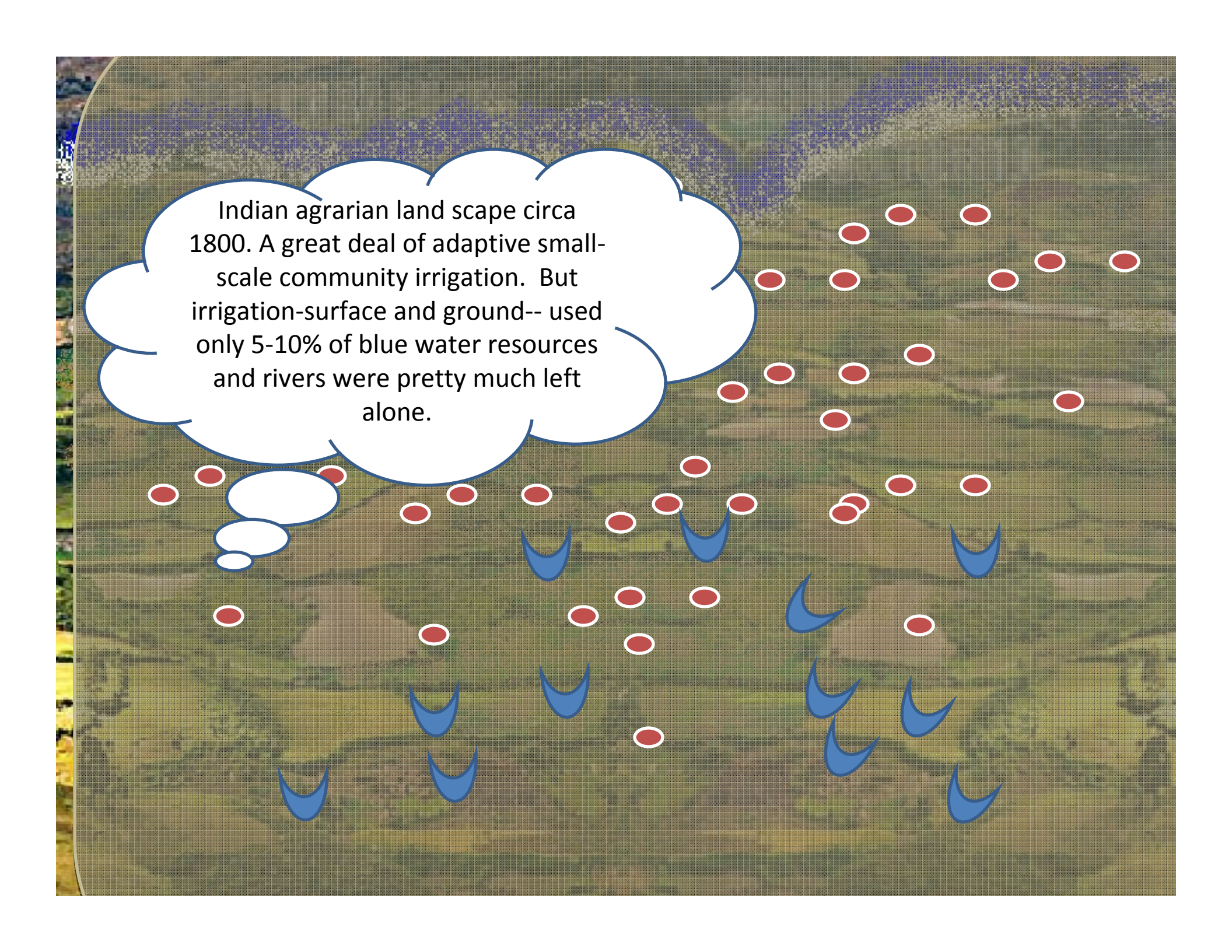


An aerial photograph of a terraced agricultural landscape. A central canal system runs through the middle, with smaller channels branching out to various rectangular plots of land. The fields are in different stages of growth, showing shades of green and yellow. In the background, there are rows of blue flowers, possibly marigolds, planted in neat lines. The overall scene depicts a well-organized and irrigated farming area.

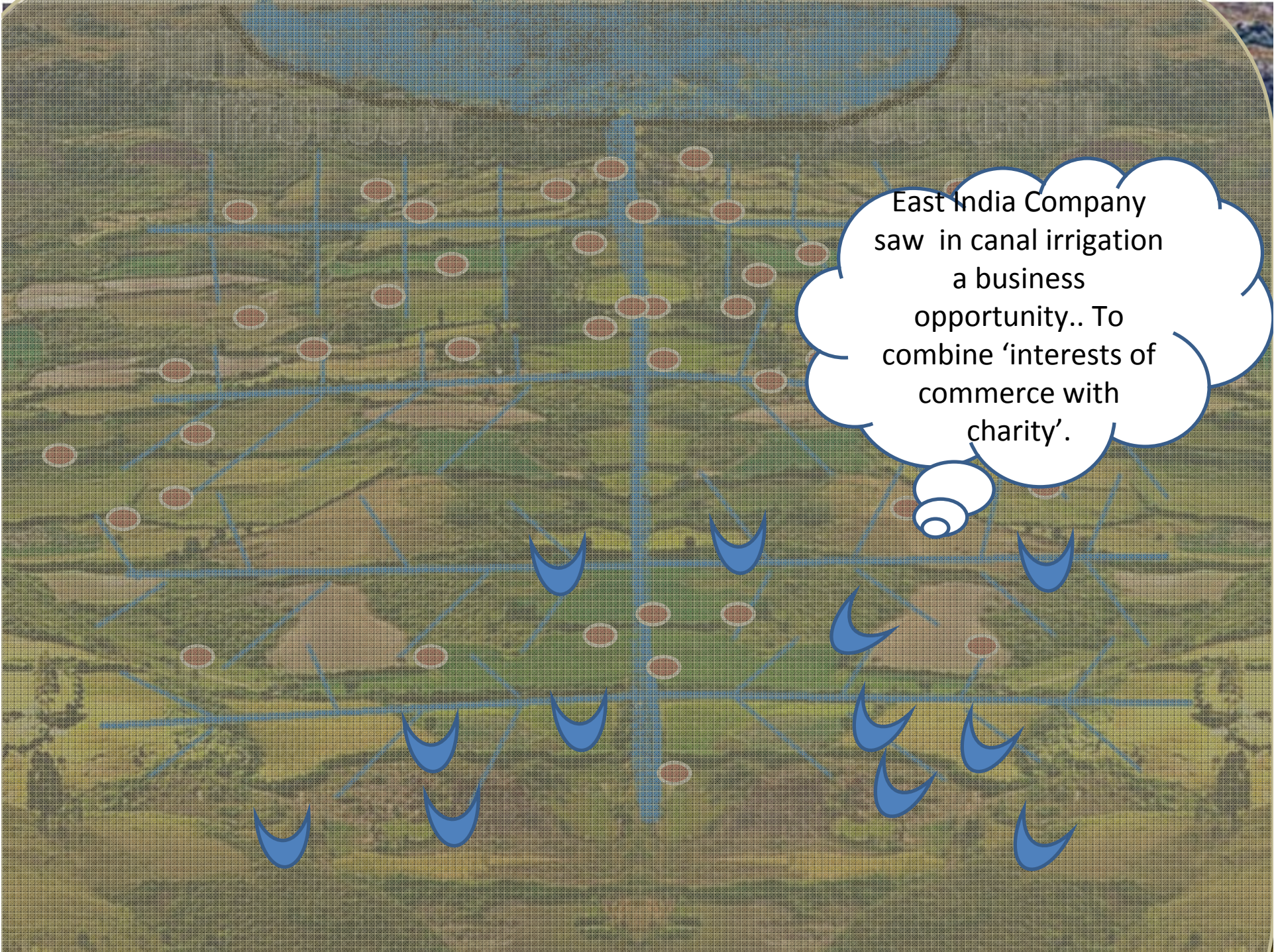
The Past, Present and Future of Canal Irrigation in India

