment would be needed to upgrade technology of existing cold storage facilities, which is estimated at INR 1,755 per ton capacity. To build specialized storage systems, such as controlled atmosphere cold stores, would involve a higher investment cost of INR 31,000 per ton capacity. The estimate for building this specialized storage with land and other ancillary infrastructure would be INR 8255 + INR 1755 = INR 10,010 per ton capacity. These figures are for the year 2012. For subsequent years, we inflate the numbers by 30% which is the total rate of inflation between 2012 and 2017. The cost of ripening

³⁰ For more on this see, "Statewise and item-wise estimates of value of output from agricultural and allied sectors with new base year 2011-2012," Ministry of Statistics and Programme Implementation, Government of India, 2016, page 301.

chambers is estimated at INR 0.5 million per piece. This data is sourced from India Mart.³¹ Agricultural output data and milk production data are sourced from the Agricultural Census 2011-2012 and the National Sample Survey 70th Round, 2013-2014. Costs relating to minimum wage rates are sourced from the Ministry of Finance, the Government of Andhra Pradesh. Macro-level data such as inflation and exchange rates are sourced from World Bank Indicators, World Bank.

Table 6 - Summary statistics

Parameters	Value
Inflation 2013	10.98%
Inflation 2014	6.65%
Inflation 2015	4.90%
Inflation 2016	4.90%
Inflations 2012 to 2017	1.302
Exchange rate INR USD 2012	53.43
Growth rate in Fruits and Vegetables	7%
Growth rate in milk	6%
Cost per ton storage, (INR in 2017 price)	49,200
Land and other infrastructure per ton (INR in 2017 price)	8,838
Upgrade requirement for existing storage facilities (INR in 2017 price)	1,879
Upgrade requirement cost for non-operational facilities (INR in 2017 price)	5,358
Cost per vehicle 30 tons (INR in 2017 price)	3,061,924
Cost per packhouse for 15 MT (INR in 2017 price)	3,479,459
Cost per ripening chamber (INR in 2017 price)	500,000
Cost per employee – Andhra Pradesh (INR in 2017 price)	58,896

Source: Agricultural Census 2011-2012, NSSO 2013-2014, World Bank, and Governments of Andhra Pradesh.

Method

The benefit from having more storage facilities is that fruit and vegetable items will not be wasted. Studies show that the proportion of wastage of vegetables and fruits due to lack of storage is between 5% and 30%. Government data put it at 5%. According to the NCCD study, the extent of loss is 9%. For this study we take an estimate of 18% which is the average of 5 and 30%.³² If 18% of the amount produced can now be saved, we assume this is the benefit from having a proper cold chain

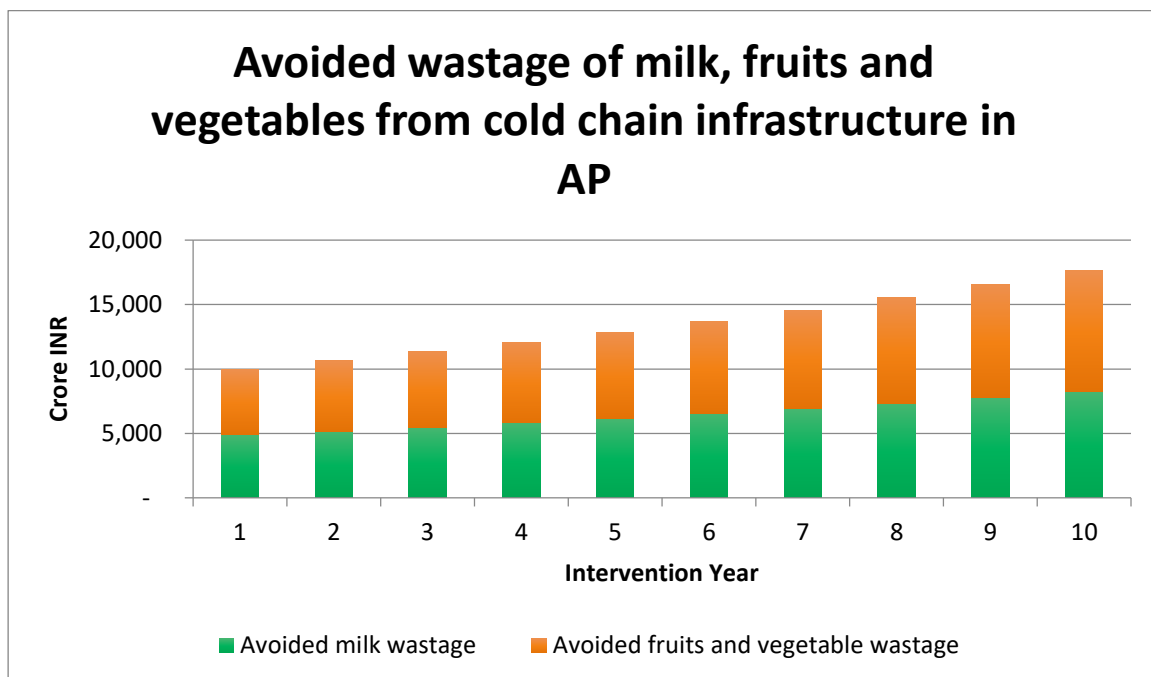
³¹ For more on this see: <https://www.indiamart.com/proddetail/banana-ripening-chambers-7901429155.html>.

