



Dutch Agriculture, European Policies and Global Food System Transitions

Preface

In the 21st century we face major global challenges crossing the borders of nations and sectors. Humanity is over-consuming nature and its natural resources, urban centres are becoming overpopulated, a major part of the population faces malnutrition and the climate is changing rapidly. The Covid-19 pandemic makes us realise even more that we are confronted with big challenges; in particular we see a rapid changing world order, a global food security crisis and rising poverty. It is clear our world needs important transitions, towards more resilient and sustainable food systems, including related public policy, business innovation and research.

I therefore welcomed the suggestion by Krijn Poppe and Ruerd Ruben to organize a symposium on the drivers and prospects for food system transformation in the Netherlands, Europe and the developing World at the occasion of their retirement from Wageningen Economic Research. An event that due to Covid-19 has to be organized as a digital symposium consisting of a series of 3 lunchtime webinars (on Monday 2, Tuesday 3 and Wednesday 4 November 2020), followed by a special session with the farewell lectures by Krijn and Ruerd and an introduction by Louise Fresco.

The symposium is a nice opportunity to match the views of experts from (international organisations with those of our senior staff. I express my sincere thanks to Johan Swinnen (IFPRI), Tassos Haniotis (European Commission) and Marjolein Demmers (Natur & Milieu) and several discussion openers for their excellent contributions.

In this publication you will find the papers that Ruerd Ruben and Krijn Poppe have written for their farewell lectures. The reflections that they share, based on a lifelong career as agricultural economists, are not only the usual rite de passage, but help us to discuss policy making, innovation priorities and research agenda's. I hope you will find them inspiring and we look forward to collaborate with you in making this world more sustainable and resilient.



Jack van der Vorst
General Director Social Sciences Group



Searching effective incentives for global food system transformation

Farewell Address

Prof. dr. Ruerd Ruben



WAGENINGEN
UNIVERSITY & RESEARCH

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Preamble

This paper is based on my journeys up-and-down between research and policy-making, being involved in issues like peasant agriculture, rural development, land reform, farmer cooperatives and voluntary standards in agri-food value chains. My interest has always been focused on determining the impact of these activities for reducing poverty and malnutrition and improving food systems performance. I gained some experience in steering interdisciplinary programmes together with crop and soil scientists, nutritionists and food technologists, economists, geographers and sociologists. After 40 years of professional life, I might have a slightly better understanding of the puzzles we face in our understanding of farmer behaviour and consumer choices, the often unexpected and perverse responses to well-intended policy incentives, and the difficulties of implementing effective pro-poor development programmes. I learned that we need specific methods and innovative approaches for generating new insights on how to address complex future challenges. In this paper I share some ideas on conducting interdisciplinary policy research to support healthier, sustainable and inclusive food system transformation processes as envisaged in the SDG agenda.

Abstract

The focus in international debates on zero hunger (SDG2) and appropriate strategies for food and nutrition security (FNS) has gradually shifted from production-oriented approaches that mainly look at food availability and the contribution of smallholder farmers for guaranteeing sufficient food supply, to more demand-oriented strategies that focus on critical constraints for equitable access to nutrient-rich food and affordable diets for resource-poor consumers. This change in orientation is accompanied by (1) a shift in analytical paradigms that give priority to food system organisation and governance and interactions and strategies for overcoming trade-offs, and (2) a search for innovative approaches to improve the impact of policy incentives for reaching key societal goals, such as poverty reduction, climate change mitigation and social inclusiveness.

This paper provides an overview of current insights regarding the effectiveness of different types of incentives for influencing the behaviour of key food system stakeholders: producers, traders, consumers and policy makers. We assess two major causes for frequently occurring policy failures: (1) lack of understanding of the underlying drivers and motives of stakeholder behaviour, and (2) limited insights in stakeholder interactions. Better understanding of food systems performance may enhance prospects for supporting food systems transformations. Disentangling our insights into the complex nature of producers and consumer decision-making processes and their non-linear responses to economic incentives, will enable us to outline possible pathways for future policy research around strategies for improving food system outcomes.

Keywords

Food & nutrition security; Agriculture; Smallholders; Food system; Incentives; Impact, interdisciplinary research; Food policies; Transition.

A close-up photograph of a young child with dark hair, looking down with a neutral expression. The child is being carried on the shoulder of an adult whose back is visible, wearing a pink sari with intricate embroidery on the shoulder. In the background, several other people are visible in a blurred setting.

1

Introduction

The questions '*what works*' to support healthy and sustainable diets and '*where and for whom*' are these incentives most effective belong to the core domain of impact and policy analysis.¹ The last few years we have seen a growing number of rather normative publications that nicely picture the requirements for better nourished people and the design of climate-smart food systems (Willett et al 2019; IPES, 2019; FOLU, 2019), but usually fail to indicate how these results can be reached. In this paper I will share some relevant insights from fieldwork and literature that illustrate **why food system interventions so frequently lead to adverse outcomes** or contradictory effects. This is caused by methodological problems that limit our insights in food system dynamics and in the motives for adaptive behaviour, as well as by analytical biases that hinder our understanding of the strategic interactions and interfaces between different stakeholders.

In my professional career I have been frequently engaged in (ex-ante and ex-post) policy evaluations to assess effective incentives to support pro-poor investments and development innovations, searching for suitable frameworks to appreciate the likelihood of generating the desired impact. Impact evaluation usually includes two interlinked dimensions (Savedoff et al., 2006; Bamberger & White, 2007):

- a the *causal relationship* between the intervention and the generated results embedded in a chain of nested cause-effect relationships (usually defined as 'attribution'), and
- b the measurement of net welfare effects compared to what would have happened without the intervention (commonly called: the *counterfactual*).

Both are analytically difficult since there are many other (non)observable variables that also influence change and therefore responses to incentives can be different from expectation. Moreover, it is also empirically quite complex to capture drivers of change since our understanding of the adaption of livelihood strategies by poor people remains fairly limited.

¹ This is in line with the common characterisation for impact evaluation as '*speaking truth to power*', referring to its role for guaranteeing accountability and enforcing policy transparency (Patton, 2010).