Tushaar Shah

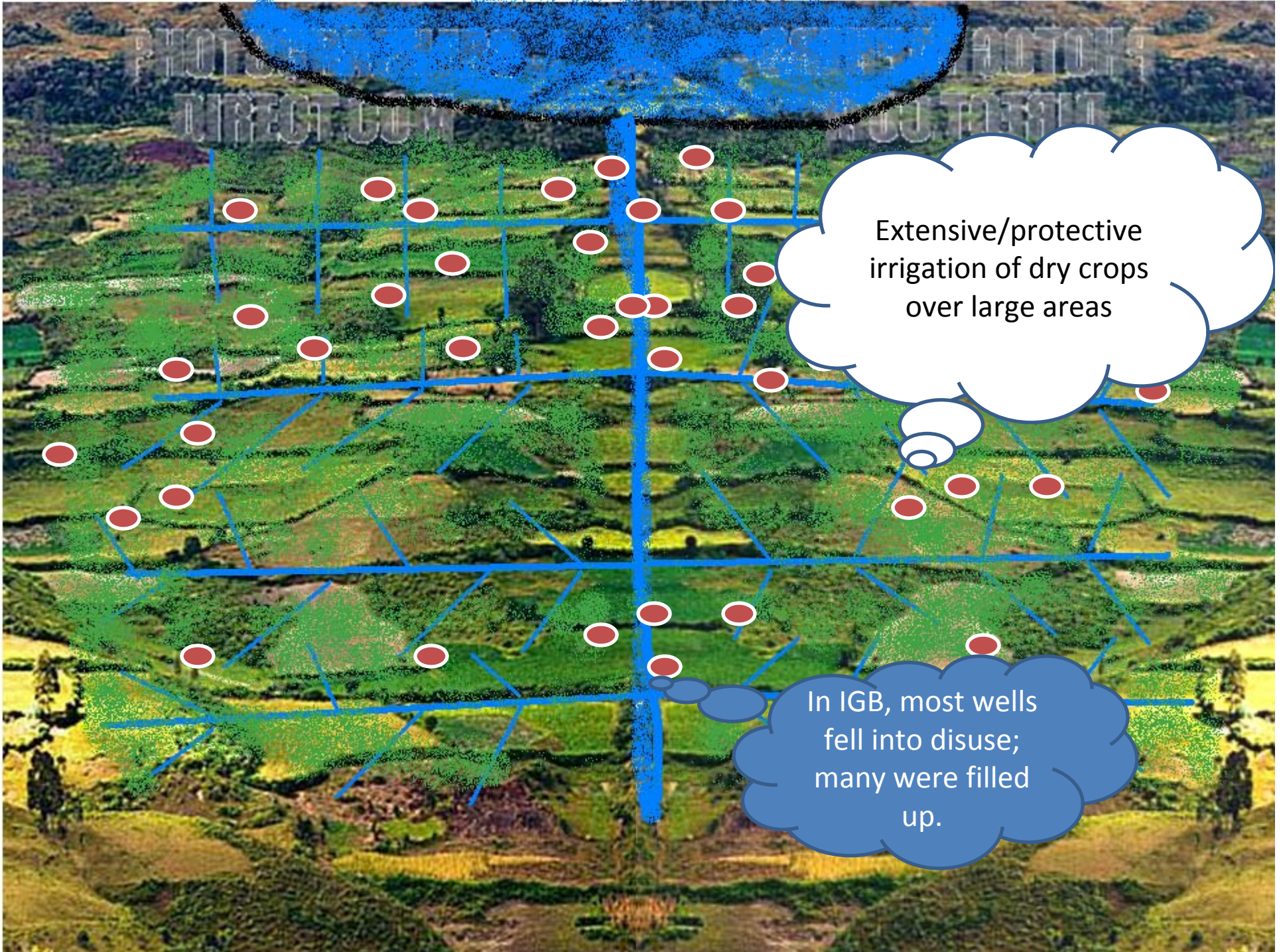
Senior Fellow,
International Water Management Institute, Colombo

An aerial photograph of a terraced agricultural landscape, likely in India, showing rows of green terraces. A large white thought bubble with a blue outline is positioned in the upper left quadrant. The text inside the bubble describes the agrarian landscape circa 1800. Scattered across the landscape are numerous red circles with white outlines, representing small-scale irrigation points. Blue crescent-shaped symbols are also scattered across the landscape, representing surface and ground water resources. The background is a textured, greenish-brown color.

Indian agrarian land scape circa 1800. A great deal of adaptive small-scale community irrigation. But irrigation-surface and ground-- used only 5-10% of blue water resources and rivers were pretty much left alone.

