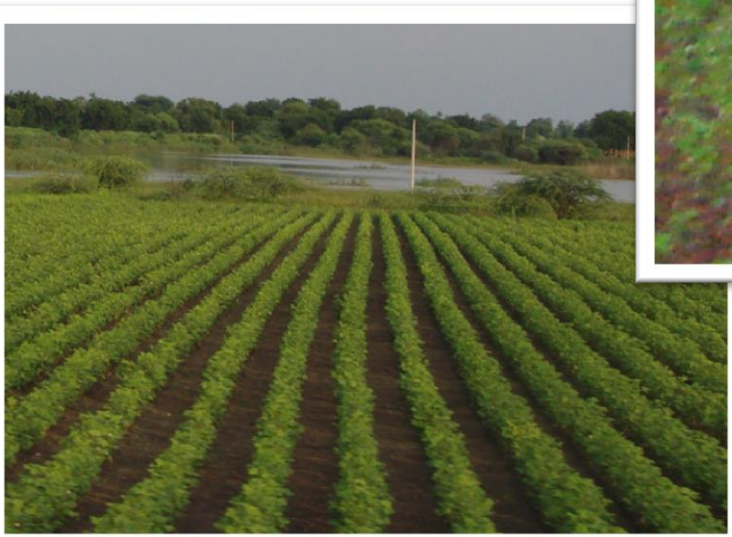
Scenario Planning for Indian Agriculture

Sample slides only



Disclaimer

This report has been prepared by International Market Assessment India Private Limited (IMA India). It provides an analysis of the agricultural sector in India with the intent of developing alternate scenarios over a 10-year horizon and gauging the implications of these scenarios for agri-business companies in India.

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Preface

- IMA India's report on Agriculture Scenarios seeks to provide an understanding of the long-term future of Indian agriculture, with the objective of enabling agri-businesses to refine long-term business strategy.
- This report is based on extensive analysis covering *nine major crops/categories* i.e. rice, wheat, pulses, maize, fruits & nuts, vegetables, sugarcane, cotton and oilseeds. Major parameters such as acreages, yields, production, cropping intensity, cropping patterns, irrigation availability, input usage, etc, have been examined at a *state/regional level*.
- Desk-oriented analysis has been supplemented with wide-ranging interviews with various stakeholders – Government officials, industry practitioners, researchers and academicians – to obtain qualitative insights and brainstorm on plausible future outcomes.

Methodology for scenario planning

The Agricultural scenario planning process is based on the following five steps:

1. ***Identification of determinants of agriculture market outcomes*** - an intensive exercise to identify all the factors that can or will influence the agriculture sector directly or indirectly. The intent of this step is to identify factors as exhaustively as possible, staying aware that relatively less important factors today may become highly important in the future, and vice versa. Further, for each driver, it is necessary to identify the sub-drivers (causative factors). This is a crucial element in being able to identify unconventional or unfamiliar market drivers, which can have an impact in the future.
2. ***Assess each determinant for 'uncertainty' and 'importance' –*** this step involves an in-depth analysis of each driver to understand firstly, its uncertainty over the long term; and secondly, its importance to outcomes in the long term. This report contains detailed assessment of over 50 drivers that are both 'uncertain' and 'important.'
3. ***Identification of the two most uncertain and most important (but independent) industry drivers –*** this step entails identification of the emerging themes based on the driver assessment of the previous step. These are common underlying 'forces' that impact multiple outcomes. Eventually, these are collapsed into the two most important and most uncertain independent forces which will shape the future of agriculture in the next 10 years. These forces may not necessarily be direct drivers of the agriculture market; they are typically more fundamental and wide-ranging in their scope, but have a critical impact on agricultural outcomes.

Methodology for scenario planning…cont'd

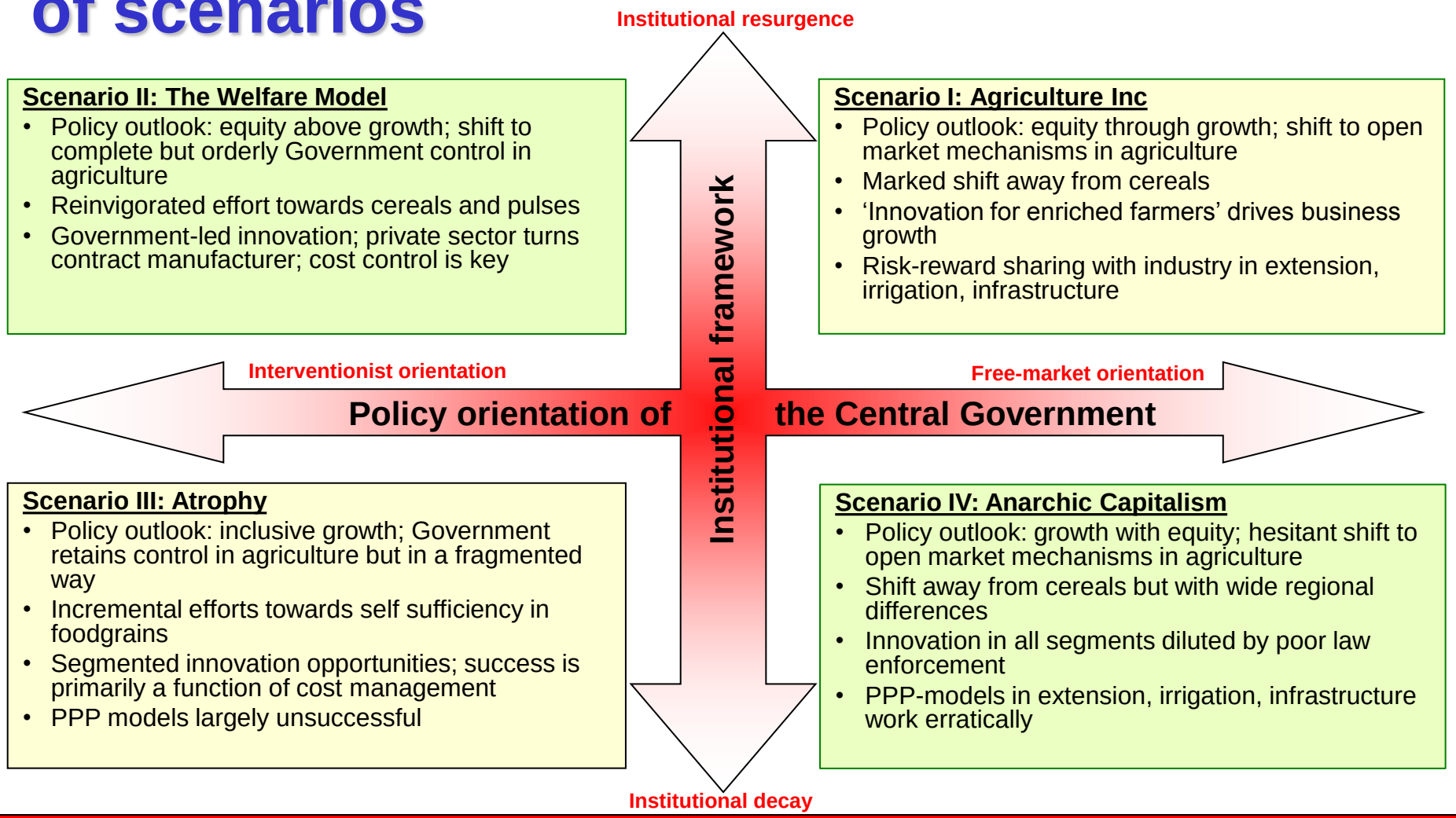
4. ***Build market stories for each scenario -*** this step creates a logically and internally consistent 'agriculture in 2020' story based on the assumptions of each scenario. Each scenario description contains qualitative descriptions supported with data-oriented analysis for the key drivers that were assessed in step 2. It also extends the logical analysis of earlier stages to answer near-term and long-term strategic questions that will enable business to better grasp the changes required to proactively respond to a dynamic operating environment. However, each of the scenarios require continuous tracking through the use of signposts

5. ***Identification of actionable signposts to guide future planning -*** in this step, the path that the major forces will adopt, is methodically plotted for each scenario i.e. what events, trends and developments will lead to a given scenario. This has been classified into four categories – 'Political timeline', 'Policy timeline', 'Institutional timeline', and 'Economy and industry timeline'.

Executive Summary

- Assessment of key drivers (steps 1 and 2) that influence the outcomes of the agriculture sector reveals five dominating themes (manifested through ~250 drivers) that have an all-pervading influence on agricultural outcomes: market forces, policy actions or decisions, farmer awareness, technology availability and dissemination, and natural factors.
- The two most suitable forces that determine the development of these themes are "**Government policy/action**" and "**the strength of the institutional framework**". Being critically important, highly uncertain and independent of each other, these two forces have been selected as the two scenario axes (step 3).
- The resultant four scenarios have the following key characteristics:
  - ***Scenario I (Agriculture Inc.)***: strategic process of dismantling state controls and enabling market forces to play out; strong institutions that ensure transparent and consistent outcomes; dramatically high and sustainable agricultural growth.
  - ***Scenario II (The welfare model)***: disillusionment with the status quo (or a serious nationwide crisis) drives a fierce process of rejuvenating the agriculture sector through state intervention; market forces are contained within narrow boundaries; strong institutions 'carry out the will of the Government' and ensure that farmer welfare is prioritised above all else.
  - ***Scenario III (Atrophy)***: continues with the historical status quo; the Government plodders on and does 'just enough' to prevent disaster or a complete break down; lethargy in reforming institutions and hence, outcomes remain incremental and uncertain; Businesses are forced to find opportunities where they can.
  - ***Scenario IV (Anarchic capitalism)***: forced liberalisation out of desperation rather than enlightenment, triggered by frequent or localised shocks and convenient political circumstances; several opportunities are unleashed, but characterised by lack of a cohesive and long term approach and weak institutions

Executive summary: Operating paradigm of scenarios



Scenario II: The Welfare Model

- Policy outlook: equity above growth; shift to complete but orderly Government control in agriculture
- Reinvigorated effort towards cereals and pulses
- Government-led innovation; private sector turns contract manufacturer; cost control is key

Scenario I: Agriculture Inc

- Policy outlook: equity through growth; shift to open market mechanisms in agriculture
- Marked shift away from cereals
- 'Innovation for enriched farmers' drives business growth
- Risk-reward sharing with industry in extension, irrigation, infrastructure

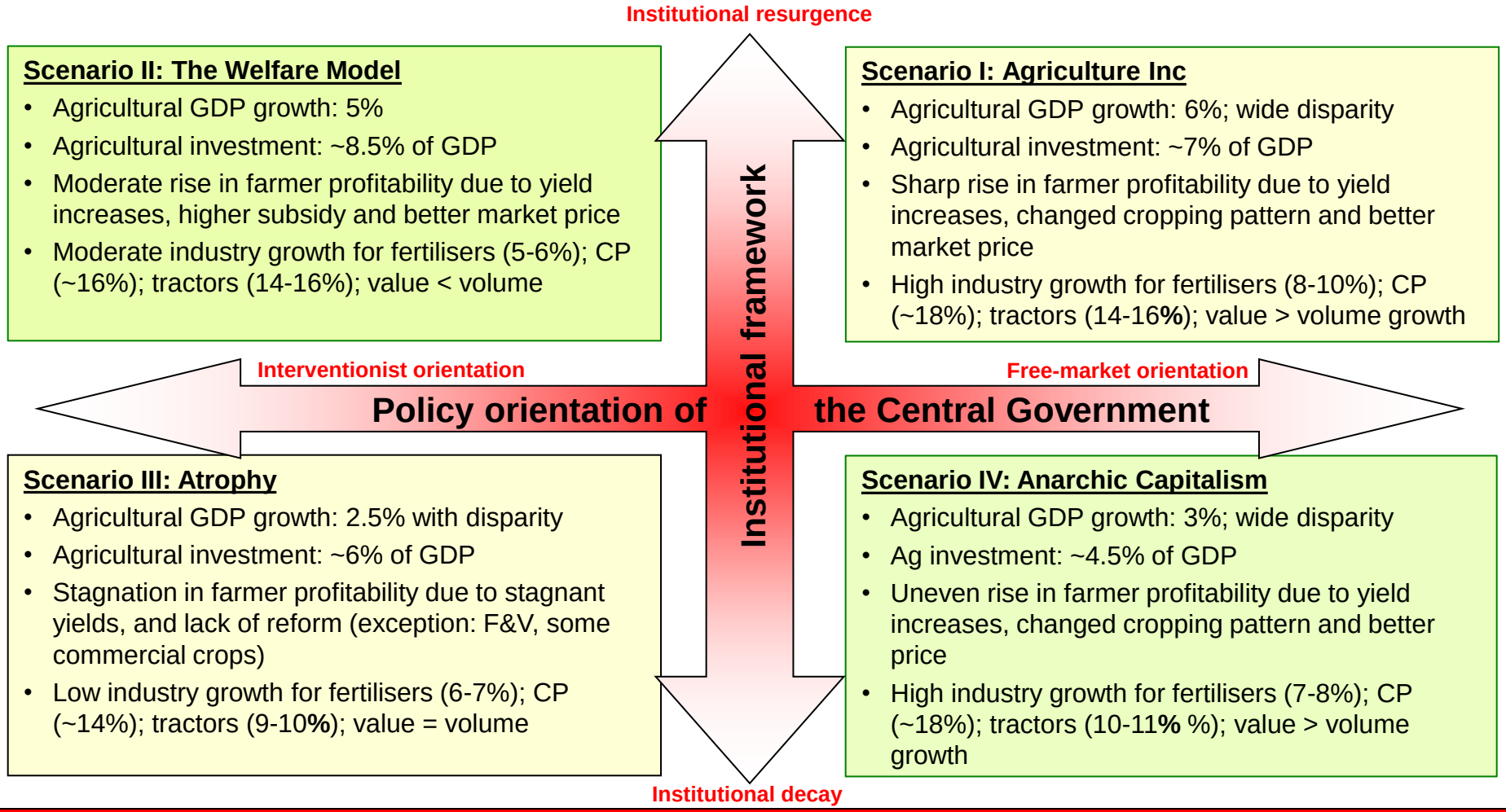
Scenario III: Atrophy

- Policy outlook: inclusive growth; Government retains control in agriculture but in a fragmented way
- Incremental efforts towards self sufficiency in foodgrains
- Segmented innovation opportunities; success is primarily a function of cost management
- PPP models largely unsuccessful

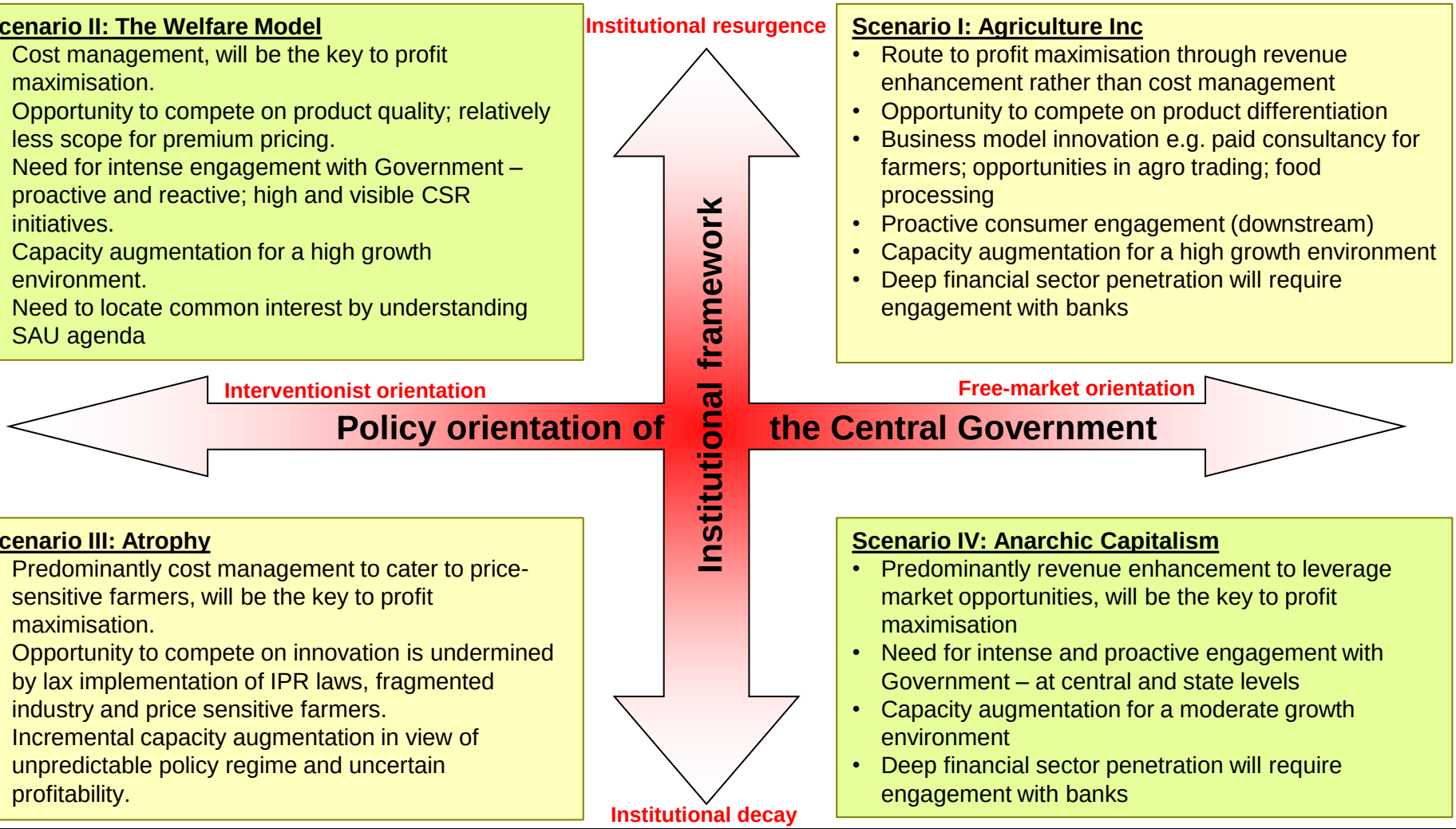
Scenario IV: Anarchic Capitalism

- Policy outlook: growth with equity; hesitant shift to open market mechanisms in agriculture
- Shift away from cereals but with wide regional differences
- Innovation in all segments diluted by poor law enforcement
- PPP-models in extension, irrigation, infrastructure work erratically

Executive summary: Agricultural performance in the scenarios



Executive summary: Strategy implications



Scenario II: The Welfare Model

- Cost management, will be the key to profit maximisation.
- Opportunity to compete on product quality; relatively less scope for premium pricing.
- Need for intense engagement with Government – proactive and reactive; high and visible CSR initiatives.
- Capacity augmentation for a high growth environment.
- Need to locate common interest by understanding SAU agenda

Scenario I: Agriculture Inc

- Route to profit maximisation through revenue enhancement rather than cost management
- Opportunity to compete on product differentiation
- Business model innovation e.g. paid consultancy for farmers; opportunities in agro trading; food processing
- Proactive consumer engagement (downstream)
- Capacity augmentation for a high growth environment
- Deep financial sector penetration will require engagement with banks

Scenario III: Atrophy

- Predominantly cost management to cater to price-sensitive farmers, will be the key to profit maximisation.
- Opportunity to compete on innovation is undermined by lax implementation of IPR laws, fragmented industry and price sensitive farmers.
- Incremental capacity augmentation in view of unpredictable policy regime and uncertain profitability.

