

GLOBAL AGRO-FOOD SYSTEMS: RESEARCH, POLICY AND IMPLICATIONS FOR INDIA

BARBARA HARRISS-WHITE¹

Transcript draft -2

It's a real privilege to join you and indeed it's a miracle of technology. At first, Professor Sriram asked me to talk about agricultural markets, but I knew that there was nobody better to do that than Dr Mekhala Krishnamurthy. My own fieldwork on food systems in India took me from 1969 to about 2014 but no further. I currently have the opportunity, however, of participating in a food systems economics commission. This experience has done much to whet my curiosity about 21st century food systems worldwide, about market systems within food systems and about the roles of policy in how they develop. I hope that what I am going to say will provoke questions. I apologise in advance because this is work in progress and, because of that, the slides I am showing are rather dense in content. If the slides and the talk interest you, do please get in touch with me for I am sure they will benefit enormously from your reactions.

First I will outline the phases of my talk and discuss definitions because, unless we all are on the same page, we often talk past each other. We often conceive ideas and theories making assumptions that need to be made explicit, because lack of clarity – though it may act as a comfort blanket - impedes fruitful interpretations and understanding. So first I am going to ask what is food. Food means many things to many people. Second I ask what are systems. To answer the system question am going to invoke the pioneering work of Rolando Garcia, which I think has stood the test of time. Then I am going to turn to the question that Professor Sriram asked me to talk about, which is that of agricultural markets. How are these seen in food systems terms? And fourth, policy: even more difficult. I will try to clarify and develop all these questions by looking at global research on food systems: not Indian research, which I normally work on, but work that tries to

¹ Transcribed from the lecture given with Prof Mekhala Krishnamurthy at the IIMB-CCP conference on public administration, August 25th 2020. I am very grateful for the excellent transcription.

encompass the entire planet. I will finish by making a link from the planetary scale to some Indian themes which I believe Mekhala will develop.

So first, *What is food?*

This may seem a strange question when we all depend intimately on food. It is important to ask because food is actually a fuzzy concept, one subject to multiple meanings. For some scientists, food is simply a set of crops we eat - so food is categorized in various ways either by individual crops or crop groups such as grains and legumes, vegetables and fruit. And very often, this kind of classification of food privileges vegetarian ideas of what food is. It neglects fish and animal meat and products. It neglects insects, which some people in some parts of the world enjoy eating quite a lot of the time. It is often quite arbitrary about what is food, feed and waste. And what we all tend to forget is that food is impossible to produce or consume without water. Others –including some anthropologists - think of food as the elements of a diet. With this understanding of food, some of the world's multitude of food cultures are found not necessarily to distinguish between food and medicine. And then there are nutritional scientists, who think in terms of nutrients: macro-nutrients which are calories and proteins, plus micro-nutrients which are vitamins and minerals. If you accept the nutritionists' conception of food you have an enormous universe of detail which you are bound to try to describe and from which you have to select if you are going to try to build models of possible food systems.

Now, the central question about food which is exercising the minds of people who study the planet is three-fold. First, that current global food production and consumption has unhealthy outcomes for humans. We live in the midst of pandemics of over-nutrition as well as under- or mal-nutrition. Second, at the same time, our global food system is environmentally destructive: it is completely unsustainable. The world food system contributes, nobody really knows how much, but around 30% of global greenhouse gases, and this would be an even bigger fraction if we factored in the enormous amount of carbon and other heating gases that are emitted when we change land use from forests to

agricultural and pastoral production. The food system is nailed as a major driver of the sixth mass extinction that is gathering apace. The food system is a critical environmental problem. Third, it is alleged - and there seem to be some data to show this - that a significant proportion of food output is wasted: we are talking 30 or even 40%. I think that FAO currently calls out 40% of food as wasted worldwide.

So the food question concerns these three sub-questions. We already know which are the foods that are most damaging, both to human beings and their health, and to nature and the health of ecosystems First, red meat produced by the mass-production of ruminants. Second, refined and highly processed starchy food: the sort of food that you grab in a hurry in a supermarket. Third, the intensive means by which milk and eggs are produced and consumed, which cause harm to both human beings and nature. So if you ask me now what should be the immediate priorities for policy, I would reply that enough is known to identify those parts of the food system as needing to be changed in directions less unhealthy for us and nature. If you agree, then what is stopping it? And if you don't consider them as a food policy priority, the question is, why not?

In the 21st century the food question is not just a question of the socio-economic system or the policies that have together produced this unhealthy outcome. It's also a question of nature. And giving nature due weight involves integrating into our concepts of food system, not just 'the environment' but the nine planetary sub-systems through which the environment is constituted. They are the carbon cycle, land use changes, water, the nitrogen and phosphorus cycles, biodiversity, chemicals production, ocean acidification, ozone and aerosols.² They are difficult for social scientists to get our minds around. The take-home fact is that our environment is made up of sub-systems. Or, at least, it currently makes sense to

² Johan Rockstrom et al 2009 'A safe operating space for humanity', *Nature*, vol 461 pp 473-5

ecologists and bio-geo-physicists to study the planet through those nine sub-systems.