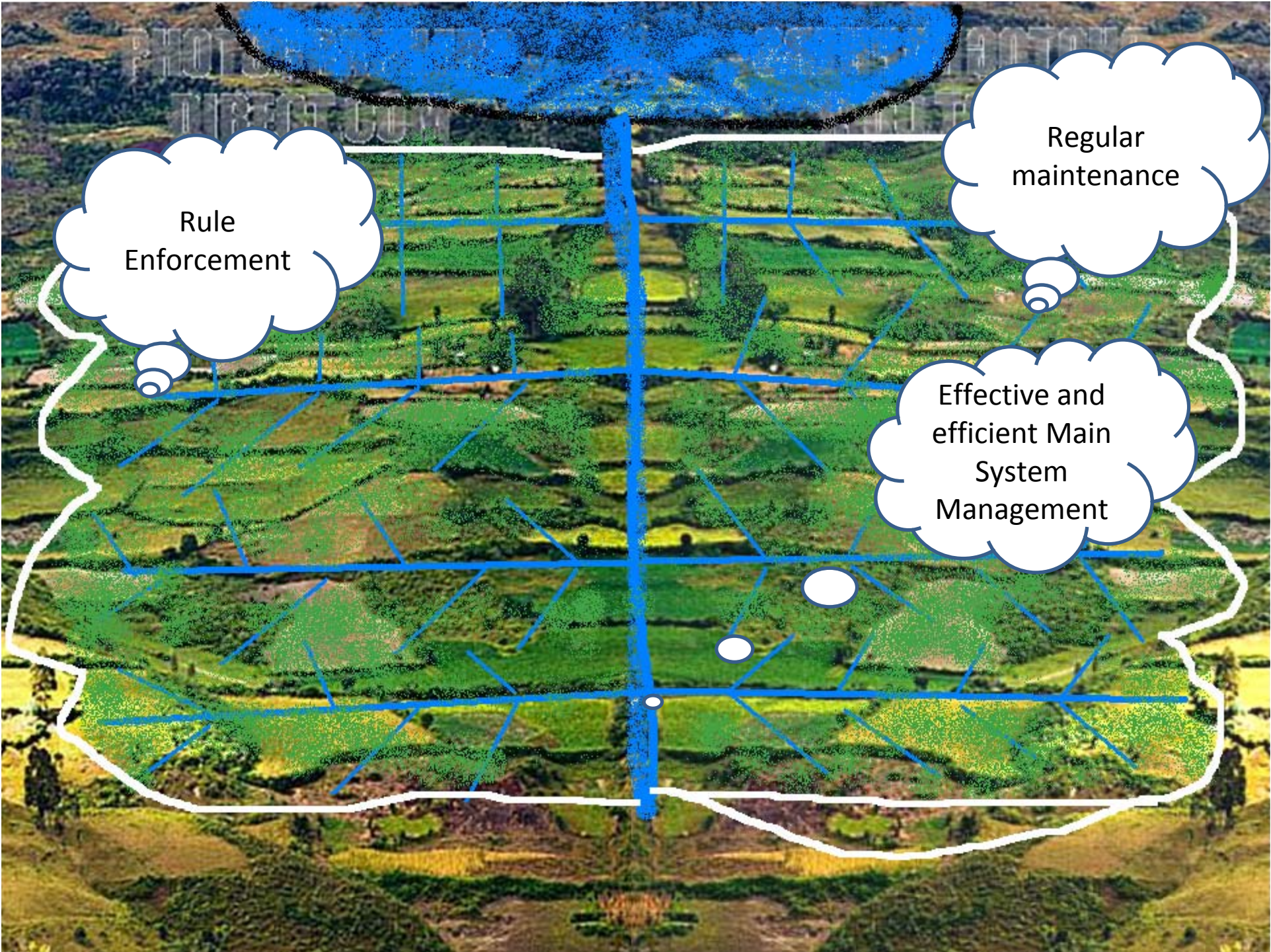
An aerial photograph of a canal irrigation system. The image shows a grid of blue canals crisscrossing a green and brown landscape. Numerous small red circles are scattered across the fields, likely representing water distribution points or specific agricultural plots. A white thought bubble with a blue outline is positioned on the right side of the image, containing text. The background has a halftone dot pattern.

East India Company
saw in canal irrigation
a business
opportunity.. To
combine 'interests of
commerce with
charity'.



Extensive/protective irrigation of dry crops over large areas

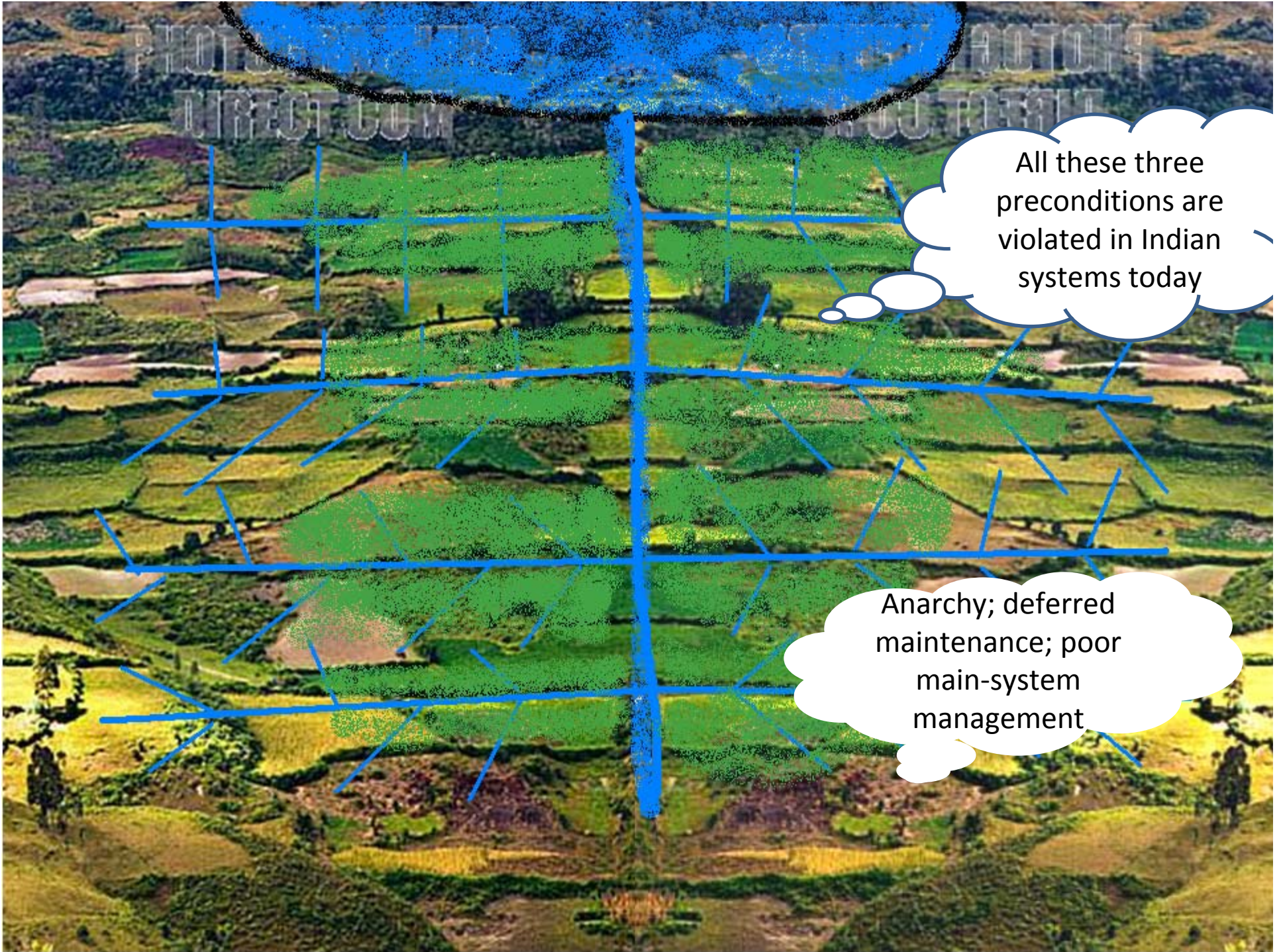
In IGB, most wells fell into disuse; many were filled up.