In this paper I will share some lessons for unravelling the question: why efforts for steering food system change are so little effective, and consequently, *why do so many people in this world still remain hungry?* (rephrasing the seminal 'why poor people stay poor' by Michael Lipton, 1977). This happens despite many well-intended efforts by development workers, local authorities, responsible businesses and civil

society organisations that try to improve poor people's access to resources and income in order to safeguard healthier and more sustainable diets. Apparently, policies and interventions that have been launched for poverty reduction and for eliminating malnutrition are not as effective as thought, and sometimes even generate opposite outcomes.

This discrepancy might occur due to three different reasons. First, we have limited insights and sometimes erroneous views on the behaviour and response of individual stakeholders (producers, traders, consumers, etc) and therefore we



tend to overestimate their possibilities for adapting current practices. Second, little attention is usually given to food system governance, e.g. the mutual interactions and interlinkages between food system stakeholders and how they strategically deal with possible trade-offs or synergies between competing objectives. Third, our policy analyses of possible pathways for improving food systems focus on partial supply responses and thus remain highly fragmented in need of a more interdisciplinary and interactive framework.

In the remainder article I will discuss some possible explanations for these unexpected (and often undesired) outcomes of different interventions for improving food system performance. It starts with presenting a couple of typical food systems puzzles from commonly applied incentives for guaranteeing food security that do not work out as expected (section 2). Hereafter, we identify major analytical biases that explain why still so many mistakes are still made (section 3). This brings us to a set of key principles that may be relevant for improving our understanding of the drivers for food systems transformations (section 4). Finally, I will outline some ideas and challenges for future policy research on food system transformation processes (section 5).



2

AGUACATES
MUY BUENOS

1 kg
100

NECTARINES
MUY DULCES

1 kg
100

1 kg
100



Food system puzzles: some inconvenient facts

Why do development interventions and policies not fully deliver the intended result? For the sake of argument, we will dig somewhat deeper into several typical examples of inconvenient findings that can be characterised as *food system puzzles* (Achterbosch et al., 2014). These puzzles are related to difficulties to capture simultaneous changes in both producer and consumer behaviour, the simultaneous adjustments in markets and institutions, and the heterogeneous responses to policy incentives for generating food system transformation (Ruben & Pender, 2004).

Many food policies start with the challenge '*how to feed a growing world population*', but that is increasingly reframed in more comprehensive terms like '*how can healthy diets be delivered from sustainable ecosystems*' or '*how can nutritious food become accessible to poor people*'. All these challenges focus on the 'how to' question and for answering them we need not only insights in the input (resources) and output (results) side of economic impact analysis (e.g. how do producers and consumers react to particular types of incentives?), but we also require good understanding of the **throughput** in food systems (how inputs and outputs are linked with markets or institutions).

From the wide array of impact studies, we can draw on some well-known examples regarding inconvenient facts of incentives that didn't work out as originally envisaged, or even resulted in perverse outcomes. We outline four examples that illustrate how the theory of change underlying these intervention may be quite different from the reactions that key food system stakeholders in practice exhibit.

Increasing food production does not end up in better nutrition

Several programmes that were launched to support smallholder food production through farmer training and extension, input and credit supply or marketing faced serious problems in reaching nutritional outcomes. Income from production does not end up with women that are in charge of household food

purchase and cooking. Even when more food is produced, revenues from food sales are not used for the purchase of nutrient-dense foods. This separation of production and consumption decisions may easily result in lower food security as a perverse outcome. In a similar vein, efforts to improve post-harvest management may not result in higher farmer revenues if they lead to suppressed food prices due to higher market supply, thus undermining the incentives for farmer's investments in PHL reduction (Verma et al., 2019).

Higher farm gate prices may result in lower food supply

Many African and Latin-American countries tried to improve the availability of food by increasing farm-gate prices with the idea that this would incentivise farmers to grow more. In a similar vein, initiatives for subsidising farmer inputs

intended to enhance agricultural productivity (Harrigan, 2008). In practice, however, when markets for inputs, labour and outputs are missing or severely constrained (de Janvry et al., 1991), farmers tend to reduce

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their farm labour efforts and increase leisure or engagement in off-farm work (Singh et al., 1986). This may well result in higher fam-household welfare but lower overall food supply and thus rising prices for consumers and less food security; quite the opposite of what was originally pursued.

Non-farm work increases dietary diversity

Rural households are frequently encouraged to produce different types of foods on their farm and in their homestead. Interestingly enough, it appears from field research in several Southeast Asian and Sub-Saharan Africa countries that greater dietary diversity can also be reached by farmers that specialise in some crops and thus rely on opportunities for engagement with seasonal migration or off-farm employment (Raman & Mishra, 2020; Babatunde & Matin, 2010). The external revenue or remittances stream and related expenditure effects forthcoming from these non-farm activities enable farmers to purchase a wider variety of food items and better guarantee their basic requirements for sustainable and resilient livelihood, household dietary diversity and nutrition security (Thow et al., 2016).

Commodity certification leads to lower farmer incomes

Farmers that engage in fair and sustainable trade labels and sell coffee, cocoa or bananas under more favourable price conditions appear to receive rather limited benefits in reality (Ruben, 2008). This is mainly caused by the fact that adoption of many good agricultural practices is easily copied by neighbouring non-certified farmers. These non-certified farmers can thus increase productivity, usually at lower costs and with less risk. In addition, certification agencies have accredited so many farmers that only a small part of the certified harvest can be sold under premium conditions. Therefore, after some initial success, certification has become nowadays a trap for farmers that become over-specialised in the production of export commodities but can hardly improve their income and food security (Rijsbergen et al., 2016).

These typical examples illustrate that partial theories that only look at direct effects of interventions may fail to capture the full impact on the adaptation of markets and livelihoods, since real-life outcomes are also based on linkages with other activities, interactions with other households or preferences for other objectives. It also teaches us that **solutions to problems can best be found in a different area than where the problem occurs**. Adequate analysis of these wider interactions requires a good analytical understanding of how food system interactions are structured (section 3) and needs to be based on improved behavioural insights on how possible pathways towards food systems change are shaped (section 4).



3



Insights in food system dynamics: what's behind food systems puzzles?

Understanding the incentives for improving food system performance is vital for fulfilling our commitment towards reaching the SDGs by 2030 (when I get 76!). Therefore, it is not sufficient to only look at the behaviour of individual agents or groups of stakeholders (like producers, traders, processors or consumers), but we need above all a better understanding on how the interactions and interlinkages amongst them are structured in order to be able to identify possible trade-offs or synergies between competing objectives (Ruben et al., 2019).