That then forces everybody – both physical and life scientists and social scientists - to figure out how we understand one another when we are talking about these sub-systems' conceptual categories and the relations between them, their measurement, and to maintain coherence and consistency when trying to make trans-disciplinary models of food systems. One question among many that might occur to you, as it does to me, is that if we measure consumption in terms of nutrients, as nutritionists do, and which seems like a good common ground amid all the diversity, should the production and the distribution system also be measured in the equivalent sorts of units, which will be energy and material elements including biomass?

The 21st century has brought new urgency to the food question and new problems in our understanding of the food system.

We also need clarity about what a system is.

What is a system?

In about 1980 I was inspired by the ideas of the food systems theorist Rolando Garcia. His training was in meteorology but he was also interested in how we know what we know, in epistemology. His contribution was to bridge the gap between the engineering and mechanical mind-set which prevails in systems modelling, and the plural theoretical worlds, the varied kinds of evidence and the reflexive nature, of the social sciences. His ideas influenced an early trans-disciplinary field project on food systems and society carried out in Mexico, in West Bengal and in Orissa and coordinated in Geneva through UNRISD, the United Nations Research Institute for Social Development.³

Garcia pointed out that systems are not something existing out there. They are conceptual devices to enable us to make sense of complicated things whose inter-related parts we think depend on each other, and whose sum exceeds the

³ Rolando Garcia 1994 *Food Systems and Society : A Conceptual and Methodological Challenge*, Geneva, UNRISD

sum of their parts. In studying systems, we are not trying to understand entities in isolation. We are trying to understand things in relation to each other. He then argued that although we are prone to conceiving systems in terms of their elements⁴, this is an incomplete approach. Rather, you can best identify elements (and the 'stocks' of which they are composed) only once you have conceived the relationships, the links, the dynamics, the interconnections, the processes that you think contribute to the purpose or the goal of the system in which you are interested. Calling them flows and fluxes, he admitted that they have many names. His point was that the structure of a system consists of these relationships and the varied ways in which they feed back upon one another. And looking at the food systems in the late 70s and the early 80s, he identified many activities that we would now talk about as policies, as flows and fluxes entering and exiting the food system. Fluxes into the system include things like 'credit policies', 'technology', 'demand for specific products', 'food imports' and 'workers'; fluxes out of the system include 'agricultural products', 'processed products', 'water', 'workers' (again), and 'profits'. We can work back from these suggestions to the theoretical ideas informing them.

If we look at Garcia's elements and relationships from a 21st century vantage point, however, we find there's no energy there, no materials, no bio-diversity or planetary sub-systems. There is not even a hint of capital, although Garcia identifies labour and workers as flows or production relationships in his food system. There is no waste. There are no gender relations. There are no policies as a category, despite many policy-like activities.

In fitting policy, and for this audience you might say public administration, into food systems, Garcia reveals that it occupies quite a fluid sort of position conceptually.

Garcia also argued that there is no single scale to a food system. In the systems concept, scales will vary according to our own needs for precision, intelligibility and interpretation.

⁴ Donella Meadows (1993) 2008 *Thinking in Systems*, London, Earthscan

Systems can, and usually must, also be conceived of as made up of sub-systems: these may overlap, they may be contained within a system or may exceed certain of its boundaries, they will almost always be in a hierarchy, and they will also be dynamic and unstable. For Garcia's food system, he suggested three sub-systems – a physical one, an agro-productive one and a socio-economic sub-system. The physical sub-system was constituted through soil, water, climate, biodiversity; the agro-productive one through costs and returns, technology, physical inputs, production relations, postharvest technology and spatial transformations, consumption and waste; and (betraying Garcia's disciplinary formation as a meteorologist) the economic-social sub-system was very loosely specified as social and political structures. This is an early pointer to the finding, that has struck me in reading for the work of the commission I mentioned earlier, that when people trained in one field, such as economics, try to model the planetary food system, vagueness in relation to other fields of knowledge is admitted alongside the precision of the concepts which their own training leads them to employ.

