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A field practitioner's perspective on developing green food value chains

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Abstract: *The article considers a bottom-up approach to developing green food value chains based on a step-by-step approach. The process attempts to learn from frugal innovations that may be environmentally friendly (green), found in bottom of the pyramid (BOP) contexts and the related informal food sector. The step-by-step process starts with forming and facilitating a multi-stakeholder working group, then moves on to appraise various food value chains, and then selects one or more specific food value chains to green. Each is then mapped, while concurrently providing for an environmental hotspot analysis and a stakeholder analysis. The approach then turns to setting specific objectives and strategies, planning and action planning, setting up a monitoring and evaluation system, and holding regular multi-stakeholder working group meetings during the implementation time period of the approach. The last step of the process considers the possibility of contributing to, and fostering, the development of a policy action plan. The approach is intended mainly for field practitioners with all its advantages and limitations, but can also provide important field-based information to local and national stakeholders, including policy-makers. The approach can also provide support in the delineation, formulation, and importantly implementation of policies devoted to developing green food value chains.*

Keywords: environment, greening, food value chains, frugal innovation, bottom of the pyramid

Introduction

Around the globe, for many billions of poor people, the quest for food is a daily struggle. The bottom of the pyramid (BOP) population is the largest, but poorest, segment of the world population accounting for about 4 billion people earning between US$1 and US$5 per day (Rangan et al., 2011), and about 1 billion of these live in urban slums (GIZ, 2012). However, the BOP can be easily extended to those who live on less than US$10 per day and thus it is estimated that about 80 per cent of humanity works and lives in BOP settings (Pansera and Owen, 2014). The BOP, though, is far from homogeneous: it represents multiple cultures, ethnicity, literacy, capabilities, and needs (Prahalad, 2011). The BOP, for its food production and consumption, is set in the informal food sector which relates to activities of food production, transport, and retailing, for example, that are

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not under the direct purview of national governments (FAO, 2003). The main characteristics of the informal food sector are that it targets households with very small budgets, and usually, but not always, provides food with low safety, hygiene, and quality standards. It also provides for strong relationships between production and consumption, with consequent local sourcing of food. It is vulnerable to seasonal changes and seemingly has a poor environmental track record (FAO, 2003). The BOP, it is commonly thought, is most vulnerable to environmental concerns such as pollution and climate change, for example, and individuals and communities have less capacity to adapt (Vermeulen et al., 2012). However, this is not always the case, as documented by Benson (2014) and Hilmi (2016a, 2016b). Further, local food producers provide for more than 70 per cent of the people around the world and provide a livelihood for over 2 billion people (Mulvany and Murphy, 2015). For example, in Kenya 80 per cent of the food distributed to urban centres is provided by small-scale farmers using local food networks, outside the formal economy, that are linked to culture and tradition (Mulvany and Murphy, 2015). Such networks are commonly in proximity to both producers and consumers geographically, relationally as well as culturally, and provide for local employment. Much of the value addition is carried out on farm, there is interdependence among the actors, and mutual rewards are real. Governance is in local hands and such networks are based on local knowledge and innovation that are passed down from generation to generation (Mulvany and Murphy, 2015). These food networks can potentially provide for greener and more productive food value chains, for example by mitigating and reducing greenhouse gas emissions (GHGEs) (Mulvany and Murphy, 2015). Moreover, replacing a certain portion of a region's food imports with locally produced food boosts sales revenue for businesses, households, and consumers as well as reducing GHGEs. Studies projecting expansion of the local food system find that import substitution is associated with increased output, higher labour incomes, and more jobs, even within the confines of seasonal supply (Pinchot, 2014).

Every community has an innovative capacity to find effective solutions to solve the problems they face on a daily basis, and to seek processes that are socially inclusive. Many communities have proven track records of being resilient to environmental challenges, as local knowledge has been co-evolving with nature for centuries. Local knowledge relies on raw materials and capabilities that are affordable and socially acceptable, such as, for example, organic farming and related sustainable land and water management practices (Pansera and Owen, 2014). Those who work in the informal food sector (and not only), be they grass-roots innovators or menial workers, attempt to provide solutions, commonly called frugal innovations. These innovators take advantage of the many challenges faced daily and transform them into opportunities. Innovations in such contexts are referred to as grass-roots frugal and/or green innovations. Such innovations are based on locally available raw materials and capabilities. These contribute to human well-being with affordable, socially acceptable, culturally adaptable, and accessible products, services, processes, and technologies, which at the same time attempt to respect the world's natural resources and regenerative capacity (Le Bas, 2016; Pansera and Sarkar, 2016;

Hilmi, 2016a, 2016b). Such innovators find opportunities in a context of adversity, think and act with agility, and aim for simplicity (Le Bas, 2016). Frugal innovation and innovators are thus a first step towards a greener economy and greener growth. This also includes a more low-carbon economy that provides for a valuable and costless mechanism of adaptation to and mitigation of climate change (Pansera and Sarkar, 2016; Hilmi, 2016b).

The foundations of green food value chain development

Tending to environmental problems rests in part in getting the economy right and this means fostering green growth: this is defined as economic growth and development that ensures natural assets continue to provide the resources and environmental services on which society's well-being relies (OECD, 2011). At the basis of green growth is the green economy which fosters improved human well-being and social equity, significantly reduces environmental risks and ecological scarcities (UNEP, 2011) while also considering, importantly, the economic efficiency of such processes. In a green economy, growth in income and employment is driven by public and private investments that reduce carbon emissions and pollution. It enhances energy and resource efficiency, and prevents the loss of biodiversity and ecosystem services (UNEP, 2011). These investments need to be catalysed and supported by targeted public expenditure, policy reforms, and regulation changes (UNEP, 2011). This development path should maintain, enhance, and, where necessary, rebuild natural capital as a critical economic asset and source of public goods, especially for poor people whose livelihoods and security are vulnerable (UNEP, 2011). Green growth policies must be carefully designed to maximize benefits for, and minimize costs to, the poor and most vulnerable, and policies and actions with irreversible negative impacts must be avoided (World Bank, 2012).