Scenario IV: Anarchic Capitalism

- Predominantly revenue enhancement to leverage market opportunities, will be the key to profit maximisation
- Need for intense and proactive engagement with Government – at central and state levels
- Capacity augmentation for a moderate growth environment
- Deep financial sector penetration will require engagement with banks

Contents

1. Driver identification

Over 250 drivers have been identified under four main drivers that directly or indirectly influence agricultural outcomes. See attached Excel sheet for details.

2. Assessment of drivers and Government programmes

Important and uncertain drivers

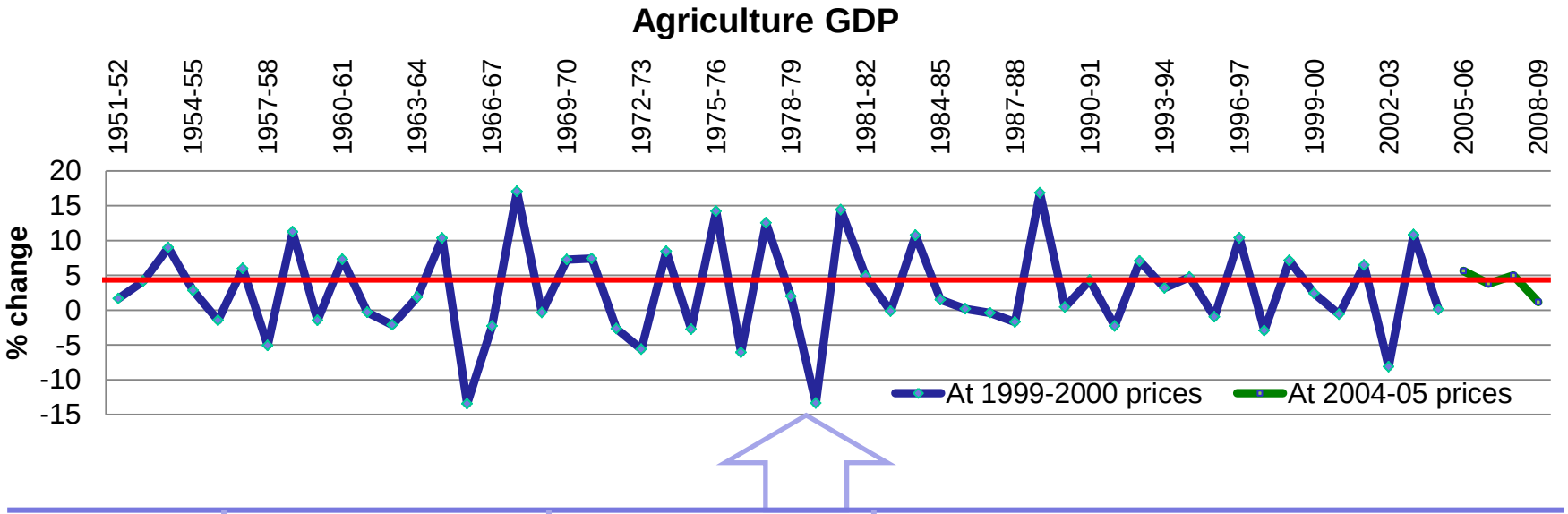
- The purpose of the Scenario Planning exercise is to focus on those drivers that are 'important' (i.e. have a significant bearing on agricultural outcomes) and those that are 'uncertain' (i.e. their past behaviour has been erratic/unpredictable or there is reason to believe that their future behaviour will be erratic/unpredictable)
- The importance and uncertainty assessments are based on trend analysis and expert opinions
- Importance is assessed by examining the nature and strength of the relationship between each driver and its parent – in some cases, this is done through quantitative evidence while in others, it is based on opinions and judgment
  - Note that, if a driver is considered unimportant, then all its sub-drivers are, by definition, unimportant too (see Excel sheet for more details)

Important and uncertain drivers (cont'd)

- Uncertainty is assessed by examining the past trend of each driver (quantitative or qualitative) to determine unpredictability in behaviour; this is complemented with a forward looking assessment with respect to its potential future behaviour
  - In the Excel sheet, a simple scoring methodology has been adopted to rate each driver's past and future uncertainty and the average value has been used as its overall score – drivers with a score >5 are considered uncertain (see Excel sheet for more details)
- Based on this methodology, 156 drivers were identified as 'important' in IMA India's opinion. Of these, ~56 drivers were considered uncertain.
- This section contains the detailed analysis for these drivers
- The identification of underlying themes and fundamental forces (see section 3 of the report) is based on these important and uncertain drivers

The main drivers of Indian agriculture

The growth rate of Indian agriculture has been consistently irregular, often registering negative growth. According to the Planning Commission, an annual 4% growth in the agriculture sector is essential during the Eleventh Five Year Plan (2007-12) to sustain the overall economic growth rate of 9% 'without undue inflation'. The two remaining years of the current plan period requires 7% growth to be able to meet the target.

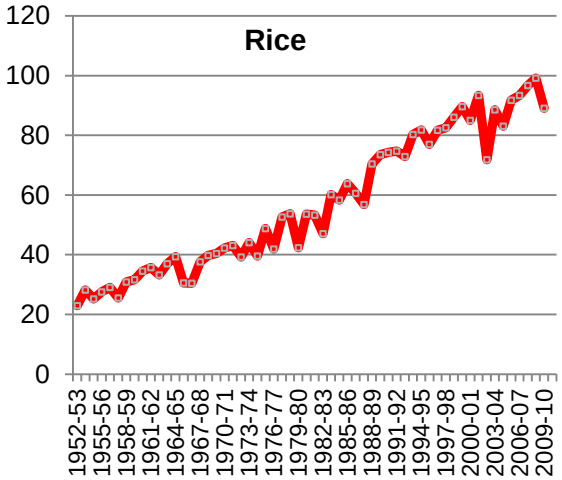


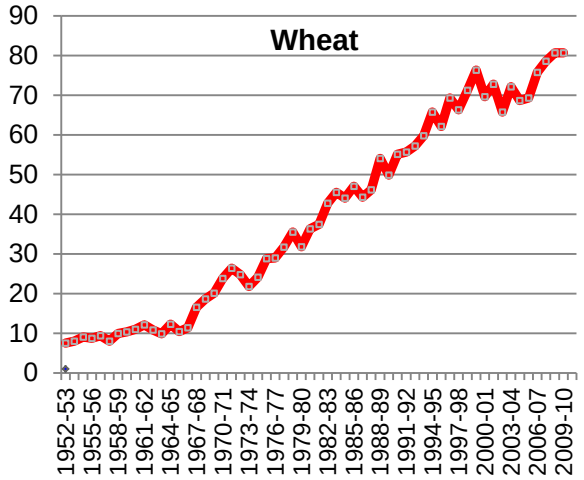
Main drivers	1. Production	2. Post-harvest losses	3. Cropping pattern	4. Natural resources (quality & quantity)
Rationale	*Growth of agriculture is directly determined by the quantum of production*	*Loss of crops after production reduces the value of the produce as well as its availability*	*Besides the volume of produce, value of the produce is determined by the crops chosen for cultivation*	*The environmental factors determine the extent of usage of natural resources, and hence sustainability of Indian agriculture*

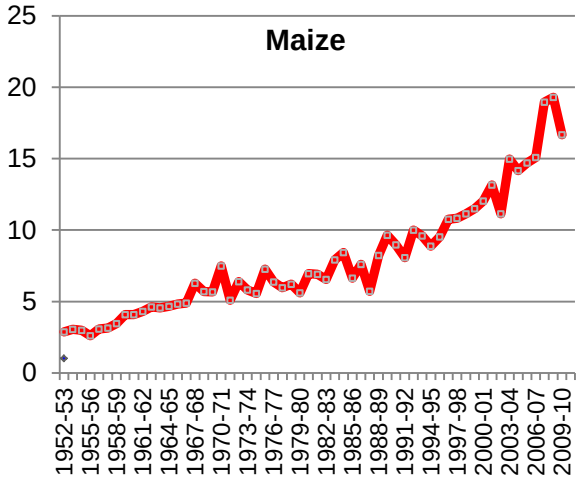
Source: CSO

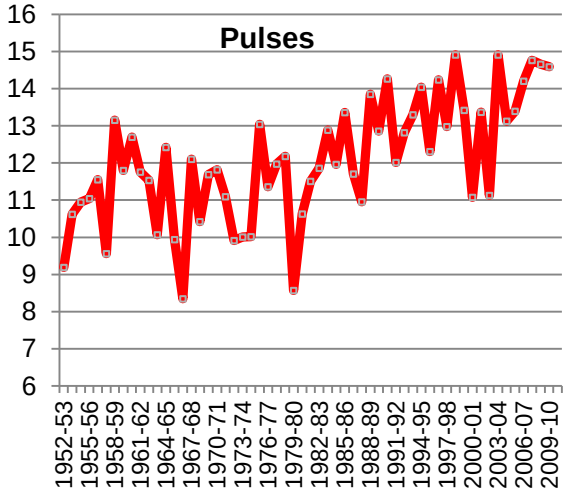
1.A. Main driver 1 - Production

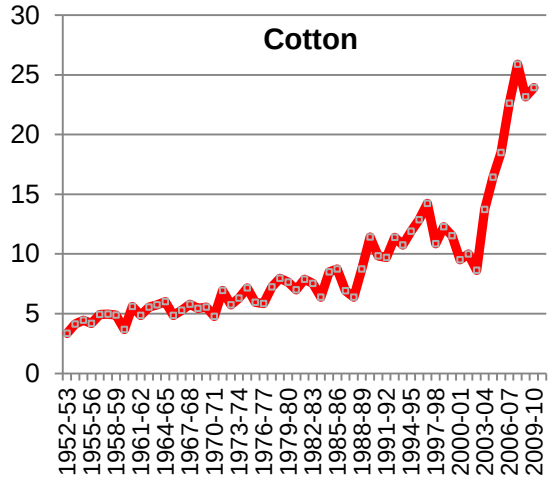
Trend in production of key crops









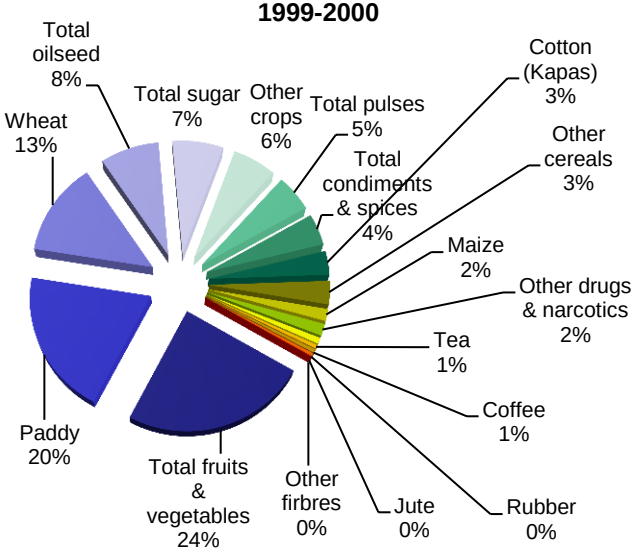


Production of key food crops, such as rice and wheat, has increased over the past decades although the growth is no longer consistent. Production of pulses has shown significant variability throughout, while maize and cotton have registered a sharp increase in production over the past few years, driven by new seed technologies. Taken as a whole, quantum of production has significant year to year variation, and hence, constitutes a key uncertainty.

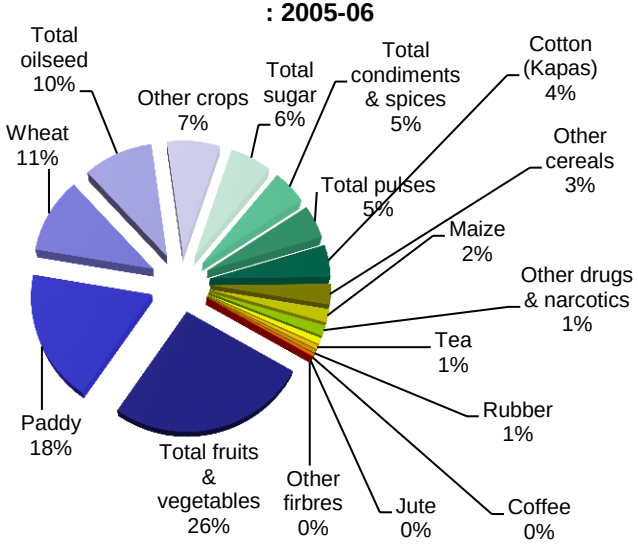
Note: All figures in million tonnes; 2009-10 figures are advanced estimates

Share of commercial crops in output value has increased

Share of each crop in total output value: 1999-2000

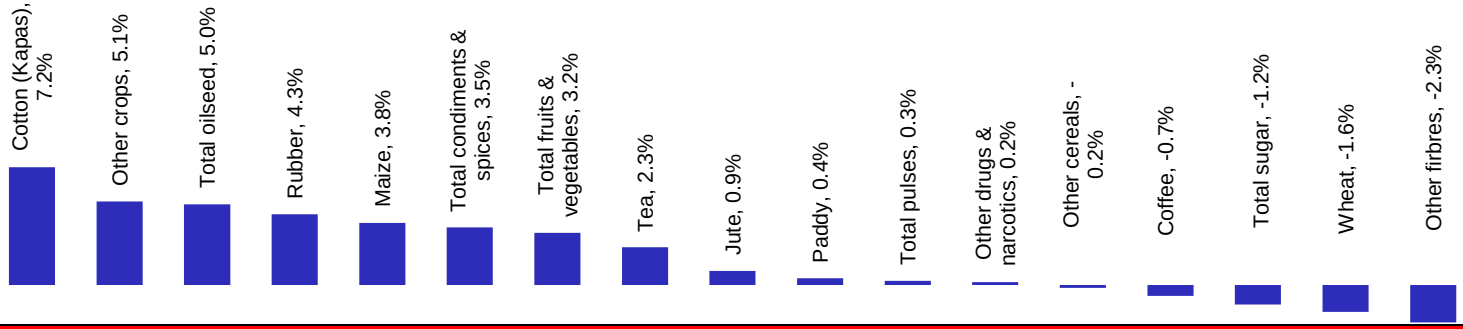


Share of each crop in total output value : 2005-06



Fruits & vegetables have the highest share of value in the total crop output basket in Indian agriculture, followed by rice and wheat. However, value of commercial crops such as cotton, oilseeds, spices and rubber has increased faster compared to food crops. Total value of wheat produced has in fact declined between 1999-2000.

Growth* in output value of crops between 1999-00 and 2005-06

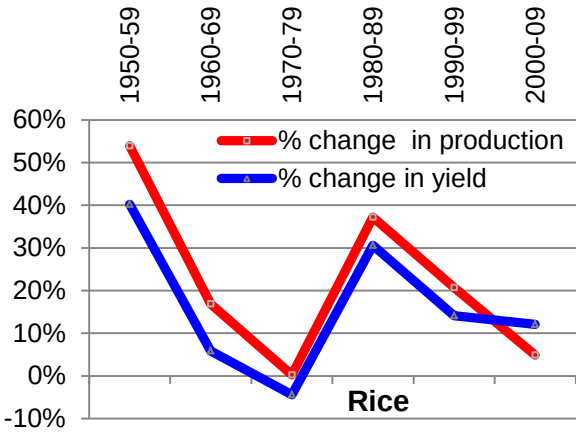


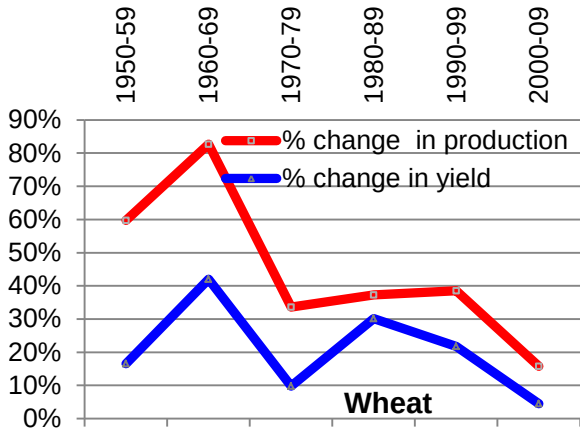
* Compound annual growth rate

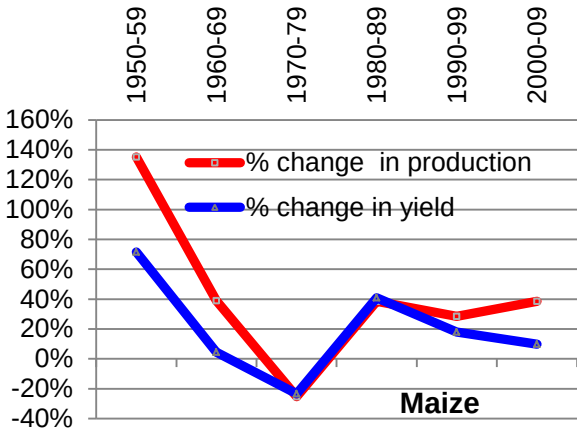
Source: Planning Commission

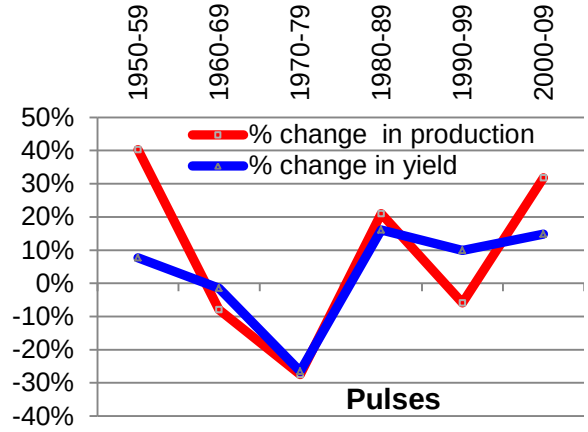
1.A.1. Sub-driver of production: Yield

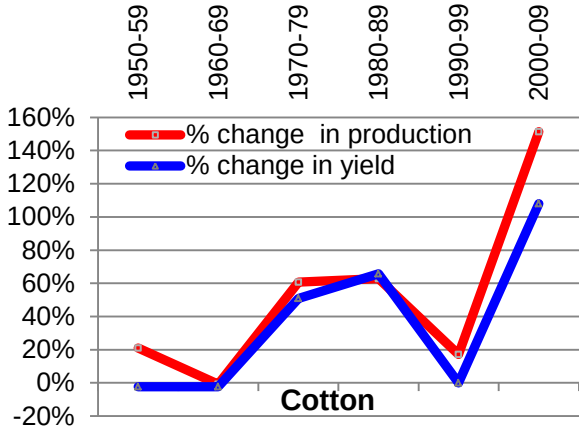
Impact of yield on production









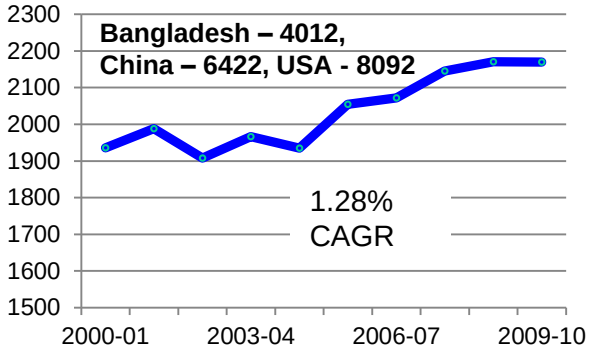


Production levels show the same pattern of variation as that of yield, for all crops. This shows the strong impact of productivity of crops on production levels. At the same time, the variability in yields indicates the uncertainty associated with this driver.