Garcia goes on to examine feedback relationships between sub-systems, and confirms that they are not symmetrical and have varied content. The forces that the physical system imposes upon the agro-productive system are different from the forces acting in the opposite direction. He talks about such system attributes as quality, stability and resilience. The last two attributes work themselves out over time - and time and delays are rarely explicitly acknowledged in depictions of systems. Resilience is something that has stood the test of time - and the evolution of the food system over time. Garcia's key attributes are not things set in tablets of stone but constantly evolving⁵. They are complex. Complexity is something we know quite a lot about these days but, for Rolando Garcia then, it was an attribute of the methodology and it was a function of our own capacities to understand. It required clear and widely comprehensible language, some kind of lingua franca, some kind of intelligibility between fields and disciplines and concepts, and this is not a trivial problem at all. At the same time, models have to

⁵ Attributes are also contested. Others, such as the systems theorist Donella Meadows, have identified attributes as resilience, self-organisation and sub-system hierarchies (2008, pp 75-85).

be selective, a selection defined by the purpose of the analyst – the function or process that s/he wants to understand.. Systems are concepts inside our heads and so we also need to be honest and critical in defending the two kinds of purpose: the purpose for which we are translating the purpose of food production, distribution, consumption into a systematic model of a system.

Okay, most real world systems are open but, when we conceive them, they have to have boundaries. They are conceptual and they result from hypotheses we have about how we might close a system conceptually. There are no isolated systems in nature. Physicists have a particular definition of closed systems⁶ but all our open conceptual systems and sub-systems have to have closure in order for us to analyse them. If you start thinking about economics, which is my parent discipline, even the economy is a closed system in terms of its concepts, its language and its definitions – all requiring us to be clear about disciplinary boundaries. We must try to specify why we bound the system in the way we do, recognising that things outside the system are not necessarily independent of it. There may be many flows, especially in the food system, which cross system or sub-system boundaries. Money, food products, material inputs and energy for instance are not independent of what we suggest as being within the food system. But there are other boundary conditions that can't be expressed as material flows and here, you, researchers in public administration and public policy, may be interested in the idea that information is both a non-material flow as well as a constraint on system functioning, and that decisions are taken outside the system which produce or include decisions and changes in flows within the system. We have to again be clear about the non-material boundaries and define them as best we can.

Lastly, reflexive relations also define the boundaries of the system – i.e. how agents within the system define the boundaries of the system they are acting within. We need to try to incorporate this as well. No-one said this would be easy.

In systems theory the environment refers to everything which is outside a system - but again, I repeat, not necessarily independent of it. Rolando Garcia talks about a

⁶ ones which do not exchange matter with their surroundings

‘continuum of relevance’ in which we make judgements about elements, stocks and flows which are outside and affecting the system to a greater or lesser degree. And these days, modelers are focussed on shocks (recognised as hidden costs by many economic modelers) which occur outside a system but affect the elements and the flows within it. How do you identify such risky or downright uncertain forces, and describe or value their impact?

So, the concept of system that Garcia described, which I think stands the test of time, attempts to minimize vagueness and yet is full of indeterminacy, full of concepts and ideas which might change in the process of research. He proposed starting with the concept of a system which is justified through hypothesizing its goals and relations, which could then be modified as things become evident from research. It’s an exciting and dynamic kind of starting point. I would just want to add that in his conception, evidence or data is something that has to be sought. It is not confined to quantitative information. It is concepts, it is relations, it is definitions which matter crucially as we go out and hunt for our system.

What are Agricultural Markets?

The next definitional part of my talk is the substance and role of agricultural markets within food systems. This is what Professor Sriram first asked me to talk about. In the food system, agricultural markets are the indispensable link between production and consumption. They consist of a series of economic activities in a sub-circuit of capital that we might call distribution. Those activities are buying, selling, brokering, transporting, storing and processing, and lending money and borrowing money throughout the sub-system that starts where production ends and ends where consumption starts.

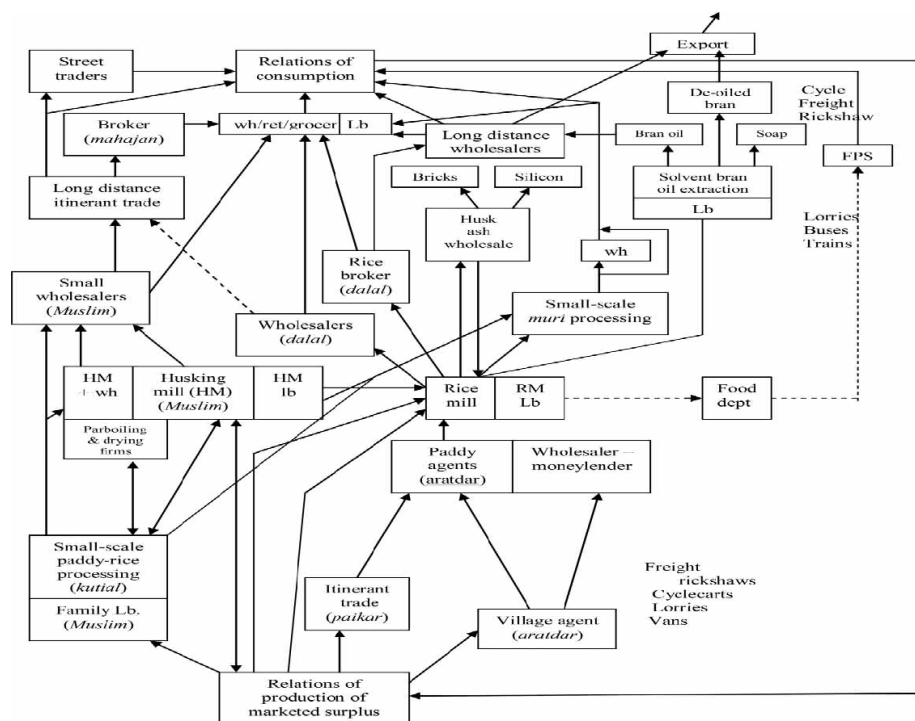
India’s agricultural markets, which Mekhala is going to talk about, are commonly depicted in two extreme ways. The first is as competitive and efficient. When I started studying them in the late 1960s, that is exactly the simple (perhaps ideologically driven) conclusion that the teeming early generation of price behaviour studies used to trot out – although they actually revealed considerable detailed complexity if you read the fine print. Second, they were and are

