A comparison of supply chains for school food: Exploring operational trade-offs across implementation models.

Aulo Gelli[1], PCD

Andreas Kretschmer[2], WHU

Luca Molinas[3], WFP

Marc Regnault de la Mothe[3], WFP

28 September 2012

Abstract

Building on the recent work by WFP, the World Bank, the Partnership for Child Development and partners, this work provides a general framework that will be used to characterise school feeding supply and value chains. Key processes are mapped against the standardized framework and some trade-offs are examined across chain models

1 Partnership for Child Development, Imperial College
2 WHU - Otto Beisheim School of Management
3 School Feeding Unit, Policy, Planning and Strategy Division, World Food Programme

Executive summary

The importance of school feeding programmes has been highlighted by the recent food, fuel and financial crises. A joint analysis developed by the World Bank, WFP and the Partnership for Child Development (PCD), identified that every country is in some way and at some scale seeking to provide food to its schoolchildren. However, school feeding is a complex intervention that is delivered in various, context-specific models or configurations. An increasing need for support has been expressed by national governments in low- and middle-income countries to understand the different school feeding models and modalities. Furthermore, supply chain management is a key factor for program delivery and performance of this complex form of intervention.

In this paper we develop a standardized framework for the analysis of school feeding supply chains that allows meaningful comparisons of programs across different implementation models. The framework is mainly descriptive in nature, and is a first step in the development of more detailed planning tools to support decision makers in explicitly examining the trade-offs of different models in specific country contexts.

The primary goal of the framework is to describe the key supply chain relationships of school feeding, that is, the flow of goods, funds and information between the supply chain actors. The framework is based on multiple sources of input, including practical experiences and insights from supply chain management and related fields.

Supply chain framework

The performance of school feeding supply chains is driven by critical factors and the specific supply chain configuration. The framework proposed in this paper consists of a supply chain context and a supply chain description that is linked with the program objectives and associated performance.

The critical factors characterizing the supply chain context can be both within and outside of the control of the school feeding program. External factors include beneficiaries, suppliers, third parties, resources providers and general context. Internal factors include supply chain strategy (with the elements priorities, targeting and modality, and operational model) and supply chain capabilities and processes (with the elements procurement and distribution, and human resources and information).

The supply chain description highlights the key activities linking food production to consumption by school children. It characterises the supply chain relationships between all the actors involved, including the flow of goods, funds and information. The supply chain description is structured along three dimensions, including the key activities of the supply chain, level of activity and actors of the supply chain. Key activities linking food producers and school children include production, trade, procurement activities and preparation and distribution. These core activities are complemented with resources and management activities. The level of activity describes at which level a supply chain activity is occurring, ranging from international, national, and regional/district to school level. The actors within the supply chain include all stakeholders involved in the various stages of the supply chain and include, among others, smallholder and other producers, traders, teachers and communities. The stakeholders performing the key activities are linked through flows of

goods, funds and information; furthermore, warehousing, processing and vulnerabilities cross-cut the whole supply chain.

Supply chain models

The different models used in practice have significant interdependencies with the context of the target region, i.e., external factors determine program elements and may limit what models may be feasible. Operating models can be characterized in terms of 2 main dimensions:

1) The centralisation or decentralisation of program management, procurement, distribution, and monitoring.
2) Whether these activities can be performed in-house or by a third party.

Different approaches can even co-exist within the same country, for example, international programs by WFP or other NGOs and programs run by a local institution.

Despite the differences between the programs, clusters of programs can be identified based on expert feedback using criteria such as size of program and program maturity. The models are classified along the two dimensions i.e. level of decision making (centralisation) and use of third parties. The combination of the two dimensions leads to 6 possible theoretical models. Furthermore, mixed models, i.e. programs with elements of several models, are also possible. For example, one commodity such as cereal based staples may follow a more centralised setup in contrast to a more decentralised setup for perishables. As a first step in the analysis, the following five main representative models types have been identified:

	Example	**Centralisation**	**Third party**
Decentralised model	Kenya	Decentralised	Insourced
Semi-decentralised model	Mali	Semi-decentralised	Insourced
Centralised model	Botswana	Centralised	Insourced
Integrated farm-to-school model*	Cote d'Ivoire	Decentralised	Insourced
Decentralised third party model	Ghana	Decentralised	Outsourced

*(*denotes explicit focus on smallholder production)*

Exploring trade-offs across different models

The selection of the appropriate supply chain model can be guided by a careful examination of trade-offs across both external and internal factors. School feeding programmes can have multiple objectives: including education, health and nutrition, as well as agriculture and community development. In order to enable improved management of any tensions between competing objectives it is critical to highlight and prioritise the main objectives for the intervention as a whole. The different models captured in the analysis all include education as the primary objective. Only the integrated farm-to-school model, as per the example in Cote d'Ivoire, has smallholder agriculture also as a priority. This strategic framing of school feeding will lead to a number of key differences across the supply chain.

The models generally face different inherent risks involved in food sourcing affecting both quantity and quality, involving seasonality, volume and price, for example. We assumed that models that work on a more decentralised level in terms of food sourcing tend to be inherently

more vulnerable than models that rely on more aggregated systems. However, some school feeding programmes, by design, may develop supply side support activities to address some of these vulnerabilities, as in the case of the integrated farm to school model where an explicit agricultural support package is provided to smallholder farmers.

The trade-offs involved in the trade and procurement dimensions are complex, including regulations and price discovery mechanisms, specifications of lot sizes and frequency of purchasing etc. and further research is required to support decision making processes in this area in particular. Generally, the functioning of more decentralised models will depend on the extent of market integration at the specific level of procurement. In general, the more decentralised the level of procurement, the smaller the market and more inherently vulnerable the model will be in terms of market effects.

Preparation and distribution activities are very similar across the five models examined, the main difference being in outsourced models (e.g. Ghana) where the private sector is tasked with the food service delivery. In terms of processing, centralised models tend to provide opportunities for improved quality control and efficiencies through economies of scale. However, overall gains in cost-efficiency would tend to be partly offset by the transportation of food from centralised warehouses to the recipient schools. Decentralised models by definition face shorter transportation legs, but are also more complex to manage in terms of quality control. This issue is particularly relevant in the case of food quality, including storage (e.g. aflatoxin contamination) and micronutrient fortification. Decentralised models can also provide fairly diversified menus, relying on perishables sourced from within the community to provide balanced meals. Storage in decentralised models can be a concern, particularly when food procurement occurs on a quarterly basis and food stocks are kept in school for relatively long periods. From this perspective resources, oversight, and quality control tend to be more straightforward in centralised models. However, decentralised models will tend to have more feedback links between beneficiaries and programme management, a key element in terms of accountability and social control.

This paper is a starting point for the analysis of school feeding supply chains and implementation models. The initial analysis of the trade-offs presented in this paper is limited by a number of factors, including the lack of data across the supply chain framework and the small number of countries included in this first step. More data both on the supply chain and the supply chain context is necessary to allow a comprehensive evaluation of advantages and disadvantages of the various models. However, the framework provides a tool to facilitate this analysis and guide the data collection. A follow-up to this paper is underway, involving a more detailed analysis of implementation models and country cases.

1. Introduction

1.1 Background

The importance of school feeding programmes has been highlighted by the recent food, fuel and financial crises. School feeding programmes are ubiquitous: A joint analysis developed by the World Bank, World Food Programme (WFP) and the Partnership for Child Development (PCD) identified that every country is in some way and at some scale seeking to provide food to its schoolchildren (Bundy et al., 2009). It is estimated that over 300 million primary school children are covered and the social investments in the programmes are substantial (WFP, 2012).

Across the globe, a key response to the recent economic crises has included the scale up of school feeding as a safety net for children living in poverty and food insecurity. Nevertheless, WFP estimates that about 66 million schoolchildren are undernourished (WFP, 2009) and an additional 67 million children are out of school (UNESCO, 2011). The burdens of hunger, malnutrition and ill-health on school-age children are major constraints in achieving the Education for All (EFA) and the Millennium Development Goals (MDGs) on education (WFP, 2006). Poor nutrition and health among schoolchildren contributes to the inefficiency of the educational system (Pollitt, 1989). Children with diminished cognitive abilities naturally perform less well and are more likely to repeat grades and to drop out of school; they also enrol in school at a later age, if at all, and finish fewer years of schooling (Jukes et al., 2007).

School feeding is a complex intervention and designing effective programmes requires careful management of trade-offs among design objectives, targeting approaches, feeding modalities, and costs (Alderman and Bundy, 2011). School feeding programmes exhibit different, context-specific models or configurations. Different approaches can even co-exist within the same country, where, for instance, programme implementation is managed by decentralised institutions (e.g. individual states in Brazil or India), or where agencies like WFP are complementing the national programmes (e.g. Ghana and Kenya). Furthermore, national governments in low and middle income countries are increasingly looking at ways to link school feeding programmes with local agricultural production to enhance the sustainability and boost local economies by generating a stable demand for small-scale farmers (Gelli et al., 2010).

Governments have increasingly expressed the need for technical support and guidance on understanding the advantages and disadvantages of different models and modalities of school feeding. As a response to this demand, the World Bank, WFP, PCD and other partners have begun to address this need, including the research and development of analytical tools to gather evidence on outcomes as well as best practices in implementation, related to the various models and modalities of school feeding. The different tools are aimed at providing a comprehensive and standardised framework for the analysis of school feeding programmes.