Inherent to this is the circular economy, which refers to the industrial economy that is restorative by intention (Ellen MacArthur Foundation, 2012; Institut Montaigne, 2016). It aims to enable effective flows of materials, energy, labour, and information so that natural and social capital can rebuild (Ellen MacArthur Foundation, 2012). The concept of a circular economy is grounded in the study of real-world, non-linear, feedback-rich systems and particular living systems: it is the notion of optimizing systems rather than components (Ellen MacArthur Foundation, 2012; Kirchherr et al., 2017). As a result, the circular economy draws a sharp distinction between the consumption and use of materials (Ellen MacArthur Foundation, 2012). Clearly consumption is the inevitable fate of some materials that are irreversibly altered during their useful life and can no longer be put to the same use afterwards: a linear system. The circular economy looks at flows that regenerate and provide new business models; these new business models create value in new ways (Ellen MacArthur Foundation, 2012).

Consequently, moving towards greener food value chains will require re-thinking of how organizations and individuals act, behave, and operate in terms of greening, while at the same time providing for the same return on capital investments. This implies that every part of a food value chain must

become more efficient and reduce impacts by using less land, water, energy, and other inputs, while still producing and delivering food sustainably and becoming more resilient to changes and shocks (UNESCWA, 2014). The farming and the processing stages of food value chains are seen as the root causes of inefficiencies, in the form of waste generation, ecosystem disruption, and natural resources depletion (UNESCWA, 2014). Consequently, a green food value chain can be defined as one that needs to provide value at each stage by proactively reducing the usage of the natural environment (natural resources, ecosystem services, and biodiversity), to diminish or mitigate adverse impacts, or even have positive impacts, while at the same time considering disposal and recycling patterns of generated waste, to recapture value at every stage of the food value chain and thus further reduce environmental impact (FAO, 2014, Hilmi 2016a, 2016b; FAO and CIHEAM, 2016). This definition provides a basis on which to define a conceptual framework for developing green food value chains. The framework, shown in Figure 1, provides for a circular (and open-ended) non-linear flow of forward and reverse food values that progress from the natural environment to final markets. The forward flows increase not only food economic value, but importantly food environmental, social, and cultural values; the food value that is wasted is recaptured with reverse flows that reset such food value from an economic, environmental, social, and cultural point of view. The intent is

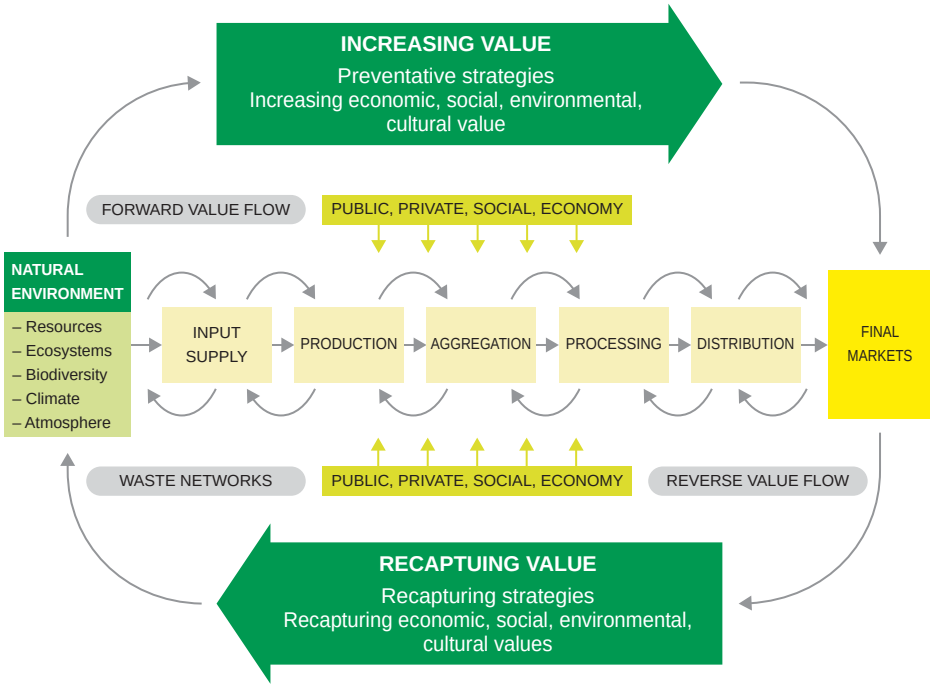

Figure 1 The green food value chain development framework
Source: Martin Hilmi (FAO, 2014)

to provide for a holistic, circular, and open-ended framework that inherently mitigates effects on the natural environment, attempts to adapt to changes, and at the same time attempts to replenish what has been used/consumed from the natural environment (FAO, 2014).

Green food value chain development: a guideline approach

The process for developing green food value chains is one that is intended to suit the necessities, time lines, and especially budgets of those working at field level. The approach can have considerable impact on the appropriate use of the natural environment, for example reducing emissions and consequently contributing to low carbon development. The approach is a step-by-step process that attempts to learn from the field and from frugal innovations, and adapts this learning to the process. For example, Hilmi (2016a and 2016b) documented many frugal innovations that were not only green, but could be learned from and applied to the process of greening food value chains. The approach needs to be treated as a 'guideline' for greening food value chains and not a specific and detailed action plan of what needs to be done. The reason for this is that greening activities need to be very context- and locally specific. The approach provided here does not consider carrying out life cycle assessments (LCAs) and the various footprint analyses that could be provided. An LCA is basically a cradle-to-grave assessment of a product's impact on the natural environment. It is a method of assessing environmental impacts of a product from raw materials used, to production, distribution, and end of life disposal. An LCA is not used here because of the long timeframe required, scientific knowledge needed, and budgets involved in such analyses. Instead the approach used here is a more field-based and practical method called 'environmental hotspots analysis' (Liedtke et al., 2010; see Box 1). Further, the green food value chain development approach, being mainly a field-based approach, does not exclude its utility for local and national stakeholders, including public, private, non-profit, and community-based organizations. The field-based information that such a process can provide, for example, can also be of good use for policy delineation, formulation, and importantly implementation.