³²This estimate about 18% wastage of fruits and vegetables annually resulting from lack of proper cold storage and warehouse facilities is same as what has been reported by the CIPHET study.

management. For milk, data shows the loss can be as high 40% and two-thirds of this loss happens during storage (ASSOCHAM, 2017).³³ Hence, the net benefit for the farmers from accessing cold storage is one-third of 40%, that is 13%. This paper has analysed storage calculations for milk because AP is one of the biggest suppliers of milk in India. Data shows that milk production is growing annually at 7%, whereas for fruits and vegetables the annual growth rate is 6%.

In the first year of this intervention, the total benefit from putting cold chain logistics in place is estimated at INR 997,854 lakh. The value of milk that can be saved by using cold storage represents 48% of the total benefit, and the value of fruits and vegetables that can be saved is 52% of the total benefit. The annual benefit increases by 6-7% per year in line with the expected rate of growth in the horticulture and dairy sectors. The year wise benefits are depicted in Figure 4 below.

Figure 4



For calculating the costs, we assume that there are capital costs associated with building the storage units and that once built they will require some additional costs for maintenance and upgrades. We also include the costs of variable inputs, such as labour, and other running cost, such as electricity and gasoline, which are required to run storage facilities, pack-houses, ripening chambers, and all other constituent elements of cold chain logistics. Similarly, the cost of running reefer vehicles and other

³³ASSOCHAM-MRSS India study noted up to 50% of milk, fruits, veggies, produced in India go waste.

fixed investment are also included. Once we have these numbers relating to the costs and benefit, we can compute the benefit-cost ratio.

Based on NCCD data and our analysis, the current total storage requirement for storing milk, fruits and vegetables stands at 744650 MT. The total number of pack houses required is 4382. The total number of ripening chambers required is 5708. The total number of specialised trucks required for transporting fruits, vegetables and milk is 1312. About 90% of the storage requirement already exists within the state, but the remaining infrastructure needs are almost non-existent. To fill this gap requires a one-off investment of INR 2686 crore, plus additional investments over the following 9 years averaging approximately 20% of this value per year to meet expected growth in the horticulture and dairy sectors.

Additionally, at the outset an additional 1261 employees would be required to run the storage facilities, 9567 employees to run pack houses and ripening chambers, and 3418 workers (including drivers and helpers) to operate the trucks. This requirement increases over the years to meet growth. The average annual workforce costs is INR 146 crore over the 10 years. Lastly, we include operations and maintenance cost of 10% of invested capital which averages INR 518 crore per year.

The year-wise cost breakdown is depicted in Figure 5 below.

Figure 5

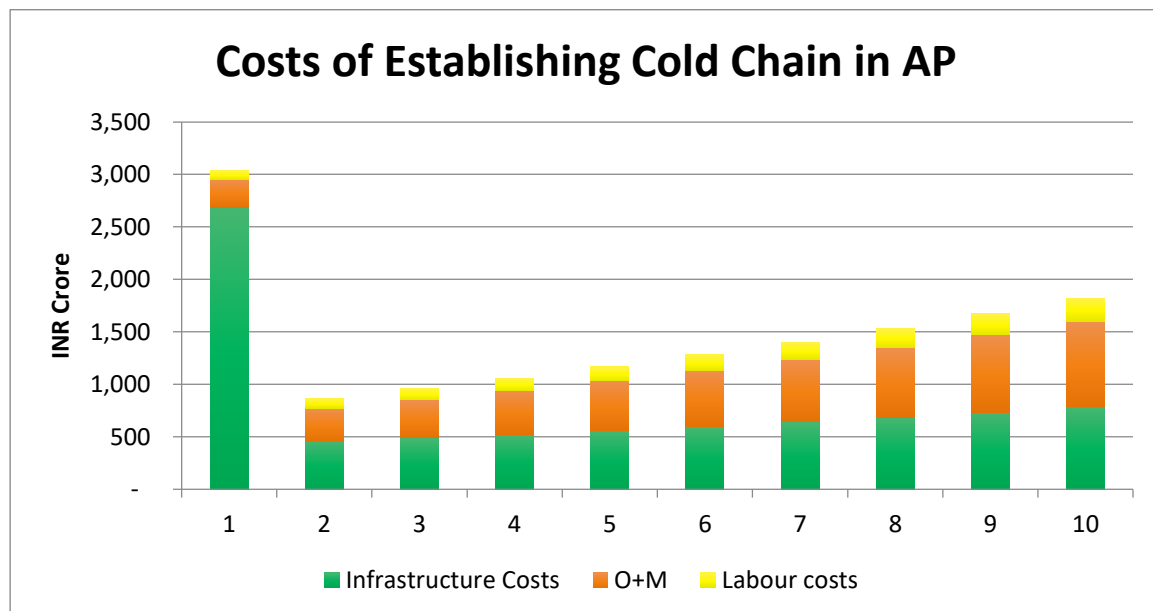


Table 7: Summary of cost benefit results (all figures in INR crore)

