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Towards a New Sociotechnical Regime with Indian Farmers? Natural Farming Promises and Controversies

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Towards a New Sociotechnical Regime with Indian Farmers? Natural Farming Promises and Controversies


International seminar "Social Scientists in the Civic Space"
India International Centre, New Delhi, 30 January – 01 February 2020

Bruno Dorin




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Towards a New Sociotechnical Regime with Indian Farmers? Natural Farming Promises and Controversies

Bruno DORIN (CIRAD-Montpellier, CIREC-Paris, CSH-Delhi)



Agro-industrial scenario?



Workforce Livelihood → **A World Without Farmers** → Food

Agro-ecological scenario?



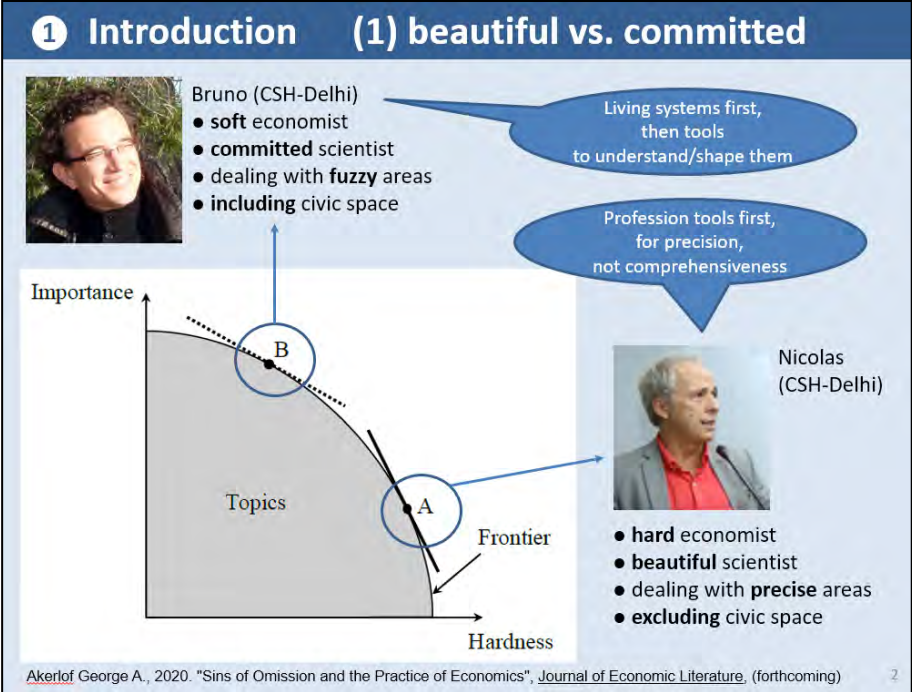
A World With Farmers and Nature

International seminar "Social Scientists in the Civic Space"
New Delhi, 30 January – 01 February 2020

(1) Dorin B., Hourcade J.-C., Benoit-Cattin M. (2013). *A World without Farmers?* CIREC WP 47, Paris, 26 p.
 (2) Dorin B., Aubron C., 2016. *Croissance et revenu du travail agricole en Inde*, *Economie Rurale*, 352, 41-65.
 (3) Dorin B., 2017. *India and Africa in the Global Agricultural System (1960-2050)*, EPW, LI:25-26, 5-13.
 (4) Dorin B., Joly P.-B., 2019. *Modelling world agriculture as a learning machine?*
From mainstream models to Agrifabium 1.0, Land Use Policy, pp. 1-10 [Online First: 06/3/2019].

The place of scientists in the civic space deeply questioned me from the beginning of my professional life, and after 30 years of experience as an economist trying as much as possible to interact and work with other colleagues in social sciences, I have come to classify social scientists into two broad categories, two archetypes, two caricatures.

The first, whether economists, anthropologists or historians, are those who are particularly averse to risk and to any form of engagement in the civic space. They claim to produce “independent knowledge”, “independent science”, whether or not the latter serves the societies which produce them and pay them. They are



usually very specialized in their discipline, strongly focussed on analytical tools and take often pleasure in using the most recondite language of their world to prove their knowledge and science, which is only accessible to a few initiates, or a few specialized journals, generally top-ranked in the discipline. I call this first archetype the “Beautiful” scientists. But we could also called them the “Hard” ones as Akerlof does for economists, because they have a “hardness bias” for precise specialized work with powerful analytical tools. Tools are first, and as Akerlof writes too, this leads them to ignore “Important” topics and problems when they are difficult to approach in a “Hard” way, and as it is usually the case. Their demand for precision, for Hardness, impedes the introduction of new ideas, as Akerlof concludes. All in all, in the name of a so-called “objective science”, these Beautiful scientists usually claim they are outside the politics of the civic space. They work for the beauty of science and human knowledge, whether or not this science leads us, directly or indirectly, to massive civic unrests, terrorism, wars or the extinction of mankind.

My second archetype are the “committed scientists”, where I position myself unlike Nicolas. These scientists are passionate about knowledge and science like the previous ones, but seek above all to put science at the service of societies, their major problems or challenges, whether social, political, economic or environmental. These scientists are generally less recognized in their discipline because, as writes Akerlof, “Importance is fuzzy”, not precise. They take professional risks also because they have to open up as much to other science fields as to major societal challenges in order to gain a little in systemic holism. They have to get out of their comfort zone to jump into the increasing complexity of the Anthropocene, into its continuous growth of orders and disorders or, as the French philosopher of science Edgar Morin would say to characterize what complexity is, the growth and cooperation of