Box 1 Hotspots analysis defined

Hotspots analysis is a methodological framework that allows for the rapid assimilation and analysis of a range of information sources, including life cycle-based studies, market and scientific research, expert opinion, and stakeholder concerns. The outputs from this analysis can then be used to identify potential solutions and prioritize actions around the most significant economic, environmental, ethical, and social sustainability impacts or benefits associated with a specific country, industry sector, organization, product portfolio, product category, or individual product or service. Hotspots analysis is often used as a precursor to developing more detailed or granular sustainability information.

Source: UNEP (2014)

Step 1: Form a multi-stakeholder working group

Form a multi-stakeholder working group (MSWG) composed of local stakeholders (public, private, non-profit, and community-based organizations) and other citizens who will be affected by the intended changes resulting from greening the food value chain. National players as well as other interested parties should also, and where possible, be included (see Box 2).

Box 2 Factors to consider in forming and facilitating a multi-stakeholder working group

- Undertake an in-depth stakeholder analysis: What are their attitudes? How are they organized?
- Include primary stakeholders (for example farmers, processors, traders and collectors, processors, wholesalers, distributors, retailers, consumers, importers, exporters) and secondary stakeholders (for example extension services, banks, transport services, R&D agencies, regulatory agencies, electricity suppliers, NGOs, public health inspectors).
- Apply principles of collaboration, openness, and mutual respect.
- Emphasize the need for inclusiveness so that all are represented and all have an equal voice.
- Highlight ownership of consultations by all and that all are accountable.
- Information concerning 'how; what and why' is distributed to all to create understanding and legitimacy.
- Identify existing mechanisms and procedures for consultation and how they can be utilized.
- Assess other mechanisms and procedures that may be required to successfully facilitate stakeholder consultations.

Step 2: Identify one or more food value chains that need green upgrading

In this second step of the process, and in agreement with all members of the MSWG, there is a need to set general objectives of the intended intervention. It is suggested that such preliminary objectives be set in a general context and then further refined during Steps 3 and 5 of the process. In these subsequent steps more information will be available and consequently a better understanding of the current situation of the food value chain will be available. For example, some general objectives could be:

- greening the operations of farmers, traders, and food processors;
- the contribution of waste valorization to the natural environment and climate mitigation.

At first, a desk research and review should be conducted to ascertain if any food value chain studies, LCA studies, etc., for example, have already been conducted in the country of interest. In this initial desk review it will be important to start to ascertain possible intervention points that can potentially be used for developing greener food value chains. This desk research can provide for an initial listing of food value chains that have a potential for green upgrading.

If the literature review does not provide sufficient information, and budget and time permits, a field research should also be conducted at this stage. Field tools for analysis that can be used for such appraisals include rapid-market appraisals, market research, and end-market research (see Box 3).

Box 3 Market appraisal methods

Rapid market appraisal

A rapid market appraisal provides a quick, flexible, and effective way of collecting, processing, and analysing information and data about markets and marketing systems (CRS, 2009). A rapid market appraisal comprises a wide range of simple methods and tools for collecting quantitative as well as qualitative information in order to minimize the costs and delays in providing timely and sufficiently detailed information (CRS, 2009).

For more detailed and further information on this method and tools and how to use it in the field see CRS (2009).

Market research

Market research is the systematic and objective search for, and analysis of, information. Market research seeks to set about its task in a systematic and objective fashion. This means a detailed and carefully designed research plan is developed in which each stage of the research is specified. Such a research plan is only considered adequate if it specifies: the research problem in concise and precise terms; the information necessary to address the problem; the methods to be employed in gathering the information; and the analytical techniques to be used to interpret it.

For more detailed and further information on this method and tools and how to use it in the field see Miehlbradt and Jones (2007).

End-market research

End markets (retail/consumer markets) are important as this is where the overall performance of a food value chain is ultimately determined. End-market research involves understanding how markets are segmented (price-driven versus quality-driven, mass market versus niche market, supermarkets versus traditional retailers versus food services, etc.). At its simplest level, end-market research should be designed to answer questions related to key business and investment decisions at the value chain and firm levels (USAID, 2008). End-market research is composed of two phases: 1) secondary end-market research, and 2) primary end-market research. The actual analysis to facilitate decision-making is structured around six Cs (Choice, Context, Channels, Customers, Competitors, and Communication). Linear progression through the two phases and six Cs provides a clear roadmap for designing and implementing an effective and efficient end-market research effort (USAID, 2008).

For more detailed and further information on this method and tools and how to use it in the field see USAID (2008).

An emphasis in these preliminary appraisals also needs to be placed on stakeholders and the identification of key informants in various food value chains and importantly on what frugal innovations can be found that can potentially contribute to greening food value chains. Further, what should also be considered in this step is the initial identification of where in the food value chain environmental 'hotspots' can be found. For example, most waste is commonly generated at farm, post-harvesting, and processing level in developing countries (WEF, 2009). Once results from the desk research and from the field research are ascertained, a list of potential food value chains to upgrade can be compiled in agreement with all members of the MSWG.

Step 3: Select one or more specific food value chains for green upgrading

Having conducted Step 2 of the process and having more information at hand, and in agreement with all MSWG members, it will be possible to set more clear and

concise objectives for the green upgrading of the food value chain. For example, specific objectives could be:

- to reduce the environmental impact of waste streams deriving from small and medium agri-food enterprises' (SMAEs) waste;
- provide capacity building and development in environmentally sound waste management and treatment practices for waste stream stakeholders;
- provide applicable and feasible standards related to the recycling of food packaging materials that are easily applicable and adaptable, and economically feasible, to waste stream operators.

The clearer the objectives are in this step of the process the easier it will be to select which food value chains to analyse further and the easier it will be to guide the research process.