Discount	Benefits	Costs	BCR	Net Benefit	Quality of Evidence
3%	113,199	12,654	8.9	100,545	Medium
5%	101,451	11,482	8.8	89,969	Medium
8%	86,884	10,026	8.7	76,858	Medium

Intervention 3: Impact of having local food processing units

Increase in income in India has led to changes in food habits - away from food grains to high calorie produce such as pulses, eggs, fish, meats, and processed food items (dairy and bakery products). At constant prices, between 2004-05 and 2012-13, the Gross State Domestic Product of AP has grown at an average annual rate of around 4%.³⁴ Enhanced income and changing lifestyle have led to increased demand for processed food items. The state is bountiful when it comes to the production of agriculture and livestock. AP ranks second in India in the production of paddy, ground nut and maize. It is one of the leading states in horticulture produce with nearly 2 million hectare with different types of fruit crops. AP ranks first in India in the production of Mango, Papaya, Lemon, Chili, Turmeric, and Tomato. It also ranks first in terms of egg production, and has a strong presence in terms of meat and milk products. During 2015-16, the state stood 2nd in Egg production (1417.67 crores), 4th in Meat production (5.66 lakh Metric Tons) and 5th in Milk production (108.17 Lakh Metric Tons) in the country.³⁵ All these make AP attractive to the food processing industry.

³⁴ In 2014, the new state of Telengana had been carved out of Andhra Pradesh. Hence, to compute growth rate we rely on data until 2013-14.

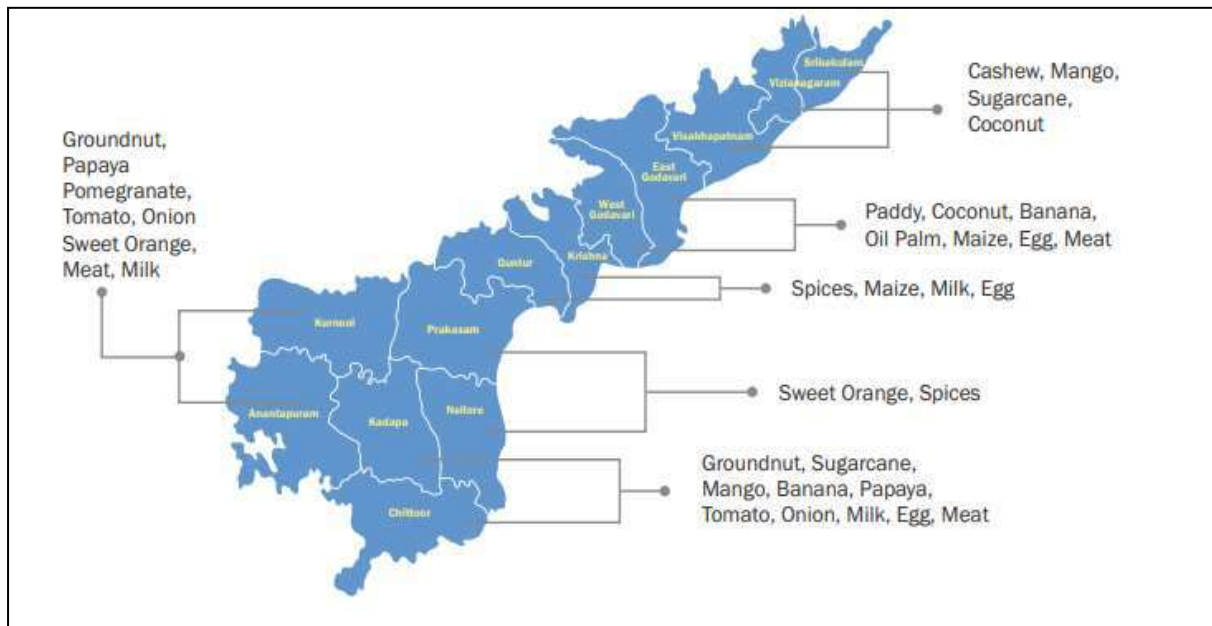
³⁵ Socio economic survey, 2016-2017, Government of Andhra Pradesh. Available at: <http://www.ap.gov.in/wp-content/uploads/2017/03/SOCIO-ECONOMIC-SURVEY-2016-17.pdf>

Table 8: Potential for AP emerging as a Food Processing Hub

Crops	Area (in Million Hectare)	Production (in Million Tons)	Rank in India in terms of Production	% Contribution to India's production
Paddy	2.58	13.91	2	10.9
Groundnut	1.18	1.23	2	12.7
Maize	0.35	5.30	2	21.8
Sugarcane	0.16	15.57	5	4.56
Mango	0.3	2.73	1	14.8
Papaya	0.02	1.55	1	27.4
Lime/Lemon	0.02	0.35	1	21.0
Tomato	0.16	3.36	1	17.9
Cashew	0.08	0.56	2	13.6
Coconut	0.12	1829 millions	3	8.00
Banana	0.09	3.16	3	10.7
Onion	0.05	1.0	6	5.0
Egg	NA	1273 millions	1	32.2
Meat	NA	0.48	2	5.38
Milk	NA	9.08 lakh litre per day	3	7.47

Source: Department of Industries and Commerce, Government of Andhra Pradesh (2015).