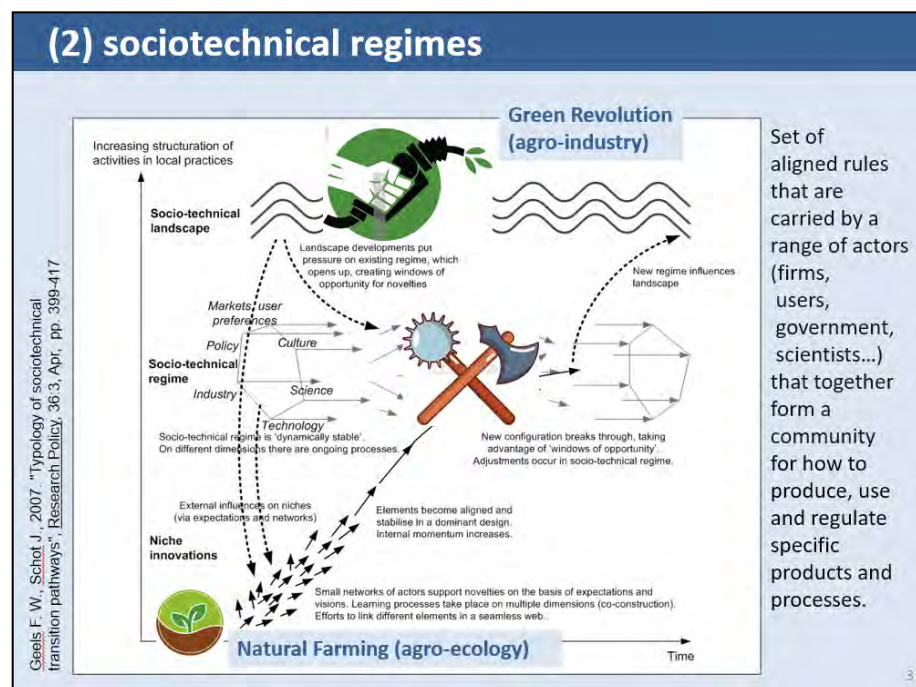
negentropy and entropy. A growing emancipatory complexity which requires ever more solidarity between peoples and scientific fields as Morin also writes, on pain of the complete collapse of humanity. Hence these “committed scientists” are clearly within the civic space. Some of them even argue that science and society are one, because the latter shape the former, from scientific questions to scientific tools or metrics, and vice-versa, in a tangled dance that science should try to understand much better than today.

I think that we need both Beautiful scientists and Committed scientists, in a balance way as at CSH, but unlike today more generally in France and India, where the moto of “scientific excellence” and its measurement reinforce the specialisation of scientific disciplines instead of a dialogue between them and with the civic space.

Thus I am a scientist Dedicated to the great problems of this world, a scientist who claims that science is not only a tool of evidence, hence a “truth machine” as the Beautiful scientists believe it, but also a tool of government of both science and the civic space. This mutual specification of science and civic space has become for me a growing subject of interest and research, as in the *Science and Technology Studies* or STS, and it led me to develop a model for long-term economic planning that Berkout and his colleagues would call a "learning machine", since it leaves room for a variety of scientific and stakeholder knowledge as well as public debate.

The purpose of my talk is not to present you today this “learning machine” called “Agribiom”, since I published on it last year in the journal *Land Use Policy*. My objective today is to illustrate and develop my points above on the basis of two materials: (1) the first is my analysis of the Indian economy and its agriculture through the eyes of this model, (2) the second being a controversy that has arisen recently in India between what looks like Beautiful and Dedicated scientists.

However, before I dive into my story and questions, I must conclude this long introduction with a few words on what Geels and Schot call a "socio-technical regime". I really like this concept because it shows very well how societies and technologies are bind together, like in this “tangled dance” mentioned earlier.

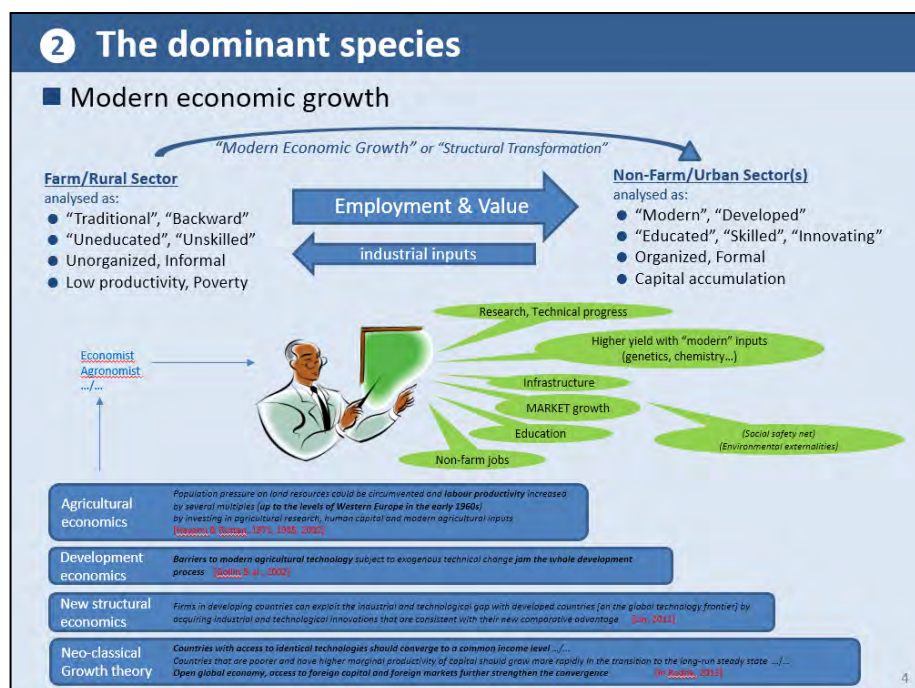


According to Geels and Schot, a regime consists of a set of aligned rules that are carried by a range of actors that together form a community. These actors are typically firms, users, governments, and scientists. They share engineering search heuristics, ways of defining problems, user preferences, expectations, product characteristics, skills, standards and regulatory frameworks. And the nature of their binding is not based on direct interaction but on the participation in the production and reproduction of the sociotechnical regime.