The one or more food value chains can be prioritized based on the specific objectives set as well as specific criteria developed for the selection process. Examples of such criteria could be:

- the potential to have less emissions with interventions in recapturing value from waste;
- the competitive potential of intervention for farmers, traders, and small processing enterprises;
- the potential to be inclusive of women.

However, it is suggested to use clear and concise criteria based on selection tools that can support the process. A food value chain selection methodology can be found in Box 4.

In selecting a food value chain(s) to green, some of the questions shown in Box 5 may also be useful.

Box 4 Guidelines for value chain selection

These guidelines offer a holistic and structured approach to value chain selection. They combine four different dimensions of value chains: economic, environmental, social, and institutional. Since the four dimensions are interconnected, overlooking any one of them during value chain selection will affect the next phase of value chain analysis and development. The guidelines include clear criteria and a set of tools to aid in the selection process. For more detailed and further information on tools and how to use them in the field see GIZ (2015).

Step 4: Map one or more food value chains, provide for an environmental hotspot analysis and a stakeholder analysis

This step in the process looks at mapping the selected food value chain(s) and identifying within the food value chain(s) stakeholders and hotspots. Thus it will involve three processes to be conducted simultaneously:

- mapping the selected food value chain;
- mapping the stakeholders and providing for a stakeholder analysis;
- conducting an environmental hotspot analysis.

Box 5 An example of some questions to consider when selecting a food value chain to green

On the present prevailing food value chain:

1. What is the prevalent type of food value chain? Who are the principal actors? What is the relation between national food production and food consumption?
2. How is food production (farming, fishing) organized? What farms and fishery types are dominant? What is the size and nature of livestock and aquaculture production?
3. Where is primary and secondary processing done and by whom?
4. Where is food being transported from and how?
5. How is food consumption being organized? What is the share of supermarkets and out-of-home consumption in total expenditures?

On natural resources:

1. What is the nature and extent of land use: is there expansion or contraction of the agricultural area? What is the situation regarding land degradation? How are crop yields compared to similar regions/potentially attainable yields? How is pasture land being used?
2. How are fisheries managed? What is the status of fish stocks? Is there aquaculture, and what are the related environmental impacts?
3. What is the situation regarding plant and animal breeds: availability, diversity, quality, genetic potential?
4. What is the nutrient use efficiency, amount of nutrients (minerals) being used, nutrient losses?
5. Is water being used sustainably and efficiently in irrigation and food processing? Are groundwater levels being monitored? Is there potential for expansion of irrigated area?
6. What are the amounts and proportions of fossil and biomass fuel used in which food system activities?
7. What are the overall environmental impacts: GHGEs, nutrient losses, pesticide emissions, soil and water quality?
8. How are property rights and land tenure organized?

With respect to food demand:

1. What is the food security situation (stability of food availability, food access, food utilization)?
2. What is the nutritional security situation (prevalence of undernutrition, over-nutrition, other forms of malnutrition)? What is the trend in diets over the last 10–20 years? What are the expectations for the future? What is the share of livestock products in diets?
3. How much fossil fuels and packaging are used in food consumption?
4. How much food waste occurs? What is happening to food waste, food residues, and human excreta?
5. What is the fate of nutrients entering urban food systems?

With respect to actors, institutions, regulation:

1. What kinds of regulation are in place to regulate food system activities, and the use of and access to natural resources?
2. What kinds of environmental regulation are in place? How are they implemented and enforced?
3. Which subsidies are installed? What is the tax regime? Are there import and export tariffs?

Source: UNEP (2016)

For conducting these it is suggested to start with commonly available value chain mapping tools. A functional and behavioural approach can be taken for mapping the food value chain as well as an institutional approach (see Box 6).

Box 6 Approaches to food value chain mapping

Functional

The functional approach to value chain mapping looks at the activities (functions) that are provided within a process. For example, buying, selling, financing, transportation, banking, risk bearing, market information, etc. There are exchange (buying), physical (storage), and facilitating (financing) functions.

Institutional

This approach looks at 'who does what' in the process. It relates to, for example, traders, processors, retailers, etc. Other institutions can be stock exchanges, produce exchanges, banks, etc.

Behavioural

This approach considers the behavioural elements of the process by looking at, for example, how traders behave within the process. It also considers behavioural aspects between actors in the process by considering, for example, power structures, relationships, partnerships, etc., between a farmer and a trader.

Mapping a food value chain provides a pictographic view, and not only of the food value chain under investigation (for example, see Figure 2). It provides a general overview of the food value chain, it identifies the constraints and solutions at the varying stages of the food value chain, and can visualize networks in the food value chain, identify food value chain stakeholders, key informants, and the linkages and relationships among them (see Box 7).

Box 7 Mapping food value chain tool book

The intent of this tool book is to provide easy to understand and, importantly, easy to use tools for field practitioners for mapping food value chains. The emphasis here is to look at food value chain mapping tools that link food value chain development with the poor, as many food value chains operate in BOP contexts. For more detailed and further information on this method and tools and how to use it in the field see DFID (2008).

Concurrently to mapping the food value chain, a stakeholder mapping and analysis needs to be conducted; see Figure 3 for an example. The process of stakeholder mapping involves identifying who are the stakeholders in the food value chain, mapping them, and understanding their views and priorities. A stakeholder analysis is basically a methodology for taking into account (profiling) the attitudes, interests, and needs of those who are involved directly and indirectly in food value chains. Its primary intent is to better understand the relations, linkages, partnerships, and power structures among stakeholders (stakeholder profiling), and who is likely to have an effect or be affected by proposed actions of change.