Figure 6: District-wise distribution of major crops and livestock



Source: Department of Industries and Commerce, Government of Andhra Pradesh (2015).

Farmers gain from selling processed food items (adding value to the raw produce).³⁶ For example, by-products of paddy are used for manufacturing straw, rice bran oil, flattened rice (poha), and puffed rice. Each one of these items sells at a higher price than paddy. Likewise, only 2% of the fruits and vegetables produced in the state are processed. Processed fruits and vegetable items are in high demand in local and export markets. Milk can be easily processed into ghee and processed cheese.

Food processing can be undertaken by small and marginal farmers with little help from the local gram panchayat (village council). Preserving food using traditional methods can smooth consumption cycle (by increasing their shelf life) especially because there are times of the year when excess production can lead to wastage or shortage in production, caused by lack of adequate rainfall (or, even floods).³⁷ Ability to process food also has an implication on production of livestock. In times of hostile climatic conditions (prolonged dry or winter seasons) crops cannot be grown. There are cases where lack of fodder leads to slaughtering of animals. In these situations stored dry grains or root crops provide energy; dried, salted or smoked meats, or cheeses provide a source of protein, vitamins and minerals; and processed fruits and vegetables such as pickles, chutneys or dried fruits or leaves provide

³⁶The net value added is highest in grain milling is 25% followed by sugars, vegetable oils, fish, edible nuts, feed, starch, fruits and bakery products (Government of Andhra Pradesh, 2015).

³⁷As oppose to local processing units, the modern processing units require higher capital investment. Modern food processing has three major aims which are: (a) To make food safe (microbiologically, chemically), (b) to provide products of the highest quality (flavour, colour, texture), and (c) to make food into forms that are convenient (ease of use) such as edible packaged food items.

vitamins and minerals. Hence, growth of local food processing units can be instrumental increasing income, promoting greater food availability, and reducing post-harvest losses for the small and marginal farmers.

The cost-benefit analysis for this intervention is based on results obtained from two case studies from the neighbouring states in Karnataka and Tamil Nadu. It is assumed that since these 2 states are proximate to AP they will have a similar cost structure and access to technology when it comes to setting up any food processing unit. Accordingly, the benefit cost ratio that we see for Tamil Nadu and Karnataka, will be similar for AP for a 'typical' processing unit. For Tamil Nadu, we looked at turmeric processing. For Karnataka we looked at a paddy processing. It should be noted that throughout the state, local conditions and availability of foods will determine the optimum food processing unit to establish. Nevertheless, the evidence presented below from both India and international studies suggests a likely benefit-to-cost ratio for local food processing of between 1-4.

Case Study 1: An Economic Analysis of Turmeric Production in Tamil Nadu.

Karthik and Amarnath (2014) undertook an economic analysis of turmeric production and processing in Tamil Nadu. They undertook this study in Dharmapuri district in Tamil Nadu, which ranks third in terms of area and production in the state, after Erode and Salem districts. Within Dharmapuri district, Harur, Pappireddipatty, and Morappur blocks were selected based on the area under turmeric production. These three blocks accounted for more than 50% of the area under turmeric production in the Dharmapuri district. Within these three blocks, six villages were selected, and from each village fifteen turmeric growers were selected at random. The total sample size was 90 and the authors used two stage random sampling technique³⁸ to analyse the cost benefit analysis for processed turmeric production.

To estimate the cost and benefit, the authors used stochastic frontier analysis. Farmers are assumed to be rational agents who maximize their production and minimize their costs. The objective is to maximize their profits. However, though every producer may attempt to optimize, not all of them will succeed in their efforts. For example, given the same inputs, and the same technology, some farmers will produce more output than others, that is, they are more efficient than others. Using Stochastic Frontier Analysis methodology, the researchers estimated the efficiency scores of individual producers. Since efficiency scores vary across producers, they can be related to producer

³⁸Samples chosen from pre-existing groups. At first, groups are randomly selected and then individuals in those groups are used for the study.

characteristics such as size, ownership, location, etc., thereby identifying the root causes of inefficiency. Interventions can then be targeted towards improving these inefficiencies.