Many of the unexpected impacts or adverse effects are caused by not fully considering feedback relationships between food system stakeholders, underestimating the complexity of decision-making processes or overlooking the competing goals of different stakeholders. To explain some of the underlying causes of the before-outlined examples of unexpected food systems response, a few systematically occurring analytical biases need to be mentioned:

a Multiple resources: overlooking substitution effects

Individual behaviour concerning food production and consumption is usually based on the allocation of limited resources (land and labour) to a few activities (food and non-food). This simple 2x2 model is nice for teaching allocative choices and to illustrate basic trade-offs, but it is far away from reality.

Econometric models already permit greater complexity, but resource competition and cross price elasticities are still scarcely used and therefore substitution effects are frequently overlooked. Intra-household resource substitution is also more likely to take place in developing countries due to higher risks and missing markets that inhibit flexible adjustments.

While many soil and crop scientists still believe that farmers look for better inputs and high-yielding seeds and aim for higher returns to land, smallholder farmers tend to consider labour as a far more limiting factor and thus look at increasing returns to labour as their prime objective. This explains - to a large

extent - why labour-demanding climate-smart agricultural practices face low adoption rates (Pamuk et al., 2019). In a similar vein, nutritionists may advocate for lower prices of healthier foods, but this can easily lead to less instead of more consumption if competitive non-food products (alcohol, cigarettes) are more appreciated. In both cases, potential technical solutions to food security will not be taken on board massively by producers or consumers.

b Multiple goals: reasons for bargaining

Many food systems analyses are driven by rather straightforward goals (like poverty reduction, healthier diets, reduced emissions, etc.) and tend to disregard the trade-offs between these objectives and the requirements for reaching bargaining solutions. Win-win strategies sound nice but are not easily attainable in practice. Moreover, key objectives like food security are framed differently by poor and middle class households, and gender, ethnicity and age may account for large differences in preferences within households.

Changing asset distribution (through land reform or taxation) is a pre-condition for supporting food and nutrition security

As long as we focus on single objectives and preferences (i.e. food, income, security) we will not be able to understand how decision-making really takes place. Inequalities in wealth and asset ownership lead to

important asymmetries in information and preferences that limit the solution space. Nowadays, it is increasingly acknowledged that changing asset distribution (through land reform or taxation) is a pre-condition for supporting food and nutrition security (Deininger, 2003).

c Multiple incentives: underestimating confounding factors²

Most empirical analyses that assess the effectiveness of incentives for improving food systems performance look at individual measures and focus on first-order supply response effects, comparing treatment and control groups before and after the intervention. Impact analyses based on behavioural experiments may consider a wider set of potential incentives but are usually limited with respect to their external validity. It therefore remains difficult to identify unambiguously the causal mechanisms through which stakeholder responses are generated.

² interference by a third variable that distorts the association being studied between two other variables, because of a strong relationship with both of the other variables.



Specific incentives may generate, however, rather unexpected reactions. We thought for a long time than land titling would automatically lead to more smallholder investments, but this only proved to be true when rural credit became available and accessible. Otherwise, putting more credit and microfinance at the disposition of farmers only resulted in higher investments if their subjective perceptions of risk improved. This can again be reinforced through collective action and women empowerment (i.e. women self-help groups) and engagement in cooperative networks that provide some type of mutual insurance. It appears that the imperfect transmission of higher welfare to better nutrition is frequently mediated by gender roles as confounding factor. Farmers seem to respond faster to negative signals than to positive incentives, as explained sometimes by loss aversion theories. Consumers also react more to warning labels than to fairness or sustainability seals. Otherwise, some (usually more wealthy) households are able to react in a more pro-active manner to policy changes, and may thus capture a first-mover bonus. Moreover, large-scale public investments (in schools, roads, electricity or drinking water) mostly generate higher positive welfare effects – and are also more cost-effective - than

many local support programmes that many well-intended civic organisations still promote. These experiences teach us that reinforcing the food environment is critical to guarantee that targeted incentives reach food system stakeholders.

d Multiple drivers: overcoming the isolation paradox

Repairing food systems failures asks for a thorough understanding of the different external drivers for initiating change, as well as their mutual interactions. Whereas responses to individual drivers (such as urbanization, economic growth, climate change) are usually fairly well understood, it becomes more difficult if they influence each other and feedback loops become relevant. Food system challenges that are simultaneously related to different drivers refer, among others, to human migration that may be caused by food insecurity and/or climate change, deforestation driven by diets and trade, and better food



production and/or post-harvest technologies that increase food supply but also reduce farm-gate prices. These changes either reinforce or weaken each other, and addressing them in isolation will delay food system transitions. Integrated and coherent policies that recognise these multi-layered interdependencies are certainly more effective.

There are good reasons why food system interactions need to be taken into consideration. New and improved technologies might be adopted slowly because smallholder farmers are locked in fixed-term market contracts. Consumers' choices also suffer from slow adaptation related to well-established habits, beliefs and preferences. The so-called triple burden of malnutrition is a typical result of multiple (market and information) constraints that poor people face at different stages of their life cycle. In a similar vein, improving food safety requires a thorough understanding of different opportunities for changing purchasing patterns and cultural perceptions as well as handling practices by producers, traders and processors.

Many of the before-outlined unexpected responses are related to an incomplete understanding of drivers and adjustment mechanisms in agri-food systems governance. They result from far too linear and straightforward concepts for

Many unexpected responses are related to an incomplete understanding of drivers and adjustment mechanisms in agri-food system governance

overcoming (technical or resource) constraints either at the demand side (consumer) or the supply side (producer, trader) of the food system. What we need instead is a more holistic and nested conceptualisation of the internal feedback mechanisms and

external spill-over effects that could guarantee a better design of policy measures and effectively anchor these changes into behavioural practices.



4



A systems perspective on food & nutrition security

A large part of the unexpected outcomes are related to limitations in our thinking on systems change. While policy makers like simple proposals for direct intervention, scientists usually come up with a range of potential measures that still generate uncertain outcomes.