Supply chain management is a key factor for program delivery and performance of this complex form of intervention (Kretschmer et al. 2012). School feeding includes various flows of products, information, and money between the involved stakeholders and supply chain costs are a major portion of school feeding budgets; commodity and transportation costs

account for as much as 80% of total expenses (Gelli et al. 2011). A number of supply chain analyses of school feeding programmes have been undertaken in the last decade. The bulk of the published practice-oriented literature on school feeding supply chain benchmarks mainly focuses on operations of the WFP, though a few studies have been recently undertaken on non-WFP operations[1].

Supply chain analyses also provide a basis for cost and cost-benefit analyses that are essential to assess the sustainability of school feeding models. Costs are also an extremely important aspect in terms of the planning and design of the programme. Bringing national school feeding programmes to scale requires considerable resources and a steady flow of funds. In low-income countries, for example, school feeding programmes on average cost about US$50 per child per year (Gelli et al. 2011). In this context it is critical to ensure that governments are adequately supported in the planning and budgeting stages of the programme. For example, knowing that a certain modality of programme (e.g. take-home rations) is considerably more expensive when compared to another modality (e.g. biscuits) from the outset may save a lot of time and money, as the programme is designed and rolled-out. Examining some design and implementation trade-offs carefully and explicitly by using decision trees, for example, can also improve the efficiency and effectiveness of the programme in the long run. To support this issue, the WB/WFP/PCD partnership has been developing a standardised methodology for cost analyses that can be used to provide benchmarks for the average costs per child per year and cost-efficiency parameters for each of the school feeding modalities (WFP, 2011).

The joint research also has other purposes, including supporting advocacy by strengthening the case for school feeding as an effective safety net, building on the assumption that school feeding is an investment in human capital for governments as it constitutes an essential component of the global strategy to achieve Education for All. One example of this is the school feeding "investment case", simulating the costs and benefits of school feeding that has been widely used with stakeholders, national governments and UN partners to support the policy dialogue on school feeding (WFP, 2011). The research activities also include a number of other analyses on school feeding programmes that are complementary to this work, including:

- Institutional framework analysis: the purpose of this work is to develop an improved understanding of the different institutional frameworks for school feeding programmes, including multi-sectoral coordination mechanisms, monitoring and evaluation…etc.
- HGSF impact assessments: the purpose of these studies is to strengthen the evidence base of school feeding programmes linked to agriculture development, including data on programme outcomes as well as on costs.

1.2 Purpose

The purpose of this work is to develop a standardized framework for the analysis of school feeding supply chains that will allow meaningful comparisons of programs across different implementation models. This paper is the first step in the development of a standardized

[1] See references for work by the Haas Business School on the Ghana School Feeding Programme, and the work by UCLA on the Ashkaya Patra model in India.

supply chain framework for school feeding and also provides a descriptive analysis of trade-offs of different implementation models. The framework will describe key supply chain relationships including flows of goods, funds and information between actors across the system, examining the advantages and disadvantages of different design options.

This work is an integral part of the global effort to help governments evaluate school feeding programmes and to decide what is the best appropriate model that applies to the needs in the country, the local context, the institutional framework, the national capacities, the objectives of the programme and the specific challenges and opportunities in the country.

The framework proposed in this paper adds to the existing work on school feeding design and implementation by taking a full supply chain perspective. This allows a holistic, system wide analysis of the product, money and information flows between the involved stakeholders and helps to identify the opportunities to achieve cost-effective and sustainable programs. The standardised supply chain framework is also a first step in the development of planning tools to support decision makers in explicitly examining the trade-offs of different models in specific country contexts (WFP, 2012).

1.3 Approach

The paper draws on both primary and secondary data sources. Recent work by the World Bank, WFP, PCD and partners on the different school feeding implementation models was reviewed and synthesised into the development of a supply chain framework for school feeding. The framework development was also guided by a series of in-depth discussions with experts and presented for feedback at the HGSF technical meeting in September 2011. Furthermore, expert feedback was continuously sought in the framework development process, and two rounds of review were undertaken before the framework was finalised. Once the basic framework had been developed, a number of structured review sessions were undertaken to examine the trade-offs of the different models across the different framework dimensions. As expected, a general lack of data resulted in expert judgement being used to characterise many of the trade-offs.

The framework is based on multiple sources of input. Both insights from practitioners and from supply chain management theory and related fields were taken into consideration due to the cross-disciplinary nature of the topic. The following goals were used to guide the development of the framework:

- The primary goal of the framework is to describe the key supply chain relationships of school feeding, that is, the flow of goods, funds and information between the supply chain actors.
- The framework should allow standardized comparison of programs. Therefore the framework is standardized as much as possible with some flexibility for deviations.
- The framework should balance level of detail with practicality. The focus is to highlight the key differentiating supply chain factors; aggregation and simplification may be used.
- The unit of analysis is the school feeding program based on a typical school.

The paper is organized as follows. The second section presents the development of the school feeding supply chain framework. In the third section a typology of school feeding models will be shown and illustrated with examples. This is followed by a review of the identified school

feeding supply chain models in section four. Section five concludes the paper with a discussion of first findings and an outlook for application of the framework and further research.

2. A School Feeding Supply Chain Framework

2.1 Framework Overview

The school feeding supply chain is a significant part of the overall school feeding program. Therefore, strategic decisions within the school feeding model planning process set the scene for the specific supply chain setup. Based on this premise, the performance of school feeding supply chains is driven by a number of critical factors and the specific supply chain configuration.

The framework proposed in this paper consists of a supply chain context and a supply chain description that is linked with the program performance (see Figure 1). The critical factors characterizing the supply chain context can be both within and outside of the control of the school feeding program (detailed in Kretschmer et al. 2012). The external factors include beneficiaries, suppliers, third parties, resources providers and general context. The internal factors are supply chain strategy (with the elements priorities, targeting and modality, and operational model) and supply chain capabilities and processes (with the elements procurement and distribution, and human resources (HR) and information).The supply chain description highlights the key activities linking food production to consumption by beneficiaries. It shows the supply chain relationships between all the actors involved, i.e., the flow of goods, funds and information.

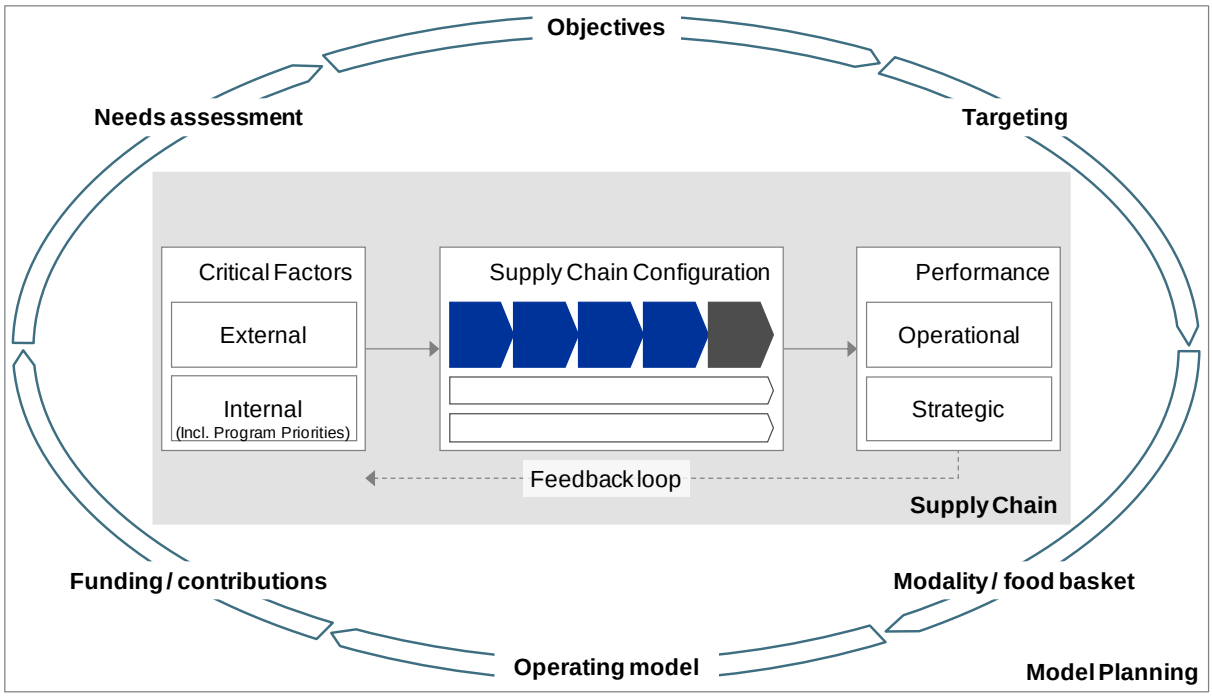

Figure 1: Overview of the supply chain framework

The critical factors and specific supply chain configuration affect the objectives and performance of the school feeding program through a number of different impact pathways. The operational objectives are directly linked to the program and include resource

performance (efficiency) and output/outcome performance (effectiveness). The strategic objectives have a longer-term dimension. A key long-term focus is sustainability, i.e., sustainable program operations with a reduction of external dependency, and promoting economic development by channelling resources into the community. Other strategic objectives include education and equitable access, nutrition and health and income transfer.