This study on turmeric processing revealed that planting material, the nitrogen and potash content of the soil, mechanization, and irrigation are important variables which contribute to the yield of turmeric. The coefficients (production elasticity) of planting material, harvesting and curing, and irrigation are significant at 1% level with values 0.321, 0.287 and 0.491, respectively. This implies that a 1% increase in respective input could increase turmeric yield by 0.321, 0.287, and 0.491%, respectively. For an average turmeric production, the mean level of technical efficiency analysis indicates that it is 15.87% lower than the maximum possible attainable using optimum technology. Therefore, it was possible to increase the average turmeric yield by 15.87% by adopting technology used by the best performers. The benefit cost ratio for turmeric powder processing plant documented in the paper is 4.3. The internal Rate of Return was found to be greater than 60%, indicating financial viability.

Case Study 2: Economics of Paddy Processing

Shwetha, et. al., 2011 undertook a study to understand the economic viability of processing paddy into rice and flattened rice (poha), both by conventional and modern rice mill processing units, in Karnataka. The authors chose Davangere district in Karnataka. Davangere district is a leading district in terms of growing paddy and processing it into rice and poha. The district consists of 150 conventional and 215 modern rice mills. In conventional mills, paddy processing is carried out in steel hullers, whereas, other activities such as cleaning, drying, grading, polishing, etc., are carried out manually. In contrast, in modern rice mills, paddy processing is carried out using rubber roll speller, a technology which is more efficient. All other activities, such as grading, polishing, drying, etc., are carried out using machines.

To understand the benefit cost analysis of paddy processing units the authors undertook a primary survey. Data related to the costs and final value of the output (rice and poha) were collected. The data was collected for a period of five years between 2005-2006 and 2009-2010. There are three major components to the processing costs. These are the cost of the interest on fixed and working capital for setting up paddy processing units. The costs of running the rice processing units, such as fuel and power costs. And finally, there are water charges. This study finds that power, fuel, and water charges together account for almost 42% of the total variable cost. The costs associated with salaries and depreciation of buildings ranges between 1 and 2% of the total processing cost of milling rice.

Table 9: Net returns realized by Conventional and Modern Rice Mills (Per Quintal of Paddy Processed;
 Figures in INR)

Particulars	Rice Milling Process		Flattened Rice (Poha) Making Process	
	Conventional Unit	Modern Unit	Conventional Unit	Modern Unit
Gross Returns	1849.50	2104.55	1381.75	1476.75
Cost of Paddy	1437	1521.6	1084.32	1123.4
Processing Cost	126	196	35.3	41.00
Marketing Cost				
a) Rice/Poha	69.80	84.33	56.8	60.40
b) Husk	4.95	10.5	5.12	4.75
c) Bran	3.92	4.48	NA	NA
d) Broken	2.62	4.50	1.70	1.80
e) Total	81.29	103.81	63.62	66.95
Total Cost	1645.50	1821.80	1183.24	1231.35
Net Returns	204.46	282.75	198.5	245.0

Source: Shwetha, et. al., (2011), pp. 334.

In terms of return, one quintal (100 kg) of paddy yields in INR 1849 worth of rice when processed using conventional units, and INR 2104 worth of rice when processed in modern units. Similarly, if one quintal of rice were to be converted into poha, it yields in INR 1381.75 when processed using conventional methods, and INR 1476.75 when processed using modern techniques. The benefit to cost ratio for paddy using conventional processes is 1.28, whereas if processed in modern units the benefit to cost ratio is 1.38. For poha (flattened rice), the benefit cost ratio for conventional units is 1.27 whereas for modern units is 1.31.

International experience from food processing in other developing countries also suggest similar levels of benefit-cost ratio. For example, evidence from the Sweet potato Coalition Project # R8273 undertaken by the Food and Agricultural Organization, United Nations, in three districts (Mukono, Luweero, and Mpigi) of Uganda, finds the benefit cost ratio for processing fresh sweet potato roots to be between 1.5 and 2.1. The corresponding values for processing sweet potato flour are 1.7 and 3.7, whereas, for sweet potato snacks the values are 0.9 and 1.1,. Likewise, examining the case for fish

processing in Nigeria, Ajang et al., 2010, find, processing fish using chorkor oven always yielded higher returns (20%) when compared with returns from fish processed using traditional smoking alter (7.20%).

AP ranks high when it comes to the production of fruit and vegetables, meat and egg, paddy, maize, groundnut and sugarcane. As less than 2% of the produce are processed there exists a huge opportunity for setting up local food processing units. Please note, local food processing units are easy to set-up. At times food can be processed using traditional methods. This is different than modern food processing units requiring higher capital investment. Food processing units not only have the added benefit of giving food grains a longer shelf life, but can also create employment opportunities in rural areas. Overall, the farmers gain as they realize higher prices by selling processed food items. Apart from farming, other sectors such as aquaculture (AP is one of the largest producer of shrimp), livestock, and diary sectors offer opportunities for farmers from AP.