Communication between scientists and policy makers can be tense and full of mutual misunderstanding. Whereas the need for evidence-based policy making is growing, in practice the uptake of science-based impact studies remains remarkably limited.³ This might be caused by the fact that policy makers look at research mainly as a decision-support tool (knowledge for ‘bridging of gaps’) instead of an arena for information-exchange (knowledge for facilitating dialogue between collaborating partners). To overcome this dilemma and to guarantee shared expectations it is of foremost importance that both sides agree on some common working principles.

For a better understanding of the process of food systems transformation, we need to generate a shared understanding of the ‘theory of food system change’. This can be based on an analytical framework that systematically distinguishes between three aspects (HLPE, 2017):

- a food system **drivers**, like urbanisation, technology change, climate and economic growth that lead to structural changes in food production and consumption patterns;
- b food system **components**: food production and distribution (food value chains) and food consumption (consumer choices) guided by the (public & private) governance environment that shapes the modalities for linking supply and demand for food;
- c food system livelihood **outcomes**: healthy diets, sustainable food supply (climate-smart & resilience) and equity (smallholder farmers and poor consumers) that could either support each other (synergies) or become conflictive (trade-offs).

³ The Dutch policy response to Covid-19 is a notable exception, even while the reliance on medical and epidemiological knowledge side-lined the expertise on incentives for generating behavioural change.

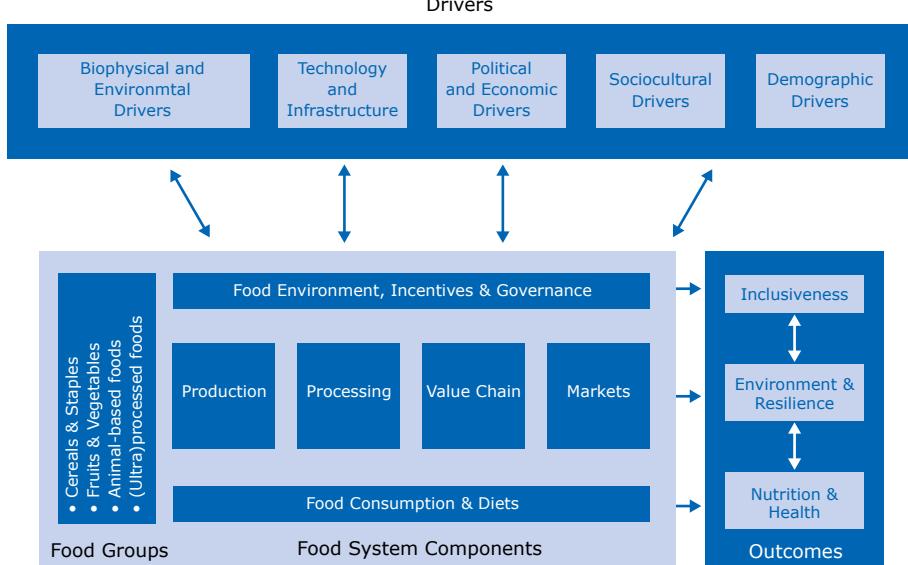


Figure 1: Food systems framework (adapted from HLPE 2017)

This food systems perspective can be very useful for generating better insights into interlinkages between different activities and the interactions between various stakeholders (Ruben et al., 2018). It searches for **leverage points** to improve food system outcomes and strategies for overcoming trade-offs between healthy, sustainable and inclusive diets. We need a systematic approach for addressing potential trade-offs identifying effective leverage points (Geels & Schot, 2007).

The essence of food systems thinking is that it does not simply look for solutions to a problem (fixing the problem) but want to **address the root causes** of the problem. These are usually found outside the arena where the problem occurs. The example that I frequently use is when there are many holes in the road, people directly start to look for methods to fill them. But many other options that could be taken into consideration, like rerouting the vehicles, delegating ownership of the road to the local community, or even introducing a toll system to finance future repair work. These options might be more structural solutions that prevent the hole coming back.

There is broad evidence from development evaluation that **straightforward solutions are not always the best ones**. Miguel and Kramer (2004) showed that school attendance can be improved with health interventions (deworming of children), and Banjerlee and Duflo (2006) found that female school absence is best addressed with investments in separate toilets. In a similar vein, farmers could be encouraged to adoption of improved practices not only through training

and extension (direct pathway) but also and sometimes even more effectively through more secure marketing contracts or higher trust with traders (indirect pathway). The same holds for changing nutrition: in

The introduction of changes in the food environment (more convenient supply) appears to be most effective

addition to providing consumer information, the introduction of changes in the food environment (more convenient supply) appears to be most effective.

Based on my long-term engagement with multidisciplinary research programmes⁴, we can outline a kind of generic operational sequence for systems analysis that is structured around a dynamic wheel with six practical steps for addressing trade-offs in food system transformation processes (see figure 2). These six steps can be divided into three consecutive stages:

- a identifying opportunities to address trade-offs: finding interfaces (step 1) and entry points related to root causes of food systems failure (step 2);
- b designing activities for dealing with these trade-offs: identifying people in need (step 3) and designing feasible (in)direct incentives (step 4);
- c putting in practice a set of concrete activities for overcoming trade-offs: packaging incentives (step 5) and anchoring change (step 6).

4 During my career I provided leadership to the WUR-DLO programme on Sustainable Land Use & Food Security (known as DLV) in Mali and Costa; the WUR-ASC programme Impact of Climate Change on Drylands (ICCD); the INREF less-favoured area programme (known as Response) between WUR and IFPRI in Ethiopia, Kenya, Bangladesh and Philippines; the IS Academy Civil Society led by CIDIN Nijmegen, the NWO-Wotro-funded programmes on value chains and on reproductive health (PopDev); IOB programme evaluations on water & sanitation, budget support and food security; the coordination of LNV-funded knowledge base Food & Nutrition security; and the WUR-IFPRI programme 'Food Systems for Healthier Diets'(part of CGIAR consortium Agriculture for Nutrition & Health -A4NH).