Hence a sociotechnical regime carries and stores the rules for how to produce, use and regulate specific products and processes. They perform the task of genes and define the boundary between technological species.

I can now briefly introduce you to two technological species, and narrate you what happens when a niche species – Natural Farming in Andhra Pradesh – challenges the current dominant sociotechnical regime of the Green Revolution.

Let's start with the dominant species, the socio-technical regime of industrial food and agriculture. We all imagine that this regime has been shaped by great advances in the exact sciences, such as thermodynamic, chemistry, hydrology or genetics. But the social sciences have also shaped it, especially

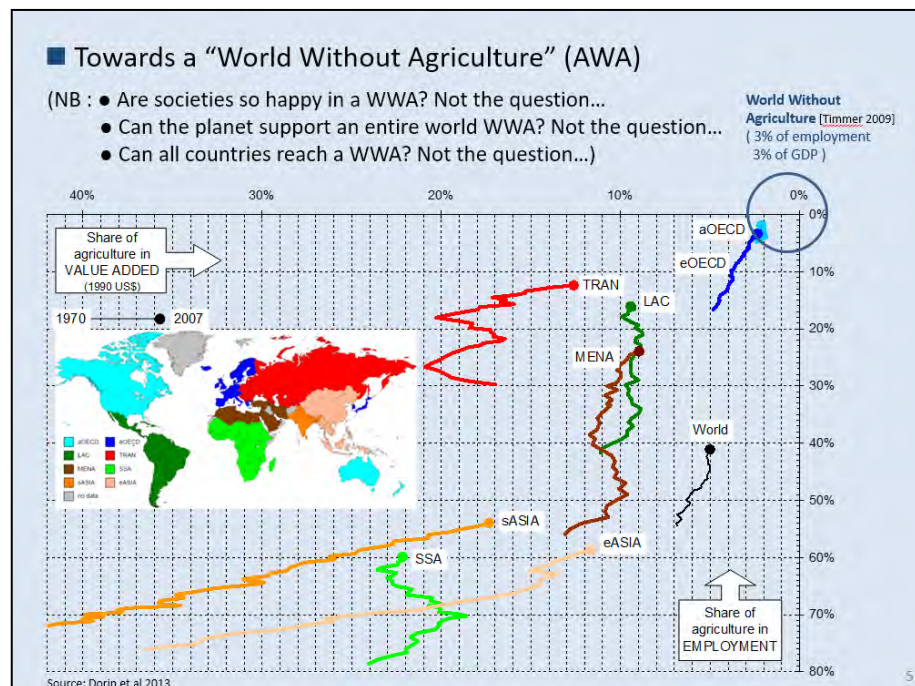


economics. It all started with Adam Smith, who showed very well how task specialization can dramatically improve the productivity of the labour force. The nail was driven a century and a half later, after the Second World War, by a vast literature on what we called in economics “modern growth” and “structural transformation”.

In very very short, this literature teach you that with free-market economies, countries can access identical technologies, hence converge to a common income level. These technologies are in fact those of the industrial revolution, and the development model behind this is of course that of today's rich industrialized countries, where agriculture provided cheap labour to propel the process of industrialization and urbanization, which in turn delivered technology and increasingly cheaper industrial inputs that increased agricultural yields and allowed people to be fed at ever lower costs. Hence, in this process, the share of household expenditure on food staples declines (Engel’s law) while outlay on manufactured food, other industrial goods and services rises, until reaching the stage of a

“World Without Agriculture” to quote the title of the 2009 book of Peter Timmer (Timmer, 2009). In the now-rich OECD countries, the share of agriculture in both total employment and value added is indeed and now 2-3%, while labour productivity across the farm and non-farm sectors has converged: historical rural mass poverty has been eradicated, this is a great achievement!

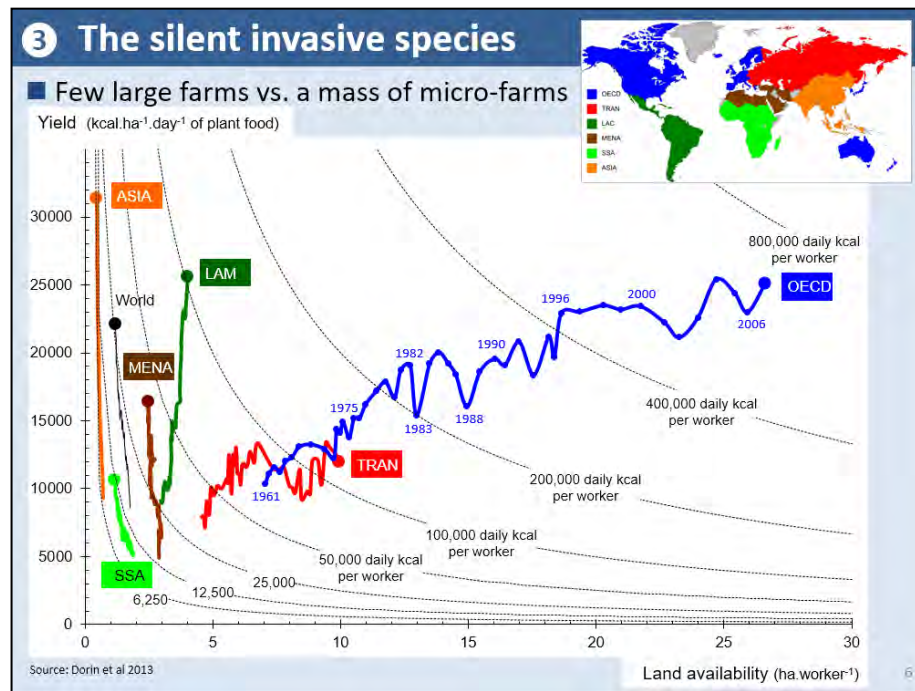
This process is evidence-based as you can see on this slide, and this model seems to be followed by all the countries of the world, as you can see on this slide too, since all the regions of the world see the share of agriculture decreasing in employment and even more in GDP.