The supply chain description is structured along three dimensions, i.e., key activities of the supply chain, level of activity and actors of the supply chain (see Figure 2). Key activities linking food producers and beneficiaries are production, trade, procurement activities and preparation and distribution (primary supply chain activities) leading to consumption by children. These core activities are complemented with resources and management activities (secondary activities). The level of activity describes at which level a supply chain activity is occurring ranging from national (or even international), regional/district to school level/immediate vicinity. Actors of supply chain denotes all involved stakeholders at the various stages of the supply chain and include suppliers, government, schools and beneficiaries among others. The stakeholders performing the key activities are linked by flows of goods, funds and information; furthermore, at each supply chain stage there may be warehousing, processing and vulnerabilities, or losses.

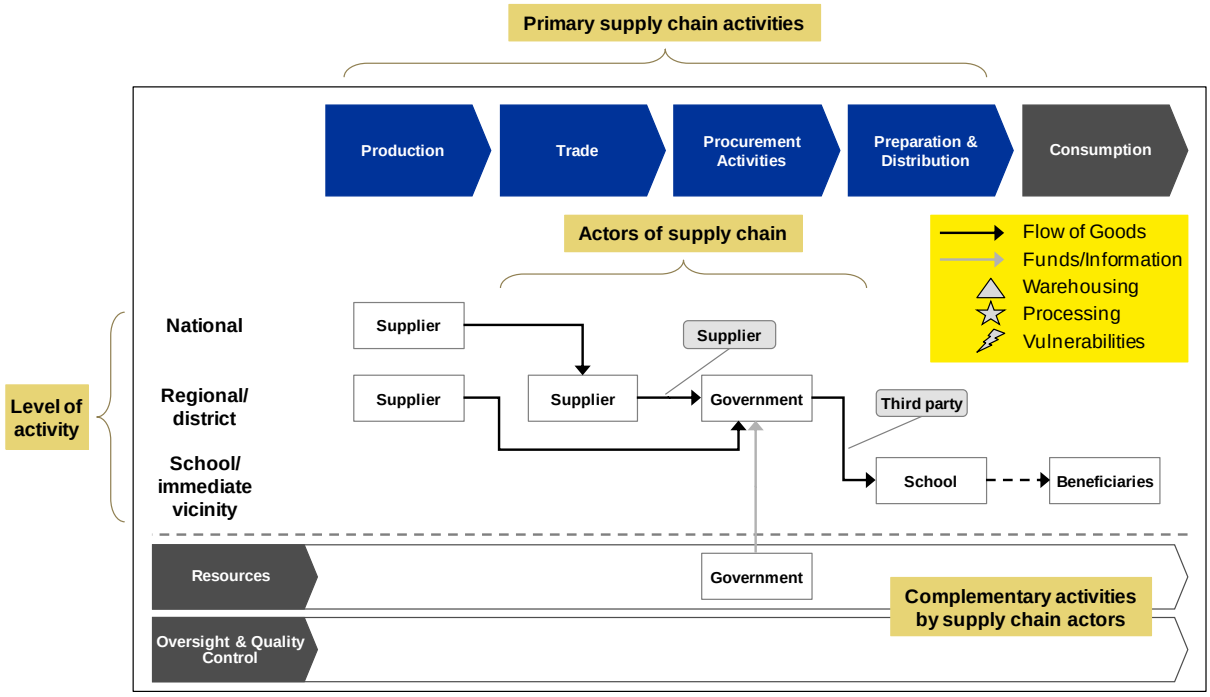

Figure 2: An example of a school feeding supply chain configuration

2.2 Program Objectives and Performance

Generally, school feeding interventions are framed as social protection or poverty reduction programmes with multiple objectives across education, and school health and nutrition dimensions. School feeding has also been a key response in emergencies and relief contexts. More recently, school feeding programmes have also been viewed as vehicles to support community development and smallholder farmers.

From the perspective of this supply chain framework, these strategic program objectives or priorities should be determined prior to the specific supply chain setup. Coherence between

the various objectives and determining a hierarchy of objectives based on prioritisation are important steps in the design process. Following the establishment of priorities the general strategy is operationalised in the supply chain strategy (see internal factors) and reflected together with external factors in the specific supply chain configuration.

The results of these decisions can be measured along the various operational objectives. Key criteria from an operational perspective are resource performance, a measure of how efficiently resources are used, and output/outcome performance, which relates to the effectiveness of goal achievement. Specifically this can be summarised as timely and uninterrupted supply of quality food for the school feeding programme. More specific objectives on small-holder agriculture and community development can be framed under this high level objective of safe and stable supply (see Figure 3). These operational objectives can be linked with specific metrics and indicators (for a first list see Appendix 1).

From a longer-term and strategic perspective the program success can be measured along the different strategic priorities such as education, nutrition, income transfer plus the more recent elements of sustainability and agriculture/community development.

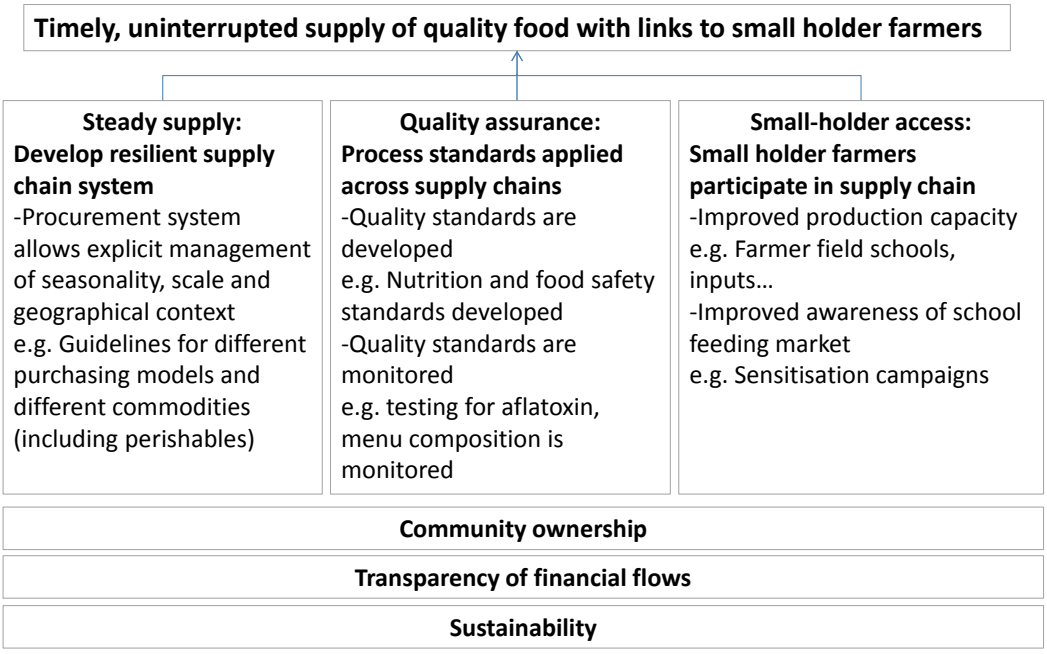

Figure 3: Stylised supply chain objectives for Home-Grown School feeding (Source: PCD, 2011)

2.3 Critical Factors for the School Feeding Supply Chain

Both external and internal factors can impact the supply chain (see Figure 4). The identified factors can be linked with the context as captured by general quality standards of school feeding, for which an assessment and benchmarking tool has been developed (Bundy et al. 2009, see also SABER framework in Appendix 3).

A first external factor is (potential) beneficiaries, which include schoolchildren, and their families, characterized by their level of food security and poverty, for example. This includes nutritional status, including micronutrient deficiencies. The needs of beneficiaries (i.e. demand) are the key drivers for the supply chain. The beneficiaries and their situation are a key factor to consider in the program design of school feeding, such as deciding what products or food modality is provided in what model.

Suppliers can be international producers, national producers (including smallholders), or intermediaries. Managing the food supply in developing countries and humanitarian settings with a particular focus on smallholder suppliers can lead to additional challenges. Key elements of supply are the amount and quality of available food. Quantity and quality are determined by local agricultural capacity, variables impacting production such as seasonality, and possible supply shocks, weather, market infrastructure (including transportation), and access to external sources. Price is determined by supply and demand, including influences by any subsidies. The suppliers determine the sourcing options for the school feeding program, including the potential for sourcing at community level.

Third parties include service providers and other partners; the key characteristics are level of service availability and quality of (logistics) services. Use of third parties and outsourcing can offer benefits in terms of costs or delivery effectiveness, as well as for social, political and local income generating objectives, making this an important option.

Resource providers can be international organizations, donors, governments (national, regional or local), or communities. Key considerations in this respect are resource consistency and adequacy. Timing and sufficiency of resources (funds and know-how) are important aspects. Furthermore, special processes, funding cycles, and earmarking can constrain the program's use of resources, reduce flexibility and thereby decrease its overall efficiency and effectiveness.

The general context consists of several aspects, including operating conditions, the political situation, and institutional arrangements. Operating conditions refer to the level of logistical infrastructure, i.e., the quality of infrastructure and facilities (road, water, and air transport), and can pose a significant challenge in the humanitarian context. The specific conditions determine the possible logistical solutions and the level of effort that will be needed to reach the intended beneficiaries. The political situation is another key aspect. Political considerations can include government participation and support, support of local political elites, as well as political stability and security. Basic security and stability (i.e., a country free of armed conflict and possessing functioning public governance) are necessary for a well-running school feeding program.