characterized as oligopolistic - and socially protected as oligopolies - with masses of petty trade surrounding them.

Now, policy for India's agricultural markets rests on two completely incompatible assumptions about them which are related to these two characterisations but which I think resulted from political processes not directly related to the polarized research conclusions. First, that agricultural markets are efficient enough only to need the regulation of the first transaction between the farmer and the trader. This transaction between farm and firm would be mediated through a democratic committee of different economic interests which would manage a Regulated Market. Mekhala will explain the fate of Regulated Markets and their 2020 reforms. The second policy assumption is that they are not efficient, they are inefficient, they fail, or they don't exist at all, and because of these circumstances, the state has to step in and replace them. Hence you have the Food Corporation of India, the states' Civil Supplies Corporations and Warehouse Corporations, the Public Distribution System, the Essential Commodities Act, the Agricultural Prices and Costs Commission, the Minimum Support Price, movement restrictions, and all the current debates. In practice in India, there is no 'either-or'. Instead the two policy principles are implemented and co-exist in layers, like geological sediments.

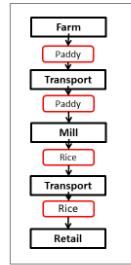
That's what I see as the essence of agricultural markets for the purpose of the food system.

Here is an agricultural market system based on my fieldwork in West Bengal in 1980-1 as a small part of the UNRISD project on Food Systems and Society to which Garcia made his important contribution.

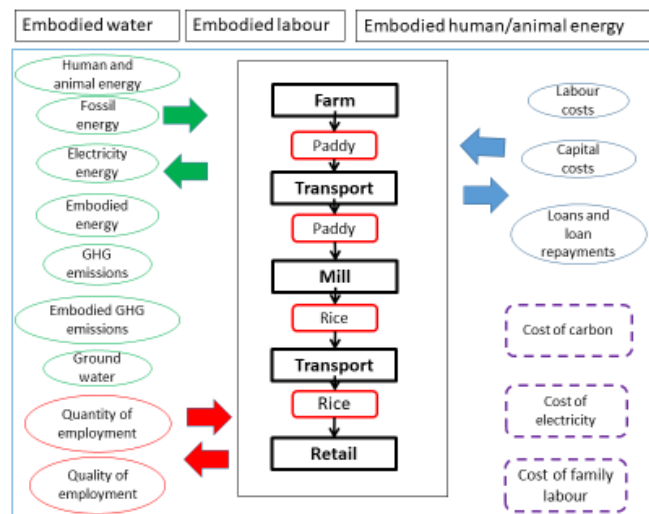


Please don't boggle too much, what you need to take away is that it is partial and incomplete - I am going to criticise it – and yet it's nonetheless complicated. In this agricultural market system, elements are firms and I classified them by scale (very roughly according to stocks of capital), by activity and by whether they were privately-owned or state-owned. And the flows are commodities. They are paddy and rice, their by-products and money. The dynamic of the system, which I would now identify as capital and labour, is missing. Energy, materials, biomass relations, all are missing. Policy is missing.

Now, Mekhala may well be going to argue that the sort of scaled-up global knowledge - that I am trying to grapple with and will present to you - is misleadingly inadequate unless it is backed up by empirical specificities. She has shown the complexity of a single *mandi* in Madhya Pradesh. However, having conceded that, when we start trying to depict a system using methods drawn both from social science and environmental science, we may have to simplify that complexity very considerably,



down to this kind of a system on to which we might be able to lay these kinds of flows and attributes.



Systems are complex in reality – in the reality we conceive. They have to be simplified. They can then be made more complex, as here, in ways that satisfy methods of environmental science but maybe not social science. In this case the stork's nest in the West Bengal system of agricultural markets has been simplified and stylized so that Life Cycle Analysis (LCA) from environmental science – through which the GHG pollution from each stage of a food production-distribution-consumption system can be computed - can be made compatible with Supply Chain Analysis (SCA) from business studies, through which we calculate costs, returns, energy and labour.