Rule
Enforcement

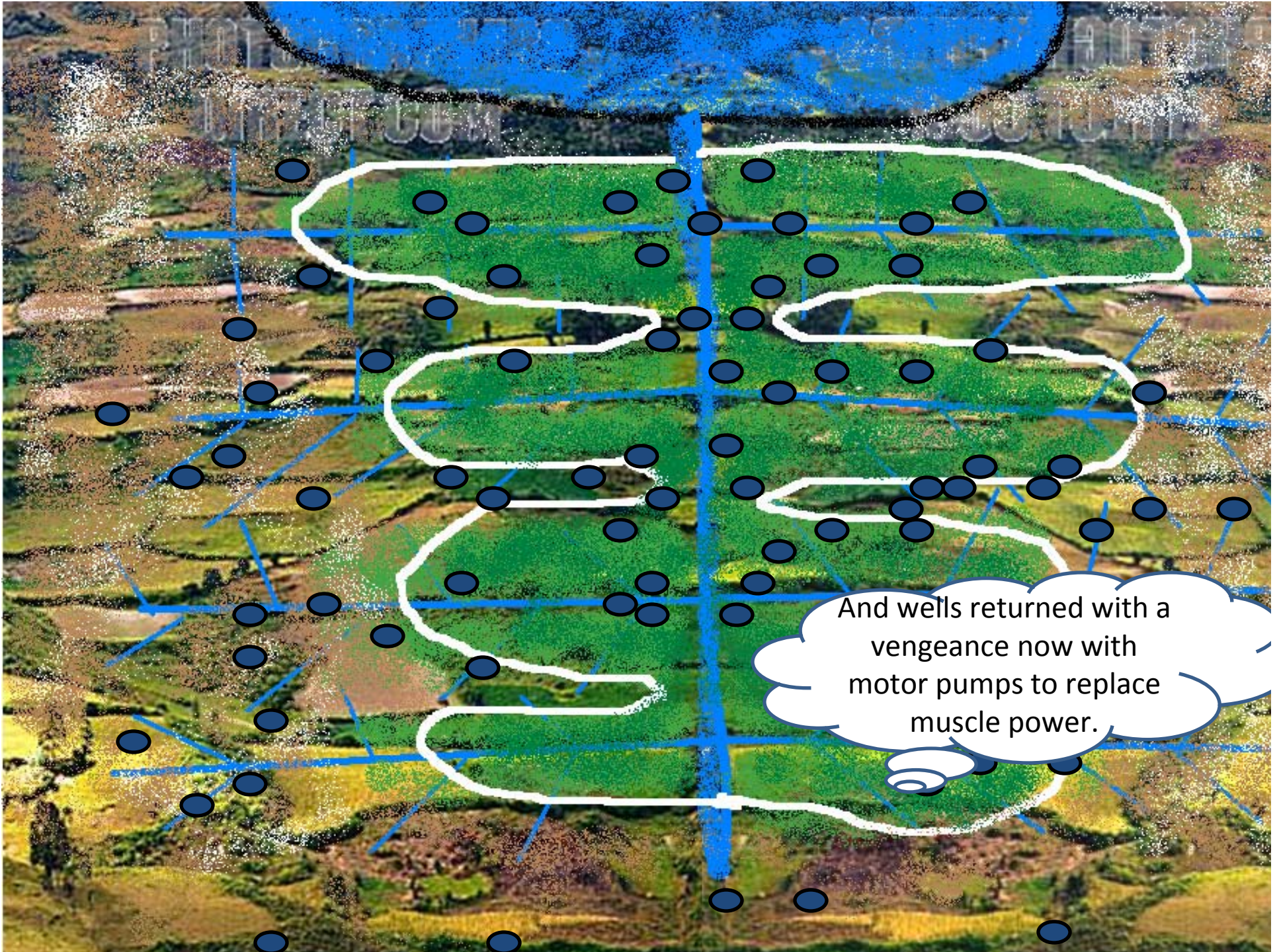
Regular
maintenance

Effective and
efficient Main
System
Management

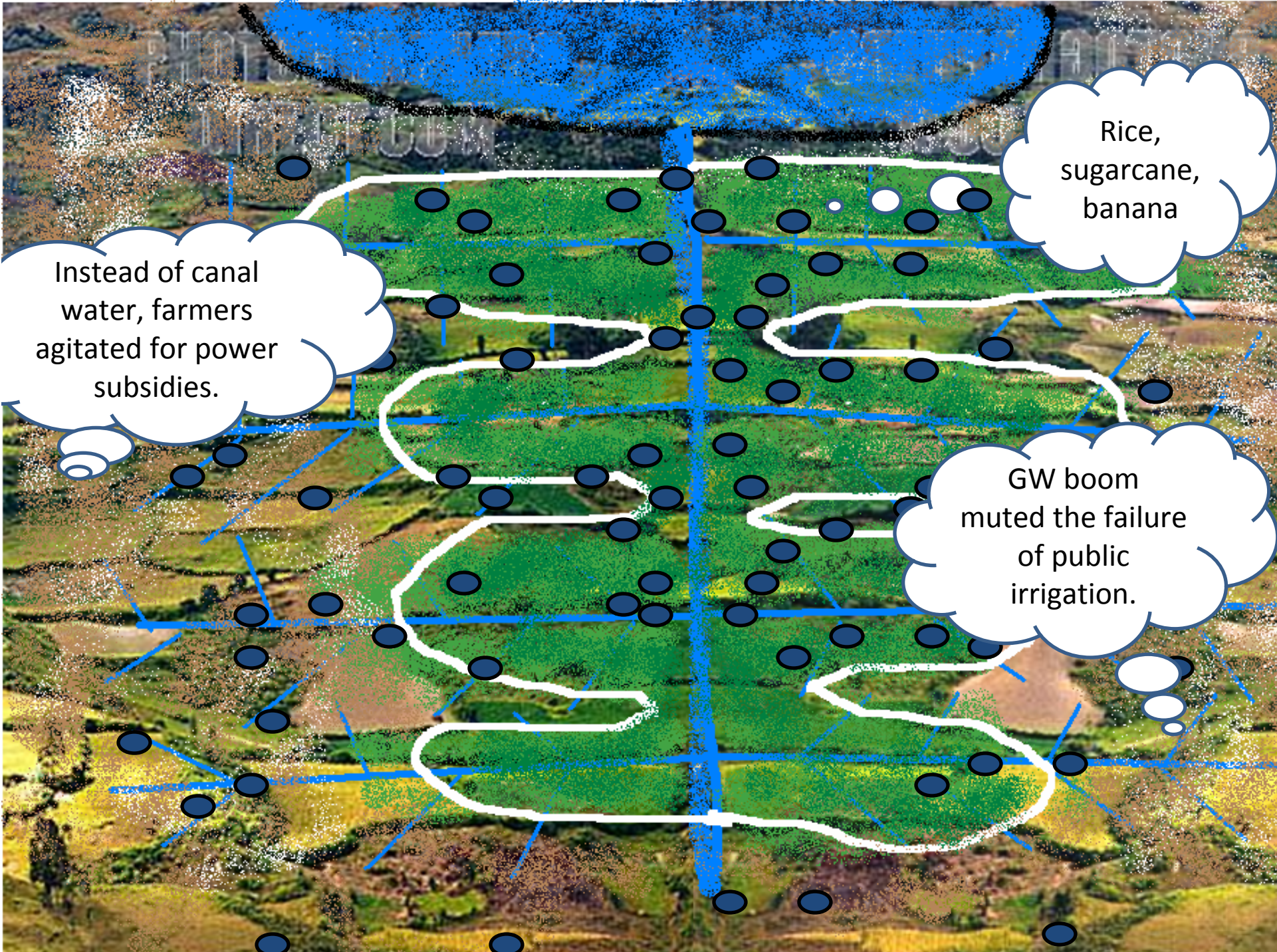


All these three preconditions are violated in Indian systems today

Anarchy; deferred maintenance; poor main-system management



And wells returned with a vengeance now with motor pumps to replace muscle power.