So let us open these poor countries to Western "modern agricultural technology" so that they can finally develop and get out of poverty, to paraphrase economists like Gollin or Matura (Gollin *et al.*, 2002, Murata, 2002). Let us continue the history of wealth, all things being equal.

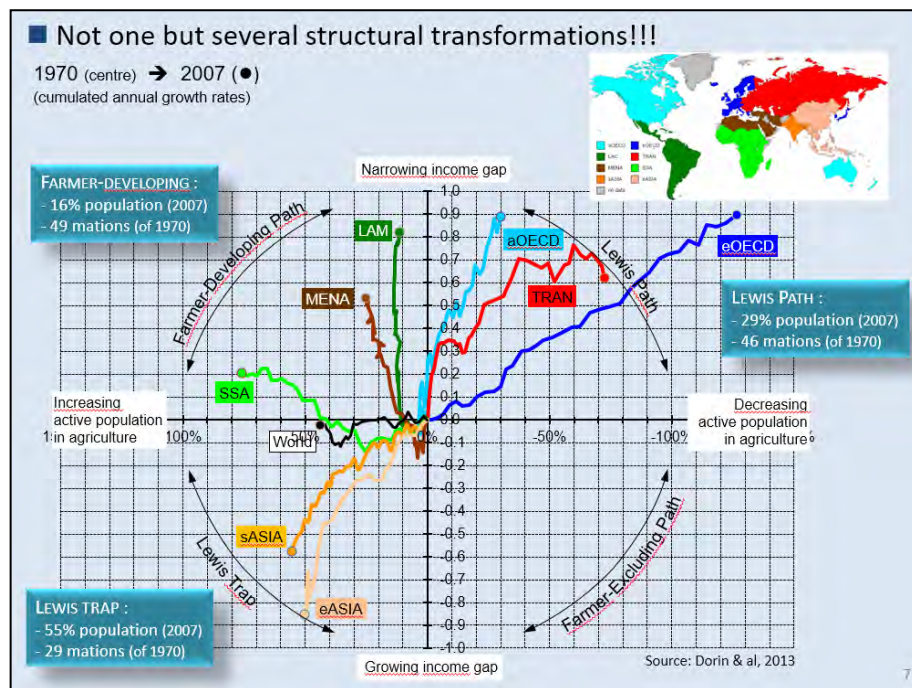
The problem is that all things are not equal, and as I try to show in works undertaken almost ten years ago now, we can hardly reproduce history, or at a much higher cost. Moreover I know that in a country like India, there are still many poor farmers despite wide access to modern agriculture technologies, and even an overuse of chemical fertilizers, pesticides, irrigation, etc. since the Green Revolution and its inputs subsidies. This is not the place to present these works here, but I need to show you three slides before I present a niche species which challenges this dominant sociotechnical regime of industrial agriculture.

This first slide shows you that unlike the land-abundant regions of Europe and the Americas, there has been elsewhere a shrinking land availability per farmers, notably in Asia and sub-Saharan Africa, as shown with the X axis. In other words, there is an invasion of micro-farms in most parts of the world.



And these micro-farms are far from being low-yielding, particularly in the Asian countries of Green Revolution, where they now produce on average more kilocalories per hectare than in OECD countries, as shown with the Y axis. This leads me to a key point that is shown with the isocurves, which represent the labour productivity in terms of kilocalories per farmer. We see that for OECD countries, the farm labour productivity has increased dramatically from about 35,000 kcal/day/worker in 1961 to about almost 800,000 in 2007, above all because of a dramatic increase in farm size and the mechanization of the latter. In Asia on the contrary, the average availability of land per farmer has decreased to 1 ha or less. And when your farm size shrinks from a generation to the next, the only way to improve or at least maintain the productivity of your work, assuming that prices do not fall, or that the cost of your inputs do not increase, it is to increase your yield. This is a challenging situation, especially if your land productivity relies on an intensive use of inputs with high financial and environmental costs, like chemical fertilisers, pesticides or fossil energy for irrigation. Despite input subsidies, you sink into over-indebtedness and your natural capital (water, soil, and biodiversity) declines faster than elsewhere. Moreover, and as observed in the next slide, the labour productivity gap between farm and non-farm workers is enlarging instead of converging as has happened in OECD countries which have followed the canonical model of structural transformation or modern growth.