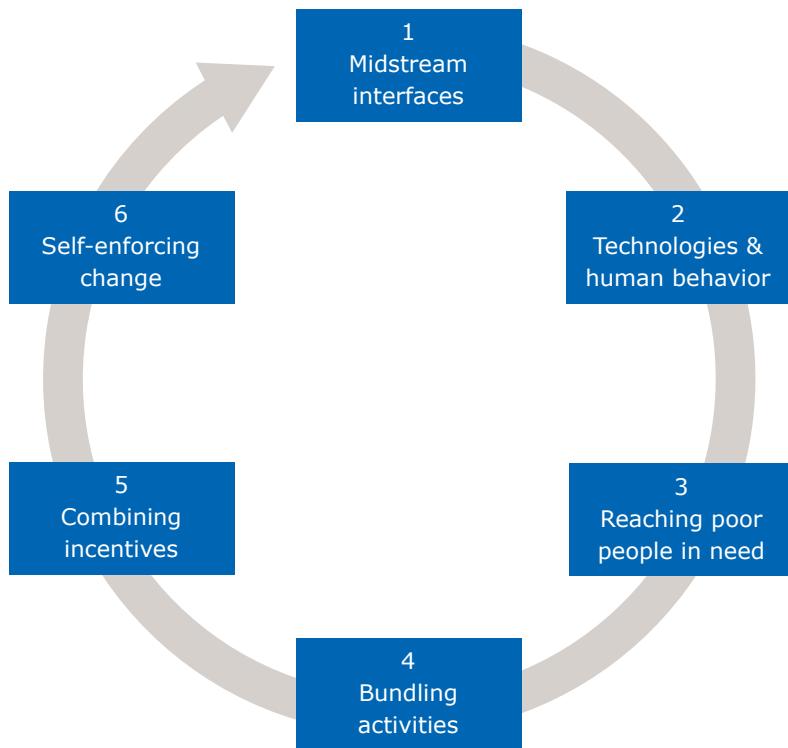


Figure 2: Six steps for addressing trade-offs in food system transformation

In the following we outline these six steps and provide some practical examples on how they can be helpful for enhancing the policy effectiveness towards food systems transformation.

1 Focus on midstream interfaces to support system transformation

Many improvements in food systems are generated by outside pressure that generate new relationships between production, consumption and governance. Typical examples are the construction of new roads that open up areas for more commercial agricultural production but also pave the way for further resource degradation (Angelson and Kaimowitz, 1999), or the growing urbanisation that supports the supermarket revolution and the rise of middle class (Reardon and

Hopkins, 2006). If we want to influence such processes, we need to focus on places where interactions between external drivers and food system stakeholders are shaped. Instead of looking at the start and the end of these transformation processes, we need to focus far more attention towards midstream interfaces that simultaneously translate or transmit signals upstream and downstream throughout the food system (Ruben et al., 2017).

This has severe implications for impact analysis, since the traditional – rather linear – theory of change (from input to output, outcome and impact) needs to be broadened to give attention to the ‘throughput’, i.e. changes that happen in the ‘hidden middle’ that influence the interactions between producers, consumers, market and institutions (Binswanger and Rosenzweig, 1986; Reardon, 2015). For food systems transformation, this implies that the rate of adoption of new production practices and/or consumption preferences can be mediated by midstream agents. This process of **working from two (or more) sides** to support the scale and rhythm of food system transformation processes takes advantage of middle segments in the food system that link producers and consumers in different areas (i.e. input flows, knowledge sharing, bulking and facilitation).

2 From technological innovations to behavioural change

Since the green revolution, much attention has been given to technological change as a key driver for system innovation. However, it is increasingly recognised that (dis)embodied technologies and new practices still need adaptation before being accepted by wider segments of the population (Ruben, Pender and Kuyvenhoven, 2007). The likelihood of adoption of climate-smart agriculture or the chance of success for the promotion of nutrition-sensitive value chains are strongly influenced by behavioural change processes for improving trust and changing risk attitudes amongst producers and consumers (Pamuk et al., 2019).

Based on the seminal work by Banerjee and Duflo (2011) we have nowadays far better insights in the possibilities for influencing agency behaviour. RCT experiments are widely used for understanding different kinds of incentives for improving school attendance and educational outcomes, for guiding healthier food choices or for enhancing the productive use of credit. A major lesson from this work is that many small-scale businesses and poor people in less developed

countries cannot easily take advantage of the best available technologies and need substantial policy adjustment.

An important implication is that food system transformations can only be supported if **dual purpose incentives** and mechanisms that permit a larger groups of disfavoured stakeholders become part of the innovation process. Anchoring change in behaviour might also bring us to other types of interventions that are more effective for overcoming (demand- and supply-side) bottlenecks. This explains why improved dietary diversity in rural households can be reached by reducing farm work and increasing off-farm employment (Dsouza et al., 2020).

3 Reaching people in need

Many food systems innovations look at individual responses of stakeholders to specific types of (dis)incentives. Whereas our knowledge on supply response elasticities still remains fairly restricted, we need to acknowledge the large heterogeneity in responses by net producers or consumers of food (Ruben and Pender, 2004). This is an important constraint for targeting and sequencing appropriate incentives in food systems innovations. Adequate outreach needs to be based on deep understanding of the livelihood constraints that poor people face.

A question of particular interest in this respect refers to correlates of **poverty and malnutrition** in rural and urban areas. Common statements refer to '75% of poverty concentrated in rural areas' (Hazell et al., 2005), but net buyers in (peri-)urban areas are increasingly vulnerable for malnutrition. Targeting rural poor might therefore be critical for poverty reduction, but is probably not fully effective for reducing malnutrition. In many African countries underweight women and undernourished children are found amongst all income classes. This is largely due to co-variate local environment risks. It implies that poverty programmes targeting vulnerable individuals (school children, pregnant women, etc.) and nutrition programmes that enhance stable access to nutritious food might be more effective for elimination rural malnutrition than global territorially-oriented poverty reduction programmes (Brown et al., 2019).

Targeting of food subsidies faces similar dilemmas. Targeting errors frequently occur if import tariffs are reduced or universal subsidies are given to (imported) foods that are broadly consumed, whereas targeting modest support for simple



local commodities or informal outlets for poor people's consumption will be far more effective in reducing malnutrition amongst vulnerable households (v.d Walle and Nead, 1995). There is also increasing evidence that (un)conditional cash transfers or in-kind vouchers to well-defined groups provided under social safety nets can be fairly effective for supporting education, health and nutrition amongst poor people (Millán et al., 2019).