A big challenge for the 21st century is to find some way to complexify food systems in a way which the physical and life sciences speak in an equal way to the social science and together bring us insights about its purpose and dynamics that we didn't know we didn't have.

What is Policy?

Lastly, what is policy? And here we have a case of experience grating against concepts. In development economics, policies are conventionally a set of implications to be drawn from a complicated modelling exercise or regression analysis. But policy isn't an implication, nor is it well represented by a linear kind of organogram with arrows from design or formulation to implementation and onwards towards monitoring and evaluation – sometimes feeding back to design. Having taught policy for many decades, I have understood that policy is being theorized inside six disciplines, each with internal debates about paradigms and about the strengths and weaknesses of concepts and theories. An important lesson or 'take-home' about policy is that there is no one superior way to analyse a policy. There's also no a-theoretical way to analyse policy, even when policy is written about without reference to theory of any kind. Even if people don't refer explicitly to theory, they have some kind of theoretical notion behind their use of the term 'policy'. I reached retirement concluding that comparative analyses combined with an inclusive but critical attitude to theoretical pluralism is very valuable. This is especially the case when we search for explanations for policy outcomes which differ radically from their apparent original intentions – a common and widespread reality.

Further, as long ago as in 1974, at IDS Sussex, Bernard Schaffer declared 'policy is what it does'. This shook me like an earthquake. I had just spent two years in the field researching the distribution of paddy and rice in South India and Sri Lanka and discovering that policy was far more than an implication. Schaffer argued that 'what policy does' involves politics, so the question was how to research the politics of policy. And what he argued in a nutshell - though certainly it was not in a nutshell, in fact it was in his rather mystifying language - is that policy is a

simultaneous process of three (I would say four) kinds of bureaucratic politics seething away all the time⁷. It's not a 'thing', it's not an implication, a lever or a 'choice bundle', it's a set of processes with their own politics, and that rings bells with Garcia's argument that systems have to be identified through processes.

The first process in bureaucratic politics is the agenda: policy formulation, plans, proposals, manifestoes, policy decisions, etc. Most academic work is about this dimension of policy. Agenda making – the social construction of 'issues' which bubble to the top of a list of priorities – is the product of a range of power relations which determine what reaches the top and also how the policy question is framed. Discourse analysis has its place here. So do the media and electoral political prospects. Agenda-forming is itself nested in a context, a political, historical context which is almost always outside the study of a given policy. In systems terms, this context is the environment of policy agenda making.

The second kind of 'politics of policy' congeals around procedure. By that, Schaffer meant laws, regulations and office practices. These are costly, though they have hardly ever been costed. One starting hypothesis is that procedure warps statements of intention uttered at the agenda stage. A second is that control over procedure is also a resource which is subject to all kinds of attempts by interested parties to capture it.

Third, and Schaffer didn't really write about this very much, are resources. We need to know about the politics of the allocation of financial resources need for implementing policy. Also, about resources of human skills and experience: the kind of personnel needed in a regulated *mandi*, for instance, to make it work. We also need to understand the politics of technology as a resource, and perhaps now energy, because we now know that these are necessary conditions for policy in practice.

Fourth in the processes of policy politics comes the politics of access. Schaffer stylised this as the rules according to which people in civil society queue (or jump

⁷ Bernard Schaffer 1984, 'Towards responsibility: public policy in concept and practice', ch 9, pp142-190 in (eds) E. Clay and B. Schaffer *Room for Manoeuvre: an Exploration of Public Policy in Agriculture and Rural Development*, London, Heinemann

queues) to gain access to the state. Queueing systems have politics, just as they have economic costs.

To accept the reality of four kinds of policy politics along with their costs is to accept complexity in real-world conditions in which there is plenty of pressure to simplify things. But if we deny the existence of this complicated set of bureaucratic political processes, they won't go away. So the current question for me is how to incorporate all this into a depiction of a food system. I don't yet have the answer.

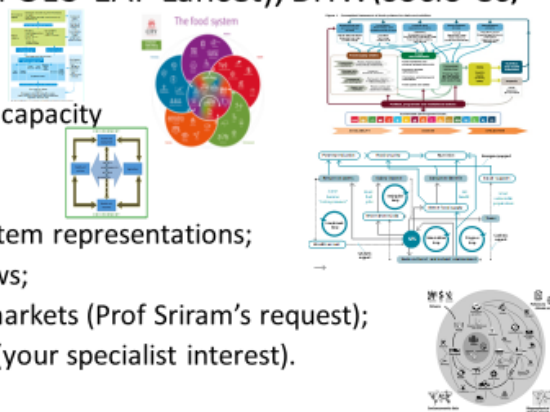
The Global Food System

Armed with these clarifications, let's turn to examine how some of these ideas are being represented at the level of the planet. Not India, but the planet. So far I have collected 16 representations/models of the global food system that have often been collectively developed by expert teams and have been peer-reviewed. I see them as internationally authoritative, published representations of our food system. I have laid out six of the 16 in this slide so you can see concretely what I am going to talk about rather more abstractly – as in the next part of this talk.