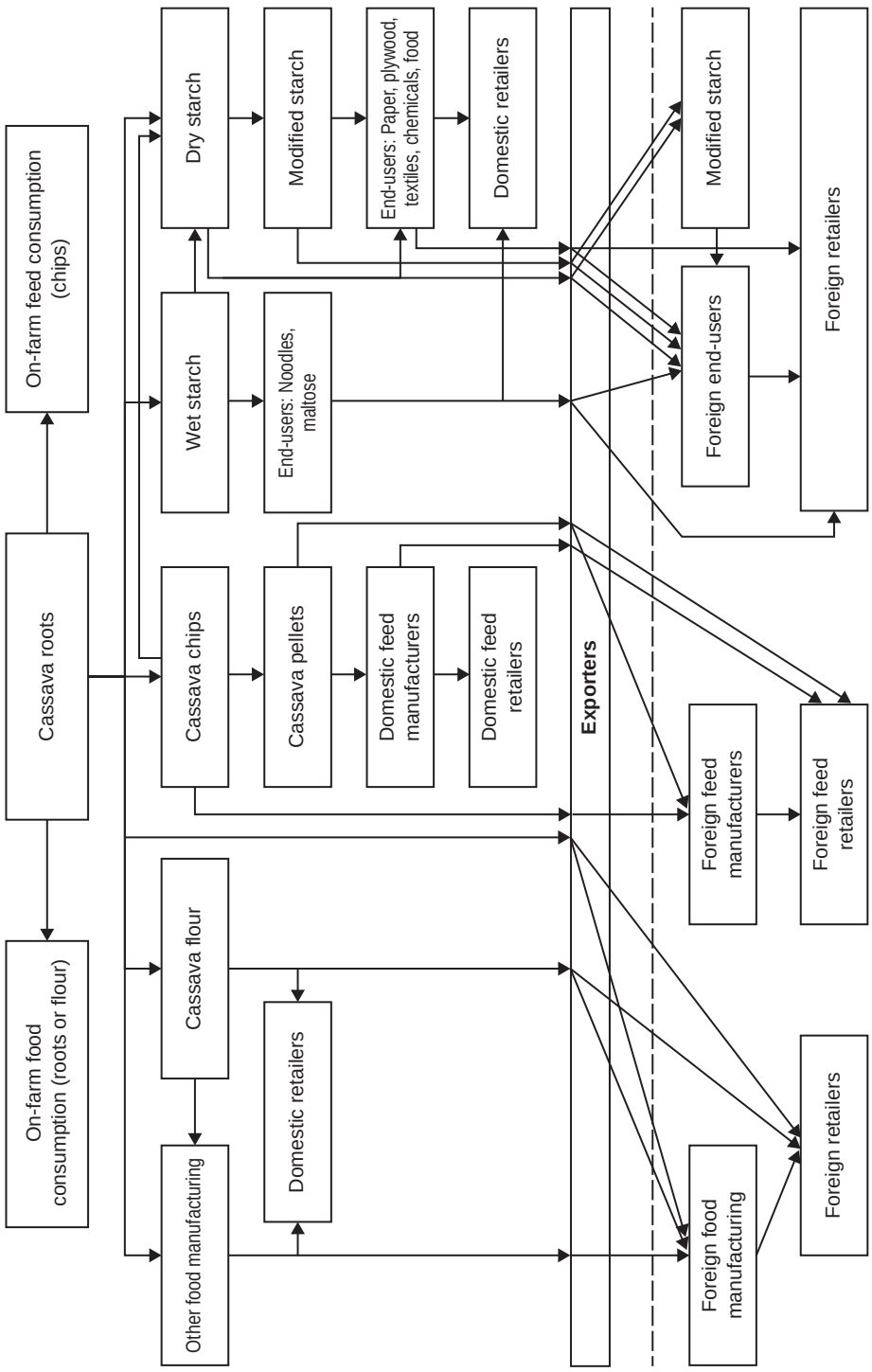

Figure 2 An example of a cassava value chain map
Source: M4P (2008)