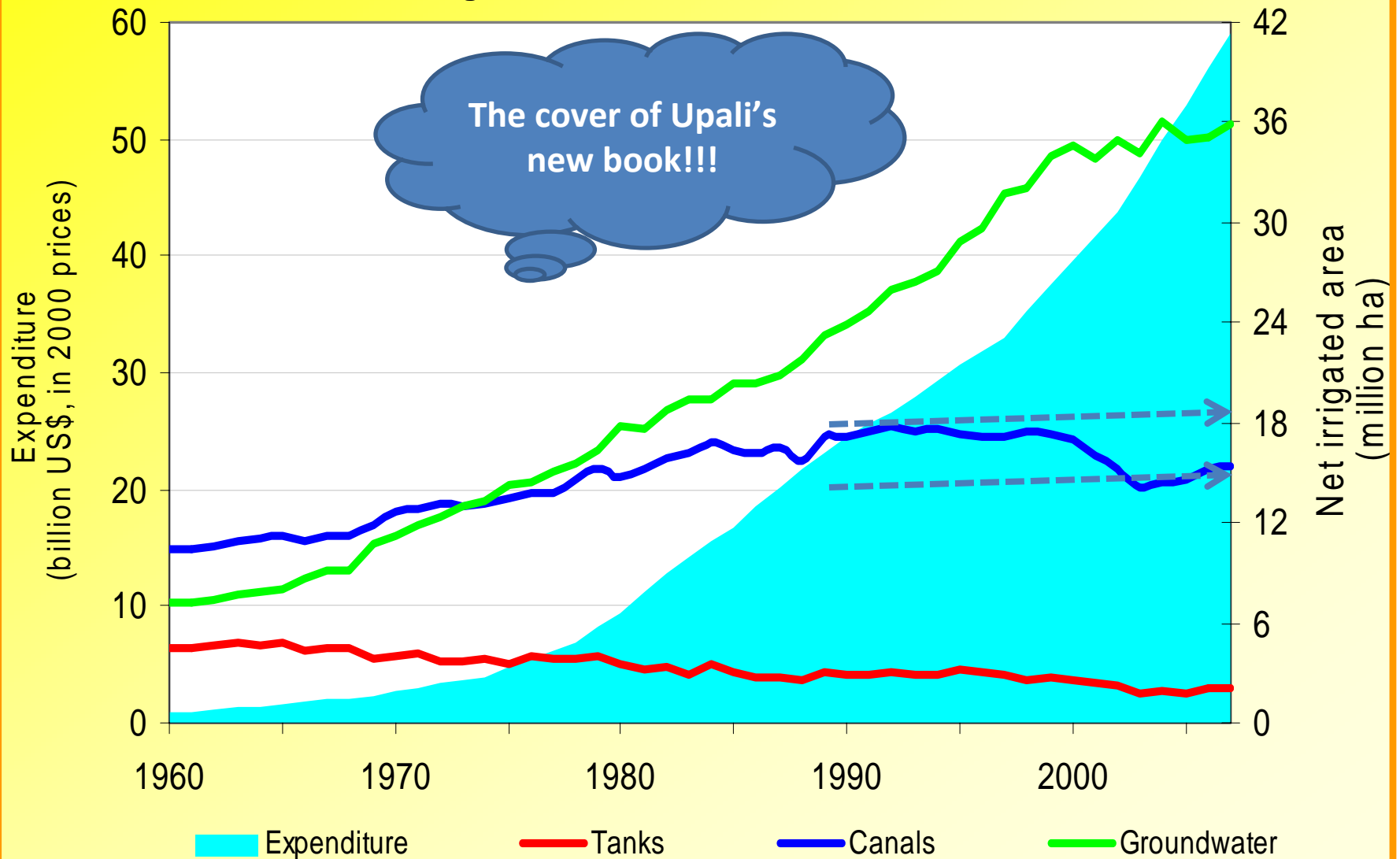


Rice,
sugarcane,
banana

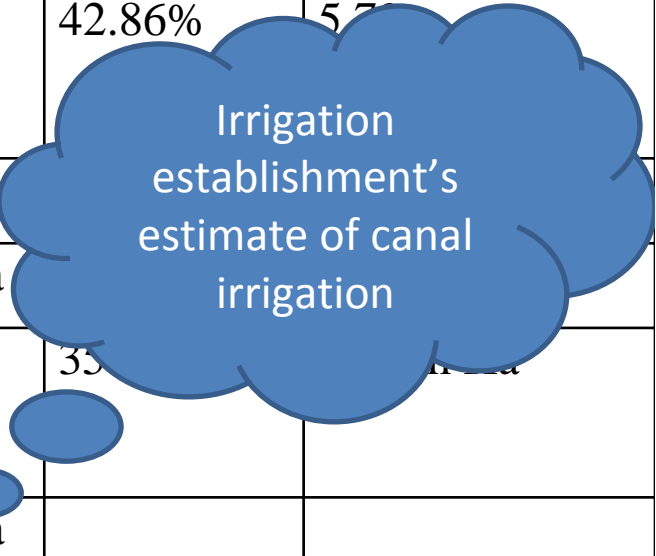
Instead of canal
water, farmers
agitated for power
subsidies.

GW boom
muted the failure
of public
irrigation.

Trends of public expenditure in major and medium irrigation and net irrigated area under different sources in India



		Data for year	Major & Medium Schemes	Groundwater	Other sources
1	Minor Irrigation Census, October 2005, Net area irrigated	2000-1	10.23 m Ha	30.5 m Ha	5.71 m Ha
2	NSSO 59 th Round:	Jan-Dec 2003			
2a	% of net area sown in kharif irrigated by:		7.75%	28.95%	5.55%
	Estimated kharif area irrigated by:		8.37 m Ha	31.3 m Ha	5.99 m Ha
2b	% of net area sown in rabi irrigated by:		7.68%	42.86%	5.71%
	Estimated rabi area irrigated by:		7.83 m Ha		
	Estimated gross area irrigated by:		16.2 m Ha		
3	Ministry of Agriculture, Govt. of India: Net area irrigated by:	2001-2	15.9 mHa	35 m Ha	
4	Central Water Commission/ICID	2003-4	31.3 m Ha		



	Pre-Colonial (Adaptive Irrigation)	Colonial (Constructive Imperialism)	Post-Colonial (Atomistic Irrigation)
1.1 Local authority structures	Strong	Strong Revenue	Weak Welfare Impossible
1.2 State interest in irrigation		High	Low
1.3 Forced Labour		High	Low
2.1 Private land		Low	High
2.2 Tenancy		High	Low
2.3 Landlessness		High	Low
2.4 Agricultural mechanization		High	Low
2.5 Agricultural extension		High	Low
3.1 Population pressure		High	Low
3.2 Intensification and diversification		High	Low
3.3 Land use		High	Low
4.1 The cost and effort needed for water lifting and transport	Very High	Very high	Low
Unit of irrigation organization	Irrigation Community	+ Centralized irrigation system	Individual farmer

Canal system= IBM Mainframe
Tubewell= IBM PC
Diesel Pump= Lap top

For exploiting peasantry through rack-renting, the Colonial administration maintained systems, enforced rules and managed main-systems efficiently. The welfare state failed to do any of these.

	Major and Medium systems in	Major and Medium Irrigation
Source	<p>The British earned 11% return on irrigation investments right up to 1945. By 1955, India was subsidizing canal irrigation.</p> <p>In 1938, water fee was the largest source of Punjab government income. In 1960, Bihar abolished water fee because collection cost was higher than the fee.</p>	
Capital project		
Area (m ha)		
Water invest		
Value invest		
Water crops irrigated		
Working expenses as % of water fee collected	36%	1265%
Maintenance expenditure as % of working expenditure	53%	34%
Maintenance expenditure as % of capital investment	2.6%	1.1%