The supply chain strategy is the first internal factor of school feeding programs with the elements priorities, targeting and modality, and operational model. The process for determining the appropriate strategy starts with an analysis of beneficiaries' needs coupled with priorities such as specific goals for education. This is followed by a selection of beneficiaries (targeting) and product modality, including a selection of the food basket contents. Targeting can be aimed at various levels, from universal coverage to individual targeting; each entails a number of trade-offs in terms of cost, effectiveness, and equity. School feeding modalities include in-school feeding or take home rations; this factor is directly connected to the food basket composition (quantity and nutritional value of food components). An additional element is the operational model, which refers to the task of organizing the different parties involved in the supply chain. Key operational models are centralised and decentralised supply chains; optionally, some supply chain execution functions, such as procurement and delivery to beneficiaries, may be outsourced. A further consideration is possible community involvement - for example, contributions of labour for

meal preparation or supplementary supplies such as fresh fruit. The decision for a specific operational model has to be aligned with strategic objectives and combined with an identification of budget requirements and funding options.

Seen from the perspective of the actors and institutions responsible for the school feeding programme as a whole, supply chain capabilities and processes include the elements procurement and distribution, and HR and information. Procurement refers to supplier identification and selection, contracting, supplier management, and supplier development. Sourcing at community level offers potential benefits for the supply chain, but implementation can be challenging for a number of reasons (for details see subsection 2.4 Production). Distribution refers to all delivery operations (transport and warehousing) and may include meal preparation. Delivery to beneficiaries is a crucial aspect of school feeding operations and requires transport planning and distribution capabilities. HR and information refers to the human resources and tools used to facilitate the supply chain processes. Specific aspects here are the capacity of program staff to plan and manage the programme (both operations and finances) as well as monitoring, evaluation, and reporting measures. Information and human resource management are key performance drivers in this respect; logistical skills and capacities are of particular importance.

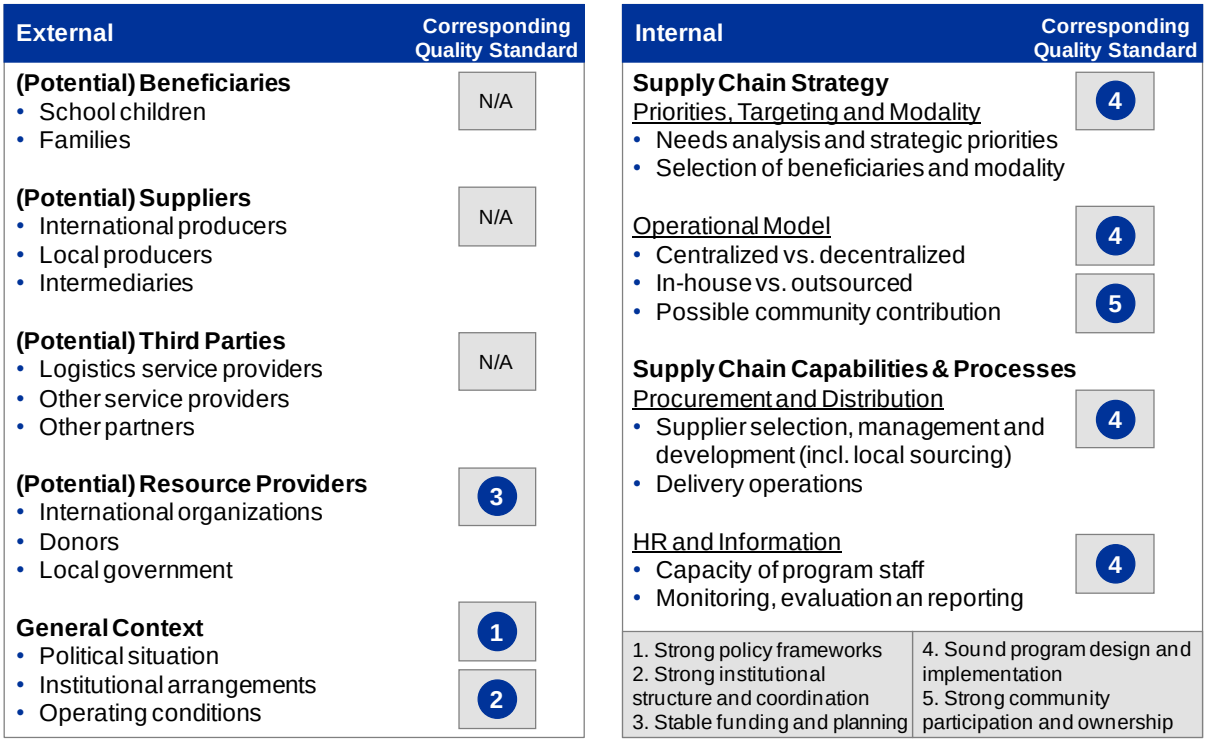

Figure 4: Critical factors for school feeding supply chains

2.4 Key Activities Linking Food Production to School Feeding

This subsection describes the key supply chain activities. These primary activities can be complemented with secondary resources and management activities, which will be presented along the structure of the primary activities.

Production refers to agriculture and livestock activities that include obtaining inputs, planting and maintaining, harvesting, and finally selling of products. Different techniques are possible

depending on the scale and capabilities of the producers and the local context, which can lead to significant differences in production yields and quality.

Smallholder farmers generally face a number of systemic challenges in accessing the school feeding market (see Table 1 for some example). As a result, a wide range of agriculture support activities aimed at improving smallholder food production have been used within the framework of Home-Grown school feeding programmes (HGSF). Using the food security framework approach, this includes activities involving resources (land, water…etc.), productive assets and secure livelihoods, as well as productivity, including labour productivity, livelihood stability and diversification (see Webb and Rogers, 2003).

CHALLENGE FOR SMALLHOLDER FARMER ACCESS	POSSIBLE MEANS TO ADDRESS CHALLENGES - FARMER SIDE	POSSIBLE MEANTS TO ADDRESS CHALLENGES - SCHOOL FEEDING PROGRAM SIDE
No information on procurement notifications	Access to ICT/mobile devices, focus on procurement opportunities	Information campaigns (radio, specific targeting)
Informal status and consequent non-eligibility	Formalization according to requirements public tenders	Simplify registration requirements and process, preferential bidding
Lack of experience with bidding proposals and competitive processes	Partnership with private company, invest in good proposal writing, link with technical assistance	Simplify proposal requirements, training, easy templates, limited waivers for smallholders and alliances between smallholders and private sector
Insufficient quantity, quality, continuity and processing capacity to meet the requirements	Collect products of organized smallholders, connect with other smallholder organizations, invest in quality and processing, partnerships with private companies	Reduce lot size, adapt to period of availability, menu based on local products, adjust standards for packaging, use of cereal banks, promote partnerships and association
Gender and cultural gap with public procurement officers	Build self-esteem, gaining experience, involve professionals, including women	Change of attitude, creativity, leadership for linking with smallholders
Higher transactions costs	Efficient management for activities at organization level, scaling up of collection	Incentive mechanisms, preferences, facilitate transport and storage
Lack of liquidity to pre-finance delivery	Link with credit institutes, sales contract as collateral, arrangements with members for delayed payments	Timely and frequent payments to the suppliers, flexibility for including credit institutes in contract arrangements
Lack of bank guarantees	Link with financial institutions, formalize assets as collateral	Reduce requirement for financial guarantees (e.g. along with reduced lot sizes), guarantee from local government

Table 1: Smallholder school feeding market access (Source: Commandeur, 2011)

Trade refers to a market intermediation function between product supply and product demand. Multiple trades are possible between the original producer and delivery. In theory, each trade provides an increase in value. Increased value can include transportation, storage, transformation, packaging, preparation or any combination. Examples are traders connecting farmers and caterers.

Procurement activities refer to food sourcing, buying and receipt of products. The aim of the procurement system is the timely, uninterrupted supply of quality food for the school feeding programme. This includes a number of activities undertaken to support the actual procurement transaction. Generally this involves food procurement modalities operating at different levels of aggregation throughout the school year. In some contexts, procurement modalities involve regulatory frameworks that specify direct links with smallholder farmers (e.g. Brazil). In most

others cases, these links involve interactions with traders (intermediaries) operating in the market. Examples of procurement related activities for school feeding include

- Food procurement mechanisms (including developing pro-smallholder procurement models e.g. soft tenders, forward contracts, warehouse receipt systems etc.)
- Guidelines, procedures, tendering processes
- Aggregation and quality control
- Market information systems, relaying data on demand from school feeding, prices etc.
- Adapting or creating pro-Farmer Organisation (FO) legislation/regulations

Preparation and distribution involves the range of different activities generally undertaken at the school level to provide the meals to the schoolchildren. Activities can include cooking of meals, preparing servings and distributing to the beneficiaries. As well as having cooks trained to provide adequate meals, preparing food in schools can involve providing fuel, cookware, cooking and serving utensils and tableware. Ideally, cooks would be trained in hygiene and sanitation, and the kitchen equipped with fuel-efficient stoves and chimneys as well as a source of potable water. A simplified breakdown of the main processes aimed at providing timely school feeding services of adequate quantity and quality to the targeted population is shown in Figure 5. Biscuits and take-home rations do not require preparation in schools and generally involve only transportation, storage, management and monitoring. At the school level, onsite meals are therefore more resource intensive relative to other modalities, in terms of cash and in-kind contributions required for service delivery. This difference in complexity is usually reflected in the magnitude of the costs associated with delivering the alternative modalities at school level. Though there is a dearth in the evidence on the benefits of school service provision at the community level, conceptually, school feeding service provision can direct financial resources in the school community through two main channels, funds for food procurement and funds for support services in terms of food management and preparation[2]. In terms of food preparation, emerging evidence suggests the potential for community development benefits but this remains another important area of future research[3].