4 Bundling activities for irreversible outcomes

Many development programmes focus on specific activities that finally result in outcomes such as better nutrition or more sustainable resource use. To become effective, these activities usually require good coordination between different stakeholders involved. That is not so easy in practice, given the different roles, practices and mandates of public agencies, private sector enterprises and civil society NGOs (Elbers, 2012; Kamstra, 2014).

Many efforts towards food security are devoted to making the 'hardware' for improving food production and value chains, whereas less attention is given to vital accompanying investments in social organisation ('orgware') and human capacity building ('software'). This is partly due to the bias in food security

programmes in favour of the formal sector, thus underscoring the importance of informal markets for guaranteeing affordable food access and food safety. The same holds for farm support programmes that focus on formal finance and extension services and thus losing sight of the fact that informal credit and information exchange networks are providing the larger share of these services (Moll et al., 2000). Food systems transformation programmes that are capable of provoking coordinated action and support the **bundling of hardware, software and orgware activities** are likely to deliver more irreversible outcomes and sustainable impact, since the combined set of activities is based on **complementarities** that permit dovetailing different processes into the same direction.

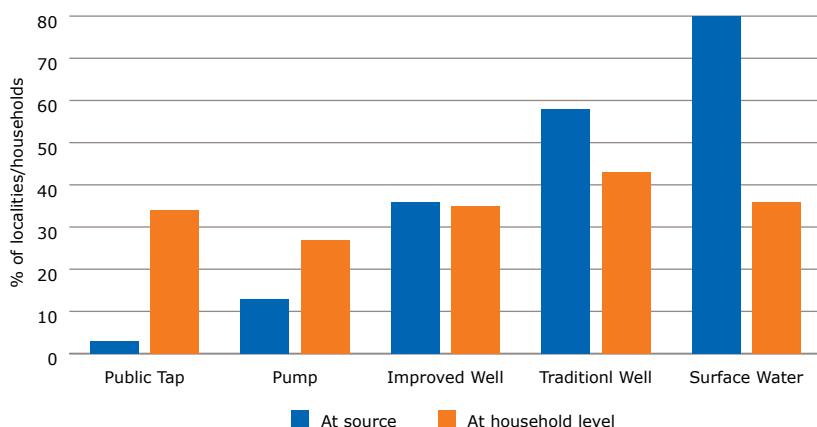


Figure 3 E-coli contamination by water source

(Source: IOB & BMZ, 2011)

The IOB impact evaluation on water and sanitation found many projects where drinking wells were improved without reaching any impact on local health outcomes. The effects of investments for the construction of wells were lost during the transport and handling, and most of the surface water (once boiled) contained similar E-coli at household level.

The key problem appeared to be that drinking water projects focus on construction (sometimes with Dutch water companies) but disregard training at community maintenance and education for better sanitary practices (washing hands) usually provided better by NGOs.

5 Combining incentives for anchoring food system change

In addition to the identification of a portfolio of promising activities, it is important to create a framework for enforcing their adoption by different stakeholders. Given that in most developing countries market imperfections and government failures tend to coexist (Bulte and Ruben, 2007), the incentive framework needs to be smart and tailored towards the needs and abilities of producers, traders and consumers.

Some incentives (price subsidies) that support consumers may be detrimental to producers. Managing trade-offs asks for good understanding of how adjustments are anchored and can become self-enforcing. In practice, this means that instead of looking at separate incentives for improving prices or resources, we need a **coherent package** for addressing simultaneously fundamental constraints (usually found somewhere else than where the observable problems occur) and providing benefits and pay-offs that motivate multiple stakeholders.

A good example refers to investments for better nutrition that have an important pay-off in terms of reduced health costs, improved labour productivity and higher household welfare. The **nutrition-health linkages** provide a strong

The nutrition-health linkages provide a strong rationale for investing in the reduction of stunting, since lifetime returns on investments are high

rationale for investing in the reduction of stunting, since lifetime returns on investments are high (Galasso and Wagstaff, 2019; Hoddinott et al., 2013). Because a large part of the global burden of diseases is related to dietary risks (Afshin et

al., 2019) and healthy diets are less affordable for people with limited resources (Hirvonen et al., 2020), investments in better diets directly pay off in terms of decreasing costs for health care, both for people as well as for the society at large (Willett et al., 2019). This provides an important rationale for a **policy mix** of agricultural supply support and food demand investments.



6 Searching for self-enforcing food system transformations

Most interventions for food systems transformation address single constraints and particular goals and only focus on direct first-order effects. However, food systems usually face trade-offs between nutrition, climate and inclusion objectives. Therefore, effectiveness of policy making could considerably increase when second-order effects - that either reinforce or weaken food system outcomes - are simultaneously taken into account. Understanding such feedback mechanisms, lock-in effects or potential spill-overs is vital for enabling the scaling and long-term anchoring food system transformations.

A well-known feedback in this respect refers to the **climate-nutrition interface**. Some studies argue that current diets inevitably lead to climate change (through deforestation and extensive animal production) and therefore changes in diets and nutrition patterns are necessary to reduce pressure on food systems (Willett et al., 2019). Other studies indicate that climate change will affect food production and the nutritional quality of food so that we first need to reinforce climate-smart production systems and supply chains (Rawe et al., 2019).

Since we are most interested in identifying self-enforcing food system transformation processes, it is of critical importance to know where to start.

Triple duty interventions that can overcome dilemmas between poverty, nutrition and sustainability outcomes are strongly based on three vital elements: knowledge coalitions, gender empowerment and information exchange for simultaneously influencing different food system processes.

Overcoming the Triple Burden of Malnutrition

New insights on the causes of overweight and obesity amongst adolescents point to the critical role of malnutrition at early age. Children that suffered from unhealthy diets have a less developed intestinal system that makes them far more vulnerable to fat, sugar and salt intake that are part of (ultra)processed foods they consume at later age. Combatting overweight should thus start with reducing undernutrition and promoting access to affordable and healthier diets amongst poor families. School feeding programmes and fruit & vegetables vouchers could be useful instruments to pursue this goal.