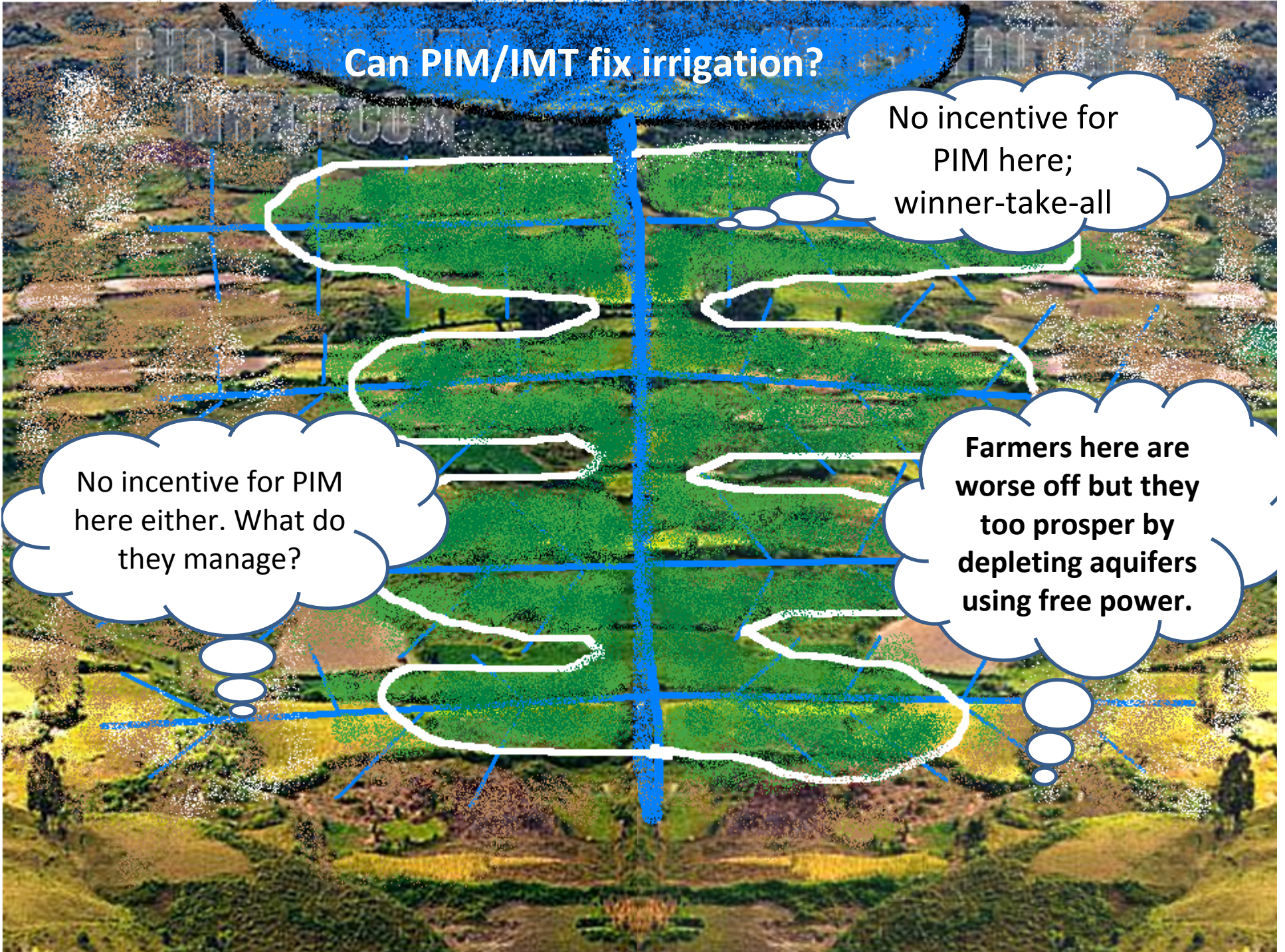
¹ Assuming 20 million ha of canal irrigated area growing crops worth Rs 20,000/ha at 2000-1 prices.

Can PIM/IMT fix irrigation?

No incentive for PIM here; winner-take-all

No incentive for PIM here either. What do they manage?