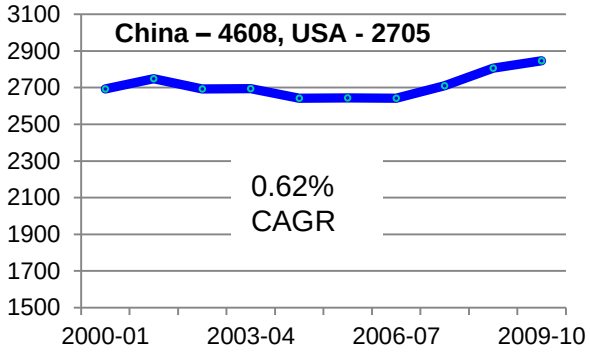
Source: Department of Agriculture & Cooperation; IMA analysis

Yield of major crops

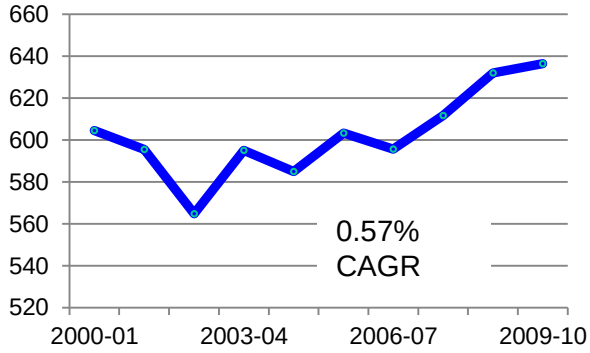
Rice yield (kg/Ha)



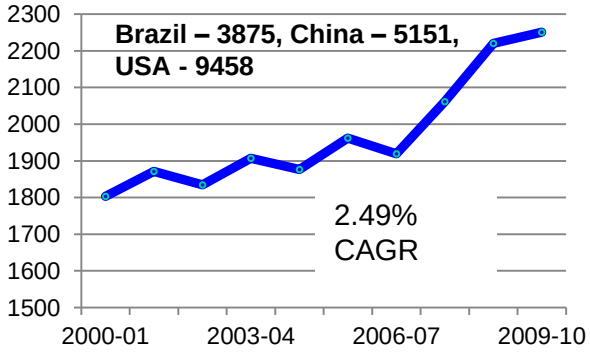
Wheat yield (kg/Ha)



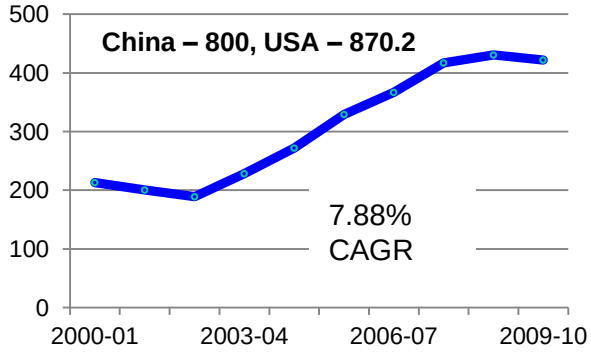
Total pulses yield (kg/Ha)



Maize yield (kg/Ha)



Cotton yield (kg/Ha)

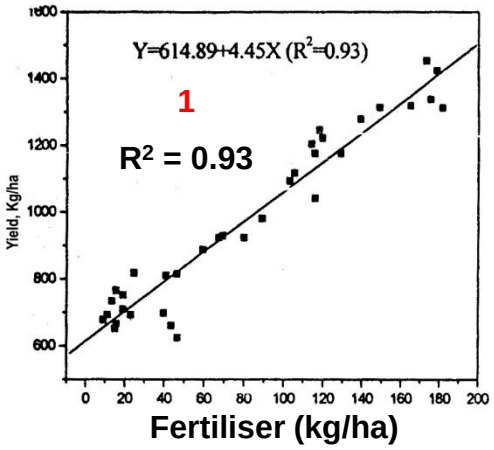


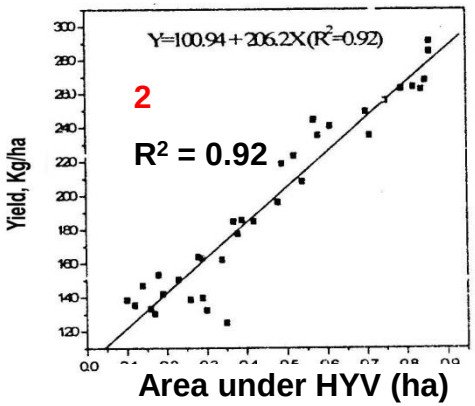
While yield of foodgrains has shown only incremental increase in the last decade, that of commercial crops has increased significantly. While Government efforts are underway to address the stagnation in foodgrain yields, their effectiveness is uncertain. This makes “crop yields” an uncertain driver.

Note: Yield figures are presented on a 3 year rolling average basis

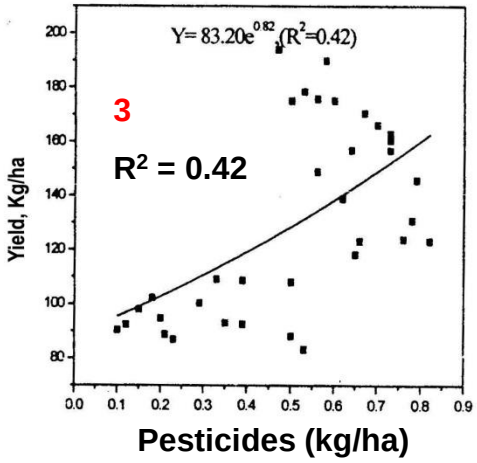
Key drivers of yield

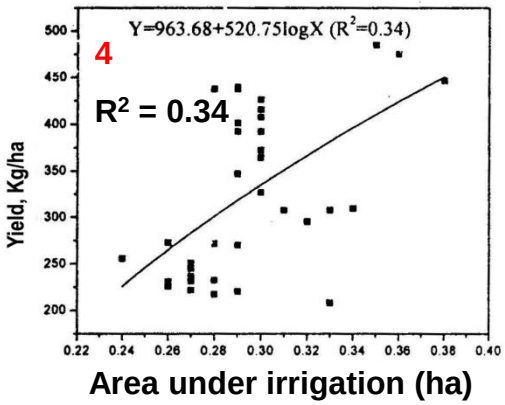
Inputs - fertiliser, pesticide, water and improved seeds – play a critical role in improving the yield of crops, and are therefore, important drivers.





Fertiliser usage and HYV adoption impact yields significantly for foodgrains. Each of these drivers is therefore important for end outcomes.

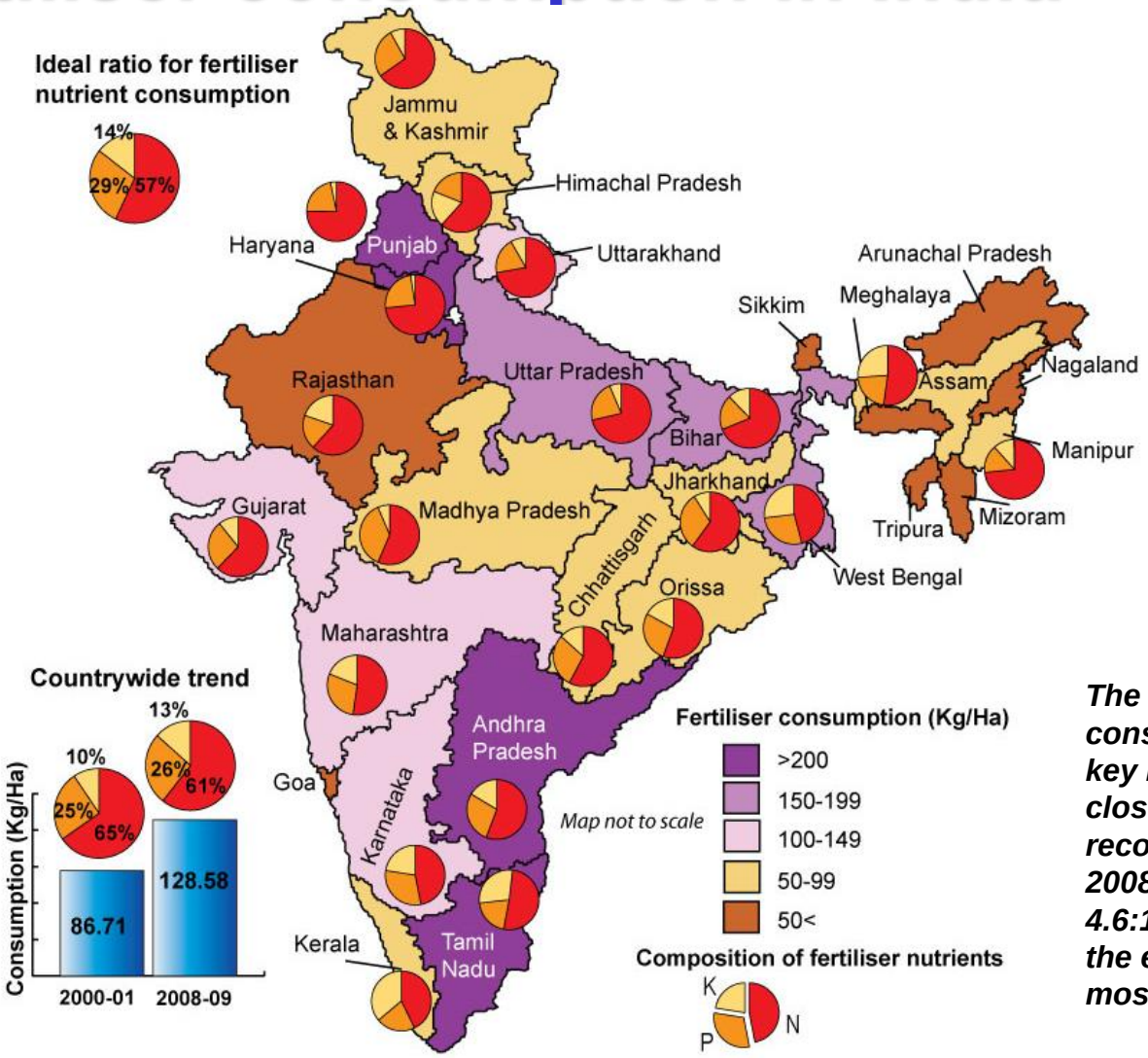




Note: Data pertains to regression analysis carried out for food grain crops. The **R^2** values are significant at 95% confidence interval. The data indicates that fertiliser usage has the highest impact in explaining variance in yields, followed by area under HYV; followed by pesticide usage; followed by irrigated area.

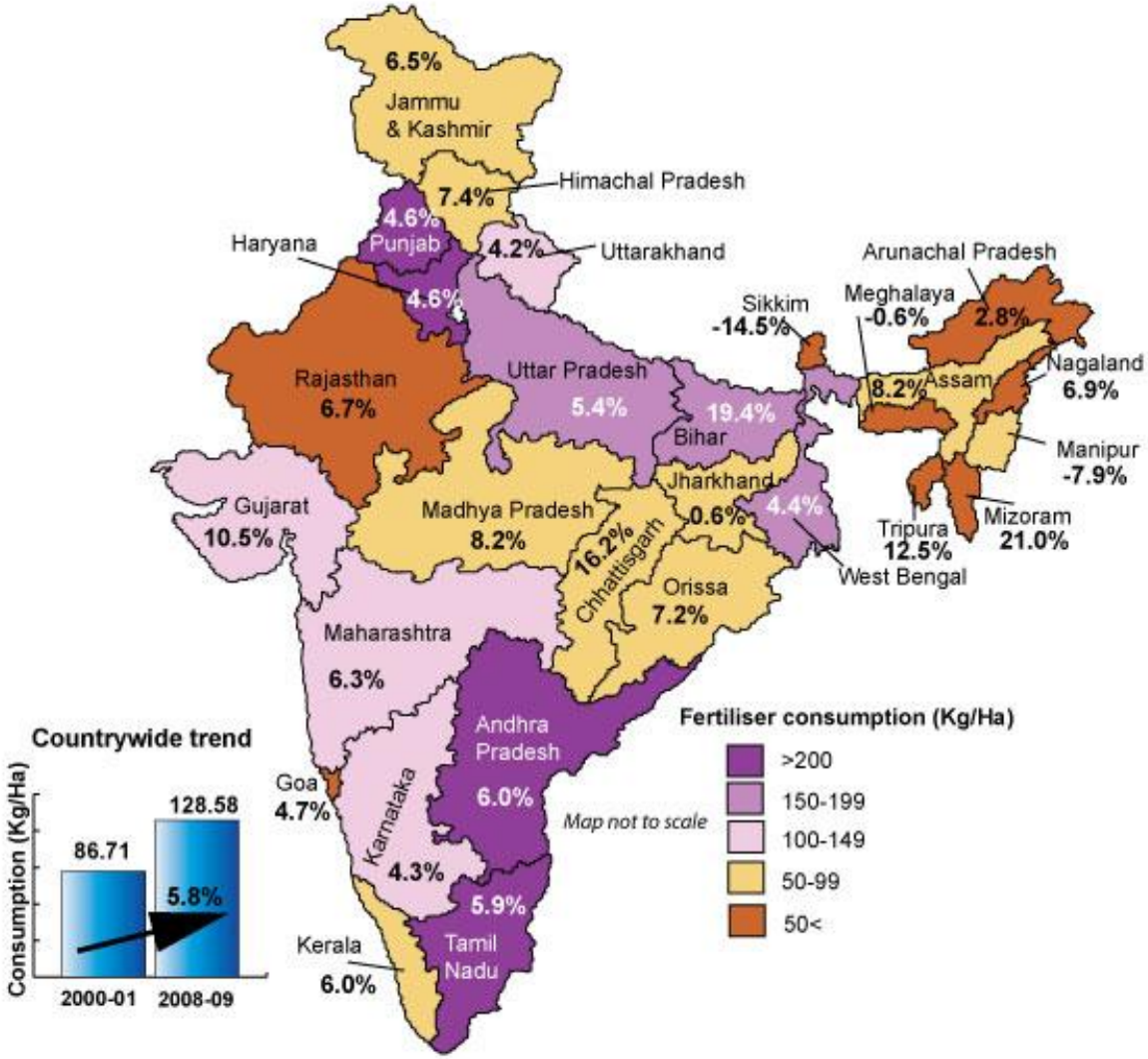
1.A.1.a. Sub-driver of yield – Fertiliser usage

Fertiliser consumption in India



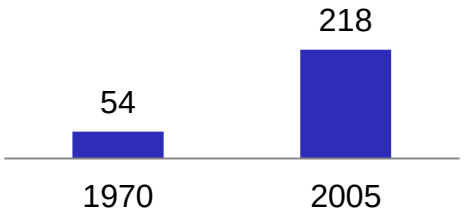
The national average for consumption ratio of the key nutrients has moved closer to the recommended 4:2:1 in 2008-09 with a ratio of 4.6:1.9:1, but this hides the extreme variances in most of the states

Fertiliser consumption has increased



- Although some of the low-consumption states are increasing their fertiliser consumption at fast pace, a new problem is causing concern among policy-makers. This emerging cause of concern is the weakening association between fertiliser consumption and food grain production due to prolonged imbalances in nutrient use and deficiency of micro-nutrients.
- The quantum of fertiliser import is increasing due to a stagnation in domestic manufacturing capability
- Despite tight controls and monitoring, insufficient availability in many areas of the country has emerged as an area of concern

NPK required to produce 2 tonnes/Ha food grain (kg)

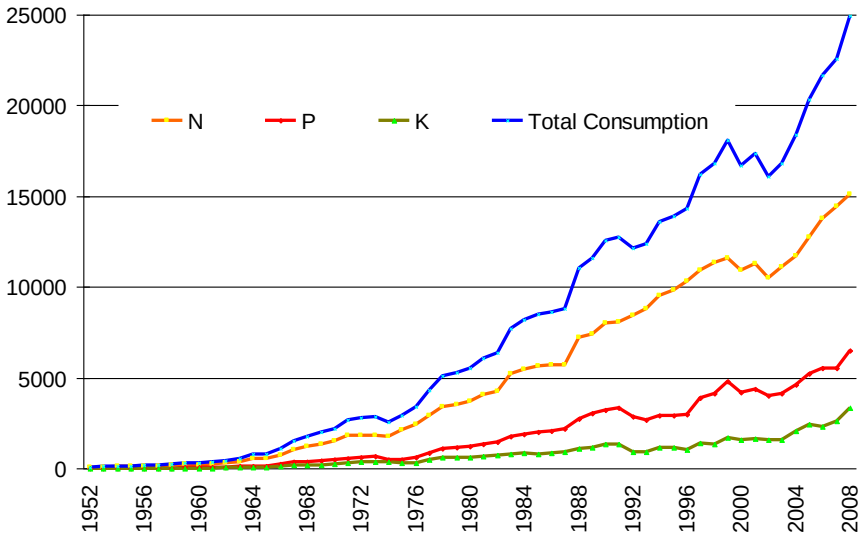


Source: Department of Agriculture & Cooperation; IMA analysis

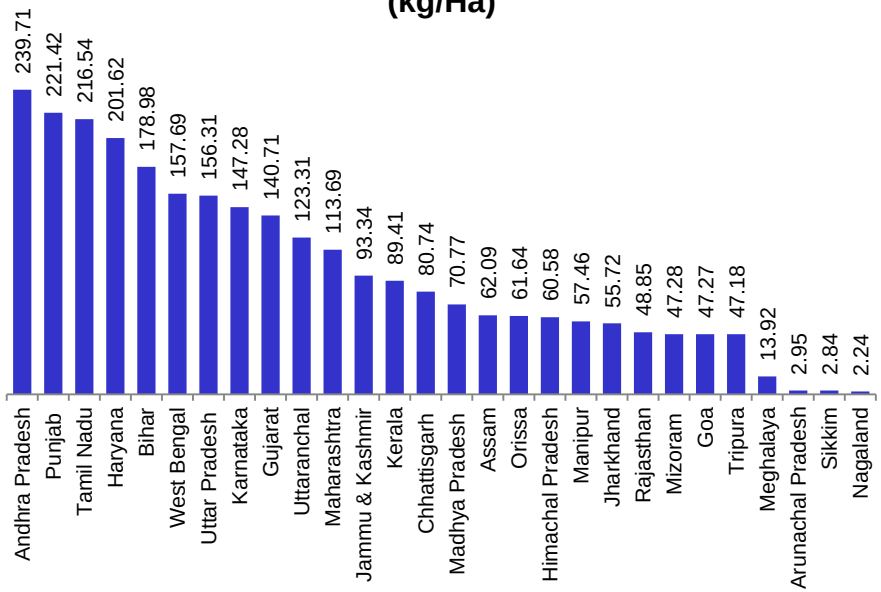
Fertiliser consumption varies widely

Fertiliser usage is heavily skewed across the country due to faulty subsidies and inadequate knowledge – this results in farmers being unable to achieve realisable yields

Fertiliser consumption in India ('000 tonnes)



State-wise fertiliser consumption in 2008-09 (kg/Ha)



- Fertiliser usage continues to be skewed due to irrational subsidy structure, but the ratios have been improving gradually over the last few years
- Matters are at an inflection point as intense debate has built up on this issue in the last few years. The introduction of the nutrient-based subsidy is a step to correct historical anomalies.
- It is too early to consider this a definitive trend, as the Government may fall into the trap of more short-term measures
- It is clear however, that fertiliser consumption patterns will undergo a change and hence constitute an uncertainty