[2] A detailed analysis on the food procurement dimension, and potential benefits to smallholder farmers is provided in a complementary paper (Sumberg and Sabates-Wheeler, 2010).

[3] See Studdert et al. (2004) for an evaluation of community based school feeding in Indonesia.

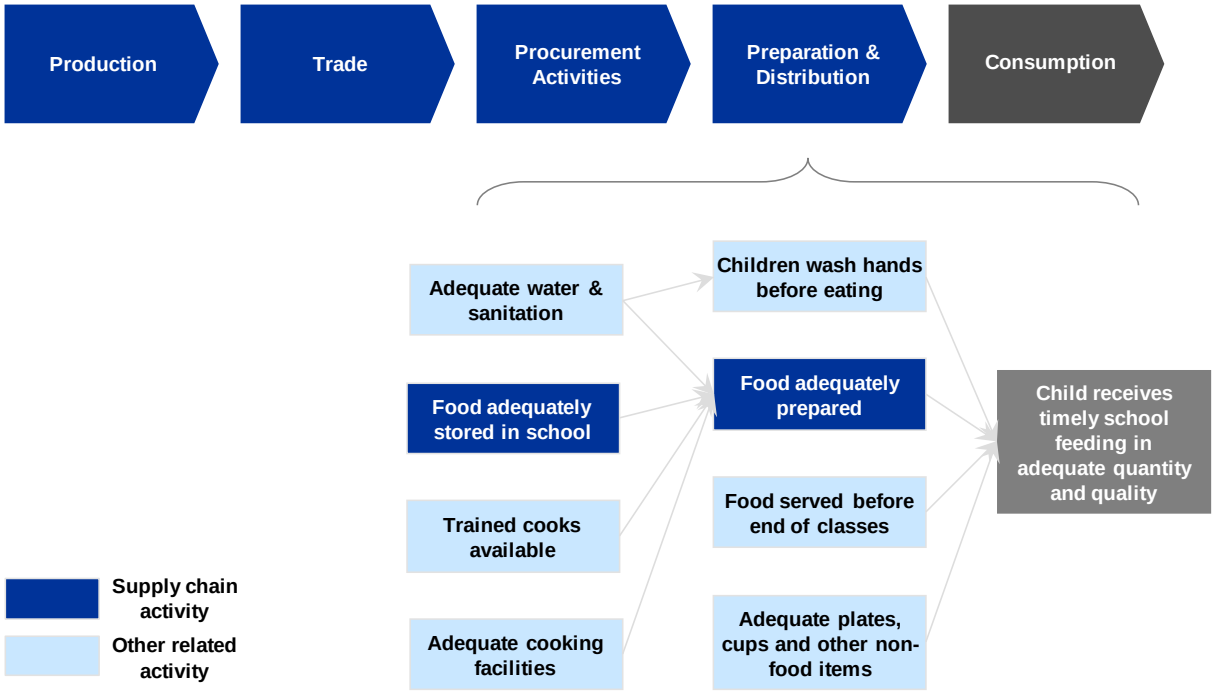

Figure 5: The last step in the supply chain: Simplified school feeding school level processes

Consumption refers to the end point in the supply chain process, or the actual consumption of the food by the children in school (or at home in the case of take-home rations).

A number of different activities occur across different stages in the supply chain by stakeholders at different levels, including:

Flows of goods (transportation), funds and information link the actors and primary activities of the supply chain. Flows of goods or transportation refer to the physical transport of goods to next activity level (ground, air, sea), covering all stages (international, national, community level …etc.).

- Examples of physical flows are traders transporting bought goods to caterers or to assisted schools.

Money flows refer to the financial transactions in school feeding supply chains.

- Examples are payment for foodstuffs by buyer and provision of funds for school feeding.

Information flows refer to the exchange of information between supply chain actors.

- Examples are enrolment figures from schools to programme offices in order to determine budget and food quantities, feedback between the beneficiaries and the programme staff on the quality of the service delivery, ordering information, providing guidelines, rules or other implementation support material.

Warehousing refers to storage of food products over time.

- Examples are various level of the supply chain are short-term storage by farmer after harvest, storage by trader, centralized storage for school feeding program by WFP and storage in school by caterers or school management committee

Processing refers to value-adding processes such as packaging, milling, fumigation and pasteurisation. An additional special process may be fortification with micronutrients. It is important to highlight that different levels of processing can occur throughout the supply chain, as also highlighted in the models below. Processing is a key step for pre-prepared foods, like fortified biscuits or take-home rations for example, as they are prepared for distribution at the school level.

Vulnerabilities refer to key potential problem areas in a specific supply chain. They may arise in each stage of the supply chain and will have an impact upon supply chain performance (for details on risks and vulnerabilities see section 2.5).

- Examples are production-related risks due to seasonality and crop-losses, pricing risks due to market conditions and spoilage during warehousing.

Resources include cash or in-kind support the program implementation and management (setting of guidelines and standards, monitoring and evaluation).

- Examples of resource transfers include financing through Ministry of Finance, and/or community contributions (labour, fresh fruit).

Oversight and quality control involve the monitoring and evaluation of programme activities, including inputs, process, outputs and outcomes (see PCD/WFP 2011).

- Examples of management oversight include the development and use of management information systems by the Ministry of Education as well as training for school level management.

Furthermore, these activities include specific monitoring activities aimed at ensuring that the school feeding service delivery is timely and of adequate quality and quantity.

- Examples of quality control activities include monitoring food quality, assessing food storage and preparation, testing for aflatoxin

This outline of activities provides a general structure for analysing supply chains. Modifications of this typical structure can be also highlighted. For example, a supply chain could include several commodity supply chains feeding into one program, which can be displayed with separate flows.

2.5 Risks and Vulnerabilities

National governments, international agencies, financial institutions, suppliers, consumers, and other stakeholders are giving growing interest to economic, environmental and social crises and the potential supply chain disruptions. Risks and vulnerabilities are therefore key variables of the school feeding supply chain. These include rapidly spreading health pandemics, high volatility in food and other commodity prices as well as emerging concerns on the effect of climate change on increased natural disasters and agricultural production. Risk and vulnerabilities are a directly impacting the functioning of food-based supply chains. These risks are more explicit as supply chains involve directly the step of agricultural production, particularly through smallholder farmers. Agricultural-related risk factors for supply chains have been extensively researched by the World Bank that listed several risk drivers affecting the quality of supply chains and proposed a number of control mechanisms and risk-management tools (Jaffee et al, 2010). A short categorization is listed as follows:

1. Weather-Related Risks include factors such as periodic deficit and/or excess rainfall or temperature, hail storms, strong winds.

2. Natural Disasters Risks are floods and droughts, hurricanes, cyclones, typhoons, earthquakes, volcanic activity that can heavily affect agricultural yields especially in low-income settings.

3. Biological and Environmental Risks include pests and diseases for crops and livestock. They also include contamination related to poor health and sanitation affecting food safety; as well as contamination of natural resources involved in the supply chain (i.e. water) and contamination and degradation of production and processing processes due to lack of environmental quality.

4. Market-Related Risks; include supply and/or demand related economic shocks that can affect domestic and/or international prices of inputs and/or outputs as well as changes in domestic market demands for quantity and/or quality, changes in food safety requirements, changes in market demands for timing of product delivery, marketing risks (changes in consumer's demand).

5. Logistical and Infrastructural Risks; include changes in fuels, communication, energy prices affecting the supply chain. Other risk drivers are poor quality in transport, communication, energy infrastructure that can be attributed to, physical destruction, conflicts, wars and social tensions such as labour instability (i.e. strikes).

6. Managerial and Operational Risks are driven by bad management in asset allocation and unequal livelihood/enterprise selection. Other factors are low productivity in use of inputs; low quality control, planning errors; breakdowns in farm or firm equipment; use of outdated seeds; lack of adaptively and response to change product, process, markets; inability to adapt to changes in cash and labour flows

7. Public Policy and Institutional Risks are uncertainties in monetary, fiscal and tax policies changing and/or uncertain financial (credit, savings, insurance policies; changing and/or uncertain regulatory and legal policies and enforcement; changing and/or uncertain trade and market policies; changing and/or uncertain land policies and tenure system; governance-related uncertainty (e.g., corruption); weak institutional capacity to implement regulatory mandates.

8. Political Risks are security and property risks associated with socio-political instability within a country. In case of conflicts with neighbouring countries they can lead to interruption of trade flows for inputs or outputs of the supply chain

The risk dimensions analysis framework proposed by WFP Purchase for Progress has a targeted focus on adding the perspective of the recipient of food assistance to the framework (WFP, 2012).