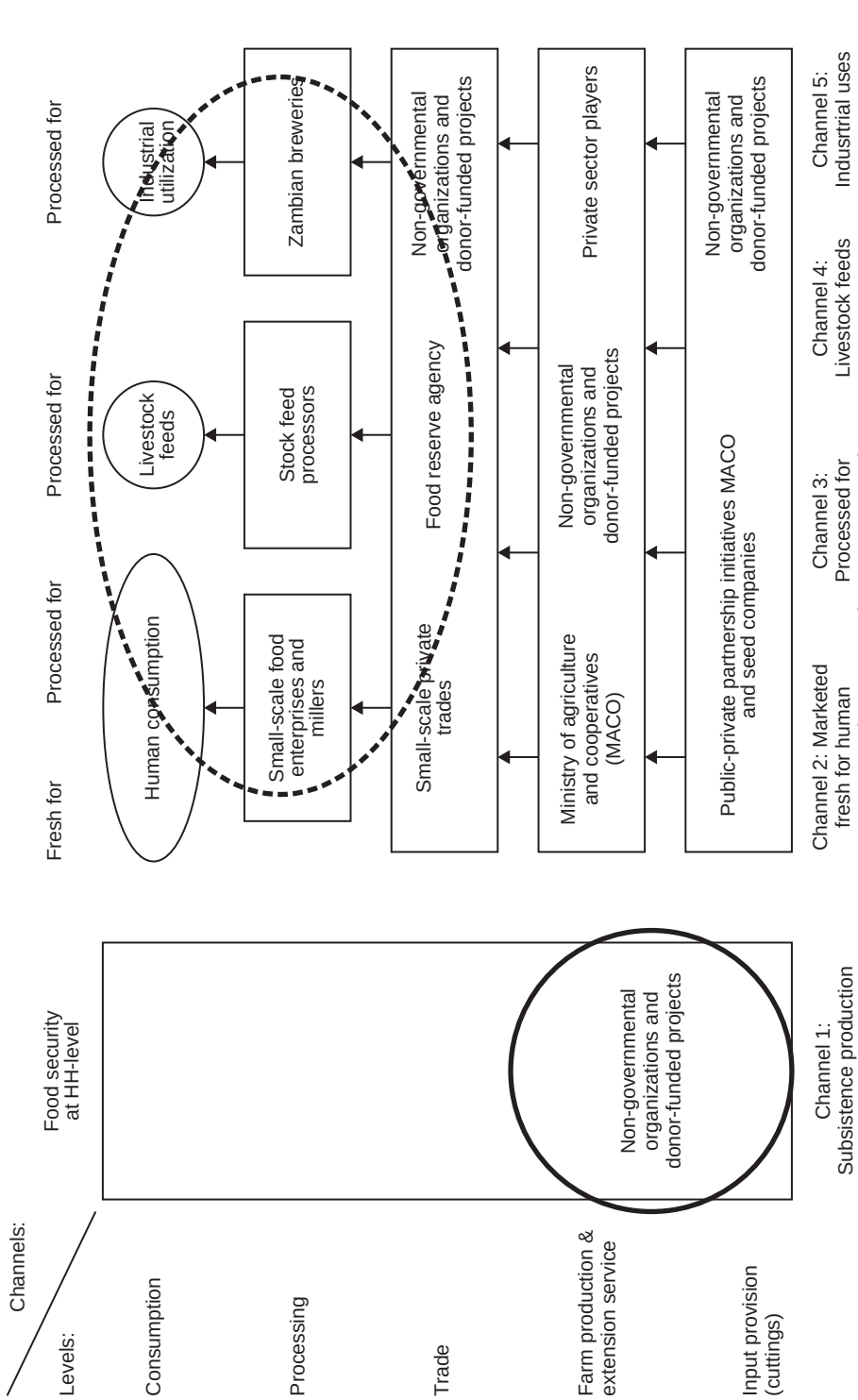

Figure 3 An example of a stakeholder map in a cassava value chain in Zambia with an emphasis on some of the key stakeholders (see circled stakeholders)
Source: Chitundu et al. (2009)

It organizes stakeholders according to the possible impact they can have on proposed changes and what impact such actions may have on them (see Box 8).

Box 8 Stakeholder mapping and analysis

The analysis is used to assess and better understand stakeholder expectations, where gaps are, how these can be addressed and how they can be revitalized, how they will react to changes, and how they may embrace them. For more detailed and further information on this method and tools and how to use it in the field see GTZ (2007).

Concurrently to mapping the food value chain and related stakeholders it is also necessary to focus the mapping exercise on the environmental hotspots that may be found in the food value chain. Usually, but not always, for example, waste in food value chains is found where natural environment resources are not being used appropriately: in other words, inefficient use of resources. Knowing where environmental hotspots are found in a food value chain can potentially be a good indicator of where interventions may be required for fostering, for example, low carbon development. So concurrently to mapping the food value chain and its stakeholders, it is also important to use a tool for assessing where environmental hotspots occur in a food value chain (see Box 9).

Box 9 Environmental hotspots analysis

This is a tool that can be used for providing an initial and indicative understanding of where in a food value chain environmental hotspots may exist. It is a rapid appraisal tool, based mainly on literature review and key informant interviews. For more detailed and further information on this method and tool and how to use it in the field see Annex 3 (pages 36 to 39) in GIZ (2015).

Step 5: Setting specific objectives and strategies

From the results of Steps 3 and 4, and in the context of the MSWG, specific, clear, and realistic objectives and targets need to be set (see Box 10). In this step, setting objectives that are attainable and provide for early gains and successes in greening will provide for buy-in from stakeholders and enable the championing of further activities to green the food value chain.

Once specific objectives and targets have been set, strategies can be provided. Examples of strategies for green food value chain development can be found in Box 11.

Step 6: Planning and action planning

This step considers developing a detailed plan and importantly action plan with the agreement of all MSWG members, outlining clearly and in detail all the necessary steps that will need to be taken to foster one or more greener food value chains. Roles and responsibilities within the plan will need to be clearly defined (see Box 12).

A detailed plan will also be needed of the estimated investments and budget required to implement such a plan (see Box 13).

Box 10 Setting specific objectives, strategies, and targets

Objectives should be measured against the following criteria, to determine if they are appropriate:

- Consensus: Is there common agreement by all stakeholders on the objective? Does the objective relate to stakeholders' expectations and requirements? Does the objective cover social, cultural, economic, environmental, and low-carbon expectations?
- Clear and specific: Is the objective clear? Does it make sense? Does it define what needs to be done? Is it practical?
- Realistic and achievable: Is the objective achievable? Are resources and time available to complete the objective? Is it impact-oriented?
- Measurable: What are the indicators that will show that the objective has been completed? How will success be measured?
- Time: Does the objective have a time frame?

Strategic questions:

- Who will do what?
- What organizational structure is required?
- What resources and people are needed?
- How will resources and people be effectively and efficiently mobilized?
- What monitoring and control mechanisms are necessary?

Implementation questions:

- What tasks and actions are involved in the implementation process?
- What kind of support for the implementation process can be expected from public, private, NGO, intergovernmental organization (IGO), and community-based organization (CBO) sector stakeholders?
- Who are the stakeholders and organizations involved and importantly who will be involved in each particular task and action?
- Who will most likely resist change?
- Who will most likely encourage and champion change?
- Who will be responsible for each particular action?
- What resources, in terms of people, financing, information, and budget, are required for the implementation process?
- What budget constraints may there be?
- What is the intended time frame for implementation?
- What gaps and weak links can be found among stakeholders and organizations in the implementation process?
- How committed are stakeholders to implementation?
- What coordination mechanisms will be needed and can be put in place?
- Is it viable to set up an implementation working group?
- What institutional strengths and weaknesses can be found?
- What institutional capacity is there?
- How will communication occur during implementation?

Setting targets:

Various issues that could be used to define the intended targets:

- constraints on low-carbon production growth – water, land;
- opportunities for low-carbon farm productivity gains, substitute farm outputs, land use alternatives;
- commercial low-carbon processing capacity, foreign/domestic capital investment in the formal sector;
- infrastructure capacity low-carbon constraints – transport, power, storage, and distribution

- financial constraints – access to credit and development loans, interest costs;
- competition constraints in agri-food product sales;
- regulatory framework and enforcement – food safety, supply contracts, foreign ownership;
- growth in consumer demand for climate-sensitive food products – product availability/ awareness, import competition, income growth.