Contemporary global food systems – 16 collective, peer-reviewed, internationally authoritative, transdisciplinary, published representations (Sources: Torrero (FAO); Rockstrom (PIK); FSEC (FOLU-EAT-Lancet); BHW(socio-ec, geog, ecol-metab))

Not one by one – (cognitive capacity constraints)
but

- 1.Characteristics of food system representations;
2. Relations, drivers and flows;
3. Handling of agricultural markets (Prof Sriram's request);
4. Handling of public policy (your specialist interest).



The six examples are complicated and every single one is substantially different from the others, not simply through their mode of visual representation but

through their combinations of elements, their linkages, and their handling of the system's environment. My curiosity has been provoked by these differences. To take the 16 individually would exceed my cognitive capacity and perhaps yours too. I will try to analyse them briefly in four dimensions.

First, how the food system is represented. Second, how its drivers and relations – which Rolando Garcia argued were crucial to a food system - are represented. Third, Professor Sriram's request to me, which was how these approaches to food systems handle agricultural markets. And last, your specialist interest as an audience in public administration: how is public policy handled in these models of the planetary food system?

The answers prove unavoidably complicated and they are provisional.

Global Food Systems Models

Our planet's food systems are stylized in 16 different ways. There is no consensus about what a food system is, and minimal consensus about what its sub-systems should be. Several identify the same sub-systems as Rolando Garcia, an environmental one although labelled variously as an ecosystem, ecology, nature etc.; an agro-production system variously called a food system (in itself) or agriculture; then a sub-system to do with society. It might be called 'people', it might be called 'culture'. Various other concepts may be added on to these three sub-systems (e.g. innovation, technology. Infrastructure). But most perplexing to me, about which I feel critical rather than simply commenting on, is that very often, the sub-systems are disciplines. There will be environmental, economic, sociological, political plus sometimes demographic or health sub-systems without apparent awareness of theoretical ferments within disciplines, of their scope, their different understandings of purposes, relationships and system drivers, their languages and protocols. In other cases, the sub-systems are food commodity groups or diet groups such as the meat/ vegetable/cereal system and so on and so forth. I hope you are getting the picture not merely of complexity but of confusion.

Only one of the 16 states that the system is irreducibly complex. This model conceives sub-systems in terms of resources and assets, labour, commodities, organisations and territorial spaces. Sometimes, the classification of the elements of the system is inconsistent. So in one case, productivity, which is an outcome, is classified on a par with farmer behaviour which is a flow, and on a par with the environment, which is either a framing or a sub-system. These conceptual and definitional weaknesses make it tantamount to impossible to make sense of the concepts through which experts and their organisations have modelled the planetary food system. And while we know that scales differ within systems, some give equal status to radically different entities as when the 'household' is the same kind of unit as 'international trade'.

The planetary food system is conceived of as a closed system with boundaries which are very rarely problematized. David Goodman, the sociologist, observes that how the agro-food system fits into global political economy is itself a big problem. I think he's right about that, but you would not draw that conclusion from the 16 models. There is no indication in any of the 16 that the boundaries are political or multiple or 'zones', or that they might be modifiable through research.

Relationships and Flows

We appreciate more why this is so as we turn to drivers, relationships, processes. In most of these models, the drivers are not relations, they are available, measurable, quantifiable data that can/are meant to/ be inserted into models. They are not theorized processes as a result of which you go and find evidence so as to make the model work, to modify it or to splice quantitative together with qualitative evidence before inputting it. Drivers are also often depicted as disciplines (e.g. politics, economics, demographics, environment) so disciplines can be sub-systems, they can also be drivers, and sometimes sub-systems in one model are drivers in another and just occasionally, the same discipline is a sub-system and a driver inside a given model.

The relationships between the sub-systems, which we know are very unlikely to be commensurable, or symmetrical, or subject to identical delays, or measurable along one single numeraire, are either evaded completely, with the use of arrows, feedback arrows, or lines connecting elements (or stocks) without specifying the content of the implied flows. Or they tend to be dollars, which I believe will become more and more important as time goes on, where flows and relationships are 'harmonised' by imputing dollar values. In substituting dollars for the material relations implied, other values are ignored and crucial relationships missed.