If we want to follow the before-outlined stepwise approach for food system transformation, it is certainly useful to dig deeper into the motivations of individual agents to find out which factors influence choices (as outlined in

It is certainly useful to dig deeper into the motivations of individual agents to find out which factors influence choices

section 3) and then try to understand how strategic interactions between agents in- and outside the market take place to safeguard food security (as discussed in section 4). This is the basis for identifying more effective incentives for guiding

food systems transformations towards desired societal outcomes (this will be done in section 5).

5



Incentives for influencing stakeholders response in food systems

After looking at the systematic challenges for sharpening our understanding of the interlinkages within food systems, we now take a closer look at the possibilities for influencing real-time behaviour of individual food system stakeholders. This is essentially a question of identifying 'smart incentives' (nudges) that are creating **synergies** in the food system, by (a) reaching out to individually targeted stakeholders for delivering multiple – sometimes competing – goals, and (b) supporting at the same time the strategic interactions between these stakeholders.

This new way of looking at food system incentives asks for intelligent and interactive procedures to identify assessing impacts. In the following, I will outline a few tips and tricks that could be helpful to support more effective incentive regimes for food system transformation processes.

a Tailoring incentives to livelihoods

Responses to incentives can become stronger if they are better tailored to key stakeholder constraints. It is well-known that microfinance credit programmes generate low response if farmers are risk-aversive and face major uncertainties. In such situations, it would be more convenient to start with an insurance offer to enable the subsequent uptake of credit. In a similar vein, premium prices offered by voluntary certification schemes only work if poor farmers can overcome major pre-finance (credit) constraints to make the necessary investments.

Many food system programmes have limited insights whether farmers, traders and consumer meet either demand or supply-side limitations. Most attention is usually given to push strategies for reducing supply constraints by improving access to resources and information, whereas it might be more important to start with strengthening the demand side and address behavioural constraints that currently restrain livelihoods. An interesting experience with highly

impactful unconditional cash transfers in several countries (Ethiopia, Mexico, India) shows that poor people very well know what their priorities are and that they are perfectly able to allocate resources towards key constraints that limit their livelihoods (Millán et al., 2019). Resources may be used in a different direction than policy makers consider efficient, but if they address important limitations experienced by famers they offer relevant pathways out of poverty.

b Self-enforcing contracts

Food system transformations are more effective if incentives are selected that are tailored to the way that stakeholder interaction already takes place. It is easy to understand that subsistence farmers will not react to market incentives, that input subsidies mainly influence the behaviour of more commercial farmers, and that value added taxes are largely paid by poor consumers. Since many market incentives (like price support, subsidies or taxes) can have a regressive impact, it is considered useful to link them with contractual arrangements that simultaneously guarantee market access by poorer households.

Typical examples of such self-enforcing contracts refer to coffee delivery arrangements that consist of a fixed base payment and a variable mark-up, and contract farming (sharecropping) arrangements that provide access to improved seeds but also expect commitments to sales (to avoid side selling). Such mixed (and repeated) contracts combine market-based signals (at the input side) with institutional guarantees (at the output side) and may reduce risks for both parties (Hayami and Otsuka, 1993).

c Incentives for stakeholder coordination

Transforming food systems asks for fluid coordination between different stakeholders. This is particularly the case when transactions are taking place that ask for simultaneous involvement of producers, traders and consumers. A

typical case in point refers to efforts for reducing post-harvest losses in perishable commodity chains. Individual farmers can be encouraged to use better handling and storage technologies (= hardware

Transforming food systems asks for fluid coordination between different stakeholders

solution), but for widespread adoption they also need training (= software) and the continued use of this handling practice depends on more secure delivery contracts from traders (= orgware). Stakeholder coordination in food system

transformation can thus be reinforced by combining hardware, software and orgware solutions that support each other (Dijkxhoorn et al., 2019). It should be noted that none of the individual incentives can deliver on its own the expected impact.

d Enabling collective action

There are several experiences with food system incentives that encourage supply response of selective individual stakeholders, but far more attention should be given to joint and coordinated actions. Effective interventions need to focus on the most pressing resource constraints and address input or output market failures that cannot be solved by stakeholders on their own and thus require some form of collective action. The latter can be encouraged by greater transparency, close monitoring and clear sanctioning as key conditions for improving reliable exchange and trust amongst farmers and with consumers (Ostrom, 1990).

Collective action within heterogeneous groups can be reinforced by shared social norms and clear boundary conditions that enable to reduce uncertainties, enlarge the time horizon and improve willingness to invest (the topic of my PhD thesis). This implies that people and groups can solve together many of the food system puzzles if they are able to act on social networks that guarantee reputation, trust, reliability and reciprocity. It is also well-known that for overcoming lock-ins such collective action is critically important.

The Cooperation Dilemma

Poor people are most in need cooperation are therefore many cooperatives end up as a 'coalition of the poor'. Fruitful cooperation and exchange needs, however, some degree of heterogeneity amongst members, in terms of age, gender, and wealth. There is growing evidence that mixed (horizontal) cooperatives perform better than homogeneous groups, as long as internal democratic procedures are maintained. We notice, however, in several parts of the world an increase in vertically-structured contract farming alliances between farmers, traders and even retailers that may reinforce rural inequality.

e Supporting synergies & spill-overs

Many stakeholders involved in food system transformation processes face multiple constraints and therefore need multiple incentives to be combined to overcome these bottlenecks and to guarantee timely and more substantial

behavioural response. It is, however, not always easy to disentangle these constraints and to identify how effective complementarities can be reached. Creating spill-overs asks for a multi-level approach that provides targeted incentives to different stakeholders and reinforce their effects over time and space.

Typical examples of spill-overs in food systems are the front-of-package food warning labels against excessive fat, sugar and salt content, that first generate quite some consumer response and then result in a fast adaptation of product formulas by food processors (Reyes et al., 2019). In a similar vein, a shift towards more circular and sustainable food systems is supported by positive consumer-oriented incentives (higher prices for animal-based products) but also by producer disincentives (higher taxes on animal feed imports). Behavioural experiments tends to find that positive incentives may generate faster responses from consumers, whereas producers act more rapidly against negative constraints. A well-designed mix of interventions at various food system levels might simultaneously tailor demand and supply reactions. Reforms in the food environment can be helpful for multi-level (nested) interventions that combine pull and push incentives towards different stakeholders.