1. Consistent supply and aggregation for the recipients of food assistance

2. Quality assurance from the agricultural suppliers

3. Price discovery to control risks of cartels and oligopoly among agricultural producers in a country.

4. Cost efficiency for WFP in terms of import parity prices with international procurement

5. Contract performance enhanced by the capacity of small-holder farmers to respect contracts

6. Elite capture includes the risk that tenders can be won by elites

7. Weak organisational capacity when farmer's organizations are not fully empowered in a country

8. Appropriate Processes and systems in terms of food quality and reliability of food production processes.

World Bank Risk Drivers Framework (Source: Jaffee *et al*. 2010**)**	**School Feeding Supply Chain risk dimension**
Weather	Production, Procurement, Stocks
Natural Disasters	Production, Procurement, Stocks
Biological and Environmental	Production, Procurement, Stocks
Market related	Trade, Procurement, Stocks
Logistical and Infrastructural	Transportation, Management and Oversight,
Managerial and Operational	Preparation and Distribution , Processing
Public Policy and Institutional	Management and Oversight, Stocks
Political	All

Table 2: General risks and supply chain implications

The table above maps the supply chain risk drivers by the World Bank framework with the school feeding supply chain risk dimension mentioned in this paper (Section 4). It is important to have an accurate mapping of the school feeding supply chain dimensions in order to minimize the potential negative impact of risks on the efficiency and functioning of school feeding supply chains.

3. Typology and Examples of School Feeding Supply Chains

3.1 Basis for Typology

School feeding is implemented in various operating models or supply chain configurations. The models used in practice have significant interdependencies with the context of the target region, i.e., external factors determine program elements and may limit what models may be feasible. Operating models can be characterized in terms of the centralisation or decentralisation (1) of program management, procurement, distribution, and monitoring. And (2) whether these activities can be performed in-house or by a third party. Different approaches can even co-exist within the same country, for example, international programs by WFP or other NGOs and programs run by a local institution.

Despite these differences, clusters, or a typology, of programs can be identified. This clustering of models should be representative and cover the breadth of different implementation models. The classification is based on expert feedback using criteria such as size of program and program maturity. The models are classified along the two dimensions i.e. level of decision making (centralisation) and use of third parties (see Figure 6).

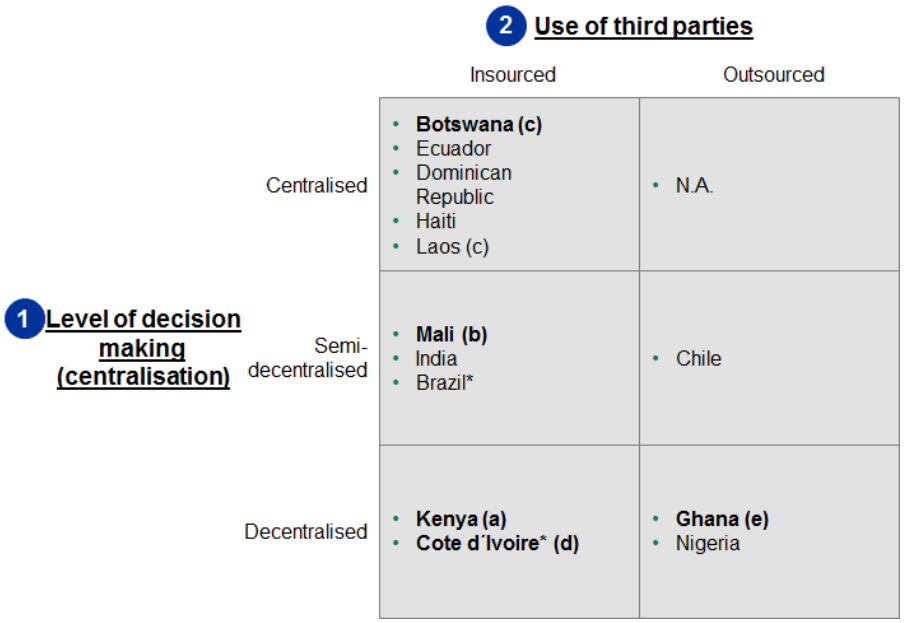

Figure 6: Examples of school feeding implementation models. (Note: pro-smallholder component is denoted by *)

The combination of the 2 dimensions leads to 6 theoretical models. Furthermore, mixed models, i.e. programs with elements of several models, are also possible. For example, one commodity such as non-perishable staples may follow a more centralised setup in contrast to a more decentralised setup for perishables. As a first step in the analysis of school feeding supply chains, this paper aims to cover only a set of the main representative models. Therefore five main types have been identified for this first analysis and will be used in this paper to highlight the application of the developed framework (see Table 3).

	Example	Centralisation	Third party
Decentralised model	Kenya	Decentralised	Insourced
Semi-decentralised model	Mali	Semi-decentralised	Insourced
Centralised model	Botswana	Centralised	Insourced
Integrated farm-to-school model*	Cote d'Ivoire	Decentralised	Insourced
Decentralised third party model	Ghana	Decentralised	Outsourced

Table 3: Main supply chain models (*denotes explicit focus on smallholder production).

3.2 Descriptions of Supply Chain Models

Decentralised model

The first type is the decentralised model; an example of a program typifying this model would be the national school feeding program in Kenya run by the Ministry of Education. In this model production of food stuffs is done by all types of farmers with no special focus on smallholders. Intermediaries such as traders link the producers with the school feeding program. These suppliers have to follow some requirements established by the government. Procurement of food for the program is done immediately after schools receive funds based

on a simple tendering system. Products are received at school level. In terms of preparation and distribution, meals are cooked and served mid-morning or mid-day using community level resources (cash or in-kind). Most of the transportation in this model is organized by the program's supplier, i.e., typically a trader. Transport volumes are small due to the small-scale transactions on school level. Traders keep some stocks while producers typically sell directly at harvest. Some stock is also kept at school level. In terms of resources and management, the government provides funds for the procurement of staples (cereals, beans) and for oversight. In addition, local communities make contributions, e.g., labour for meal cooking, fresh vegetables. The school management committee is tasked with managing the school feeding programme at the school level, including keeping all records of food procurement transactions. At the district level a district government unit such as the District Education Office in close collaboration with relevant line ministries and partners carries out quarterly programme monitoring visits. More decentralised units also monitor programme implementation at the school level.

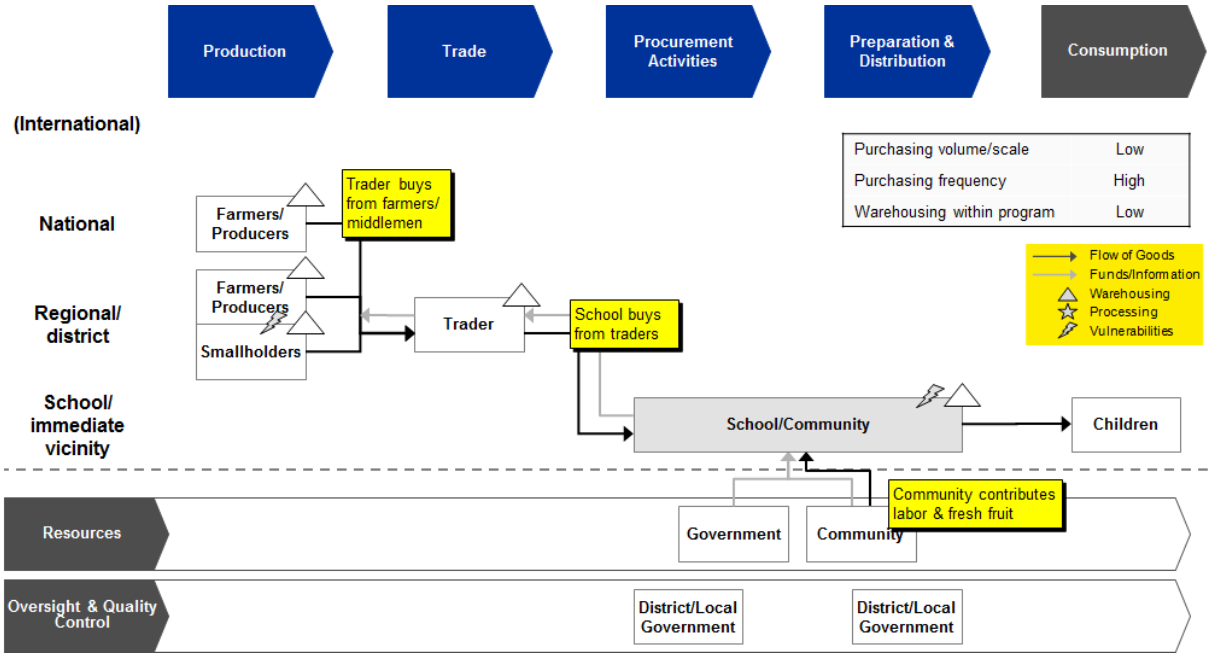

Figure 7: Decentralised model – example Kenya

Semi-decentralised model

The second type is the semi-decentralised model, such as the national school feeding program in Mali. Similar to the decentralised model, production of food stuffs is done by all types of farmers with no special focus on smallholder production. Also intermediaries such as traders are used and satisfy requirements established by the government. The main difference with the school based model is that the district level, i.e., the mayors, are involved in procurement process. Transactions tend to happen less often than in the school level model and involve larger volumes of food. Cash is released through the mayors, with procurement ideally when prices are the lowest. Processing is done at school level. Meals are cooked and served mid-day to schoolchildren. In terms of transportation and warehousing the model is similar to the decentralised model, i.e., transportation is organized by the supplier (trader) and some stocks are kept at trader and school level. In terms of resources and management, the government

provides funds for the procurement of staples (cereals, beans) and for oversight. Local communities contribute as well, e.g., labour for meal cooking, fresh vegetables. The school management committee is tasked with managing the school feeding programme at the school level. Oversight is also provided at the district level, for example, through the Ministry of Education decentralised offices.