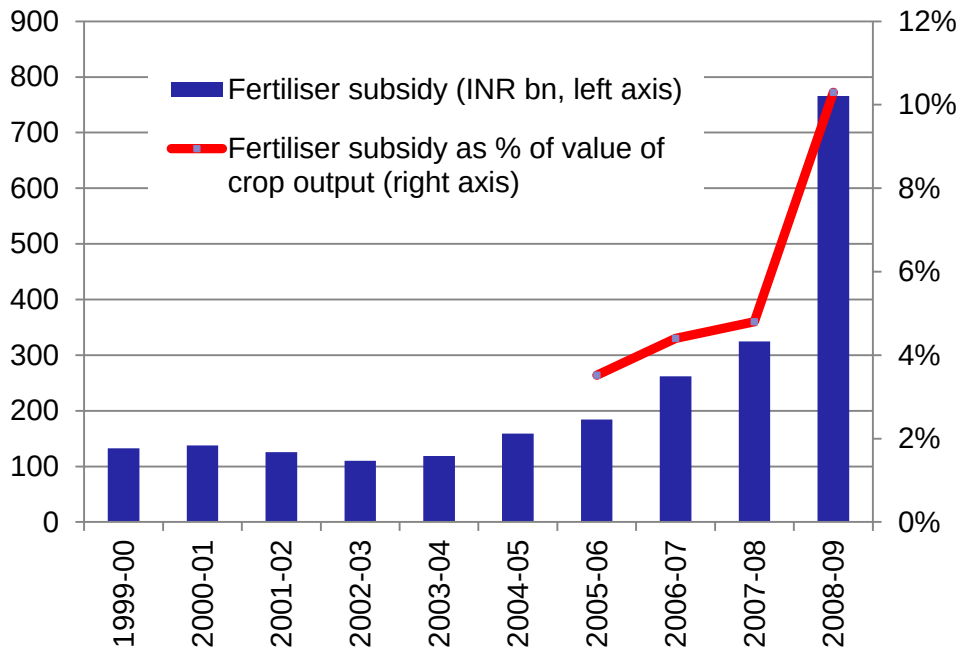
Source: *Agricultural Situation in India;* Department of Agriculture & Cooperation; IMA analysis

Towards integrated nutrient management

- Although a soil testing programme was set up as early as 1955-56, it has not made much impact due to its low scale, as well as under-utilisation of faclities across the states.
- Till 2007, there were only 517 static and 134 mobile soil testing laboratories in the country.
- In 2008, the Government announced a new programme – “National Project on Management of Soil Health and Fertility” – under which it targets setting up an additional 500 static and 250 mobile laboratories. The project offers Central assistance to set up laboratories.
- Till 2009-10, the total capacity of the existing 715 soil testing laboratories in the country was 7.8 million samples annually. This capacity, however, is highly inadequate in view of the fact that India has over 106 million operational farm holdings.
- Yet another constraint has been the focus of most laboratories on the major nutrients (NP and K) only. The new programme, however, recommends testing of secondary (Ca, Mg, S), micro (Zn, Fe, Cu, Mn, B, Mo and Cl) and auxiliary nutrients (C, H and O) as well.
- Moreover, the project allows for participation of non-government organisations and the private sector . Although the programme seeks to fulfill an important need, its success is not certain. PPP models have not worked in agriculture because of IPR and commercial concerns and even the INM programme will be impacted by these concerns.

Source: Planning Commission; Department of Agriculture & Cooperation

Subsidies on fertilisers are unsustainable



Fertiliser subsidies as a percentage of farm output have almost tripled from 2005 to 2009. The overwhelming subsidisation of urea, and its low selling price is a major driver of its overuse. By extension, Government policy on fertilisers is an important driver.

The Planning Commission has recommended that balanced use of NPK should be brought in either by redistributing the subsidy to make it nutrient-neutral or by increasing subsidy on P and K so that farmers are induced to use fertilisers in a balanced way.

The fertiliser consumption pattern (both absolute and relative quantity) is not likely to change unless there is a change in Government policy (in terms of pricing/subsidy) and this is accompanied by farmer education efforts. The change in Government policy has only just begun, with the introduction of nutrient-based subsidy, but there still remain several uncertainties with respect to future policy decisions.

Source: Planning Commission; IMA research & analysis

Fertilisers: Key observations

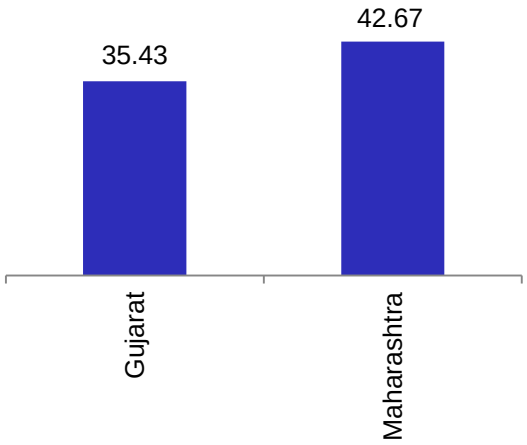
- Although nutrient consumption ratio has improved over the past few years, imbalance in consumption pattern is still prevalent across the country.
- The Government has initiated early steps towards fertiliser price decontrol (primarily through subsidy rationalisation), which can have a two-pronged impact – on the exchequer as well as in consumption behaviour.
- The soil-health factor has also emerged as an area of critical concern. Effectiveness of programmes designed to address this concern will determine future consumption of fertilisers. The breadth and depth of the knowledge of soil health generated through such programmes at micro levels have the potential to catalyse innovative formulations (such as customised fertilisers) targeted at specific locations.
- Changes, especially in the form of new products, are also visible in the sector that has been marked by lack of innovation.
- However, a strong intellectual property protection framework is yet to take shape – a development that will provide momentum to innovation

1.A.1.b. Sub-driver of yield – Improved seeds

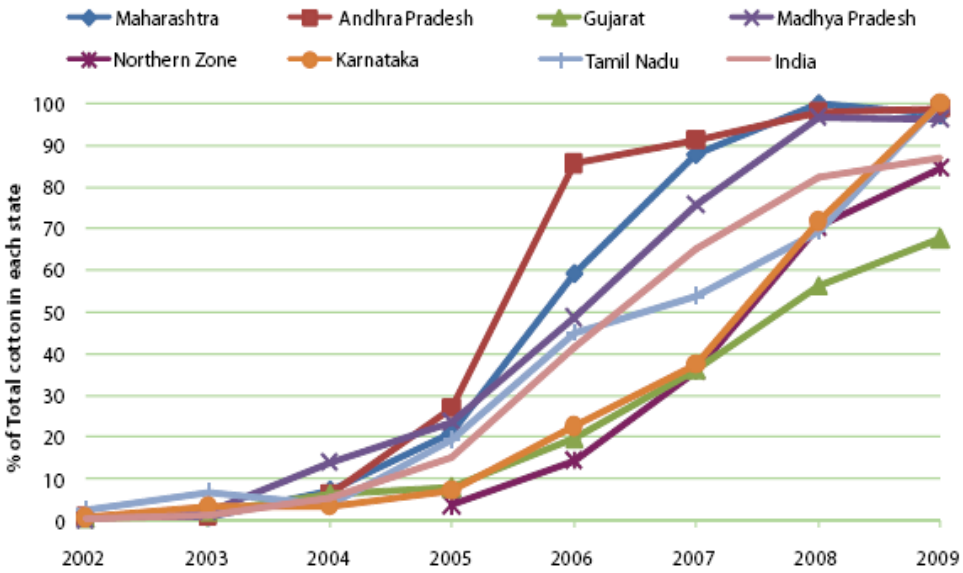
Improved seeds lead to higher yields

New seed technologies, such as genetically modified seeds and hybrids provide significantly higher yields compared to traditional varieties. Available data also demonstrates that farmers respond by adopting the better quality seeds even if they have to pay a premium for the quality.

% increase in yield due to adoption of Bt cotton



% adoption of Bt cotton in India

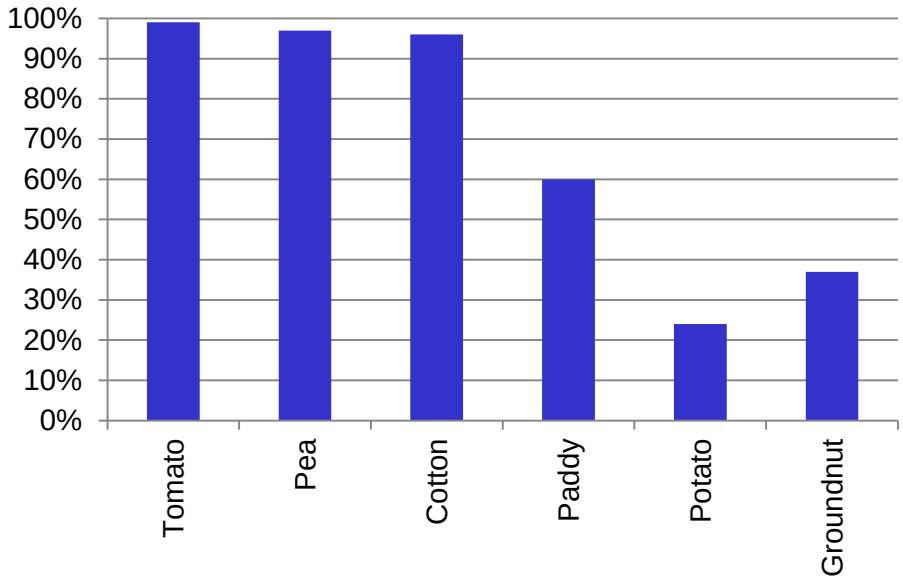


While Bt cotton provides a stark example, there are several other crops whose yields have improved due to improvement in seeds. This reinforces the importance of seeds as a driver. The uncertainties associated with seeds are several, and include R&D challenges, difficulties in commercialising new varieties and consistency of R&D focus on various crops, IPR laws, changing farming patterns etc.

Source: *Bt Cotton in India*, ICRISAT; ISAAA

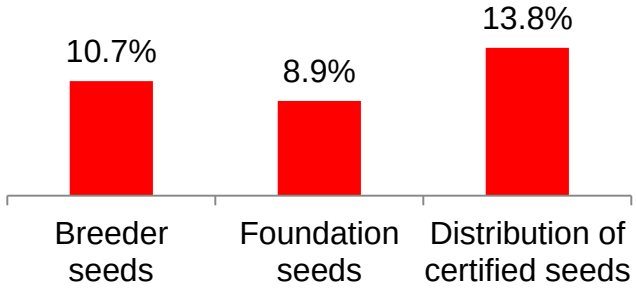
Marginal improvements, but constraints remain

Proportion of area planted with commercial seeds



- Although the use of commercial seeds has increased for many crops, important food crops such as paddy have a long ground to cover.
- Low seed multiplication ratios are a key reason for lack of availability, high prices and low quality. As compared to an ideal of 1:40, average multiplication ratios (for certified good quality seeds) are 1:17 to 1:23

Growth rates* between 2004-05 and 2008-09



* CAGR

A higher rate of breeder seed production compared to foundation seeds implies sub-optimal use of its potential to produce certified seeds for ensuring higher replacement rates. Quality of the distributed seeds is an area of concern too.

Source: *Agricultural Economics Research Review*, January-June 2008; Planning Commission

Seed replacement is low for most crops

Seed replacement rates for key crops (%)

	2001	2002	2003	2004	2005	2006	Range in 2006*
Wheat	13.04	13.00	13.00	16.48	17.64	18.03	9 (Jharkhand) – 41 (Maharashtra)
Paddy	19.22	19.31	19.16	23.28	24.35	25.1	3.96 (Madhya Pradesh) – 76 (Andhra Pradesh) **
Maize	20.98	21.35	24.41	31.50	35.39	36.23	0.07 (Himachal Pradesh) – 69 (Punjab) ***
Gram	4.17	4.23	7.09	9.87	9.41	9.54	2.15 (Madhya Pradesh) – 56 (Punjab)
Moong	13.47	13.80	19.48	12.34	12.50	12.82	0.07 (J&K) – 32 (Andhra Pradesh)
Arhar	8.71	8.84	13.60	9.80	10.48	10.88	2.68 (Orissa) – 40 (West Bengal)
Soyabean	12.44	12.45	15.58	27.00	28.88	32.34	10.99 (Rajasthan) - 91 (Andhra Pradesh)
Sunflower	13.73	15.69	19.61	60.15	67.67	69.17	3.33 (Madhya Pradesh) – 69.30 (Orissa) ^
Cotton	21.21	21.86	19.84	20.73	21.78	22.27	3.85 (Orissa) – 95.00 (Punjab) #

* Range of SRR across states; ** Andhra Pradesh showed a 100% SRR for hybrid rice; *** Key states growing hybrid varieties, such as Andhra Pradesh, Karnataka, Himachal Pradesh, showed 100% SRR for those varieties; ^ Key states growing hybrid varieties, such as Andhra Pradesh and Karnataka showed 100% SRR for those varieties; # Key states growing hybrid varieties, such as Andhra Pradesh, Karnataka, Gujarat, Maharashtra, and Madhya Pradesh showed 100% SRR for those varieties

- Seed replacement rate is an area of concern, with seeds saved by farmers constituting around 85% of seed supply. The replacement rate, however, varies widely across states and crops. Hybrid varieties for which private sector participation in seed production is higher, show higher rates of replacement, reaching 100% replacement rate in most cases. The Planning Commission has stipulated a desirable replacement ratio of 25% for self-pollinated crops, 35% for cross-pollinated crops, and 100% for hybrids.
- In order to improve the quality of seeds being used by farmers, the Seeds Bill of 2004 had proposed to lay down quality standards even for seeds sold by or exchanged among farmers. However, the Bill has now been amended to exempt farmers from such quality requirements. Till today the Bill has not been passed by the Parliament.

Source: Seednet India; Planning Commission, Working Group on Agriculture

Hybrid varieties hold the key to yield increase

The extent of hybridisation varies widely across cereals, pulses, and other crops. Hybrid varieties are more widespread among vegetables

- **Rice**: Hybridisation is increasing at the rate of 15-20% per year. Adoption of hybrid rice mainly in Uttar Pradesh, Bihar, Jharkhand, Haryana and Punjab. Adoption rates in the two key rice-growing states of Andhra Pradesh and West Bengal have been slow due to poor quality of the rice, as well as low yield gain compared to high yielding varieties.

Profitability of hybrid rice in Andhra Pradesh		
	Hybrid rice	HYV
Grain yield (tonnes/ha)	6.90	6.62
Grain price (Rs/ha)	5,269	6,580
Gross return (Rs/ha)	42,394	44,321
Total cost (Rs/ha)	17,635	14,120
Net profit (Rs/ha)	24,759	30,201

- **Wheat**: Adoption of hybrid wheat variety has been almost insignificant. A 2005 field study estimated the adoption rate to be 0.1% (up from 0.031% in 2001)
- **Maize:** 70-75% of maize acreage is under hybrids. The key adopting states are Bihar, Karnataka, Maharashtra, Andhra Pradesh and Tamil Nadu.
- **Brinjal**: Adoption of hybrid brinjal varieties vary widely across the regions. While around 65-70% of area are under hybrids in the South and the West zone, only 1-2% of area in the Eastern states and 2-5% of area in the Northern states are under hybrids. Growth in hybrid penetration is around 7%
- **Tomato**: 55-60% of area is under hybrids, growing at 8%.
- **Okra**: Hybrid penetration is around 18-20% each in North and the East; in South and West, the penetration rate is around 30-32% each
- **Cabbage**: 50% acreage under hybrids, growing at around 4% per year. The hybrid market is growing fast largely due to prevalence of diseases in the open pollinated varieties
- **Cauliflower**: 25% of area is under hybrids, growing at around 7%. Nasik (Maharashtra) and Hapur (Uttar Pradesh) are two key markets

Presence of the private sector is limited

- India is the sixth largest seed market in the world with a market size of USD 1.5 billion in 2010. The market is estimated to be growing at ~12% per annum.
- However, the organised seed sector (including both private and public sectors) accounts for 15-20% of total distributed seeds.
- Although the private sector accounts for ~70% of the seed market in value terms, its focus in seed production has been limited to high value and low volume seeds. The key crops that have seen high levels of private sector participation include maize, bajra, jowar, and vegetables.
- Research in crops where seed rate is high (such as, paddy and wheat) has remained largely with the public sector.
- The Seeds Bill of 2004 promises to bring about a sea change in the seed industry in India. However, the extent to which the Bill is further amended and subsequently implemented, will have a significant bearing on the future of this industry.

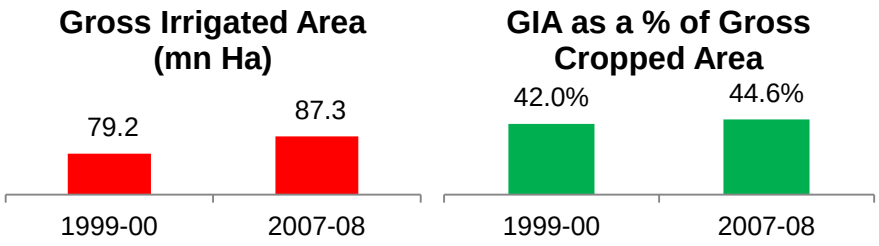
Source: International Seed Federation; Commodity India; Seednet

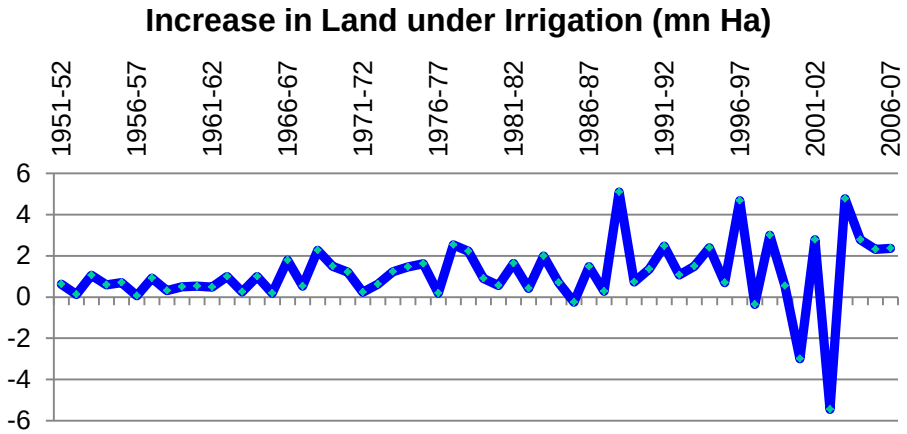
Seeds: Key observations

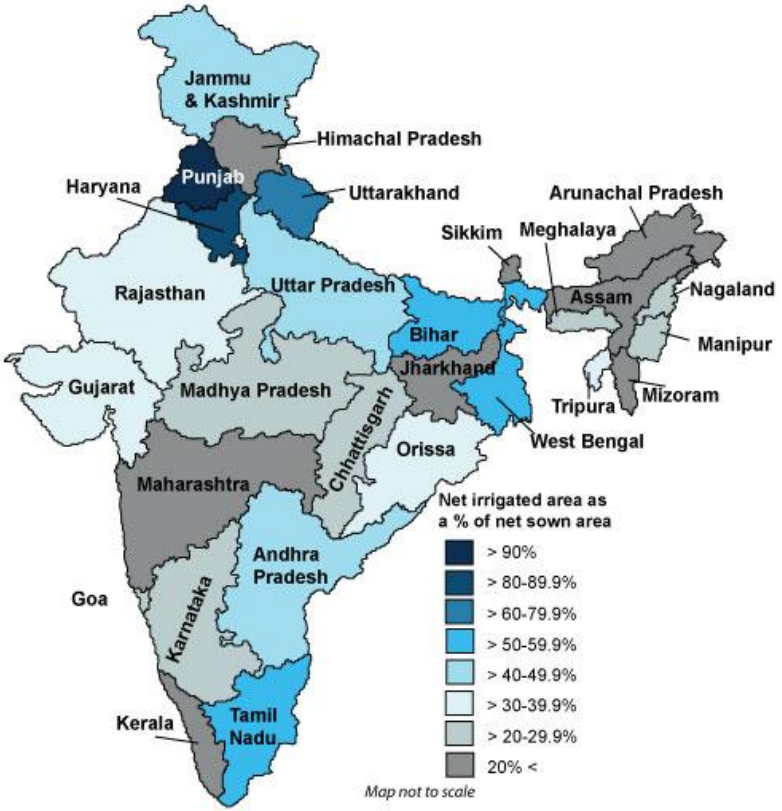
- Most problems holding back improvement of the seed sector have been identified by successive Governments and planning agencies, but efforts to address them have not been fruitful.
- Seed replacement ratio still remains a key concern and current trends show that it is likely to remain so unless new and improved quality seeds, combined with incentives to replace seed, are available to farmers. For instance, hybrid crops which have significantly higher yields have achieved 100% replacement rate in most cases.
- While yield levels of commercial crops have shown significant improvement over the past years, the foodgrain segment (the most critical segment as far as food self-sufficiency is concerned) has seen no infusion of new technologies. The linkages between the research system and the farmers will need a thorough overhaul to change this situation.
- Greater involvement of the private sector can address this problem partially.
- New legislation (the Seeds Bill) is likely to improve quality of seeds sold in the market by edging out small and low quality producers. However, as in the case of other agricultural programmes, this could remain ineffective too, unless accompanied by a strong enforcement mechanism.
- Under the current circumstances, pricing is likely to remain a politically sensitive issue; Government's attitude to price control has become increasingly unpredictable in recent years

1.A.1.c. Sub-driver of yield – Irrigation

The spread of irrigation has been erratic







- The rate of increase in irrigation has not been able to keep pace with increase in gross cropped area on account of the inefficiency of the Government; moreover, states show significant variation in the levels of irrigation – indicating the substantial scope for improvement.
- The Government has set a target of adding 16 mn ha of new irrigated land in the XI 5-year plan (2007-2012).
- However, past years' trend shows that programmes have often failed to meet target. Achieving forward targets therefore is not assured, and hence, constitutes a source of uncertainty.