Table 10

Intervention	BCR	Benefits	Costs	Quality of Evidence
Local food processing units	Approximate range of 1.0 – 4.0	Depends on local conditions and type of processing	Depends on local conditions and type of processing	Medium

Conclusion

The results from the analyses suggest that, for intervention 1 (farm loan waiver schemes), the economic cost is higher than the benefit. If the objective of the loan waiver is to help smallest farmers, farm loan waiver schemes do not fulfil that objective. This is because only 15% of smallest farmers have access to institutional credit (formal credit), and loan waivers cater primarily to farmers who have accessed formal loans. Even for those with 2.0 ha or less, roughly 50% of them access formal credit. Moreover, studies have shown that the long-term impact of loan waiver programme results in a fall in agriculture output and a reduction in the amount of formal loans available for small and marginal farmers following the loan bailout period. Also, the costs to the national exchequer result in a higher fiscal deficit. The opportunity cost of investing the same money into other productive purposes, such as electrification of rural areas, building more canals and irrigation facilities, could be high.

This study finds that intervention 2, cold chain infrastructure is a prudent investment. Interventions in cold chain, with the aim of improving post-harvest management, results in economic benefits that far outweigh the economic costs. Improper post-harvest management not only leads to crops and milk being wasted, but also discourages small and marginal farmers from growing these high-value items. These items are in high demand in international markets and among corporations with a large presence in the food processing industry. However, small farmers do not want to venture into growing these perishable items as lack of cold chain management either leads to crop wastage or degraded to a standard which is not acceptable internationally by large corporations.

Intervention 3 is about food processing units. AP is bountiful when it comes to agriculture and livestock. Two case studies suggest that the benefit-cost ratio from setting up food processing units range between 1 and 4 in the Indian context. International experience from food processing units in other developing countries also suggests a similar level of benefit-cost ratio. For example, evidence from the Sweet potato Coalition Project # R8273 undertaken by the Food and Agricultural Organization, United Nations in three districts (Mukono, Luweero, and Mpigi) of Uganda, finds that the benefit cost ratio for processing fresh sweet potato roots is between 1.5 and 2.1. Likewise, examining the case for fish processing in Nigeria, Ajang et al., 2010, find that processing fish using chorkor ovens consistently yielded higher returns (20%) when compared with the returns from fish processed using traditional smoking alter (7.20%).

Summary Table of Interventions

Intervention	Discount Rate	Benefit	Cost	BCR	Quality of Evidence
Farmer loan waiver	3%	25,229	25,476	0.99	Strong
	5%	24,629	24,860	0.99	
	8%	23,787	23,996	0.99	
Cold Chain Infrastructure	3%	113,199	12,654	8.9	Medium
	5%	101,451	11,482	8.8	
	8%	86,884	10,026	8.7	
Establishing local food processing units	3%	Depends on local conditions and foods available	Depends on local conditions and foods available	1-4	Medium
	5%				
	8%				

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Sector Expert Review

Andhra Pradesh Priorities
An India Consensus Prioritization Project

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The paper is concise and well written with supporting data and documentation. Conclusions of the study are on the expected lines.

The paper listed three interventions for analysis i.e. 1. Farm loan waivers, 2. Building additional storage capacity, and 3. Introduction of e-mandi, but finally the analysis is confined to only the first two interventions. The reasons for not analyzing the third intervention are not known.

1.Farm Loan Waivers:

The conclusion that farm loan waiver benefits only small segment of formal institutional credit borrowers and excludes large number of small and marginal farmers who rely on informal credit channels is largely true as revealed by several studies and anecdotal evidence.

Results from the paper indicate that for AP the net benefits of the farmer loan waiver is less than 0, and the benefit-to-cost ratio is less than 1. Farmer loan waivers in AP would create 7bn INR in social losses.

The argument that loan waiver creates a bad environment in the credit market and will lead to a problem of moral hazard where in more productive farmers who can pay-off their loan, willfully default, thereby resulting in lower loan availability during the next cycle is also a strong argument against loan waiver programs. Burden on the exchequer due to loan waiver is real and substantial and this amount can be more fruitfully spent on creating infrastructure, irrigation to build the capacity of farmers to withstand drought conditions and improve the productivity and profitability of production. Despite these arguments the political attraction loan waiver has not diminished over time and is even getting more political fans.

Even if we agree that the intervention of Farm Loan Waiver does not create value for society in AP based on the analysis, this is being contested by the farmers and some social scientists including politicians on the ground that it is the only way to reduce the debt burden in the short run and provide relief to the distressed farmers and enable farmers to further invest

on the land. We often here criticism that debt relief of large sums is given to industry by the government banking system to few irresponsible industrialists without any large distributional impact as in the case of farmers. However, it is politically an attractive proposition as farmers constitute substantial chunk of electorate in this country. So, the justification for farm loan waiver comes largely from politicians and some segments of social scientists whose agenda is promotion of equity. We have witnessed in recent years that despite intellectual arguments against the loan waiver more and more state governments including the BJP ruled states like UP have embraced this program.

Farmers suicides are not just related to crop failures or depressed prices for the produce but due to a host of factors like illness in the family and hospitalization of family members incurring huge expenditure and social pressure to spend on marriages, death ceremonies beyond their means which could not be met from the meagre income from monocrop farming and borrowing from private lenders at exorbitant interest rates. The amount of short-term institutional loans for agriculture exceeds the total cost of inputs including hired labour at an all-India level and in many States. This indicates that a part of crop loans is likely spent on non-agricultural purposes. NSS surveys on Investment and Debt (NSS-I&D) indicate that the loans taken by cultivators from non-institutional sources, which involve high interest rate, is rising faster than from institutional sources.