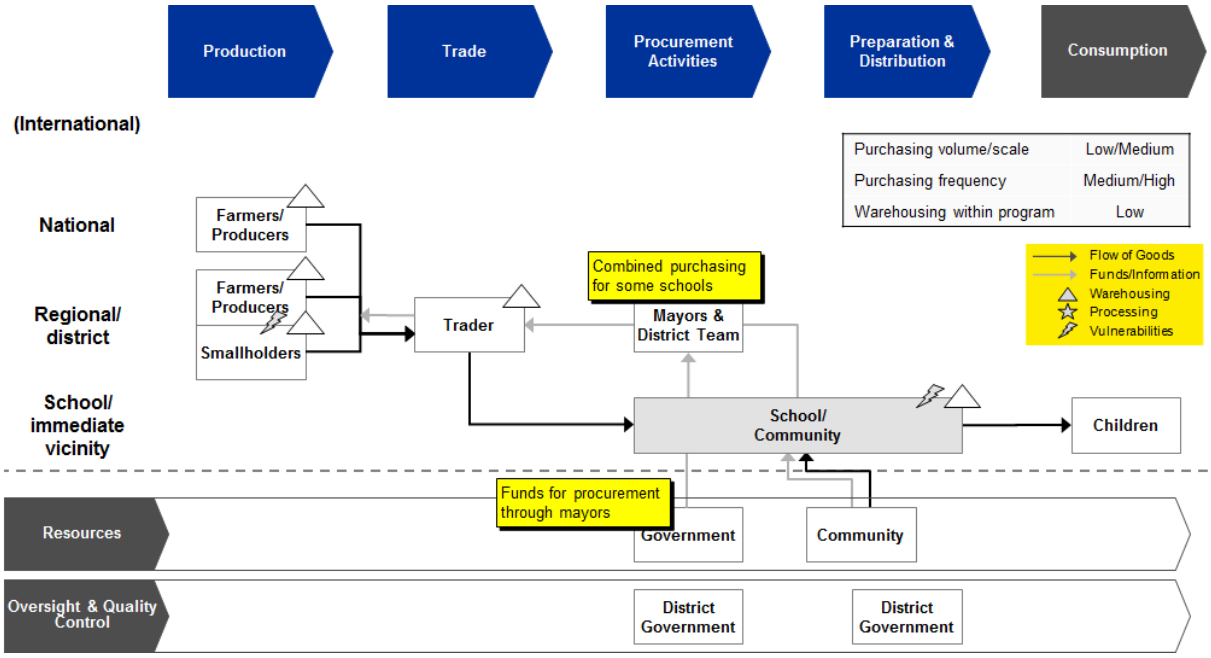

Figure 8: Semi-decentralised model - example Mali

Centralised model

The third type is the centralised model, which refers to country programs administered on a national scale such as Ecuador and Botswana. Often these programs were started by international organizations and followed by a transitioning process to national programs. Here, large-scale national (or international) producers supply the program. Intermediaries may be involved. The key difference is the central food procurement for the whole program. This is done by a unit at national level such as a department in a ministry. Foodstuffs are centrally received and may be stored at intermediate depots. The first leg of transportation tends to be organized by the suppliers or the lead organization. From there they are transported to local delivery points. This is can be organized by the lead organization and executed through (logistics) service providers. Meals are prepared and distributed at school, typically through contracted workers or community members. The program oversight is undertaken by the lead organization, usually with units/staff at regional/district level. Funds for the program are typically provided by the local government (government budget, sometimes supplemented with international support) and given to the central country program. Oversight is generally provided by education officers at district level in the form of quarterly monitoring reports.

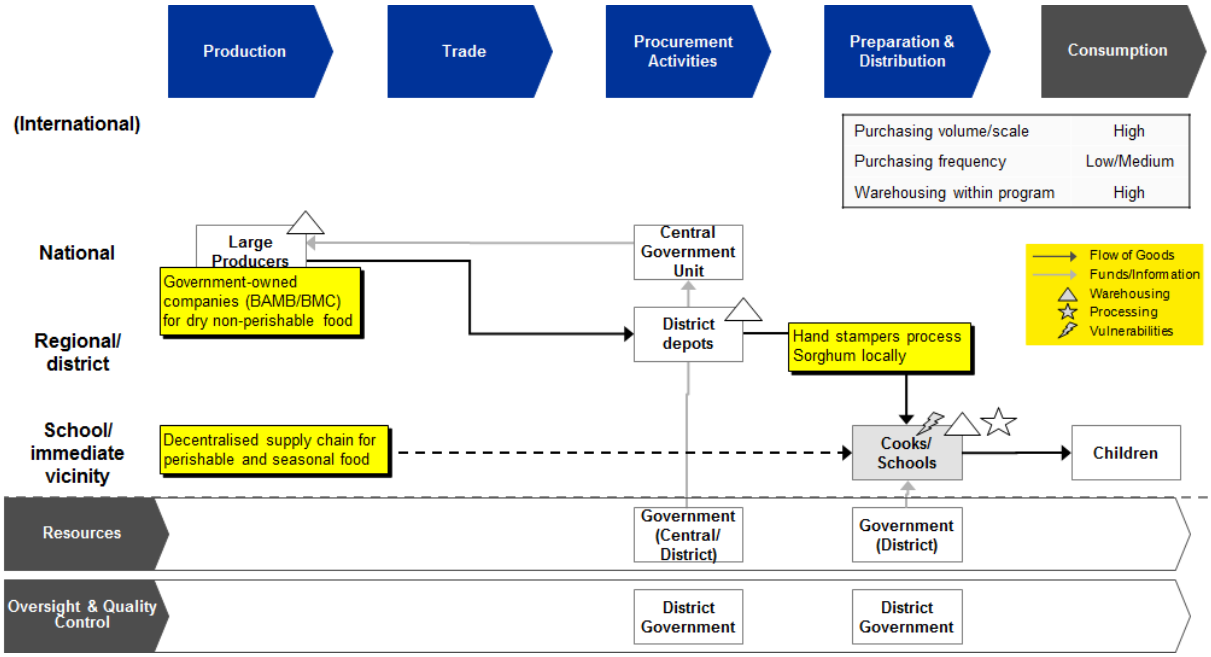

Figure 9: Centralised model - example Botswana

Integrated farm-to-school model

The fourth type is the integrated farm-to-school model, such as the school feeding program in Cote d'Ivoire. In this model special focus is given to the organization of smallholders around schools. These could be, for example, women's groups, whose children attend the same schools that benefit from the school feeding programme. The program includes agricultural support and training to enable the smallholders to increase productivity and progressively meet the school food requirements. In the case of Cote d'Ivoire, the agricultural side of the programme includes provision of inputs such as seeds and tools; advice on the establishment of co-operatives (legal support, statute, internal rules and regulations, organization, financial management); training on farming and livestock techniques, livestock health protection (including vaccinations) and sanitation; food conservation and processing; marketing techniques. Agricultural extension services are provided by a parastatal entity linked to the Ministry of Agriculture, in close collaboration with the institution managing the national school feeding programme. The supply side support activities enable smallholders to increase productivity and quality, and incrementally meet the school food requirements over a period of four to six years. In addition, an alternative sourcing channel provided by larger suppliers is available when smallholders cannot meet the demand. Traders must be certified service providers by law. The sourcing volume is determined based on enrolment figures with smallholders being the preferred first channel. The remainder is sourced at national level through traders. For all transactions commodity prices are set by a central market board. Food stuffs are processed at school level. Subsequently they are cooked and served mid-day. Transportation is organized either through nationally contracted service providers for sourcing from suppliers (national level) or organized by local women's groups. Some stocks are kept at trader level and women's groups. The government provides funds and supports the women's smallholders. Community contributions are possible, as well. Oversight is generally provided by officers from both Ministries of Education at the school level and Agriculture at the farmer organisation level.