Now, missing from all of these models are gender-relations, and food behavior inside the family which, if you are worried about over-, mal- and under-nutrition as parts of the food question, and if the purpose of modelling the food system is to improve such outcomes, ought to figure in global models. Even more striking, not one of the flow relationships expresses the contradictory economic interests of capital and labour. That the system's dynamics are not really interesting to the modelers except for the modeling of resilience, is likely to be due to the intellectual history of resilience in SDG 15. And questions of information, of money, of energy and its dissipation, of waste which is central to the food question, all these processes, relations and sub-systems are missing from these models, or at best occasionally alluded to at levels of abstraction which don't actually go into the difficulties of trying to relate them to other sub-systems.

Agricultural/Food Markets in Systems

How are agricultural markets or the system of agricultural market depicted in these food system models? For the most part, it's a lucky dip, it's shambolic, it's absolutely untheorized. References to aspects of agricultural markets are splattered all over the sub-systems. Only one model has a systematic representation of elements of an agricultural marketing system. But even this depiction does not show flows between its elements. Agencies, organisations, sectors and activities are conflated. So you recognise a category called 'traders' alongside one called 'food industry' or one called 'wholesaler' alongside 'delivery', or composite categories like {marketing and storage}, {distribution and retail},

shuffled from one model to another as {distribution and storage}, {marketing and retail}. Sometimes, concepts like 'food supplies' stand in for markets. Marketing processes are reduced to 'sourcing'. Some models ignore markets completely. Clearly, what a market system consists of needs better understanding. There are substantial literatures in social science which are being ignored while physical science imagines social science to suit its purposes.

If we reduce food market systems to global supply chains, as I did in the earlier diagrams when I was explaining agricultural markets as systems, what we neglect are the market systems which are complex. In simplifying planetary food markets to global supply chains we also miss out about 70% of food which is not actually entering global supply chains in the way that supply chains are modelled. This actively expels the idea that local food markets are in fact major manifestations of commercial capitalism with local institutional specificities.⁸

If you are provoked by this state of knowledge, please work on it to make this part of the food system better conceived and more systematically represented.

Policy in Food Systems

Last, how do the 16 models deal with policy? While the purpose of food systems modelling is to see how to change its parameters, by providing a rational basis for policy, and while a model ought to be able to indicate the directional impacts of pulling a policy lever, there is very little shared understanding of what policy actually involves. Or where policy for a better global food system could be made.

The conception of policy in these food system models, if it exists at all, is usually confined to Bernard Schaffer's first process of bureaucratic politics: agenda – policy formulation and decision-making/selection. Occasionally it's seen as part of the environment outside the food system and labelled as such. Sometimes, it's a 'frame', or context, and labelled as a 'system setting'. Sometimes, it's a sub-system in its own right and labelled 'choice bundles'. Sometimes, it's an element and sometimes, it's a flow. Very often it's ignored, or it's aggregated on a par with

⁸ Stefan Kuhl 2019, *Work: Marxist and Systems Theoretical Approaches*, London, Routledge

other categories so you get {policy + institutions}, {policy law, political parties and governments}, or it's reduced to 'governance', or it's a list of specifics, all of them idiosyncratic. Few give policy any kind of attributes except, in one or two models, as 'lobbying' (which might be understood by some as an inconvenient and illegitimate interference with an ideal process). One of the models however does recognize trade-offs between policies as being an attribute of policy, which I think is an important insight.

But overall there is no sign of engagement with implementation or policy practice as a field of public administration. In that sense, there seems to have been no change since the 1970s.

How can we conclude other than that notions of policy are chaotic, that they are depoliticized in Schaffer's sense, or that they are re-politicised as a technical matter with power residing in the technician and scope confined to the agenda. Yet again there seems to be a great deal of work needing to be done.

Conclusions

What are we to make of these 16 models? Is the obscurity we uncover actually for a purpose? One kind of interpretation is that of David Goodman and Mike Watts, both sociologists of the food system, when they talk about a panoply of tools and invoke the value of and the necessity for theoretical plurality⁹. But is that really what we are seeing here? An alternative interpretation would be critical of an empiricism which is led by available data, unaware of the kind of preconceptions that lie behind the terms that are being invoked. On a bad day, you might call it pre-conceptual anecdotalism. And if there is no theory, and if empirical categories are driven by the availability of data – and it's got to be a certain kind of comparable data for, say, a minimum threshold of 150 of the world's 196 countries – what is the explicit role of a factor like 'experience' which the systems theorist Donella Meadows recognized as valuable in evaluating models? Has experience –

⁹ David Goodman and Michael Watts, 1994, 'Reconfiguring the rural or fording the divide? Capitalist restructuring and the global ago-food system', *The Journal of Peasant Studies* 22 (1) 1-29.

presumably that of experts – replaced theory and evidence? If so, why? These are questions I can't at present answer but they must be asked.

So, much of consequence for the 21st century's food question is missed out of the 16 attempts, all published in the 21st century, to model the food system. For environmental scientists, society can be simplified to the point of meaninglessness as 'people' or 'culture'. And conversely, the same is true for the environment when social scientists invoke it as 'resources'. There's an enormous trans-disciplinary project ahead, to accept sub-systems at different scales while making their analytical units consistent – which may – or may not - involve material elements and nutrients.