Declining terms of trade of agriculture vis-a-vis Industry, trade and services sectors is also an important factor in this context.

Studies show that in many cases the suicides are more among cash crop cultivators like cotton which require large investment in the face of low quality seed, vagaries of nature and depressed prices due to market uncertainties. All these factors need to be addressed systemically through the existing institutional structures which is a real challenge.

Suggestions have come from several quarters to remedy the situation. Economists like Dr.C.Rangarajan have suggested interest waiver with rescheduling of loan rather than loan waiver which needs a serious consideration by the policy makers. But this may not be the most popular idea for politicians.

A more sustainable relief can be provided by developing crop mortgage instruments and extending concessional credit and by developing efficient storage systems and cold chain facilities. Another important area neglected so far is the development of comprehensive crop/agricultural insurance market. Currently agricultural insurance is limited in India. Instruments of insurance are also limited. More diversified insurance products need to be developed and introduced to suit the varied needs of the farmers. Further considering the small size of majority farm holdings in India the only way to sustain the farming is by diversifying the sources of farmers income by promoting non-crop alternatives like animal husbandry, fisheries and horticulture which can provide stability and sustainability of farm incomes. Low input organic farming which is now being encouraged widely is another important option as studies have shown that in organic farming the cost of production is low, variability in production is less and prices are higher than inorganic production.

While in the formal sector, there is always limited liability on the entrepreneur, in agriculture, farmers face unlimited liability. Farmers need credit products that they are at least partially exempt from repaying whenever there are disasters and losses.

NITI Aayog (December 2015) has also made several suggestions that are worth considering. Apart from efforts to increase yields, the framework for land leasing can be strengthened, which will not only allow consolidation, but will also give an opportunity to unwilling farmers to exit the sector. It also highlighted the idea of price deficiency payment. If the price of a crop falls below a predetermined threshold level, farmers can be compensated through cash transfers. Adequate safeguards need to be built in order to protect farmers against both production and price risks. Cooperatives can also be encouraged; these will help reduce risk and transaction costs.

In the longer run, strengthening the repayment capacity of the farmers by improving and stabilizing their income by raising income from agricultural activities and enhancing access to non-farm sources of income. Improved technology, expansion of irrigation coverage, and crop diversification towards high-value crops are appropriate measures for raising productivity and farmers' income

Intervention 2: Building more Storage Facilities

The conclusions from the analysis of intervention of building more storage facilities are also indisputable. Realizing the importance of storage and cold chain logistics the Government has made several policy initiatives from time to time. Encouraging private investment with incentives is one such important measure. However, the results have been slow and inadequate to meet the needs of the farm sector. Access to modern storage and transport is limited to large and medium sized farmers with small and marginal farmers largely left out from the system resulting in low price realization by small and marginal farmers. Minimum support prices(MSP), and cooperative farming and off late farmers producers organizations targeted largely to help small and marginal farmers have not been able to provide relief to large number of small and marginal farmers.

These smallholder farmers do not have access to cold storage and reefer vehicles due to high cost and low availability in many places. Moreover, these facilities are suitable only for horticulture and animal husbandry products whereas bulk of the small and marginal farmers grow only low value crops like cereals, pulses, cotton, jowar which are not generally stored as the cost of storage in the total value realization will be very high hence not economically viable.

The solutions for this problem are known but not implemented in the past due to institutional constraints and inadequate investments and extension services. Cooperative farming is tried out in many areas but has been successful only in a few states like Maharashtra and Gujarat that too in a few subsectors like sugar, milk etc. Off late Farmers Producers organizations have been given importance to improve the productivity and realize better prices for small and medium farmers. But here also the results are mixed with better organized FPOs are able to reap the benefits while large number of them are facing several financial, management and other organizational issues. These are to be addressed in the systematic and sustained manner.

This report is a useful step to understand the cost benefit analysis for specific interventions in different States. However, it needs to be interpreted with caution considering the presence of private sector and quality assured diagnosis / treatment, the socio economic profile of the population, the health seeking behavior, the capacity of the public health system for intensified case finding activities in urban slums / vulnerable population, etc.

Even after twenty five years of being declared a global health emergency, TB continues to be a major public health challenge, particularly in India. According to the Global TB Report 2017, out of the global 104 lakh new cases per year, 28 lakh are from India, i.e., we account for one-fourth of the global burden of tuberculosis. Tuberculosis is one of the leading causes of deaths worldwide, with India accounting for 4.2 lakhs out of the 17 lakhs deaths occurring globally due to TB. In India, TB causes more deaths than any other infectious disease, including both HIV and Malaria.