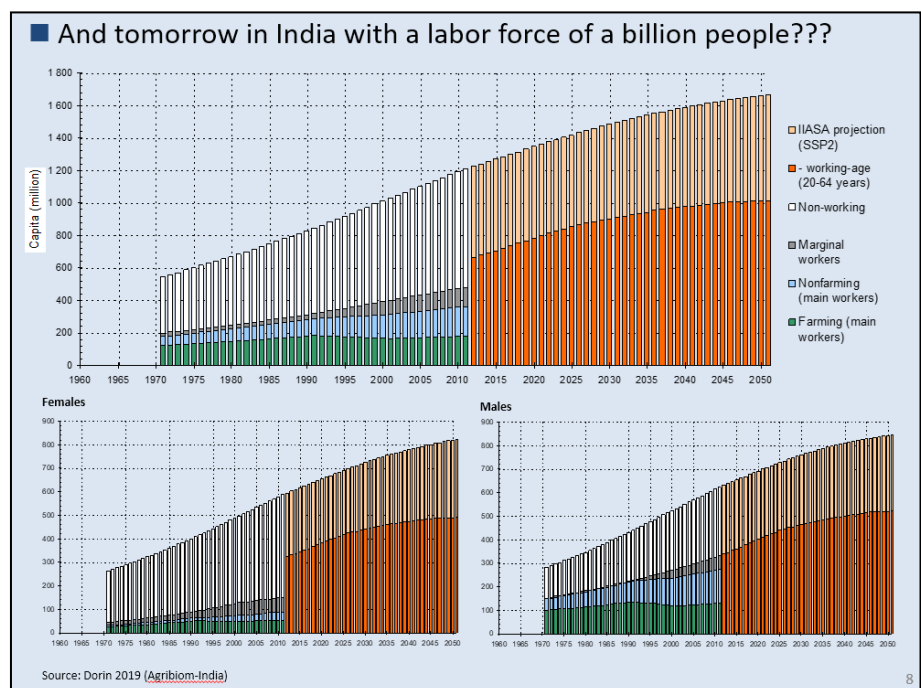
As shown on this figure that I do not have time to explain you, there is in fact not a single movement towards AWA as evidences of my slide 5 made us believe, but at least three types of structural transformation which occur in the world, with two opposites I called, on the one hand the text-book canonical “Lewis path” of the OECD countries, and, on the other hand, the “Lewis trap” of the Asian countries, especially India.



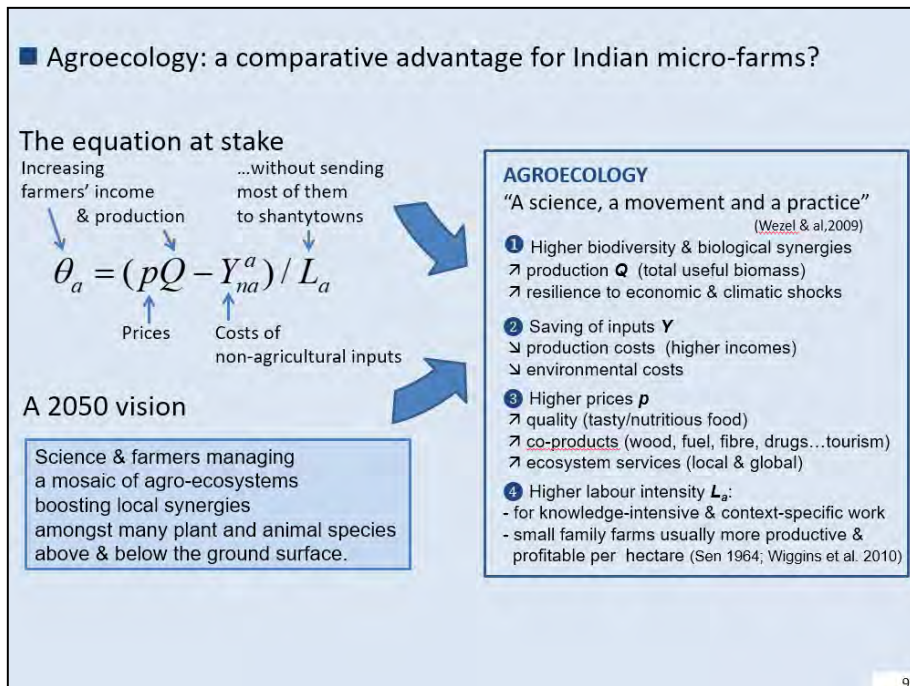
In India, farmers are dangerously trapped in a low profit business and would like to escape it, but unfortunately, they are also trapped in world history:

- Firstly, they can no more emigrate massively to land-abundant regions, as did the Western Europeans to the New World from 1850 to WWI and even after;
- Secondly, they have to compete a lot to find a job in nonfarm sectors since due to automation, these industries are much less labour intensive than they used to be in the past.

And tomorrow, what will be the situation when the workforce of India will reach a billion people according to the latest IIASA projections?



All of this brings me to the conclusion that we need a different development paradigm than the one we find in economics textbooks. And I believe that a sustainable path lies in a high-tech agriculture of a very different nature from that which has been strongly encouraged and subsidised over the



last half-century, in India, in France and everywhere else in the world. Because India today faces all the economic, social, nutritional, financial and ecological burdens of conventional intensive agriculture, and because it is also the biggest world democracy with dynamic farmers and a large scientific community, I am convinced that this country could lead a much more sustainable and inclusive agricultural model. The technical and institutional challenges are vast and complex. However, we are not starting from nothing. In recent years, there has been more and more international debates and literature about "agroecology", and here are the seeds for a paradigm shift in our thinking of agriculture, especially smallholder agriculture that will continue to remain dominant in the world.