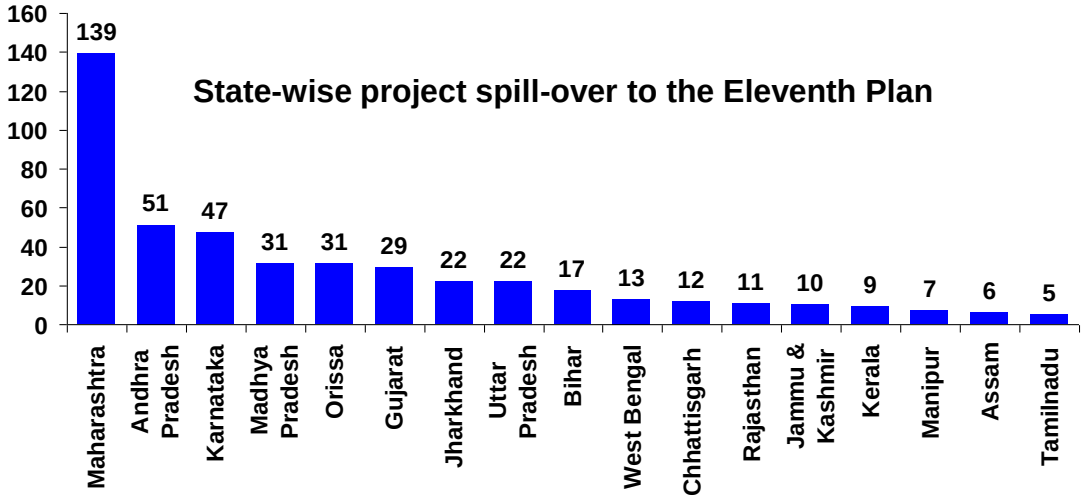
Source: Department of Agriculture & Cooperation; IMA analysis

Project execution has been inefficent

Start of project	Number of incomplete projects
Second Plan	2
Third Plan	6
1966-69	2
Fourth Plan	17
Fifth Plan	53
1978-80	14
Sixth Plan	50
Seventh Plan	34
1990-92	4
Eighth Plan	78
Ninth Plan	77
Tenth Plan	140
Total	**477**

A total of 477 irrigation projects spilled into the Eleventh Plan (2007-12) from as early as the 1950s. Among the most laggard states are Maharashtra, Andhra Pradesh, Karnataka, Madhya Pradesh, and Orissa.

Around 35% of the incomplete projects were of major irrigation, 46% medium and the remaining 19% concerned with extension, modernisation and renovation.



The poor rate of project completion will undermine future irrigation investments, thereby giving rise to uncertainties

Source: Eleventh Plan, Planning Commission, Ministry of Agriculture; IMA analysis

Impact of irrigation on yield

According to expert estimates, a further 50% yield improvement (across all crops) is possible if the complete irrigation potential of India (140 mn ha, according to GoI) is exploited.

Net returns in case of F&V cultivation rise dramatically with the availability of irrigation

Type of irrigation	Net returns (Rs/ha)	
	Irrigated farm	Un-irrigated farm
Flow	25,842	4,741
Tube Well	9,666	8,200
Lift	79,776	6,000
Tank (flow)	73,225	8,010
Tank (sprinkler)	64,685	10,188

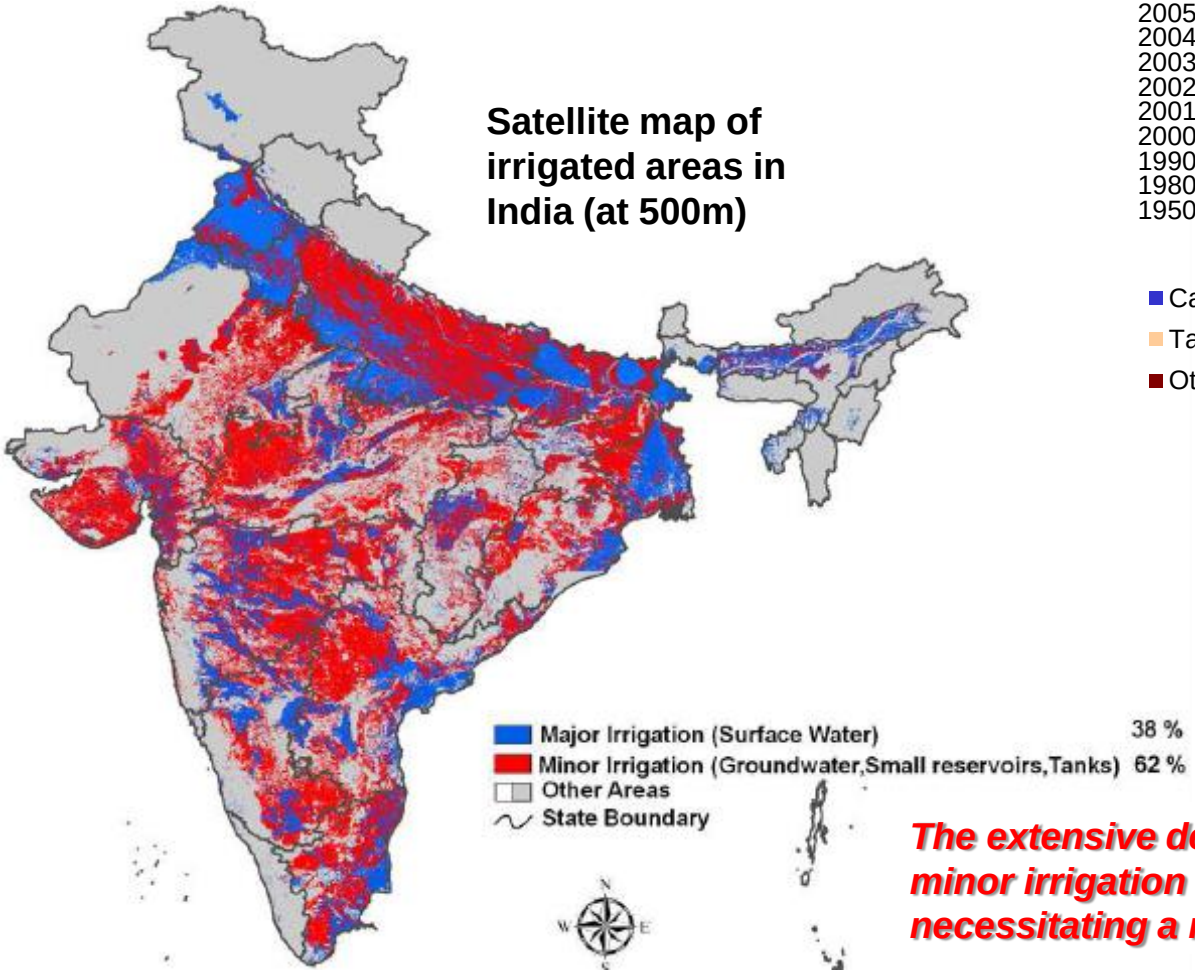
Field studies clearly demonstrate that irrigation raises yields significantly for F&V

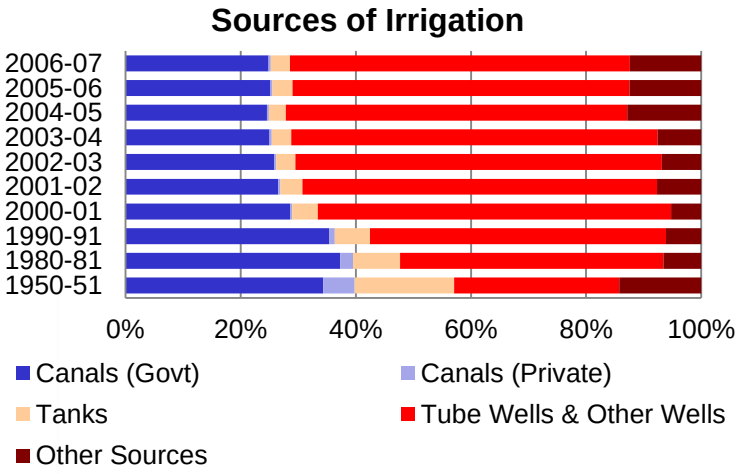
Clearly, therefore, irrigation is a critical driver

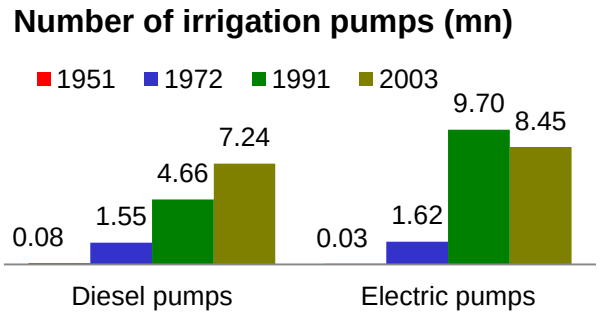
Source: * IARI research paper; # *India's Agricultural Challenges*, Ramesh Chand; *Agricultural Situation in India*, Directorate of Economics and Statistics; IMA analysis

Irrigation is over-dependent on groundwater

Between 1951 and 2007, irrigated area from groundwater increased 6.3 times, as opposed to 1.9 times from tanks and 3.5 times from major projects





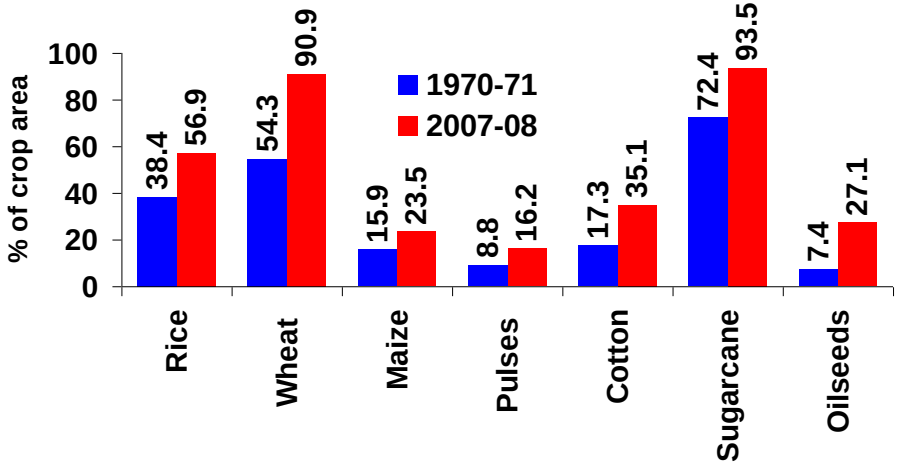


The extensive dependence on groundwater-based minor irrigation is depleting natural resources, and is necessitating a rethink of strategy.

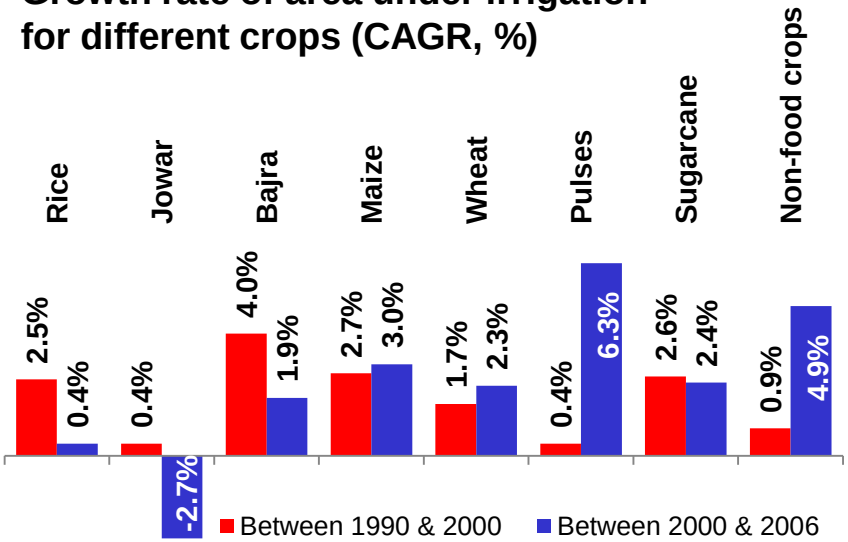
Source: International Water Management Institute; Department of Agriculture & Cooperation; Indian Agricultural Statistics Research Institute; IMA analysis

Changes are taking place on crop focus

Crop-specific irrigation availability



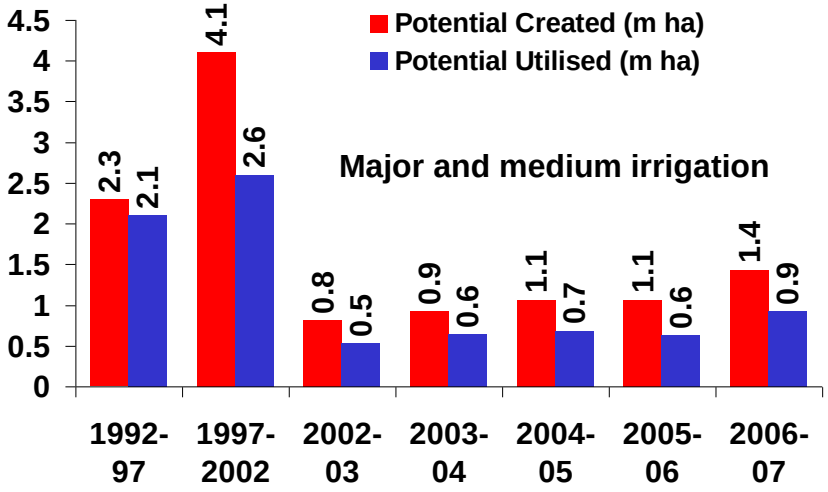
Growth rate of area under irrigation for different crops (CAGR, %)

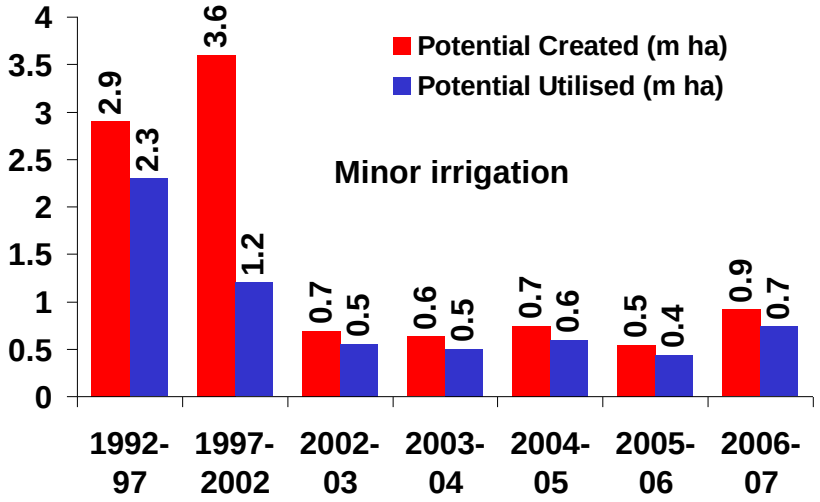


Rice, wheat and sugarcane have been the focus area for irrigation provision in the past. However, this pattern is set to change as other crops are beginning to receive greater attention.

Source: Department of Agriculture & Cooperation; IMA analysis

Other shifts are visible too





- In the latter half of the 90s, the Government's investment efficiency (in terms of completing irrigation targets and utilising potential) dipped to below 50%.
- In the present decade, efficiency has improved marginally. Overall, efficiency levels in minor irrigation has remained higher than in major and medium irrigation. This is partly on account of the marked shift in the source of irrigation over the past five decades – medium and minor irrigation have become greater sources of water availability compared to large-scale canal projects.

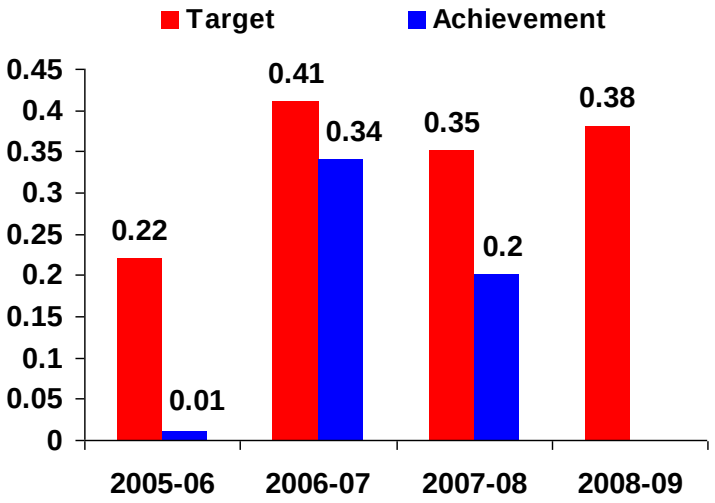
Decentralised small irrigation will remain more efficient in terms of achieving potential, but given its ecological consequences, will pose conflicts for policy makers.

Source: Department of Agriculture & Cooperation; World Bank; IMA analysis

The Government is trying to make amends

- In January 2005 the Government approved a **National project for Repair, Renovation and Restoration of Water Bodies** directly linked to agriculture, to bring more area under irrigation.
- In view of the massive investments required in irrigation projects, the Union Budget for 2008-09 proposed the establishment of **Irrigation and Water Resources Finance Corporation (IWRFC**).
- The **Accelerated Irrigation Benefit Programme (AIBP)** initiated in 1996-97 continues to extend assistance in completion of irrigation schemes which have remained incomplete.
- A centrally sponsored **Scheme on Micro Irrigation** was launched in 2006, which involves implementation of drip irrigation and sprinkler irrigation system with the objective to have better water use efficiency, increase in yield, better quality of produce, saving in fertiliser usage and weeding cost along with easy intercultural operation in all types of soil including saline soil. However, the success rate of this scheme since inception has been erratic and well below target.