Structure policies can speed up spill-over effects towards different stakeholders. Land reform programmes not only improve smallholders' revenues but also increase – through the labour market – rural farm and non-farm employment and income opportunities for seasonal and permanent wage labourers. In a similar vein, bundling land and finance programmes could enhance the effectiveness of food systems innovations. Upgrading of quality in certified coffee and cocoa value chains (output market) starts with improved access to pre-finance (input market) and training.

f Guaranteeing dynamic feedbacks

Finally, it is important to guarantee during the process of food system transformation timely access to information on real-time responses to incentives. Given that several simultaneous changes are promoted, the outcomes are uncertain and insecure. Moreover, since we intend to modify the internal procedures and interactions within the food system, we need to install self-supporting feedback mechanisms of behavioural change.

Real-time **information** on food systems performance nowadays can become readily available using ICT (product sensors; precision farming; mobile phone payments; shelf-life surveillance etc.). Also aggregate data on food supply, stocks and prices is collected on a regular basis in many countries. This is helpful to support producers, traders and retailers in their negotiation on contractual terms and enables the creation of local supply chain coalitions between producers and consumers.

In addition to information, feedback loops in food systems depend on effective **communication** and **bargaining** between stakeholders (Sundkvist et al., 2005). Critical interactions refer to price regimes that influence value added distribution in supply chains, the equitable remuneration of farmers and workers within cooperatives and under commodity certification schemes, and payments for environmental services that try to support more sustainable resource management (recycling in circular systems).

Mixed incentive regimes that combine a fixed ex-ante base-level remuneration with variable ex-post rewards (according to quality compliance or timeliness in delivery) seem to be quite effective for generating appropriate individual and collective responses and to safeguard more pro-active and responsive behaviour. This can also be used to control environmental externalities by taxing revenues (or even imposing absolute constraints) beyond certain critical levels.



6



Outlook & future challenges

Considering the importance of adequate interdisciplinary approaches for analysing food systems that are able to overcome the common fallacies in food and nutrition policies, we can outline some preliminary ideas and challenges for future research on food system transformation processes that could offer guidance for future-oriented food policies.

There has been a plethora of recently published reports that offer analysis and/or provide advice on food system transformations (such as the EAT-Lancet

Food system responses to the Covid-19 crisis also put fundamental new challenges on the table

report; FAO State of Food Security and Nutrition in the World; IFPRI Food Policy Report, etc.). That has also led to a growing misunderstanding on the drivers of food systems performance and the

requirements for food systems change (Brouwer et al., 2020). Food system responses to the Covid-19 crisis also put fundamental new challenges on the table that ask for a **forward-looking (next level) strategies** (Kampers and Fresco, 2017), based among others on:

- Possibilities to reduce food dependence (through more diversified sourcing and stronger contractual linkages between producers and consumers)
- Requirements for enhancing food safety (biodiversity management) and food quality (reducing vulnerability of obese people)
- Growing recognition of the importance of public policies (such as social safety nets and health care)
- Growing opportunities for influences consumer preferences and empowering consumers (making use of nudging approaches and better information technologies).

In this context we can outline five **strategic areas for WUR/WECR research** that will be able to generate new insights for innovative agri-food policies & programmes and for designing more effective incentives & investments to support food system transformation. We suggest a **two-pronged approach** that is capable to link the cornerstones of food systems in their different dimensions:

-
- 1 Strategies for overcoming food system dualism by reconciling producers and consumers objectives and combining market and institutional incentives (mixed solutions)
 - 2 Linking horizontal arrangements between producers or consumers (cooperatives) with vertical arrangements between value chain stakeholders (contracts)
 - 3 Strategies for effective scaling of innovations, taking advance of spillovers of individual to collective response over space and time
 - 4 Dual purpose policies that are capable to address simultaneously the need for improving diets and reducing climate change (modelling to tackle food-climate interactions)
 - 5 Tracing the final impact for women, families and communities by systematically addressing resource constraints, empowerment, knowledge-sharing, and bargaining.

Taking up this challenge for **interface research** requires strong interdisciplinary cooperation and an interactive multi-stakeholder approach. I am fully confident that our colleagues at Wageningen University & Research will be able to take this up. It will certainly contribute to the WUR strategic goals of 'searching solutions together' for 'science with impact'.

A word of thanks

After more than 40 years of engagement in policy and research for development, I would like to express my gratitude to all those people that made my life and work enjoyable, rewarding and (hopefully) effective. I took my education at Free University Amsterdam, where Professor Hans Linnemann (a member of the famous Club of Rome) and Dr. Jan de Groot made me enthusiastic about food security and agricultural transformation processes. After graduation, I spent almost 12 years working on land reform and rural development in Central America, especially in Nicaragua after the Sandinista revolution, but also in the sometimes violent settings in Honduras, El Salvador and Guatemala. In 1993, the Development Economics group at Wageningen (led by Professor Arie Kuyvenhoven) offered me the opportunity to strengthen my theoretical understanding of peasant economics (my teaching assignment) and collective action (my PhD topic). In this period I was engaged with the coordination of several large interdisciplinary systems research programmes (DLV, RESPONSE, IFPRI, NWO).

In 2005 Radboud University Nijmegen appointed me as professor in development studies and this was very helpful to further enhance my experience with interdisciplinary cooperation. My period as director of the Policy Evaluation Department IOB at the Ministry of Foreign Affairs (where I was known as ‘the least diplomatic diplomat’) enabled me to better understand the dynamics of policy processes and made me acknowledge that reaching impact is not the only goal of development cooperation. Finally, six years ago Wageningen Economic Research requested me to support the further development of its international profile and also assisted in my appointment at the special chair ‘Impact Assessment for Food Systems’.

I would like to thank my former colleagues in these different organisations for their continuous support and endurance. I learned much from the many creative students in the courses I delivered at Managua, Wageningen, Nijmegen, The Hague and in seminars and workshop in places like Ethiopia, Kenya, Mali, China, Thailand, Bangladesh, Philippines, Peru, Honduras, Mexico, Bolivia, USA, Australia and Canada (IPDET). I had the opportunity to provide supervision to more than 40 PhD students (and there are still 5 in the pipeline to keep me busy). I am extremely grateful for the support from WEcR management and WUR colleagues at different departments, and to my colleagues at IFPRI and other CGIAR institutes for their collaboration in the ‘Food Systems for Healthier Diets’ programme.

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