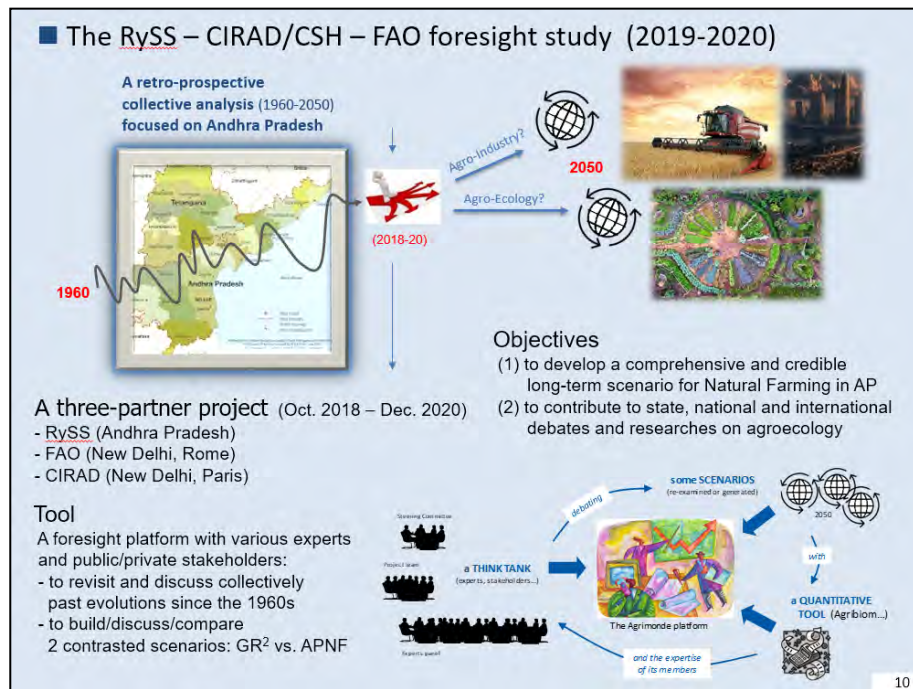
Agroecology embraces many definitions. In my opinion, agroecology does not completely ban the use of industrial inputs like in organic farming or permaculture. But in agroecology, increase in agricultural productivity does not rest on few large-scale monocultures and an intensive use of water, fossil fuels and agrochemical inputs, but rather on context-specific agro-ecosystems boosting biological synergies below and above ground, amongst numerous plant and animal species, from soil fungi to trees, from soil bacteria or worms to buffalos, etc.

According to me, boosting biodiversity and ecological functions in each unique agro-ecosystem is highly complex and requires marrying the best science with traditional indigenous knowledge. But compared to current techno-centric modern agriculture, this agroecology is likely to be in the long run:

- more productive per unit of land,
- more resilient to climatic or economic shocks,
- more labour-intensive than capital-intensive,
- more profitable for farmers if commodities of higher quality (diversified tasty nutritious food) and

(e) ecosystem services of local and global importance are equitably priced on local and international markets, such as safe water, biodiversity pools, soil fertility, nutrient recycling, pollination, disease and flood control, climate mitigation and adaptation, etc.

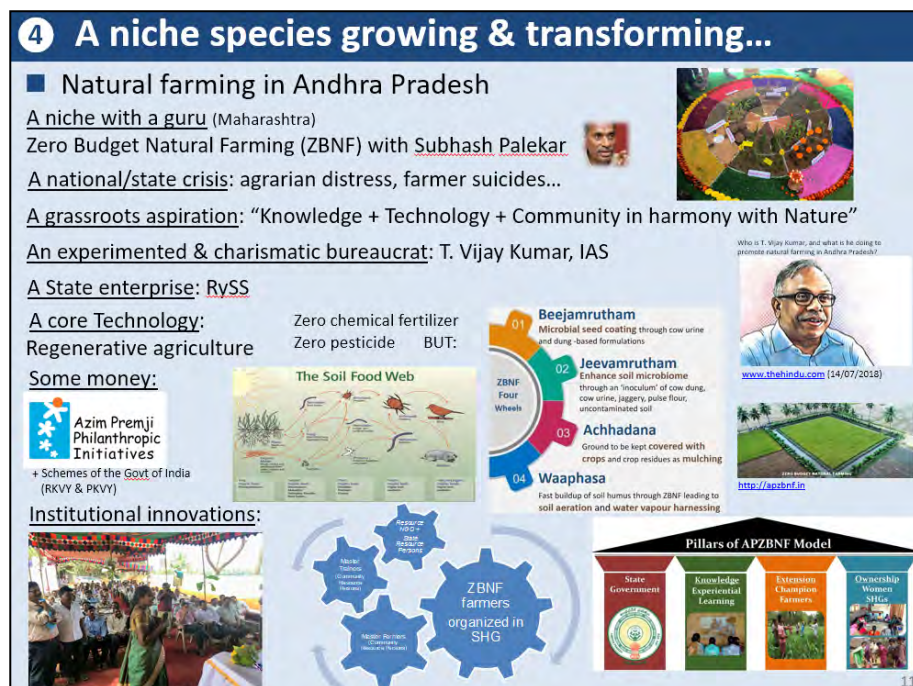
What would a world with agro-ecology and a large number of farmers look like compared to a world of agro-industry and almost no farmers? Can this world feed the population? Will it lead to income convergence? Under what conditions? Will we have to replace the current massive inputs and food subsidies with PES? It is precisely to try to answer these



kinds of questions that we launched a 2-year foresight project, which will adapt and use my AgriBiom model built for collective future studies, and which will be based on a form of agroecology which is developing in Andhra Pradesh under the name ZBNF.

So what is Natural farming in Andhra Pradesh?

Since 2014, the government vision of this southern State of India is to enhance both short term and long term farmer's welfare, particularly small and marginal farmers, through climate change resilient, low cost 'zero budget' natural farming (ZBNF). Its



core technology is "Regenerative Agriculture", a holistic land management practice that leverages the power of photosynthesis in plants to close the carbon cycle, and build soil health, crop resilience and nutrient density. ZBNF reduces farmer's costs through

eliminating external synthetic inputs and utilising in-situ biological resources to rejuvenate the soil, whilst simultaneously increasing yields, restoring ecosystem health and climate resilience through diverse cropping systems

A growth faster than science-based evidences & explanations...

.../...

A growth faster than science-based evidences & explanations...