Targets and achievement under Micro Irrigation Scheme (million ha)



The reform of these efforts will have a crucial bearing on agricultural outcomes in the coming decade

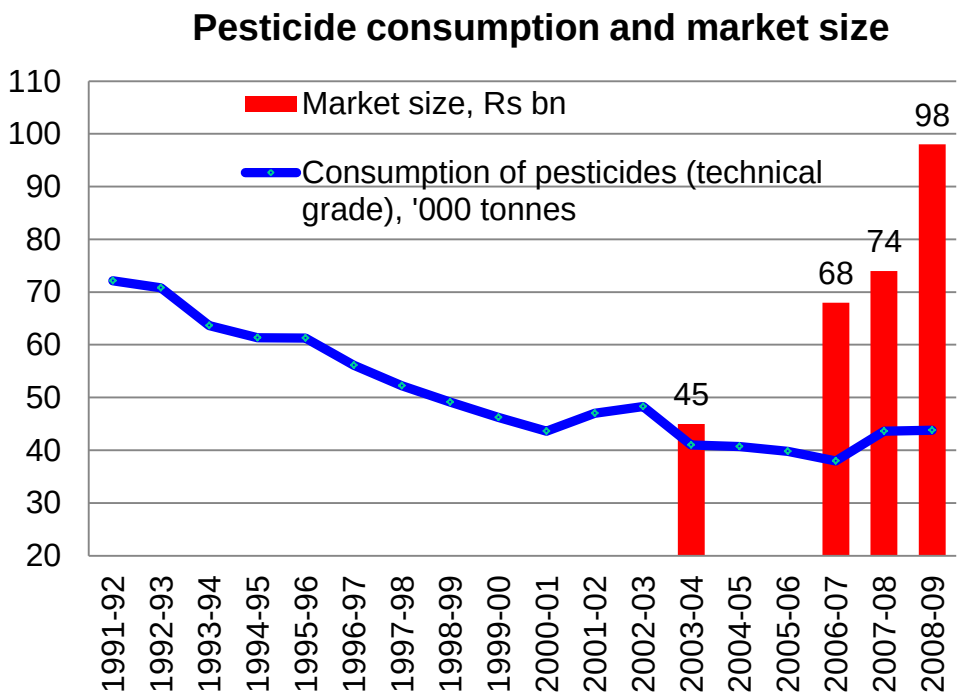
Source: Department of Agriculture & Cooperation; IMA analysis

Irrigation: Key observations

- National and state-level data show that cropping intensity has a direct association with availability of irrigation.
- Assured supply of irrigation enables farmers to make choices to move to higher value crops and therefore has the most direct impact on cropping intensity and cropping pattern.
- There is an increased focus in the Government on the need to expand irrigation as a means to raise productivity and cropping intensity and to compensate for falling water levels.
- The Planning Commission has set a target of adding 16 mn ha of new irrigated land in the XI 5-year plan (2007-2012).
- Past years' trend however shows that programmes have often failed to meet target. Achieving forward targets therefore is not assured.
- Rates of utilisation of irrigation potential have been declining over the past decades.
- Inefficiencies in canal-based irrigation and over-dependence on groundwater extraction are the two factors that require to be addressed effectively to improve the irrigation availability for a host of crops as well as reduce regional disparities.

1.A.1.d. Sub-driver of yield – Crop protection

Pesticide market is undergoing a change



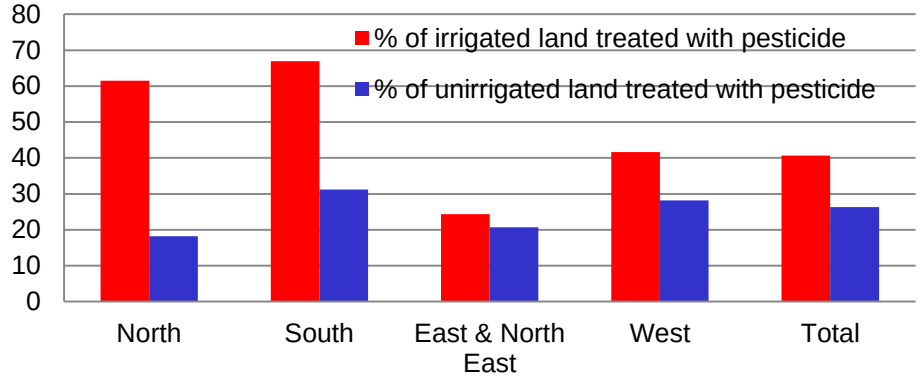
- The estimated crop losses due to pests, diseases, rodents and weeds generally range between 10 to 30% every year.
- Pesticide consumption in India (by volume) has steadily declined over the years. However, this decline is explained to a large extent by the fast adoption of new and more effective molecules which require consumption of lesser amounts. This is reflected in the rapid growth in the market for new chemistry molecules. In recent years, the market has grown at an annual rate of 12-15% for overall pesticides and even higher rate for herbicides.
- The per hectare consumption of pesticides in India is significantly lower (0.57 kg/ha) than many developed (Japan – 12 kg/ha, USA and Europe – 3 kg/ha) and developing countries. Combined with the high level of disparity across states, this presents attractive growth prospects for the crop protection industry.
- The new chemistry market however still faces competition from the cheaper generics, manufactured domestically as well as imported (the import of generics has been on the rise).

- The pesticide consumption pattern in India differs significantly from the global pattern.
  - Rice, cotton and wheat account for around 70% of total pesticides consumption. This trend is in contrast to the global trend where fruits and vegetables account for majority consumption.
  - Whereas herbicides and fungicides dominate the global market in terms of consumption, in India insecticides account for over 60% of the pesticides market. This trend, however, is likely to change in favour of herbicides, with growing shortage of agricultural labour force leading to high cost of labour.

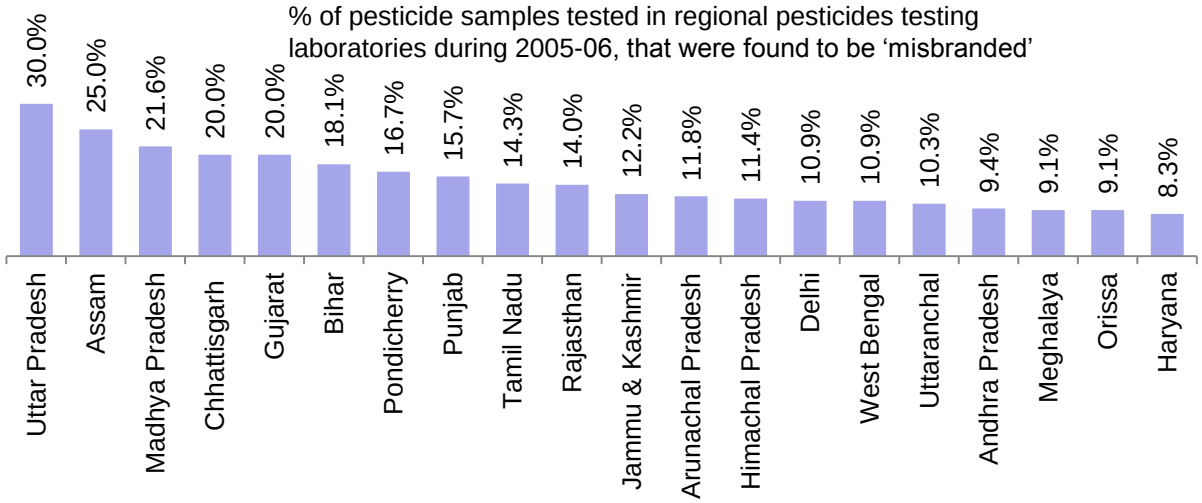
Source: Department of Agriculture & Cooperation; University of Agricultural Sciences, Bangalore; Industry reports; IMA analysis

Disparity and quality of pesticide usage

Pesticide application is higher in irrigated areas



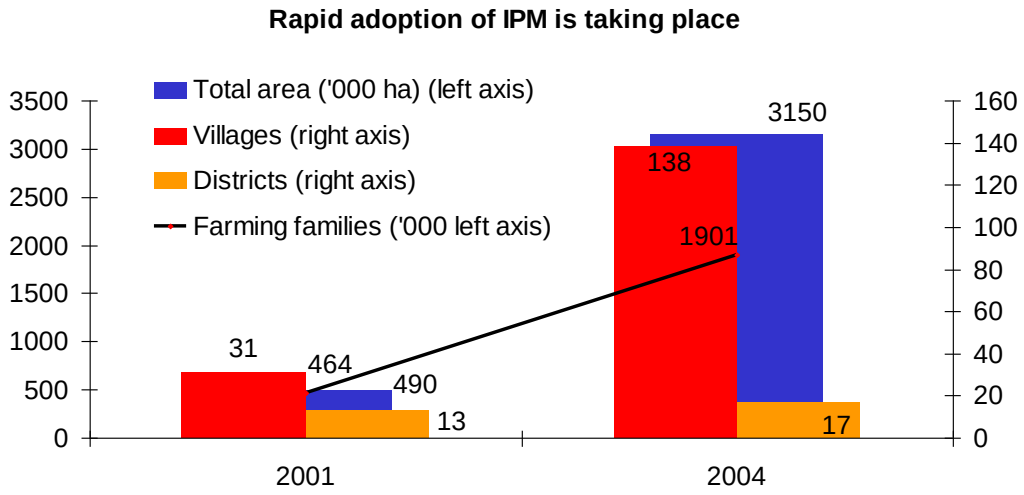
The problem of spurious pesticides: another important influencer of CP usage

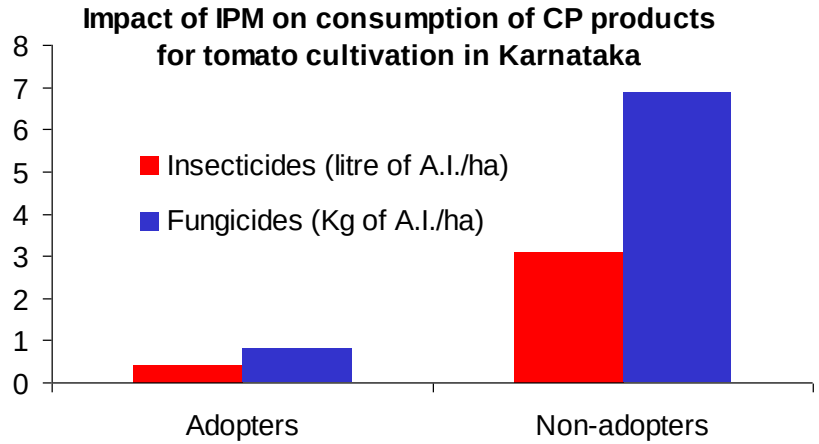


- The higher affordability of farmers in irrigated areas, as also their higher levels of awareness and sophistication are two key drivers of higher CP usage.
- On the one hand there is an urgent need to increase CP usage (in terms of treated area) while on the other hand, there is growing concern on the consumer safety aspects of CP usage. These trends will define the pattern of development as far as future CP usage is concerned. IPM is one of the consequences of this concern.

Source: Department of Agriculture & Cooperation; IMA analysis

The Government is promoting alternative methods





Integrated Pest Management (IPM) is being promoted by the government to reduce unbalanced chemical use by farmers as well as to deal with pests and diseases in a holistic way. Although its spread is limited to small pockets of the country's agricultural map, the data shows the potential of increasing its application. **Till 2010, government-sponsored initiatives have brought 3% of cropped area under IPM.** The use of IPM techniques will impact CP usage as they seek to minimise/correct the use of chemical inputs.

Source: *Agricultural Economics Research Review;* National Centre for Integrated Pest Management; IMA analysis

Pesticides: Key observations

- The pesticides market has seen the beginning of a structural change in recent years, with many farmers opting to pay a premium for more effective products that improve performance.
- However, generic products, which offer a cheaper avenue for most farmers are unlikely to be weeded out of the market in the near future.
- Increasing labour shortage is likely to pave the way for a higher growth in herbicide use.
- Concerns raised by civil society over health impacts of pesticides will remain a political pressure point for the crop protection industry.
- The Government has proposed a new legislation (Pesticides Management Bill) that seeks to integrate pesticides use with food safety, and also seeks to achieve a greater control over the quality of pesticides sold in the market. This Bill, however, is yet to be passed by the Parliament.

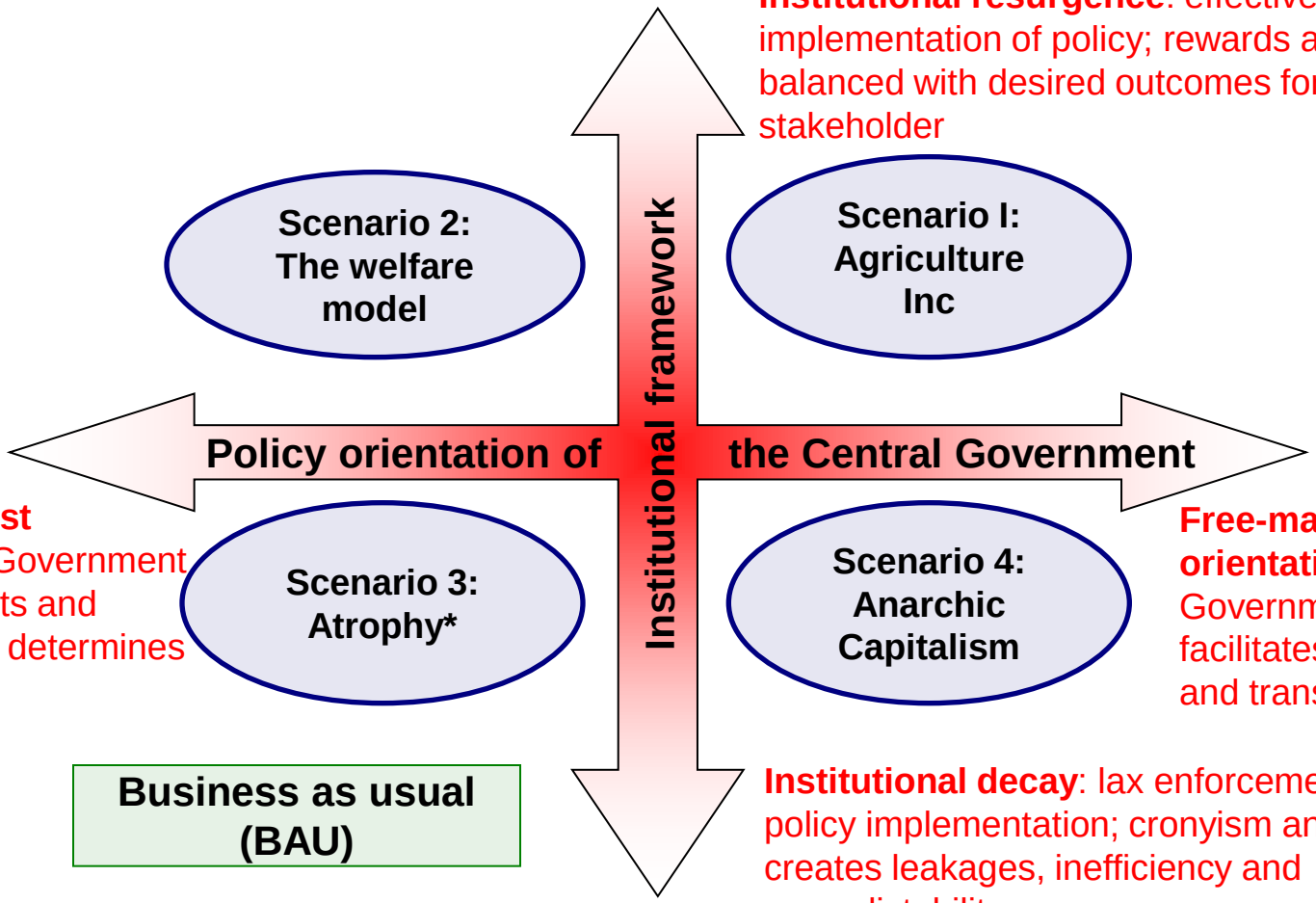
3. Identification of underlying forces and scenario development

Emerging themes from the driver analysis

An examination of ~58 drivers that are high on 'Importance' and high on 'Uncertainty' reveals five dominating themes that have an all-pervading influence on agricultural outcomes (central question):

- **Market forces** – these influence crop prices (and hence, farmer income, affordability, value of production and by extension, cropping choices) as well as input costs for farming (and hence, farmer profitability and investment)
- **Policy actions or decisions** – this is by far, the most important influence given its sheer scope of impact across the sector, although it comprises of several individual elements (policy on various agriculture related issues as well as investment/spending)
- **Farmer awareness** – this influences farming practices, input usage, and crop choices, and by extension, farmer profitability, affordability and agricultural growth
- **Technology availability and dissemination** – ranging from improved seeds to superior packaging technology, this factor plays a role across the value chain; dissemination is a higher impact driver than mere availability (development) of technology, as demonstrated by extensive evidence to this effect
- **Natural factors** – the deterioration of natural resources (both in a quality and quantity sense) not only undermines farming performance and profitability, but equally affects consumer safety/hygiene, and in the long run, threatens the very basis of Indian agriculture

The scenario matrix



***Note**: Scenario labels are purely illustrative and intended to convey an underlying principle. The labels are not to be interpreted literally.*

*** Scenario 3 most closely represents Business as Usual (BAU)**

The dominant scenario themes: I

Scenario 1: Agriculture Inc

- Enlightened realisation guides a strategic process of dismantling state controls and enabling market forces to play out.
- The core of the process lies in strong institutions that ensure transparent and consistent outcomes.
- While safety cushions are created, they are well targeted, non-disruptive and intended to ease the transition pain.
- Agricultural growth is dramatically high (>6%), is sustainable and releases unlocked productivity and opportunities that have wider benefits for the economy.
- However, disparities are high and the overall process is characterised by hit-and-trial pangs.

