Inclusive development with limited supplies of land. Agro-industry vs. Agro-ecology

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Agro-industry vs. Agro-ecology
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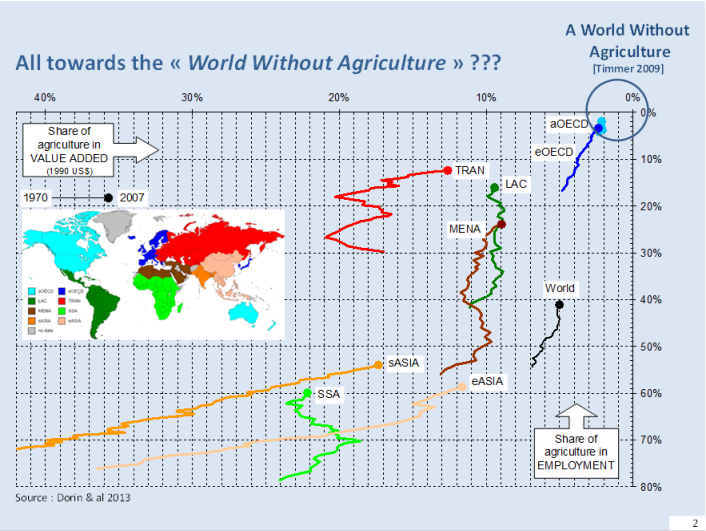
Dear Prof. Radhakrishna, Prof. Galab, Prof. Harrris-White,
Dear Friends and Colleagues,

Following the instructions of our Chair Barbara for this panel on inclusive development and agriculture, I have maximum 12 minutes to talk on a topic of my choice. My topic is centered on what we call in economics "structural transformation" or "structural change", and my personal focus is on long-term employment dynamics, farm size, income convergence between farm and nonfarm workers, and ecological services.

To quickly summarize what is the model of structural transformation in the economic literature, therefore the model that should follow all world countries,

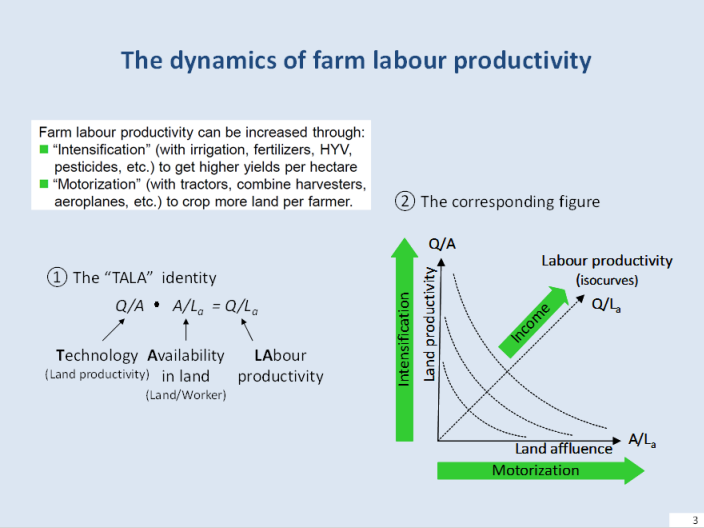
let us start with few figures on agriculture in France, my native country. Between 1970 and 2010, the number of French farms and farmers was divided by more than 3 in 40 years. This impressive desertification of rural areas enabled the remaining farmers to enlarge their cultivated land: from 19 ha in 1970 to 55 in 2010, on average. In other words, we have now in France 4 times less farmers than in Punjab while our net sown area is almost 5 times higher.

After this accelerated structural transformation advocated by economists, agronomists and industrialists, in 2010 in France, agriculture does not account more than 3% of total employment and 3% of total GDP. We are in the "*World Without Agriculture*" that Peter Timmer depicted in his 2009 book (Timmer, 2009). In this world are also other OECD countries. It looks like the destiny of "modern agriculture", of what I called the "*Lewis Path*", the canonical path of structural transformation, the path of "modern economic growth" as Simon Kuznet would also say (Dorin *et al.*, 2013, Dorin et Aubron, 2016). And all countries or global regions seem to go towards this "*World Without Agriculture*" as we can observe on this figure, where we see that the share of agriculture in both GDP and employment is declining everywhere in the world.