Source: APZBNF Brochure, RvSS, September 2019

AP ZBNF Programme at a glance

Particulars	2018-19	2019-20	Coverage
No. of Mandals covered	664	664	100%
No. of G.P.s	3011	3011	29%
No. of Women SHGs	1,41,361	1,41,296	22%
No. of Farmers enrolled	5,23,000	6,25,000	9%
No. of landless, SC, STs and other		3,00,000	
Total		6,50,000	

Women Groups/Federations, 20+ years APNF and CASGA - 2005+

Year	2015-16	2016-17	2017-18	2018-19	2019-20
40,654 farmers	163,000 farmers	523,000 farmers	625,000 farmers	625,000 farmers	625,000 farmers
704 villages	972 villages	3011 villages	3011 villages	3011 villages	3011 villages
2016-17	2017-18	2018-19	2019-20	2019-20	2019-20

Funds Received (in Crores)

Year	2015-16	2016-17	2017-18	2018-19	2019-20
34.04	45.91	38.38	63.00	181.33	
18.34	13.3	10.93	90.32	132.89	
52.38	59.21	49.31	153.32	314.22	

A.P Vision – to cover all 60 lakh farmers and 80 lakh hectares by 2027

Source: Vijay Kumar, New Delhi, 27/01/2020

ZBNF IMPACTS

Centre for Economics and Social Studies – Crop Cutting Experiments Independent Evaluation

Crop	Condition	Net Income (Rs/ha)			Percentage increase (%)	Crop	Condition	Cost of cultivation (Rs/ha)			Percentage Change (%)
		Net Income ZBNF	Net Income Non-ZBNF	Net Income Diff.				Cost of cultivation ZBNF	Cost of cultivation Non-ZBNF	Cost of cultivation Diff.	
Paddy	Integrated	4320	4127	193	4%	Groundnut	Integrated	1195	1095	100	9%
	Control	4185	4181	4	0%		Control	1195	1095	100	9%
Millet	Integrated	4906	2176	2730	125%	Cotton	Integrated	2172	4073	-1901	-47%
	Control	2206	4117	-1911	-45%		Control	4117	1128	2989	72%
Sambhar	Integrated	3039	4062	1023	25%	Sambhar	Integrated	4062	4062	0	0%
	Control	2016	4062	2046	51%		Control	4062	4062	0	0%

Yields (kg/ha)

Crop	Condition	Yield (kg/ha)			Percentage Change (%)
		ZBNF Yield	Non-ZBNF Yield	Yield Diff.	
Paddy	Integrated	6728	6494	234	4%
	Control	620	723	103	14%
Millet	Integrated	5228	382	4846	1270%
	Control	2183	362	1821	505%
Sambhar	Integrated	1700	1700	0	0%
	Control	1700	1700	0	0%

Source: Vijay Kumar, New Delhi, 27/01/2020

Growing interests from India and abroad

.../...

Growing interests from India and abroad

National and International Recognitions for APZBNF

- World Future Council selected AP ZBNF as one of the top 30 most promising policies in agroecology
- Global Alliance for the Future of Food has selected AP ZBNF as one of the 21 'Beacons of Hope'
- UN Agencies (WFP, UNEP, CBD, WHO, IFAD, FAO, UNDEP) has approved the Scaling up Agroecology Initiative work plan for 2019-2020. Mexico, Senegal and APZBNF selected for the first phase of implementation.

- The Hon'ble Prime Minister has mentioned ZBNF as a way forward for farming in India during Parliament session and in COP 14 speech in Sept'19
- NITI Aayog, Govt of India has commended the Government of Andhra Pradesh's ZBNF strategy. The Ministry of Agriculture is setting up a National Mission for scaling up of ZBNF in all the States.
- Himachal Pradesh, Karnataka, Rajasthan States have visited AP and are interested to adopt APZBNF model.

Partnerships and Collaborations

Women Self-Help Groups


Source: APZBNF Brochure, RvSS, September 2019 (http://apzbnf.in/wp-content/uploads/2019/11/170919-Brochure-final_updated_Million_Final-for-print.pdf)

First studies or scientific articles

.../...

■ First studies or scientific articles

Reports



Peer-reviewed articles

Münster Daniel, 2016. "Agro-ecological double movements? Zero Budget Natural Farming and alternative agricultures after the neoliberal crisis in Kerala", in Mohanty B.B. (Dir.), *Critical Perspectives on Agrarian Transition: India in the Global Debate*, Routledge, New Delhi, pp. 222-44

Neelam Hema Sarat Chandra, Kadlan K.S., 2016. "Cow based natural farming practice for poor and small land holding farmers: A case study from Andhra Pradesh, India", *Agricultural Science Digest*, 36:4, pp. 282-6.

Khadse Ashlesha, Rosset Peter Michael, Morales Heida, Ferguson Bruce G., 2017. "Taking agroecology to scale: the Zero Budget Natural Farming peasant movement in Karnataka, India", *The Journal of Peasant Studies*, pp. 1-28.

Münster Daniel, 2018. "Performing alternative agriculture: Critique and recuperation in Zero Budget Natural Farming, South India", *Journal of Political Ecology*, 25:1, pp. 748-64.

Khadse Ashlesha, Rosset Peter M., 2019. "Zero Budget Natural Farming in India – from inception to institutionalization", *Agroecology and Sustainable Food Systems*, pp. 1-24.

Bharucha Zareen Pervez, Mitians Sol Bermejo, Pretty Jules, 2020. "Towards redesign at scale through zero budget natural farming in Andhra Pradesh, India", *International Journal of Agricultural Sustainability*, pp. 1-20.

Smith Jo, Yeluripati Jagadeesh, Smith Pete, Nayak Dali Rani, 2020. "Potential yield challenges to scale-up of zero budget natural farming", *Nature Sustainability*, 20th January.

14

...until a frontal crash with the dominant species

.../...