The dominant scenario themes: IV

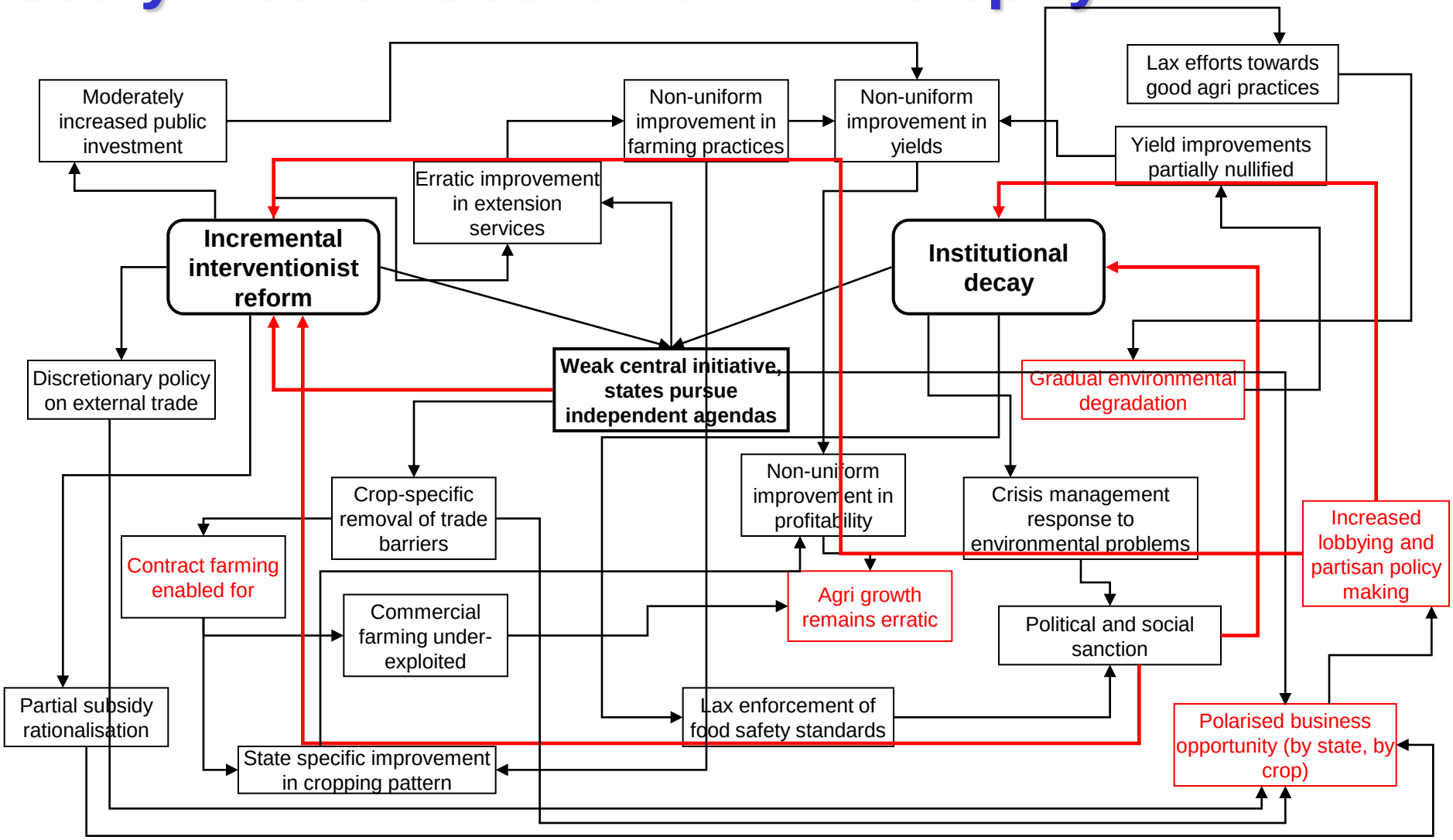
Scenario 4: Anarchic capitalism

- Forced liberalisation out of desperation rather than enlightenment, triggered by frequent or localised shocks and convenient political circumstances.
- Several opportunities are unleashed, but the lack of a cohesive and long term approach results in unfettered depletion of environmental resources, and high levels of inter-state and inter-crop disparity.
- This benefits several farming sections and business interests and, in the absence of serious institutional reform, provides the political sanction to continue the regime.

4. Market stories for each scenario

Scenario 3: Atrophy (business as usual)

Story Board: Scenario III – Atrophy



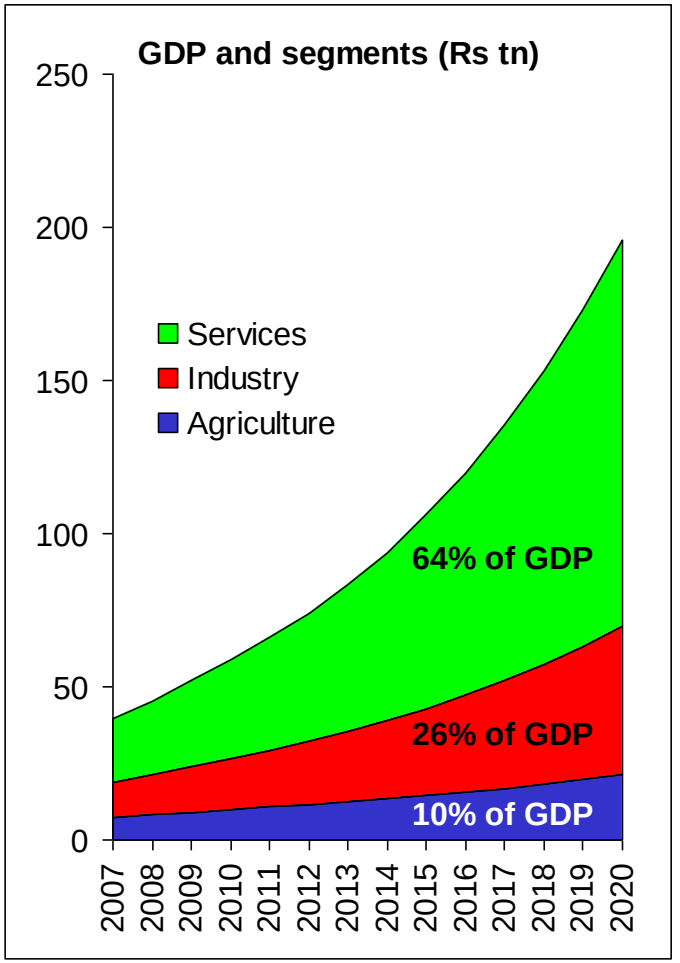
Bold boxes indicate dominating themes and forces in this scenario; red boxes indicate key outcomes; bold red lines indicate routes of reinforcement, which ensures scenario stability

Political Environment

- The central Government will continue as a moderate/ weak coalition, led by the left-of-centre Congress party
- The 2014 election will return a Government similar to the present one, both in terms of composition and strength – Rahul Gandhi will become PM
- At the state level, different regional parties will continue to hold sway (Congress will be unable to displace them in a major way), thereby creating conflicts on policy decisions relating to state subjects i.e. agriculture, education, healthcare, land, etc
- Inclusiveness will be the driving philosophy of the Government, which will be used to justify both populism and short termism
- The inability and unwillingness of the political leadership to enact administrative reforms will ensure institutions across the board remain weak and inefficient; in many ways, this is in their self-interest and this helps to maintain status quo

Macroeconomic environment

- **GDP growth** will average 8% pa for the next 4 years, and will increase thereafter to 8.5% pa (average); in nominal dollar terms
- In terms of segments, agriculture will grow at 2% (rising to 3%); industry at 8% (rising to 9%) and services at 9% (rising to 10%)
- **The Rupee** will witness upward pressures in the short term as India attracts FII capital flows, but this will be curtailed through (typically) 'knee jerk' regulation

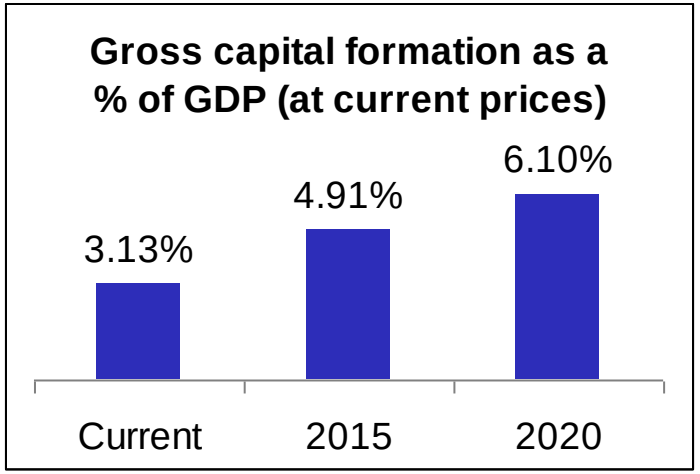


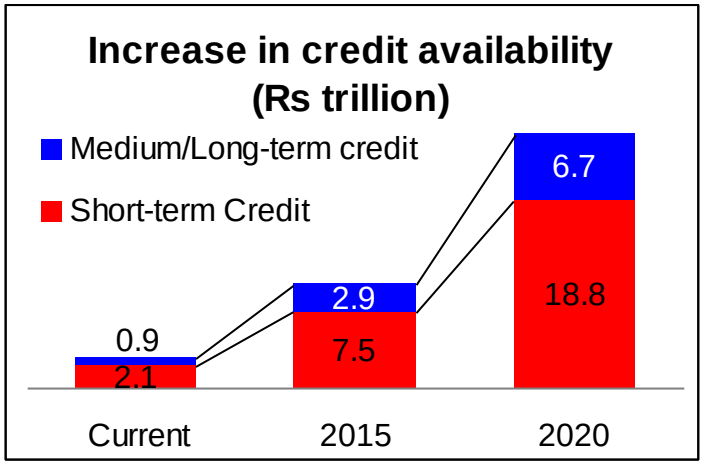
Macroeconomic environment… cont'd

- **Fiscal deficit:** Despite attempts to control spending, political imperatives of a fragmented Government will ensure that the deficit remains involuntarily high (>4%) with only a marginal improvement in spending efficiency
- **Monetary environment:** Inflationary pressures on account of a supply constrained economy will ensure that monetary policy will generally have a hardening bias
- **Foreign investment:** FDI restrictions will be partially relaxed in sectors such as retail, insurance and aviation. This will be followed by media, banking, and defence sector relaxations; however, the pace of relaxation will be slow; in the case of FII flows, occasional attempts at imposing capital controls will keep inflows below potential while creating high levels of uncertainty
- **Overall policy outlook** will be to balance growth with equity, but this will typically done in an opportunistic manner, thereby ensuring that both goals remain unachieved

Investment and credit in agriculture

- Continuing a trend recently established the Government will gradually increase investment in the agriculture sector from 3.13% of GDP to 6.1%
- Investment will grow at ~18% pa, marginally higher than the nominal rate of GDP growth
- The share of the private sector versus the public sector will tend to fluctuate, continuing its past trend
- Credit availability will grow at 18-20% pa on the back of KCCs and the eventual roll out of the UID





Cropping pattern

- A gradual shift away from core cereals in most parts of the country towards fruits, vegetables, and other high value crops
- In the Eastern region, the shift away from cereals will be slower to take root as there is scope for further gains in rice
- In the North, excessive rice-wheat cropping will begin to unwind (but slowly), while the South will take the lead in terms of a proactive shift towards other crops
- The West may see mild acreage gains for rice and wheat, but eventually reversals will happen in this region as well
- In the case of pulses, while NFSM and ISOPOM will help increase acreages, the growth will be gradual due to low productivity increases
- Crops witnessing consistent productivity gains (e.g. cotton, maize, F&V) will see steady acreage increases

Cropping pattern…cont'd

- Fruits & vegetables will benefit due to short cropping duration and favourable economics; while sugarcane expansion is based on the assumption of slow and erratic policy reforms in the sugar and ethanol sectors (where demand already exists and will continue to grow)
- As a result, even though arable land will witness a net decline, gross acreage will increase from 159 mn ha to 184 mn ha through mildly higher cropping intensity (due to greater sowing of short duration crops)

	Acreage for nine major crops in 2015 and 2020 (mn ha)		
	Current	**2015**	**2020**
Rice	45.46	43.44	42.87
Wheat	27.73	27.43	26.82
Pulses	22.11	24.62	25.88
Maize	8.20	9.68	11.12
Oilseeds	27.54	29.24	31.10
Cotton	9.40	10.46	11.40
Fruits & Nuts	6.10	8.03	10.17
Vegetables	7.93	10.09	12.20
Sugarcane	4.40	5.12	5.34

Cropping pattern…cont'd

	Rice (mn ha)		
	Current	2015	2020
East	22.65	22.30	22.35
West	4.00	4.12	4.22
North	10.74	9.86	9.50
South	8.06	7.16	6.81

	Wheat (mn ha)		
	Current	2015	2020
East	2.72	2.67	2.63
West	5.90	6.42	6.26
North	18.83	18.07	17.62
South	0.28	0.28	0.30

	Pulses (mn ha)		
	Current	2015	2020
East	3.04	3.56	3.94
West	8.43	9.10	9.33
North	6.23	6.73	7.07
South	4.41	5.23	5.55

	Maize (mn ha)		
	Current	2015	2020
East	1.33	1.50	1.70
West	2.00	2.47	2.89
North	2.66	2.99	3.22
South	2.21	2.73	3.32

	Oilseeds (mn ha)		
	Current	2015	2020
East	2.01	2.32	2.61
West	13.45	14.52	15.64
North	6.71	6.89	7.24
South	5.37	5.51	5.61

	Cotton (mn ha)		
	Current	2015	2020
East	0.07	0.09	0.10
West	6.12	7.06	7.79
North	1.29	1.47	1.50
South	1.92	1.85	2.00

	Fruits & Nuts (mn ha)		
	Current	2015	2020
East	1.30	1.62	1.97
West	1.85	2.89	4.05
North	1.05	1.16	1.28
South	1.89	2.36	2.88

	Vegetables (mn ha)		
	Current	2015	2020
East	3.76	4.65	5.39
West	1.14	1.52	1.94
North	1.81	2.45	3.13
South	1.22	1.47	1.75

	Sugarcane (mn ha)		
	Current	2015	2020
East	0.18	0.21	0.23
West	1.06	1.49	1.69
North	2.37	2.61	2.67
South	0.79	0.81	0.75

Production

- Production levels for cereals increase slowly as yield gains are partially neutralised by acreage losses
- While overall quantities will generally remain sufficient for domestic consumption, distribution inefficiencies will ensure the need for imports occasionally
- Maize, fruits, vegetables and cotton will see the highest increases in production on account of the twin benefit of yield and acreage increases

Production of key crops in 2015 and 2020 (mm tonnes)			
	Current	2015	2020
Rice	98.44	101.03	106.06
Wheat	80.66	82.67	84.07
Pulses	14.50	17.84	20.46
Maize	19.63	28.18	38.23
Oilseeds	25.06	31.98	36.51
Cotton	22.28	34.04	48.07
Fruits & Nuts	60.66	89.05	122.78
Vegetables	128.33	181.67	238.16
Sugarcane	283.43	358.01	381.35

Production…cont'd

Rice (Million tonnes)

	Current	2015	2020
East	40.97	44.22	47.91
West	5.29	5.95	6.61
North	28.36	28.66	29.48
South	23.82	22.20	22.06

Wheat (Million tonnes)

	Current	2015	2020
East	5.57	5.93	6.34
West	10.63	12.72	13.41
North	64.21	63.67	63.83
South	0.26	0.35	0.49

Pulses (Million tonnes)

	Current	2015	2020
East	1.88	2.62	3.27
West	5.96	6.69	7.20
North	4.08	5.35	6.52
South	2.59	3.18	3.47

Maize (Million tonnes)

	Current	2015	2020
East	2.81	4.28	5.88
West	3.44	5.83	8.87
North	4.93	6.78	8.67
South	8.44	11.29	14.81

Oilseeds (Million tonnes)

	Current	2015	2020
East	1.04	1.92	2.45
West	14.40	16.85	19.42
North	5.18	7.92	8.55
South	4.44	5.30	6.09

Cotton (Million bales)

	Current	2015	2020
East	0.16	0.23	0.30
West	12.62	19.52	27.50
North	4.87	7.83	10.71
South	4.62	6.47	9.55

Fruits (Million tonnes)

	Current	2015	2020
East	12.48	16.37	20.42
West	19.21	33.38	51.69
North	9.26	12.89	16.90
South	19.71	26.41	33.77

Vegetables (Million tonnes)

	Current	2015	2020
East	55.44	73.50	89.55
West	17.34	27.50	39.72
North	30.36	43.99	59.01
South	25.20	36.67	49.88

Sugarcane (Million tonnes)

	Current	2015	2020
East	8.34	11.43	12.93
West	79.13	123.93	140.72
North	124.44	145.81	154.55
South	71.51	76.84	73.16

Production and consumption

	Rice	Wheat	Vegetables	Pulses
Consumption				
Current	76.8	60.2	90.6	12.1
2015	87.9	68.9	134.7	17.1
2020	96.0	75.2	177.0	21.6
Production				
Current	98.4	80.7	128.3	14.5
2015	101.3	82.7	181.7	17.8
2020	106.1	84.1	238.2	20.5

Mn tonnes

- While self sufficiency for cereals will continue in terms of production, distribution inefficiencies will ensure that imports may still be required
- In the case of F&V, India will increase its exportable surplus, while the precarious position in pulses will not be resolved

Yields

- Overall improvement of yields is limited, on account of the slow rate of soil improvement, technology development, policy reforms and farmer education
  - Rice yields have scope for further increases on account of hybridisation; subsequently, yields will stagnate until soil quality improves (latter half of the scenario horizon)
  - Fruits and vegetables will continue to see healthy yield improvements due to greater hybridisation and adoption of better practices driven by contract farmers; Bt brinjal will raise yields upon its entry around 2013
  - Sugarcane yields will begin to plateau in West and North, but scope for improvement exists in other regions
  - Cotton yields will rise due to improved Bt varieties, while corn and soya will benefit from GM seed introductions, around 2018

Yields…cont'd

Rice

	Current	2015	2020
East	1.81	1.97	2.10
West	1.31	1.43	1.53
North	2.69	2.88	3.05
South	2.95	3.08	3.18

Maize

	Current	2015	2020
East	2.23	2.81	3.42
West	1.74	2.38	3.09
North	1.85	2.27	2.70
South	3.82	4.18	4.51

Wheat

	Current	2015	2020
East	2.02	2.22	2.41
West	1.80	1.98	2.14
North	3.41	3.52	3.62
South	0.93	1.26	1.64

Pulses

	Current	2015	2020
East	634	734.3	830.8
West	706	735.0	772.5
North	659	795.5	922.2
South	589	609.3	625.7

Oilseeds

	Current	2015	2020
East	709	827	941
West	1071	1161	1242
North	1109	1145	1176
South	829	961	1087

Cotton

	Current	2015	2020
East	397	453	505
West	351	502	678
North	644	911	1216
South	409	665	996

Vegetables

	Current	2015	2020
East	14.76	15.83	16.64
West	15.20	18.07	20.45
North	16.79	18.01	18.92
South	20.61	24.92	28.54

Fruits & nuts

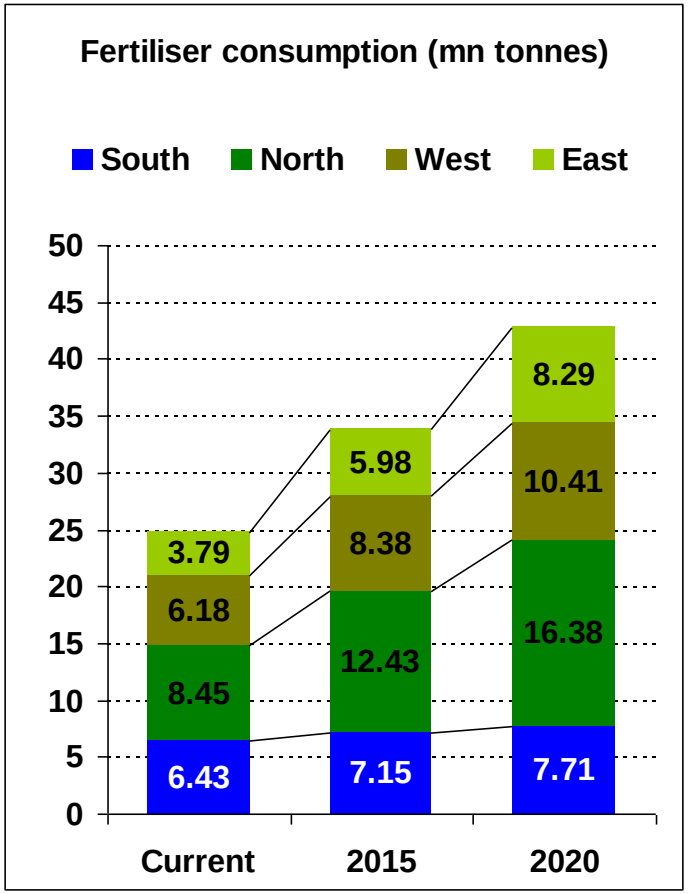
	Current	2015	2020
East	9.57	9.91	10.16
West	10.36	11.90	13.14
North	8.82	11.22	13.33
South	10.43	11.18	11.75

Sugarcane

	Current	2015	2020
East	49.94	54.37	57.07
West	74.70	82.23	86.86
North	52.66	55.82	57.71
South	91.01	95.31	97.86

Fertilisers

- Urea is notionally brought under NBS by 2012 but effective price decontrol happens in 2015 after the installation of a new Government
- Meanwhile, plant growth regulators and micro nutrients will be adopted at a fast pace to help address the soil nutrition problem
- Customised fertilisers will grow at a moderate pace initially, on account of inadequate IPR protection and unfavourable cost economics (in terms of cost reimbursement by the Government)
- Subsequently, the growth of this segment will pick up in the latter half of the scenario horizon



Fertilisers…cont'd

- Overall industry growth rate will increase in the latter half of the scenario horizon as the above challenges are resolved through appropriate policy action
- Through persistent but inefficient Government efforts and pricing reform, a gradual improvement in the N-P-K ratio across states takes place; ideal ratios are not achieved by 2020 however
- Overall growth in the industry averages 3.5% during 2010-2014, and then increases moderately (to 5%) as the effects of price de-control and other reforms become evident

	Current NPK ratio			2020 NPK ratio		
	N	P	K	N	P	K
South	2.45	1.26	1.00	3.24	1.67	1.00
North	15.53	5.06	1.00	7.99	3.43	1.00
West	1.92	1.04	1.00	4.32	2.39	1.00
East	2.93	1.25	1.00	3.66	1.71	1.00

Pesticides

- The pesticide market will be marked by fragmentation and will see a gradual consolidation during the final years of the forecast period.
- Replacement of generics by branded products will be slower compared to all other scenarios.
- Incremental increase in farmer affordability will result in marginal increase in the sector's growth rate.
- While the generic products segment will continue to grow, it will witness increasing pressure from the civil society over adverse health impact of chemical pesticides.
- Greater focus on post-harvest crop management as well as shortage of farm labour will result in increased growth of fungicides and herbicides.
- Overall, the pesticides market will grow at ~12% during the initial years, increasing to ~14% during the later stage, taking the market size to around Rs 325 bn to 2020.