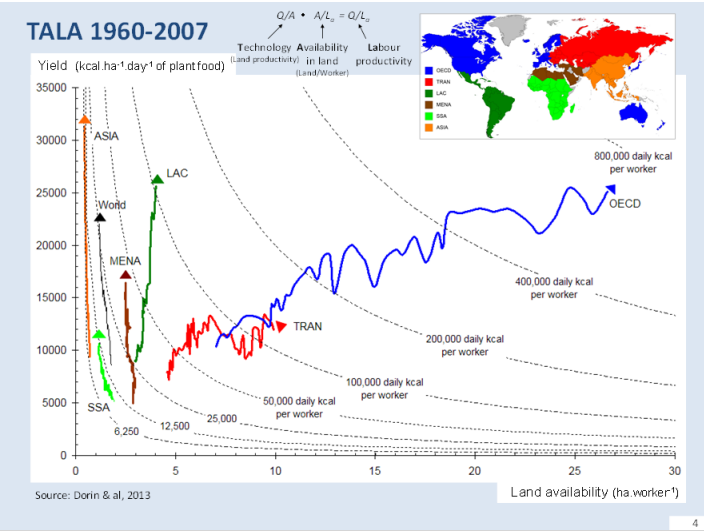


If you follow this path of industrialization and reach this "*World Without Agriculture*", you get almost no farmer but the later harvest huge piece of land with big tractors, combine harvesters and sometimes airplanes, and their incomes climb up to those of other workers in the society. There is no more what we call "agricultural productivity gap". The farm labour productivity has increased thanks to powerful or sophisticated robots using fossil energy. This it is the modern way to eradicate historical rural mass poverty, the one depicted in textbooks in economics. You develop agriculture by expelling farmers from the land. Can India and its States also follow this kind of modern economic growth? My answer is clearly no, or at extremely higher economic, human and environmental costs than for the OECD countries.

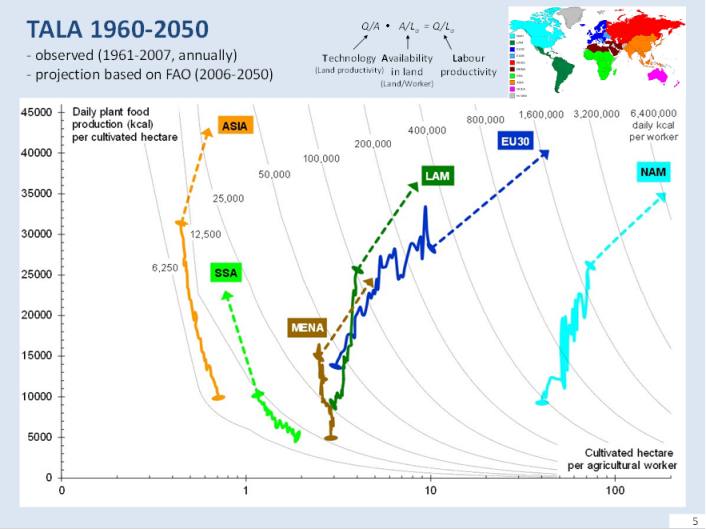
The French canonical structural transformation is a fact, but it has not been without lively debates still ongoing, and peasant suffering still occurring, especially for those who cultivate –let us say for the time being– less than 100 ha. However, in a country like India, we are facing an agricultural industrialization much more pathetic than that of France. The reasons of this pathetic industrialisation of Indian agriculture are fairly easy to understand but, what it surprising, not yet mentioned nor developed in the mainstream economic literature. Let us start with the labour productivity in agriculture. Basically, it can be increased in two ways:



In my work, I have shown that in the OECD countries, the convergence of farm and nonfarm labour productivity was mainly due to an increase in land availability per farmer rather than in yield (Dorin *et al.*, 2013). This figure illustrate these results:

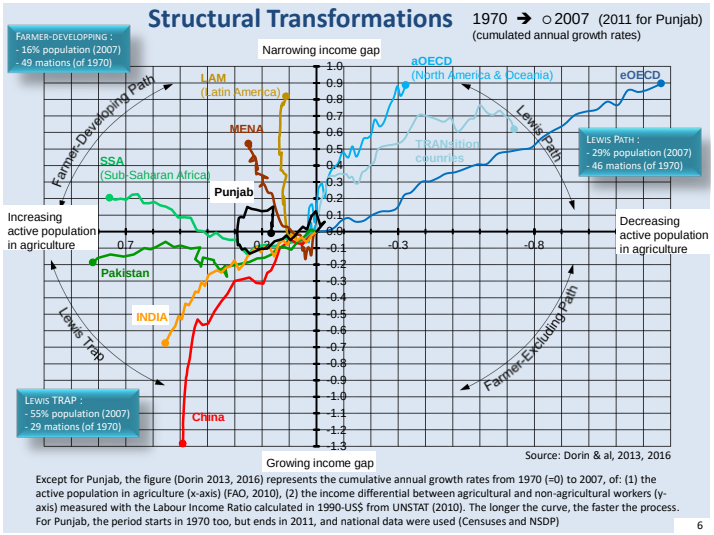


In a paper published last year in one of my favourite Indian journal, *Economic and Political Weekly*, I have extended these curves up to 2050 using the projections of the FAO, which we can consider as a "business as usual" (BaU) scenario (Dorin, 2017). According to this FAO scenario, and as you can see on this figure, the available land per farmer may grow up to 200 ha on average in North America in 2050, while the same figure would be less than 0.8 ha in both Asia and Sub-Saharan Africa. The today figure for India is less than 0.7 ha.



In other words, according to these BaU scenario of the FAO, in 2050, each farmer in Asia, even with higher yield than elsewhere as it is projected, would produce less than 30,000 kcal per day per farmer while it would be more than 6.6 million in the large-scale motorized agriculture of North America. This is a huge gap and this gap, in fact, is increasing at least since the early 1960s. There is no international convergence in farm labour productivity but rather the opposite despite huge investments in irrigation and modern agricultural inputs as in India since the 1960s with the Green Revolution.

Asia is embarked upon what I called a "*Lewis Trap*", the one represented on the bottom left of the figure, the polar opposite to the *Lewis Path* followed by OECD countries, on the top right:



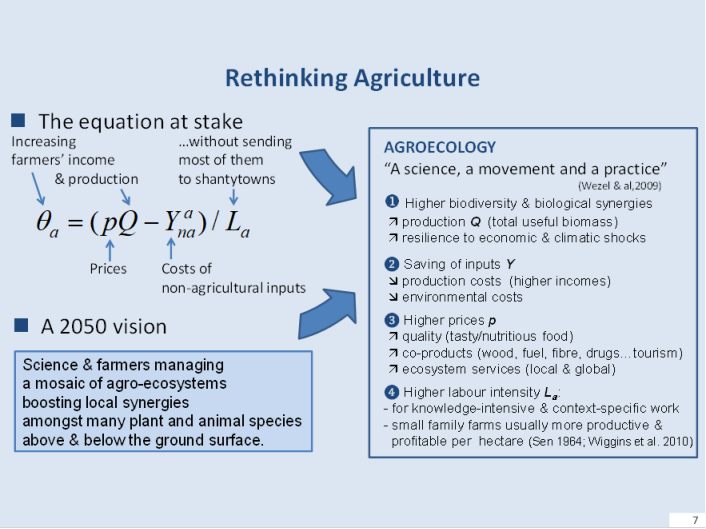
I have not time to explain in detail this figure, just the time to tell you that I have tried to add Punjab on this figure with the Indian statistics I could found (preliminary results). And what do we see for Punjab, the so-called best performing agricultural State of India? Its goes around in circle since 1970. All in all, in 2011, compared to 1970, the income gap with other workers has not increased nor decreased, but its active population in agriculture has increased. Hence the average available land per farmer has shrunk in 40 years. And how to increase the farm labour productivity when your land is shrinking from a generation to another instead of enlarging? The only option is to increase the yield per unit of land, with the crops and technology sponsored by national and international organisations, public and private. Hence, you go for mono-cropping, with ever more genetic engineering, groundwater, chemical fertilizers and other agrochemical inputs whose marginal productivity is declining while your costs are rising and your natural capital is eroding faster than elsewhere: soil, biodiversity, safe water, etc.

You are dangerously trapped in a low-profit business and would like to escape it, but you are also trapped in the world history:
(1) Firstly, you 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;
(2) Secondly, you 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; these industries may grow fast as in India today, but without employing the hundreds millions of people it should in order to follow the *Lewis Path*.