5 ...until a frontal crash with the dominant species

■ Short narrative

May 2019 **Dr. Rajiv Kumar, Vice-Chairman of the NITI Aayog**
Chancellor of the Gokhale Institute of Economics and Politics (Pune)

July 2019 **Finance Minister Nirmala Sitharaman**
when presenting the national budget

Sept. 2019 **Prime Minister Narendra Modi**
when addressing the 14th Conference of Parties (COP14) to the UNCCD (United Nations Convention to Combat Desertification)

National Academy of Agricultural Sciences (NAAS)
after a "full day Brain Storming Session" on ZBNF with "about 70 experts representing scientists across disciplines and organisations, policy makers, industrialists (fertilizer, chemicals and pesticide, seeds), Govt. Departments, NGOs, Farmers and others"

Nov. 2019 **Zero Budget Natural Farming - A Myth or Reality?**
Nov 2019: 28-page Policy Paper

We have to fulfil PM's promise of doubling farmers income. Agriculture needs reducing the cost of production and for me a new model that we are examining very carefully is the so-called zero budget natural farming model which eliminates the use of chemicals in agriculture (Economic Times, 20/05/2019)

ZBNF can help in doubling our farmers' income in time for our 75th year of independence

India is focusing on Zero Budget Natural Farming (ZBNF)

The Government of India should not needlessly invest capital, efforts, time and human resources towards promoting the ZBNF on the grounds of technical infeasibility for India to explore this unproven and unscientifically proposed technology

It is the firm opinion of the Academy that promoting technologies which essentially rely on crop varieties which have inherently low yielding potential would be detrimental to the Indian resolve of meeting the Sustainable Development Goals (SDGs) .../...

The Academy is of the considered opinion that there is no scope for an incremental value gained by the farmer or the consumer through ZBNF that represents one of the many such practices followed in India prior to the 1950s when no more than 50 Mt of food grains could be produced, making ZBNF a technology that lacks rationale or acceptability as a production technology.

Sept 2019: 3-page letter to Prime Minister

15

Results and conclusion

.../...


Results

Public sphere **ThePrint** (31/12/2019)
Modi govt supports Zero Budget Natural Farming but doesn't have enough budget to promote it

Professional sphere
 Prof. X from university Y in Delhi
 • Indian Ph.D. in economics
 • No training in biology & agro-science
 • No field visit/survey of AP-ZBNF
 • Anti-Modi
 to his friend Bruno after an exchange of emails on ZBNF with a UN guy in country Z

I am not going to mince words. ZBNF is a ridiculous idea. It is utterly unscientific to argue that cow piss and cow shit can be used as "inoculants", in India, cow shit and cow piss are believed to have magical powers to cure cancer, aids, and "treat" homosexuality. All of these, along with ZBNF, are being promoted as solutions by lawmakers in India today. ZBNF is not agro-ecology. **This is witchcraft** applied to agriculture. (15/01/2020, 4:30 am)

I would like to see such pseudo-science being promoted in developed countries rather than being tried on the poor peasants of the third world. (21/01/2020, 8:40 pm)



Preliminary conclusions

- (1) AP-ZBNF is "a grassroots movement that is attempting to improve India's capacity to produce its own food by farming with nature and ending farmers' reliance on purchased inputs and credit" (Smith et al. 2020)
- (2) Its core technology and productivity are based on complex biological synergies, notably with microorganisms, which have been excluded from (global) agricultural sciences for the past half century (too complex!?)
- (3) The (imported) sociotechnical regime of the Green Revolution is so strong that Indian science, instead of sending a mass of scientists to the field to document, validate (or not) and understand what is happening, has felt its legitimacy and authority shaken and condemned ZBNF as witchcraft as soon as it appeared seriously on the national scene
- (4) Beautiful scientists are not well equipped to understand and model complex objects such as agroecology (Wezel et al 2009: "a science, a movement and a practice") due to their "industrial specialization", the core principle of efficiency and wealth in "modern economic growth" and "modern agriculture" → Efficient/Healthy nature and civic space do not work on such a principle...

16

Post-scriptum

.../...

As far as I am concerned...

I keep asking myself the question, for more a decade now (see below):
 how to reconcile the "beautiful scientist" with the "dedicated scientist"
 the "techno-productivist" with the "socio-ecologist"
 the "wizard" with the "prophet"
 ...for the greatness of science and the civic space!

Why I am a Prophet and not a Wizard...

LinkedIn Published on 16th February 2018

Bruno Dorin
 Head "Economics and Development" at CSRI (Delhi); Senior Researcher (Economics) at CIRD (Montpellier) and CIRD (Paris)

Some year ago, in the aftermath of an international seminar on "Agriculture and Food in a Globalizing World" at Cerisy-la-Salle (a well-known place in French Normandy for intellectual meetings and debates of any kind), I published with Michel Petit (ex. World Bank) and Jean-Luc François (AFD, French Development Agency) a paper in French entitled "Agriculture, food and globalization: paradoxes and controversies" (Dorin et al 2013). In this paper, we highlighted two visions of the future of agriculture and food in the world, two contrasting visions which give rise to the main current controversies and the urgency to overcome them.

A few years later, the controversies did not stop at all between what we called the "techno-productivists" and the "socio-ecologists". But Charles C. Mann has now just published in *The Atlantic* a much better (and longer) piece than ours, "Can Planet Earth Feed 10 Billion People? Humanity has 30 years to find out" (Mann 2018), based on his most recent book "The Wizard and the Prophet". This paper is definitely worth reading. It illuminates the political, scientific and economic battles that have implications down to the farms and the farmers. It is pleasant to read, well balanced and well documented.

If a reconciliation between Wizards and Prophets seems unfortunately very difficult, then I am not a Wizard but a Prophet. See for example my last paper "Towards a new Sociotechnical Regime?" (Dorin 2017) published in *Economic and Political Weekly* which clearly pleads for agroecology, as a science, a movement and a practice (Wezel et al 2009). And as for practice, also take a look at the [small video-documentary on ZBNF](#) (Zero Budget Natural Farming)'s movement in Andhra Pradesh (a state in southern India): Prophets are plenty!

17