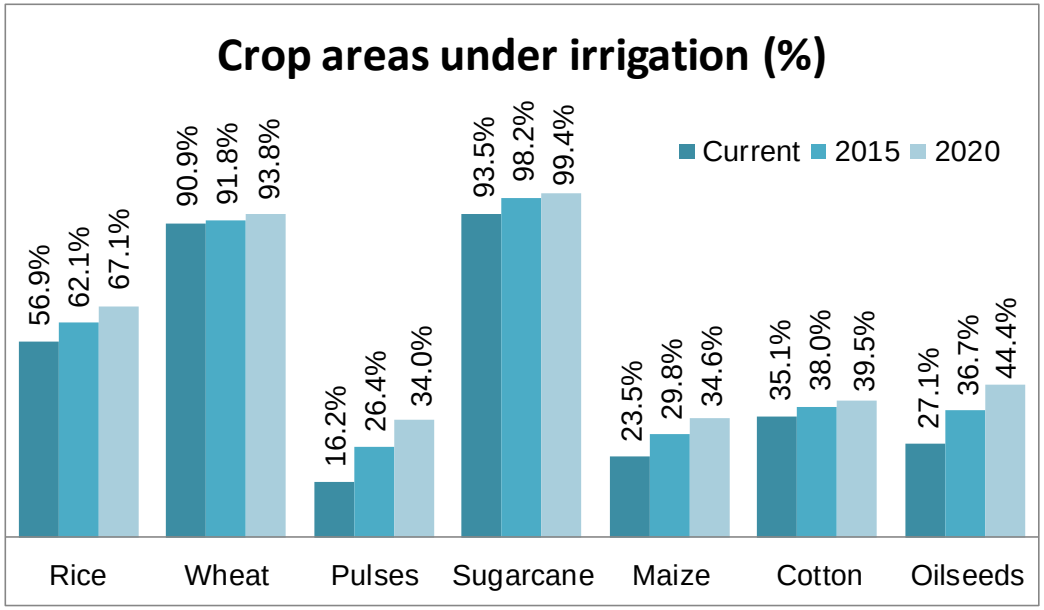
Agriculture extension

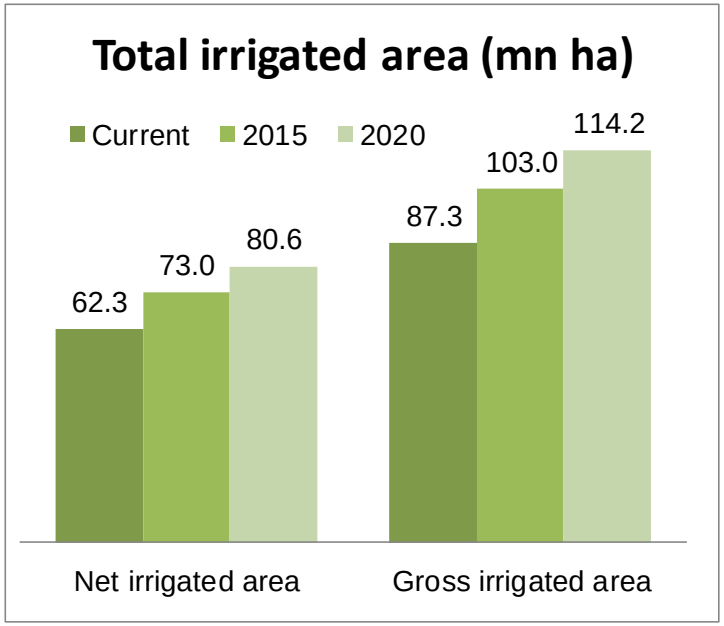
- Amongst the most complex challenges facing the Government, extension services will not be dramatically reformed over the next decade, largely due to administrative lethargy
- Incremental improvements, with some support of the private sector, will be the order of the day; an unwillingness to engage the private sector in a formal arrangement will detract from efficiency
- Imbalances in the agricultural research system (in terms of funding, research agenda and delivery of implementable results) will continue
- Consequently, crops such as wheat, pulses and oilseeds, which are suffering from lack of new technologies, will not see a significant and sustainable improvement
- Truly ‘business as usual’…

Irrigation and cropping intensity

- The Government will attempt to involve the private sector in irrigation projects through the PPP model; however, commercial and financial difficulties will prevent the partnership from working smoothly
- In parallel, efforts towards greater watershed management and encouragement for micro irrigation techniques will produce erratic results across states; much will depend on private sector initiatives
- As a result, the reliance on minor irrigation (usage of ground water) will continue to grow, placing growing strains on water availability
- This will necessitate changes in water pricing to reflect its scarcity as well as greater encouragement to the private sector to invest – the effects of these trends will not be significantly visible in the scenario horizon
- Cropping intensity therefore, will increase primarily on the back of greater sowing of short duration crops
- This will be facilitated by a gradual improvement in soil quality and an improvement in farming practices

Irrigation…cont'd





- A gradual increase in irrigated area will continue, with the biggest gains in pulses, maize and oilseeds
- Total irrigated area will increase from 62.3 mn ha to 80.6 mn ha; however, efficiency will be impacted due to erratic water availability

The policy environment

- Overall strategic focus
  - The Government will continue an attempt to balance the need to ensure food self sufficiency and enhancing farmer welfare
  - However, lack of political will, short-termism and incorrect prioritisation will undermine the effort and prevent either of the goals from being fully realised
- Food Security
  - The NFSA will come into effect by 2012, initially with limited coverage and by 2014, with broadened coverage
  - This will necessitate an increased focus on foodgrain production and the Government's distribution machinery (however, a revamp will only happen in the latter half of the scenario horizon)

The policy environment… cont'd

- Government investment
  - Overall investment of the Government in agriculture will continue to rise gradually and moderate efficiency improvements will come about on the back of technology (IT, UID, etc)
  - However, Centre-state relations, conflicting Ministerial priorities and short term political motivations will act as undermining forces
- Subsidies
  - Hesitantly, the Government will carry through reforms in fertiliser subsidy, but the process will be long drawn and tedious
  - In parallel, subsidies will continue to increase in other areas (irrigation, MSP, PDS, etc) thereby ensuring that reliance on the Government continues

The policy environment… cont'd

- Land ceilings
  - The Government will remain convinced about the need for rural land ceilings and hence, most states will persist with the Act with marginally higher ceilings
  - Pooled farming will emerge as an informal substitute for land consolidation
- Intellectual property
  - The Fertiliser Control Order will be relaxed to the extent of protecting customised formulations and in order to encourage innovation over a 5-6 year period
  - In seeds, implementation of existing IPR laws will be gradually strengthened, but farmers will not be denied the right to continue selling saved seeds

The policy environment… cont'd

- External trade
  - The imperatives of food security in a weak political configuration imply that exports will never be fully freed, although quota restrictions may be relaxed
- Internal barriers to trade
  - Eventually all states will dismantle explicit barriers to agricultural trade
  - However, a continuing APMC mind-set implies that ad-hoc restrictions will be imposed whenever state Governments sense a threat on prices or availability; this will create unpredictability for both farmers and industry
- GM seeds
  - A negative risk perception will continue, undermining the pace of introduction of GM crops – particularly in foods
  - After much debate, Bt brinjal will be introduced around 2013-2014; prospects for GM seeds in other major foods (rice, soya) are poor – around 2018

The policy environment… cont'd

- Production enhancement strategy
  - Recognising the poor soil conditions, the Government will make efforts (e.g. soil testing programmes) to improve the situation
  - However, inherent institutional weaknesses will ensure that the onus informally falls upon the private sector itself
  - Crop specific policies will continue in the form of multiple, fragmented programmes as opposed to integrated ones – this will undermine their efficiency
- Water and watershed management
  - Responding to the emerging water crisis, the Government will increase the budgets and the number of programmes
  - However, an inability to reform basic administrative issues will limit their efficiency (already there are 6 separate programmes under 'watershed management')

Scenario III: Strategy implications

Strategic approach	• Predominantly cost management to cater to price-sensitive farmers, will be the key to profit maximisation
Innovation	• Product innovation: opportunity to compete on innovation is undermined by lax implementation of IPR laws, fragmented industry and price sensitive farmers
Stakeholder relations	• Need for intense and proactive engagement with Government and civil society – at central and state levels
Investment	• Incremental capacity augmentation in view of unpredictable policy regime and uncertain profitability
Alliances	• Scope for alliances with SAUs – on research and extension • Alliances with rural marketing organisations (financial services, retail, etc) leveraging a common technology infrastructure

5. Signposts

Signposts for Scenario III

Signposts for Scenario 3

2010 2015 2020

Political timeline

Bickering between Centre & states continue on account of continued multi-party politics
Political fragmentation ensures continuation of vote bank politics, ie, populism

2012-14: Congress performs poorly in many state elections, while regional parties consolidate their position in the states

2014: Congress returns to power as a leader of a ruling coalition, with a weak majority. Sets a social equity-based inclusive agenda

2016: Internal dissension within the coalition, coupled with serious threat from the regional parties. This forces desperate and populist policy-making.

2016-18: State assembly elections once again favour local parties. The central coalition undergoes changes in its composition, but remains fragmented.

2019: Another coalition returns based on the recurring theme of public welfare

Signposts for Scenario 3

Policy timeline

For instruments such as APMC, individual states will continue to follow their own pace of reforms
Government investment in agriculture as a percentage share of agricultural GDP continues to grow at the same pace

2012: The NFSA is enacted with limited coverage

2012: Restrictions continue to exist on commodity trading and futures

2013: Increase in the number & scope of region & crop-specific programmes

2014: The first GM food crop is introduced

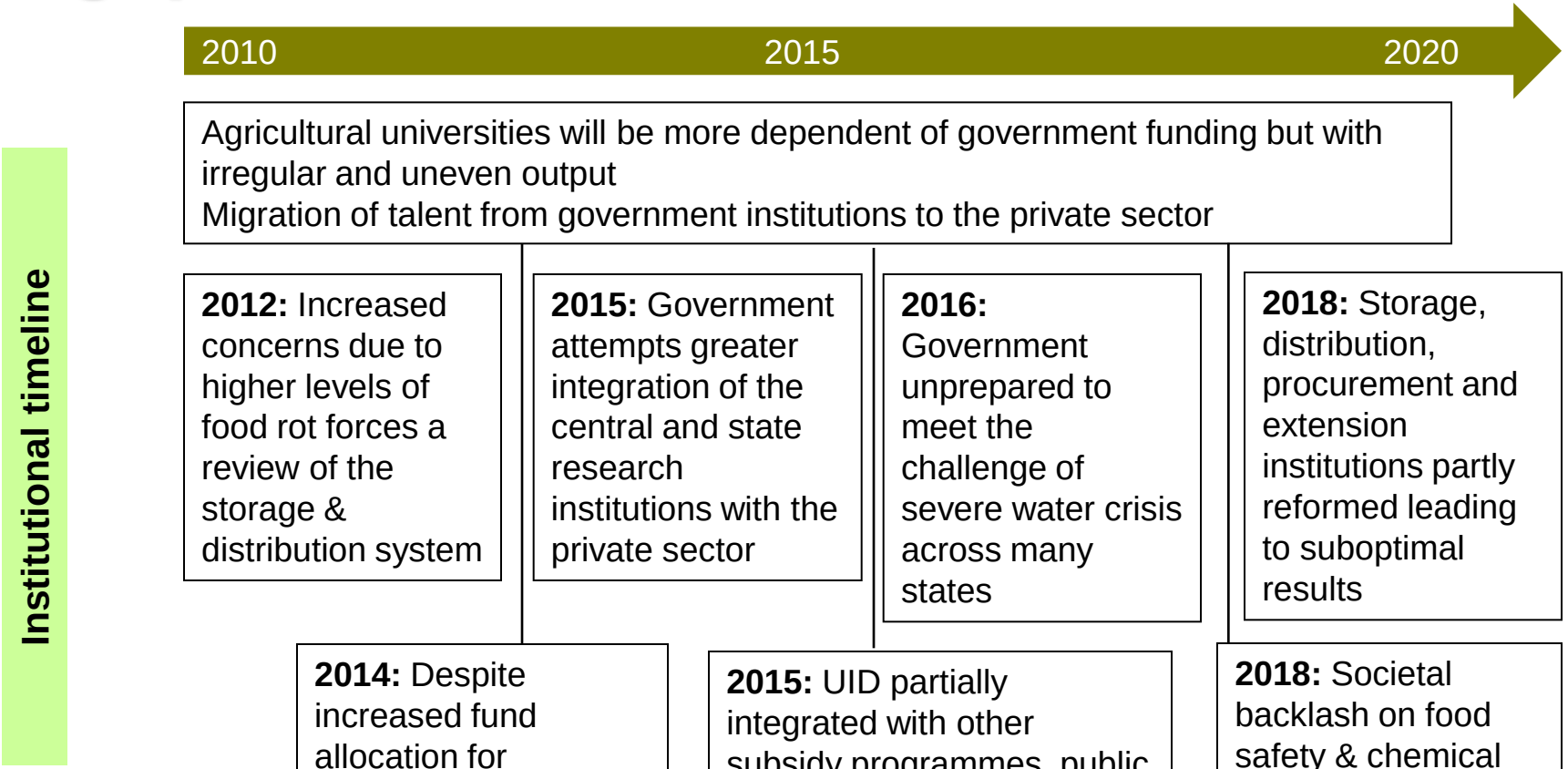
2014: Scope & coverage of FSA increased significantly

2015: FDI in food retail partially relaxed; strictures introduced for existing players

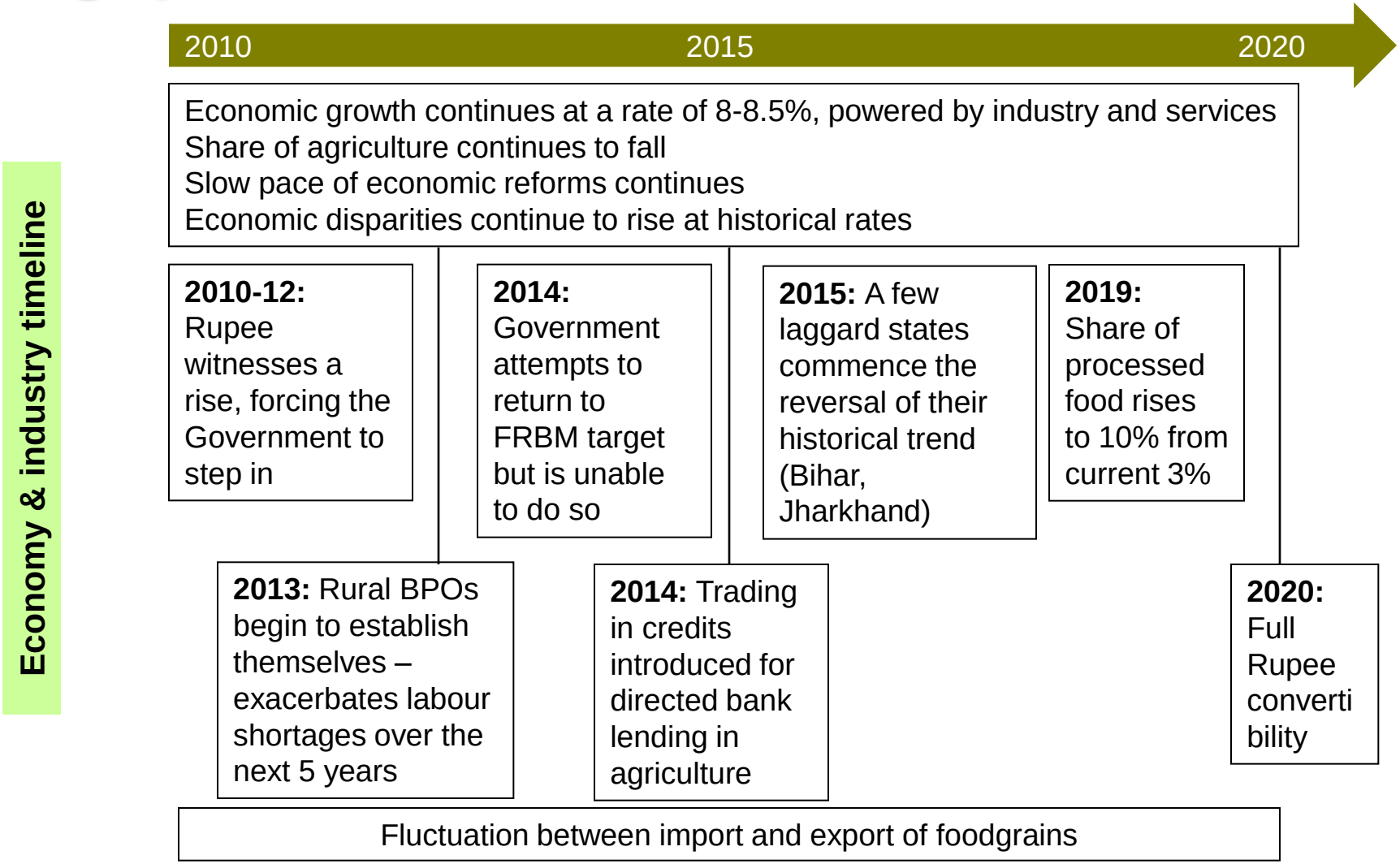
2016: ~5 states revise land ceiling upward

2018: Fertilser sector largely decontrolled

Signposts for Scenario 3



Signposts for Scenario 3



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