Farmers here are worse off but they too prosper by depleting aquifers using free power.

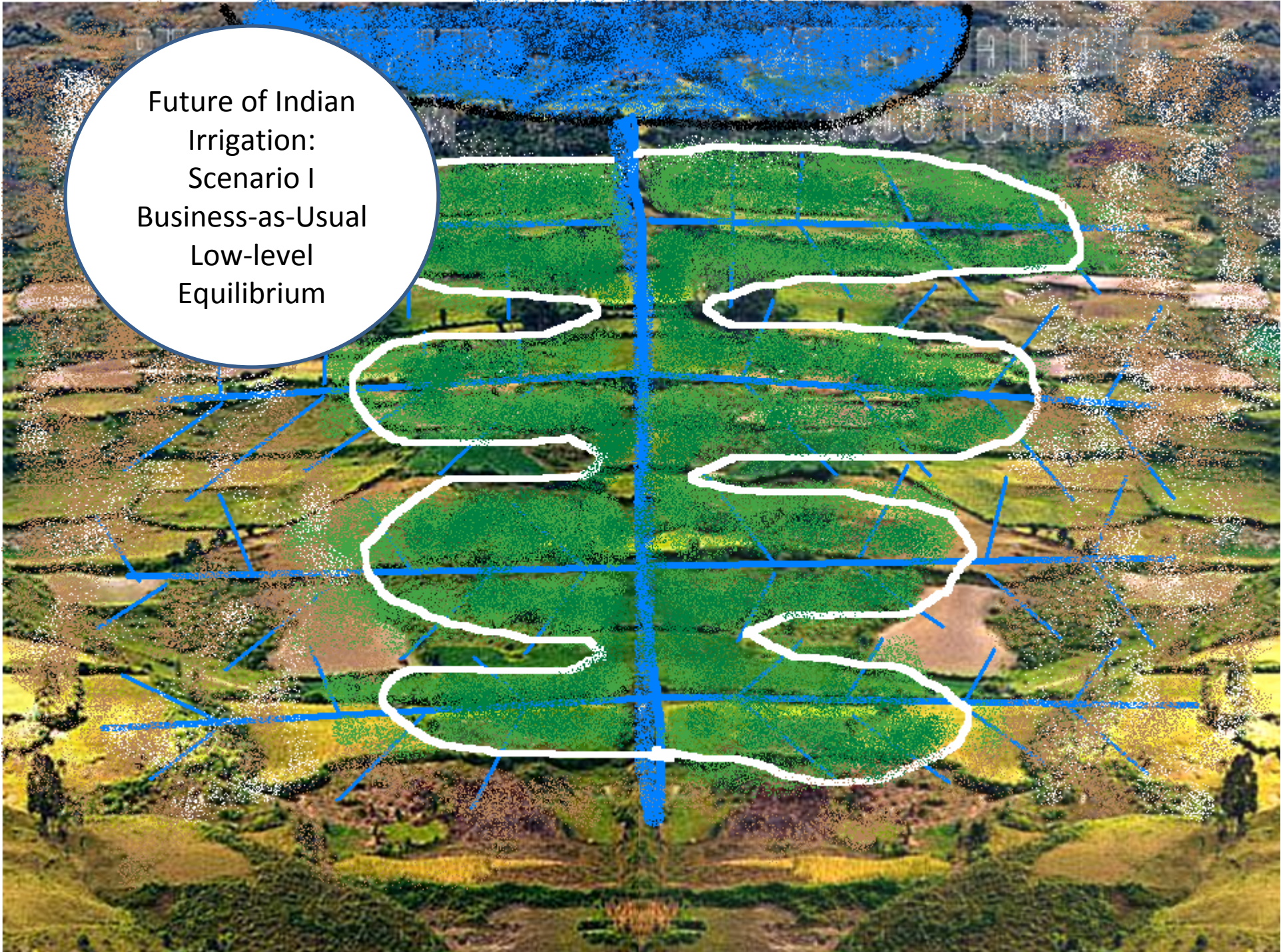


Shrinking of Canal Commands

	Canals	Groundwater
Storage	213 BCM	413
Diversion	90 BCM	-
Total water circulating	300 BCM	230 BCM
Net Area irrigated	16 m ha	50-60 m ha
Storage/ha of net irrigated area	19000 m ³	4200 m ³