Source: UNEP (2016)

Box 11 The main strategies for green food value chain development

Preventive strategies

This looks at better understanding how preventive strategies for averting inappropriate use of the natural environment can be defined and importantly implemented all along the food value chain or in defined sections (stages) of it. This will not only pertain to purely functional aspects, but also look at how institutional and behavioural aspects can be geared to the prevention of the inappropriate use of the natural environment. Importantly, such strategies will need to build on and learn from existing greening competencies found within such food value chains and not introduce practices that are not part of the cultural context, are not economically and socially viable, and are convenient to implement. Examples of common preventive strategies include: in Tanzania a cassava grater was made from locally available materials (UNEP, 2006), thus preventing the import of materials with its related and extensive carbon footprint; also in Tanzania energy for processing grains for small processing enterprises was sourced from self-made water mills (Lubinza and Hilmi, 2013), thus averting the use of fuel. All of these strategies were based on local technology, know-how, and knowledge and thus enabled a good uptake and usage.

Reduction strategies

Such strategies seek to reduce the inappropriate use of the natural environment where preventive measures are not feasible and/or applicable. In very much the same way as preventive strategies, reduction strategies require local adaptation and acceptance by food network stakeholders and blend in well with cultural, social, and economic contexts, and importantly need to be convenient to implement. Commonly reduction strategies relate to products, for example reducing packing materials in food products. However there are also other strategies: for example in Ghana a transport trailer was designed so as to increase its loading capacity for farm crops (UNEP, 2006) thus reducing the number of trips required for crop collection; in pistachio processing in Iran, pistachio shells were used as fuel for powering processing machinery (Hokmabadi, 2015), reducing the need for using other energy sources.

Recapturing strategies

This looks at strategies that can recapture any value to be found in waste derived from food chain operations. In food value chains, more often than not food losses and waste may be inevitable because of the biological nature of food, for example, and thus such strategies for recapturing value from losses and waste need to be in tune not only with environmental priorities, but also and importantly social and economic priorities of stakeholders. Many networks for recapturing value from waste operate efficiently in recapturing residual value found in food losses and waste, but the efficiencies may be social as well as economic. For example, in pistachio processing in Iran, pistachio hulls, which can be considered waste, are used to make essential oils, jams, and animal feed (Hokmabadi, 2015); in Malaysia palm biomass waste is re-used to produce plywood for furniture, palm fibres, pellets, high value chemicals, and soil mulching (Ng et al., 2012).

Box 12 Matters to consider in planning

Issues that may be relevant for consideration in developing a road map for implementation include:

- Priorities – opportunities for early gains, prerequisites for action.
- Responsibilities – government (local, provincial, national), sub-sector organizations, private sector.
- The need for a new or existing organization to oversee the implementation process.
- Legislation for policy instruments – drafting time and submission time for parliamentary review.
- Budget and availability of programmes – implications for effectiveness and adoption rates.
- Regional variation in policy application and adoption rates.
- Implementation constraints on policy instruments – cost, availability of professional staff, timing and resources to establish regulatory agencies, equipment supplies, infrastructure, data requirements for drafting standards and testing programmes, training staff and facilities.
- Public sector exit strategy for public–private sector initiatives – timing and how it will be achieved.
- Monitoring and evaluation mechanisms – timing, a mid-term review.

Action plan considerations:

- List and clearly understand the tasks and actions that need to be taken to implement the plan.
- List stakeholders, organizations, and individuals that need to be involved in each action and which task each is responsible for.
- Clearly delineate and specify the resources (finance, people, equipment, information, etc.) required to complete each activity.
- Clearly specify time frames for each activity, making realistic estimates of required times, needed resources, and so forth.
- Identify risks, gaps, and weak links in the action plan and how these will be addressed.
- Set priority activities and tasks. Start with the most important tasks and activities.
- Split the action plan into short-term and long-term priority areas.
- Address those involved and obtain commitment by written agreements, sector work programmes, budgets, etc.
- Ensure that coordination mechanisms are agreed upon.
- Agree on a monitoring and evaluation system.

Box 13 Matters to consider in the investment and budgeting plan

- Set objectives for investments and budgeting.
- Understand the long-term nature of investments and budgeting.
- Prepare a time schedule of when investments will be needed and when expenditures will occur and for what activities and tasks they will be needed.
- Clearly understand all expenditure items that may be required for the planned process.
- List items and categorize them.
- Estimate item costs and take into consideration cost increases over time.
- Provide for flexibility and contingency set-asides in the estimates.
- Set up a monitoring and control system.
- Set a schedule for budget reporting and review.
- Provide investment and budget estimates to stakeholders and other interested parties.
- Take account of all feedback provided.

Step 7: Set up a monitoring and evaluation system

A monitoring and evaluation system will need to be designed, set up, staffed, and implemented. This will be an important part of the process as it will enable progress to be checked regularly and, importantly, enable evaluations on how matters are progressing. Some of the matters to consider in setting up a monitoring and evaluation system are provided in Box 14.

Box 14 Matters to consider in setting up a monitoring and evaluation system

Main issues to consider in effective monitoring and evaluation:

- A baseline of indicators needs to be set up. Bottom-up monitoring needs to be undertaken, with the specific objective of capturing the impact of interventions.
- Monitoring needs to be undertaken periodically, measuring predetermined indicators.
- A specific period for monitoring needs to be agreed upon and supported.

What can go wrong?

- changes in the implementation environment, such as a change in local authorities, changing priorities;
- price instability, animal disease, food safety scares that change the competitiveness of the market;
- policy changes that have a detrimental impact.

An effective M&E system will:

- provide 'hard facts' and play a crucial role in keeping the plan on target;
- allow priorities to be reassessed and encourage more effective use of resources;
- increase understanding and learning as to why particular interventions have been successful or not;
- inform those involved in decision-making and improve their performance; and
- encourage stakeholder ownership and inevitably long-term sustainability.

Step 8: Hold regular multi-stakeholder working group meetings

Regular MSWG meetings should occur to discuss and act on opportunities and challenges provided by the progression of the various plans devised. This will help clarify matters which may have been raised and importantly build a common consensus around possible solutions. In Box 15 an example of implementation problems commonly found is provided with a possible set of solutions also provided.