Let us summarize now. In the world today, we have on the one hand growing large-scale and capital intensive agriculture with few farmers whose incomes are based on specialization and economies of scale and, one the other hand, hundreds of millions of very small-scale farmers who are locked up in agriculture because they cannot find a better livelihoods in other sectors. Any breakthrough in

biotechnology will not reverse such a trend as some want us to believe. As far as I am concerned, I now believe that a sustainable path lies in a high-tech agriculture of a very different nature from that which has been strongly encouraged and subsidized over the last half century, in India, in France and everywhere else in the world.

I come now to my second point: we have to rethink agriculture, but how?



Because India face today all the economic, social, nutritional, financial and ecological burdens of conventional intensive industrial 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 for smallholder agriculture that will continue to remain largely dominant in the world as I have shown you.

Agroecology still 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, these industrial inputs are no more the core drivers of land productivity. Increase in agricultural productivity does not rest, above all, 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:
(a) more productive per unit of land,
(b) more resilient to climatic or economic shocks,
(c) more labour-intensive than capital-intensive,
(d) more profitable for farmers if commodities of higher quality (diversified tasty nutritious food, pesticide-free products, etc.) and 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.

If time permits, let me conclude with an action guide that I suggested earlier this year at a meeting with Indian decision-makers and FAO in Chandigarh, Punjab. These are six guidelines for a paradigm shift to convert the burden of small-scale farming into a comparative advantage. Keep also in mind that the bulk of the scientific literature shows that agriculture – unlike other sectors – is more efficient at small rather than large scales.

(1) Employ high-qualified people to improve annual statistics and modelling at the farm level, at least in four fields:
- water withdrawal per unit of biomass produced (plant and animal products)
- fossil energy used per unit of biomass produced, including through chemical fertilizers and other inputs
- soil organic carbon
- Annual Work Unit equivalents (AWUs)[1] engaged permanently or temporary on the farm, for either production, processing or marketing.

[1] One AWU is equivalent to one adult working full time for a year on the farm; it is termed '*Unité de Travail Agricole*' or UTA in France.

(2) Register accurate numerical benchmarks of how disastrous is current Punjab agriculture, especially on environmental and income aspects. These benchmarks are key to assess how Punjabi agriculture could improve in the future, and get payments for that. In future, Punjabi cultivators and labourers must be paid not only for their production, but also for all the services they can deliver to the local as well as global societies. They can clean water and air instead of polluting them, they can sink carbon instead of emitting large quantity of greenhouse gases, they can help preventing floods and other disasters instead of accelerating them, they can secure the national long-term food security with fertile soils and large stocks of biodiversity instead of eroding them, they can increase the resilience to climatic and economic shocks of the overall Indian economy.

(3) Assess and bargain future payments for environmental services from local municipalities, the National Capital Region, the Central government as well as international organisations. Join for instance the 4p1000 initiative (www.4p1000.org) and become its leader in order to claim that any sink of carbon by agricultural soils must be a major part of the carbon trade system.

(4) Start advertising in the state, in the country and also abroad, as do Chandrababu Naidu and Vijay Kumar for Andhra Pradesh, that Punjab agriculture is moving firmly towards agroecology, and may be 100% organic by 2025. You could even claim an ambition to become a world net exporter of very various plant and animal organic products whose demand is growing sharply everywhere. Affirm this ambition by passing a State law for changing production models to combine economic and environmental performances, as did the French in 2014 with their "*loi d'avenir*" in favour of agroecology.

(5) Radically change the rationality of Indian incentives to agriculture. Huge amounts are at stake and could be much more beneficial to small-scale Indian farmers in the end. Instead of incentivizing directly or indirectly the mono-cropping of wheat and rice, as well as the use of groundwater, chemical fertilizers and fossil fuels, distribute these huge subsidies by rewarding the saving of water or fossil energy by ton of biomass, the storage of soil organic carbon, the crop and livestock diversity, etc. Deliver also cheap credit and insurances, especially to encourage entrepreneurship in small-processing units, new marketing strategies, safe storage and transport.

(6) Last but not least, encourage also group farming, so that they can save on credit, input, machinery, storage, transport and advertisement costs, have more time for experiment, training and leisure, develop geographical indications, labels, brands or participatory guarantee schemes, and, all be proud to be the new modern farmers of India since they are able to deliver to their community and the world a wide range of economic, social and environmental services that are greatly missing today.

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