- Canal areas apply 4 times more water than groundwater
- A good deal evaporates
- Spreading surface storages thinly over much larger areas is the best option for conjunctive management

Future of Indian
Irrigation:
Scenario I
Business-as-Usual
Low-level
Equilibrium



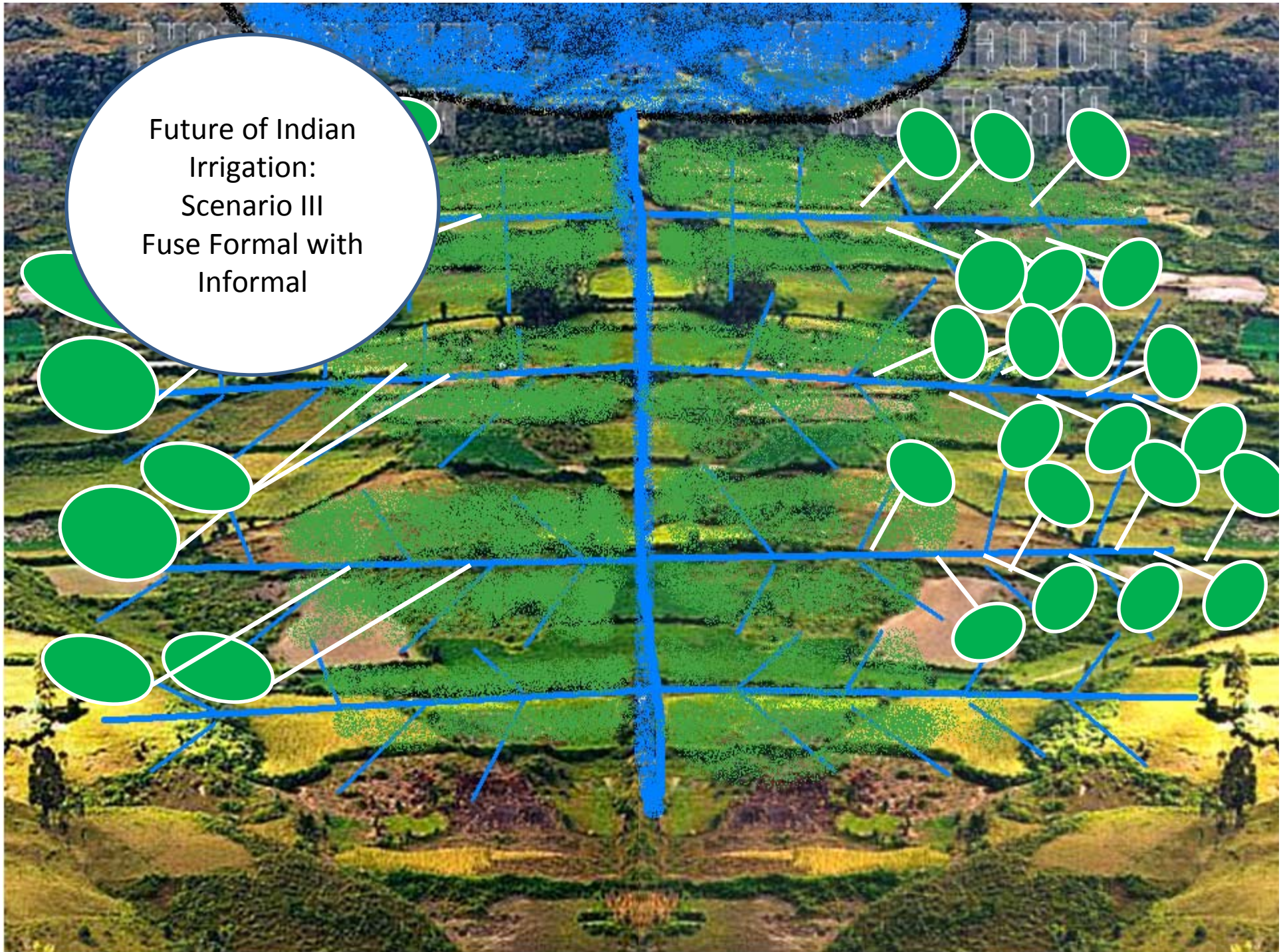
Future of Indian
Irrigation:
Scenario II
Rehabilitation and
Modernization,
PIM/IMT
Build-Neglect-
Rebuild

**Rehabilitation &
Modernization
Projects try to do
this.**

**However, these
overlook the changing
socio-technical context.**

**Blind to the built-in-failure;
Blind also to new
opportunities.. South Asian
canal commands are unlike
any in the world.**

Future of Indian
Irrigation:
Scenario III
Fuse Formal with
Informal



#	System modification and adaptation	Examples	How widespread is this in India?
1	Classical Canal Irrigation: The System operates as designed; wells are driven out by gravity flow irrigation.	? Mahi command in early 1970's; Bhakra command in the 1950's	Not at all
2	Main system delivers water in farm ponds (diggi's) fortnightly	Indira Gandhi canal, Rajasthan	Not very
3	Main system delivers water in village ponds as intermediate storages; farmers irrigate by gravity or lift	Sardar Sarovar; System tanks in South India	Some
4	Main system delivers water into canals; farmers/groups lift and irrigate	Mahi system; Upper Krishna, Sardar Sarovar command	Very widespread throughout India
5	Main system delivers water to a village contractor on volumetric basis and he allocates water to farmers and collects water fees	Several systems in China	This model is spreading in China
5	Main system recharges the aquifers in the command; much irrigation surplus results from tubewell irrigation	Bhakra; Mahi; Upper Krishna basin	Very very widespread
6	Irrigation tanks support well irrigation in their command	Tamilnadu; AP, Karnataka, Eastern Rajasthan	Very, very widespread
7	Irrigation tanks converted into percolation tanks	Tamilnadu; Rayalaseema in Andhra Pradesh	Not very, but gaining

For leapfrogging Indian public irrigation, what is needed is:

1. Redefine the role of irrigation deptt.
2. Capacity building in irrigation bureaucracies
3. Culture change; performance orientation; incentives and authority
4. Improved main-system management;
5. Public private partnership in water distribution

To maximize areas under conjunctive use.

Thank you.