Resistance to conventionally used anti-TB drugs has also emerged as an enormous public health challenge with an estimated 1,47,000 cases of DR-TB occurring annually out of the notified cases of pulmonary TB in India. India currently has the highest burden of both TB and DR TB and second highest of HIV associated TB, according to estimates reported in Global TB Report 2017. Based on the first National Drug Resistance Survey (2014-16) approximately 3% among new TB cases and 12 - 17% among previously-treated TB cases have DR-TB. An estimated 87,000 HIV associated TB occurred in 2015 and 12,000 estimated number of patients died among them.

To fight this massive public health problem, the Government of India (GoI) launched the National TB Programme in 1962. After pilot testing recommendations from an expert committee, a full-fledged Revised National TB Control Programme was started in 1997 using the Directly Observed Treatment Short-course chemotherapy (DOTS), which was fully established by 2006. In 2007, GoI introduced the Programmatic Management of Drug Resistant TB (PMDT) to combat drug resistance and achieved full geographical coverage by 2013.

The program has come a long way since then and has undergone major changes over the past few years. Much effort is being made to make the program more patient-centric and provide comprehensive treatment care and support.

- The Technical and Operational Guidelines were updated in 2016 which gives a comprehensive picture for case finding, diagnosis, treatment and care for Tuberculosis under RNTCP.
- Daily regimen through fixed dose drug combinations (FDCs) to reduce the pill burden, enhance patient autonomy and adherence without compromising on the effectiveness of treatment.
- To enhance adherence to treatment, the TB program has adopted digital technology in the form of ICT enabled patient centric adherence support called 99DOTS. It is an innovation that seeks to address issues of adherence by using basic mobile phones and augmented packaging for medication. This has further increased patients' control over their treatment and has advanced patient rights and autonomy.
- To improve case finding and 'Reaching the Unreached', the country has undertaken Active Case Finding (ACF) over three phases in 378 districts, wherein high risk and vulnerable populations were screened for TB. Through this effort, more than 25,000 additional TB patients were diagnosed.
- Provision of incentives for nutrition for all TB patients through Direct Beneficiary Transfer (DBT).
- Provision of incentives to private practitioners as well as chemists to notify tuberculosis patients to the RNTCP.
- Interdepartmental linkages through 'single window care' for TB-HIV co-ordination is in place, with all diagnosed TB patients being referred for HIV testing and all People Living with HIV/AIDS (PLHIV) being screened for tuberculosis.
- Cross referral and Linkages with the National Tobacco Control Programme (NTCP) and National Programme for prevention of Cancer, Diabetes, Cardiovascular disease and Stroke (NPCDCS) have been established.

- Public private linkages are being enhanced which may help us to extend our diagnostic, treatment and patient support services even to patients seeking care in the private sector.
- To ensure early case detection and initiation of treatment for drug resistant TB, 1135 CBNAAT machines have been put in place. These rapid molecular diagnostics have revolutionized the programmatic landscape and have enabled the Revised National TB Control Programme to decentralize Universal Drug Susceptibility (U-DST) testing services.
- The PMDT Guidelines have been revised to adopt a new and more robust diagnostic algorithm that will help in early detection and treatment initiation of DR-TB.
- To aid early detection of drug resistant TB, Universal DST (U-DST) is being implemented across India, wherein all diagnosed TB patients are being offered CBNAAT testing to detect Rifampicin resistance, at the very outset of their treatment.
- To strengthen monitoring the program has introduced web based case management system called “Nikshay” through which data access and analysis have both been made easier. Nikshay Aushadhi has been introduced to strengthen the procurement and supply chain.

These new adoptions are crucial to tackle the crisis of tuberculosis and help attain the ambitious goal to End TB, as envisaged in the National Strategic Plan (2017-2025).

As a new state, Andhra Pradesh faces a bright future, but it is still experiencing many acute social and economic development challenges. It has made great strides in creating a positive environment for business, and was recently ranked 2nd in India for ease of doing business. Yet, progress needs to be much faster if it is to achieve its ambitions of becoming the leading state in India in terms of social development and economic growth. With limited resources and time, it is crucial that focus is informed by what will do the most good for each rupee spent. The Andhra Pradesh Priorities project as part of the larger India Consensus – a partnership between Tata Trusts and the Copenhagen Consensus Center, will work with stakeholders across the state to identify, analyze, rank and disseminate the best solutions for the state. We will engage people and institutions from all parts of society, through newspapers, radio and TV, along with NGOs, decision makers, sector experts and businesses to propose the most relevant solutions to these challenges. We will commission some of the best economists in India, Andhra Pradesh, and the world to calculate the social, environmental and economic costs and benefits of these proposals



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Copenhagen Consensus Center is a think tank that investigates and publishes the best policies and investment opportunities based on social good (measured in dollars, but also incorporating e.g. welfare, health and environmental protection) for every dollar spent. The Copenhagen Consensus was conceived to address a fundamental, but overlooked topic in international development: In a world with limited budgets and attention spans, we need to find effective ways to do the most good for the most people. The Copenhagen Consensus works with 300+ of the world's top economists including 7 Nobel Laureates to prioritize solutions to the world's biggest problems, on the basis of data and cost-benefit analysis.