Box 15 Implementation problems and matters to consider

Common plan implementation problems include:

- lack of political will and leadership;
- changes in organizations' leadership;
- lack of committed resources (in terms of both capital and human resources);
- inadequate institutionalization;
- absence of appropriate management;
- poor scheduling of activities and tasks;
- inadequately defined tasks and activities;
- ineffective time scheduling;
- poor coordination, competing activities, insufficient capacity, and so forth.

(Continued)

Box 15 (Continued)

Matters to consider in attempting to solve implementation problems:

- Are the required partnerships in place to implement the plan?
- Is there enough institutional support for the process?
- Are the resources necessary available and sustainable in the long term?
- Are the priorities set appropriately?
- Are those responsible for activities able to carry out what is required?
- Have measures and milestones been set appropriately?
- Are the set time schedules realistic?
- Is there a system to track progress?
- What may go wrong?
- Are there contingency plans in place in case things go wrong?
- Have risks been minimized?

Step 9: Attempt to contribute to and foster the development of a policy action plan

A policy plan of action should also, if possible, be attempted so as to provide for institutionalization of the approach at local level and with local level decision-makers. Where seen as feasible, national decision-makers should also be part of the process. For both local and national level, active campaigning from decision-makers throughout the duration of the plan needs to be implemented. Such a plan, where possible and feasible, will require interactions, linkages, and harmonization with similar policy plans at national level as well as at wider continental, regional, and international levels (see Box 16).

Box 16 Matters to consider in policy planning

Proposals for policy instruments to be included in the plan have to be consistent with local and national government economic development objectives and policy positions adopted in other parts of the economy. Policy conflicts need to be identified before the plan is finalized and presented for approval. Some issues that may arise include:

- food safety standards, laws, regulations;
- existing regulations – environmental, water and road access and use;
- local or provincial food price controls;
- agricultural extension programmes;
- agri-food sector development programmes for other agricultural products;
- international trade obligations;
- import constraints affecting inputs and market returns;
- bank supervision regulations, interest rate and credit controls; and
- food price regulations, poverty assistance programmes.

Some of the key considerations for developing an advocacy programme include:

- preparation of a published document outlining the detail of the plan;
- distributing the document to all stakeholders;
- identifying ministers and public sector officials responsible for different elements of the plan;
- developing a communication programme to 'sell' the plan – targets, role of leaders, schedule of advocacy opportunities, briefing of groups not represented in the working group;
- preparing briefing notes for leaders involved in 'selling' the plan;

- providing evidence of the consultation process and confirmation of stakeholder agreement;
- understanding the implications of policy instruments for government – budgetary expenditures, consistency with national development objectives, policy conflicts, precedents and reforms;
- covering the cost of advocacy efforts – travel, publishing, and distributing the plan;
- a process to respond to feedback and refinements of the agri-food sub-sector development plan.

The components of an effective communication strategy encompass:

- Identify the targets for the communication strategy – ministers and public sector officials, sector leaders, politicians, and other interest groups.
- Develop the messages through preparation of short and targeted briefing materials to support effective sector communication efforts.
- Sell the plan through designated spokespersons who 'champion' the plan.
- Identify opportunities for political drive and public review to build support.
- Build influence by demonstrating broad ownership of the process, document consultations during the strategic and operational planning process, and provide visual confirmation of stakeholder support for the plan.
- Ensure availability of resources to pay for the communication strategy.

Conclusions

Clearly a bottom-up approach to green food value chain development reflects the reality of many contexts found in numerous developing countries. The approach provided above needs to be seen from the eyes of field practitioners and how such contexts require easy to use and practical approaches. The approach though is far from static, especially in such BOP contexts, and there are clear signs coming from evidence (for example see Banerjee and Duflo, 2012; Viswanathan et al., 2012; Hilmi, 2016a, b; FAO and CIHEAM, 2016) that market mechanisms, especially in the informal sector, can provide for greening food value chains at the local level. However, the private sector cannot 'jump-start' major efforts in greening food value chains in all cases, and thus 'seed money' from the public economy and/or from donors will be needed. Importantly though, an inclusive multi-stakeholder approach is required including all local level stakeholders, and where possible also includes national stakeholders. This will also be important, for example, in knowledge transfer of know-how and technologies found in BOPs to a wider target audience. The collaboration and understanding among various stakeholders can enable such 'know-how and technologies' to be made more available, adaptable, and scalable to others. It is also clear that far more awareness creation targeted at decision-/policy-makers, with an effective communication strategy, is needed. This will not only raise awareness of the necessity to develop green food value chains, but also bring into the limelight BOP contexts that are usually marginalized, undervalued, and in some instances invisible to policy and development processes.

The way forward

Seeing that the green food value chain development approach is not static, there is a need for more research to be conducted on innovations that can green food value chains in BOP contexts, as well as on how to further upgrade existing green

food value chain development efforts within BOPs. Consequently, there is a need to apprehend more information, know-how, lessons learned, and experiences on greening practices, including: activities, processes, systems, institutions, organizations, and behaviours. Further, such practices will need to be categorized and ranked and guidelines on best practices identified. Such systemized guidelines on best practices could also be of great support to developing sets of guideline best practices for field practitioners that are inclusive and consider all stakeholders at both local and national level. In other words, guidelines for best practices could be developed for each type of stakeholder. For example guidelines for best practices could provide effective support to the informal private sector that commonly operates in BOP settings, along with guidelines for best practices for the formal private sector. Further guidelines for best practices could also be provided to policy-makers to support their attempts to contribute to green food value chain development from the public sector point of view. Supporting the public sector is important, owing to its role in emanating policies and legislation, and hence more research is also required in terms of how and what the public sector can do to support the greening of food value chains. Most of the research conducted has shown that BOP settings work mostly with little if any public support. This situation needs to be modified and in order to do this the public sector not only requires awareness campaigns, but also and importantly guidance, especially at local level. Thus, crucially, more research is required in providing guidelines for best practices for the public sector in how to green food value chains at the local level.

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