Now, Rolando Garcia, whose contribution I summarised at the start, acknowledged that systems are mental constructs and they are built for purposes. So when 16 models of the food system differ, should we be at all surprised? Perhaps not. But these models have been built for more or less the same purpose. I prefer to conclude that this extreme lack of consensus about the planetary food system and the privileging of idiosyncrasy is both surprising and a problem. It is not eased by invoking 20th century disciplines with all the contentions we know that exist within them. When disciplines are deployed to mask over discursive chasms and complexity, and when disciplines still remain irreconcilable domains of knowledge, when politics or economics or sociology are invoked as sub-systems – or drivers - of a food system, assuming no difficulty in interpreting what the discipline stands for, I think we have a problem. I prefer to conclude provisionally that these systems manifest a stupendous disregard for theory of any kind. So the food system exists, it exists in our heads. It functions in reality with outcomes we deplore. But conceptually it is broken.

Are food systems modelers merely bringing the limits of their own experience to the food system? Or are we living through a crisis of naming where innovative labels are prized for their originality but where, at the same time, collective projects are more easily advanced if labels are fuzzy concepts and can mean whatever you like them to mean?

Why are physical and life scientists treating the social sciences as though they did not exist?

For a country like India, this messy planetary situation presents an enormous opportunity for Indian food systems analysts to spot and avoid some of the elephant traps I've indicated while, like the proverbial blind men, you feel the elephant of the food system. In India, there can be a rigorous analysis of the socially and ecologically beneficial and damaging outcomes of the Indian food system for specifically Indian objectives – and of the politics of Indian policies – nationally, at the state-level and locally.

Some Constitutive Context for Indian Agriculture

If you develop public policy as a political sub-system within the Indian food system, some aspects of the constitutive context may be worth flagging as a link from this to Mekhala's talk on India's reforms to agriculture and to agricultural markets.

First with respect to policy agendas, there is the power of hot air – of intention - in which the government of a country like India, (and this is certainly not confined to India) can sign international resolutions to limit global heating to so many degrees (say 1.5), or to claim a paradigm change in agriculture (in this case towards agro-ecology), and not to do very much about either in practice. Just 10 of the 27 states in India have policies promoting agro-ecology and they are all at variance with each other. India has made a commitment to zero budget natural farming but without any role for evidence in this decision and precious few resources to invest in a practical pathway which carries short and medium term yield risks, and which would require an increase in land area for cultivation.

All policies have necessary preconditions and hostile forces and other obstacles to their implementation. Behind the scenes, big agri-business campaigns for cash crops. And while the animal economy, fishing, and forestry are neglected as sacred or unimportant, or both, agri-business can ride roughshod over them, driven by its search for profit. Most of the resources, most of the subsidies for agriculture,

incentivize intensive, chemicalised and fossil fuel-based agriculture. There is both a rhetoric and a research aspiration toward agro-ecology but they both face a structure of incentives favouring chemical agriculture.

We need to try to figure out what institutions need to be in place for the policy to be implemented as we suggest it should, where the hostile forces are, and how their power is expressed. But for these hostile forces, sensible policies would have been implemented already. Where is the opposition? How is it to be neutralized, or bought off, or bypassed, or overcome? These questions need mainstreaming in all discussions of policy.

Another contextual factor for agricultural policy-making concerns its sites. It is widely believed that agricultural policy sits in the ministry of agriculture in central government and in departments of agriculture in the states. However, I challenge you to examine every nook and cranny in every department of both the central and state governments to figure out what the implications of their policies are for agriculture. You will find agricultural policy, or policy relevant to agriculture, everywhere, which means that there are many, many agendas at the discursive level whose implementation is carved up in institutional terms and which roll out differently at different scales.

And quite a lot of India's food system and India's agriculture is not regulated by the state at all, it's not directly influenced by policy because it's 'unorganised', it's informalised. I think India's informal rural economy is facing a great crisis as we speak, because of the shocks rippling through it from 'outside' – from the response to covid-19, which Dr Saumya Swaminathan will address. In agriculture, exchanges of credit, the circulation of seeds, commodities, labour relations, insurance against shocks are not regulated effectively by the state. Non-state institutions fill the gap. We need to seek to understand how they work, how they make their equivalent of policy, and resist that of the state, and evaluate their implications for the contribution of agriculture to India's economy and society.

Last, we need to remember that policy is sedimented. Procedure, resources and access move more slowly than turbulent, volcanic agendas. India has moved from state capitalism through neoliberal reforms to new forms of state capitalism –

more competitive, more subservient to private capital, less coherent. All manner of metamorphic schists, slates and quartz accrete around policy processes. Ignoring them does not make them disappear.

Thank you very much for listening.