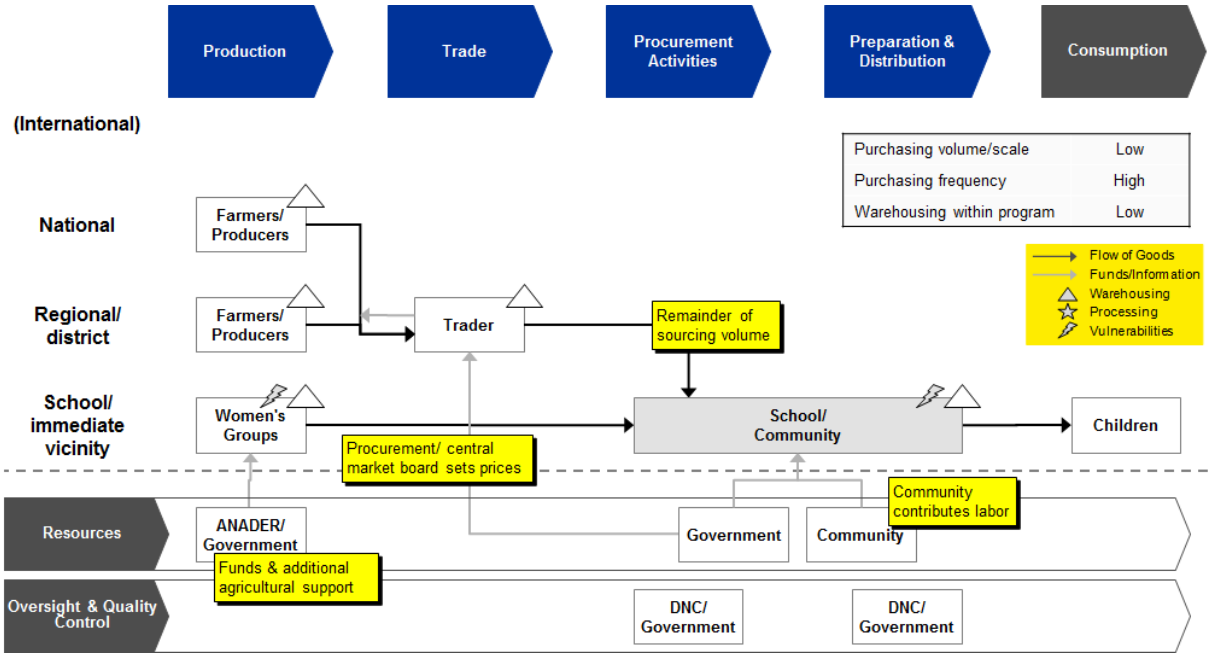

Figure 10: Integrated farm-to-school model - Cote d'Ivoire

Third-party model

The fifth type is the third-party model, such as the national program utilizing caterers in Ghana. Production is mainly done through farmers with no special focus on smallholders. Traders are often used as intermediaries. In this model contracted service providers organize food procurement and processing. Furthermore, they prepare the meals and distribute them to the schoolchildren. Transportation can be organized by the service providers and the suppliers. There is some stock keeping at the service providers depending on their credit. In this model the government provides funds to the service provider, for example, a fixed payment per meal served. Oversight and quality control are provided by the school management committee at school level and by district level education officers.

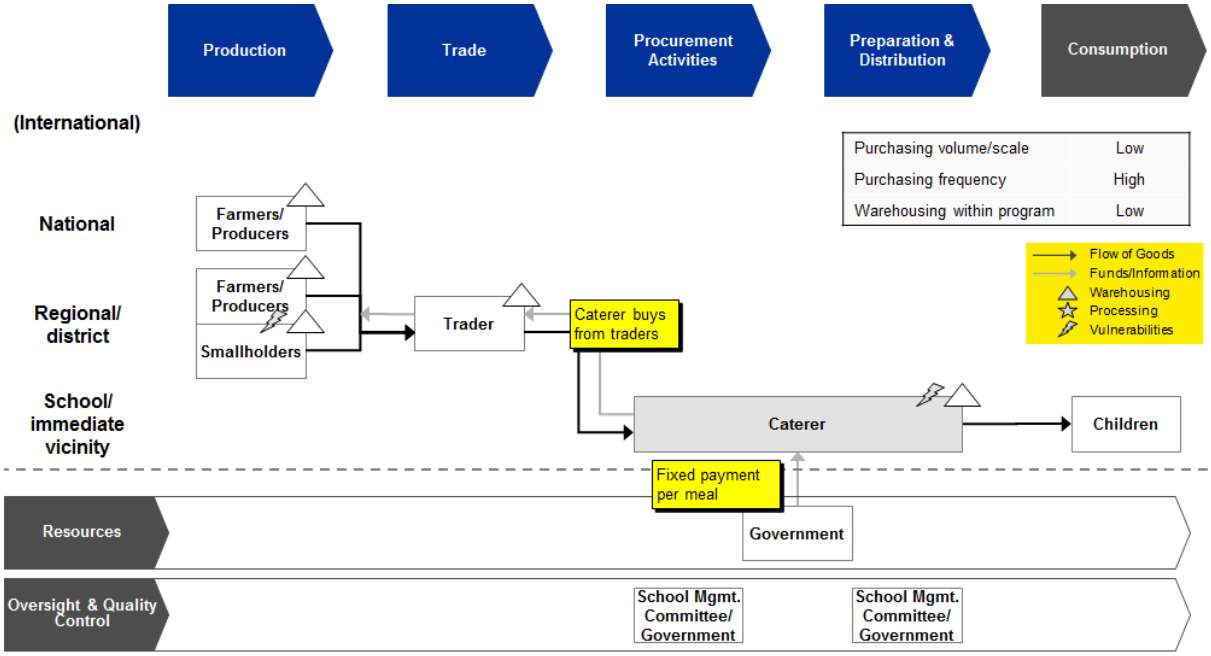

Figure 11: (Decentralised) Third-party model - example Ghana

4. Discussion: Comparison of Supply Chain Models

The selection of the appropriate supply chain model can be guided by a careful examination of both external and internal factors. In this section we will focus on describing some of the questions guiding the decision making process with regards to model selection and internal factors, considering in turn the different dimensions of the supply chain system (see also Table 4 and 5 in Appendix 3). The purpose of this section is to capture some of the inherent trade-offs involved in the decision making process using the supply chain framework developed in section 2 and the 5 supply chain examples in section 3.

It is important to clearly highlight and prioritise the main objectives for the school feeding programme as a whole. This will provide a framework to consider possible trade-offs between objectives in determining specific supply chain strategy and related activities. The different models discussed in the previous section are all framed with education as the primary objective, as is the case for most school feeding programmes. Only the integrated farm to school model, as per the example in Cote d'Ivoire, has smallholder agriculture as a priority. The other models tend to see school feeding as an opportunity for smallholder agriculture market development but have no explicit programme component to address this aspiration.

The models generally face different inherent risks involved in food sourcing. The main assumption in our analysis is that models that work on a more decentralised level in terms of food sourcing (e.g. direct links with smallholder production) are inherently more vulnerable than models that rely on more aggregated systems. Note that the risks we consider are relative to the provision of a steady supply of food of adequate quality and quantity. These risks include contract defaults, delivery of contaminated foods, or delays in delivery, for example. This assumption is reflected in terms of primary food sources, with centralised systems relying on production at national level. However, decentralised school feeding programmes by design may develop supply side support activities, as in the case of the integrated farm to school model where explicit agriculture development activities are provided to reduce the range of vulnerabilities associated with smallholder food production. The trade-offs involved in the trade and procurement dimensions are complex, including regulations and price discovery mechanisms, specifications of lot sizes and frequency of purchasing etc. and further research is required to support decision making processes in this area in particular. The models rely on market transactions at different spatial levels to provide the food supply for the school feeding programme. We make some broad assumptions when examining the different models in these areas. The functioning of more decentralised models will depend on the extent of market integration and efficiency at the specific level of procurement. We made the main assumption that the more decentralised the level of procurement, the smaller the market and more inherently vulnerable the model will be in terms of market effects. Generally, the different models include a number of procurement procedures that guide the operations of the different stakeholders involved in the market transactions.

Preparation and distribution activities are very similar across the models, the main difference being in outsourced models like Ghana where the private sector is tasked with the service delivery (IBD/GIMPA, 2011). In most other cases the programmes rely on different degrees of community involvement, covering both cash and in-kind contributions.

In terms of processing, centralised models tend to provide opportunities for improved quality control and efficiencies through economies of scale. However, overall gains in cost-efficiency will inevitably be offset by the transportation of food from centralised warehouses to the recipient schools. Decentralised models by definition face shorter transportation legs, but are also more complex to manage in terms of quality control. This issue is particularly relevant in the case of food quality, including storage (e.g. aflatoxin contamination) and micronutrient fortification. Decentralised models can also provide fairly diversified menus, relying on perishables sourced from within the community to provide balanced meals. Storage in decentralised models can be a concern, particularly when food procurement occurs on a termly basis and food stocks are kept in school for relatively long periods. Some decentralised outsourced models counter this risk by reducing the time between food purchases to a maximum two week period, as in the case of Nigeria (Shaad et al., 2010).

From this perspective resources, oversight, and quality control tend to be more straightforward in centralised models. However, decentralised models will tend to have more feedback links between beneficiaries and programme management, a key element in terms of accountability and social control.

5. Concluding remarks

This paper presents a first analysis of the supply chains models of school feeding programs. School feeding is a complex form of intervention that is delivered in various, context-specific models or configurations. An increasing need for support and understanding of the different models and modalities has been expressed by governments to aid the design of school feeding programs. Furthermore, supply chain management is a key factor for program delivery and performance of school feeding. A few supply chain analyses have been undertaken in the past; but the focus and approach varies.

This paper develops a standardized framework for the analysis of school feeding supply chains that allows meaningful comparisons of programs across different implementation models. The framework is based on multiple sources of input, coming both from literature and practice such as expert feedback.

Furthermore, this paper proposes a first typology of school feeding supply chain models and provides a background on key examples and models. The framework is used to show the key supply chain relationships in these examples. Based on expert judgement and iterative working sessions a descriptive comparison of the identified school feeding supply chain models was developed, which provides a first view on the various trade-offs of the different implementation models.

This paper is a starting point for the analysis of school feeding supply chains and implementation models and faces a number of limitations. This work is mainly focussed on capturing the perspective of stakeholders responsible for managing a school feeding programme as whole, providing a systems view on the different elements of a school feeding programme. We did not attempt to map the details of all the stakeholder relationships across the system, nor focus on agriculture value chains for school feeding programmes - these remain important areas of further work. The initial analysis of the trade-offs presented in this paper is also limited by the lack of data across the supply chain framework and by the small

number of countries included in this first step. More data both on the supply chain and the supply chain context is necessary (and will be collected) to allow a comprehensive evaluation of advantages and disadvantages of the various models. The developed framework provides a tool to facilitate this analysis and guide the data collection (for a first list of metrics and indicator see Appendix).

A follow-up to this paper involves is a detailed analysis of implementation models and country cases. Based on the proposed frameworks performance indicators and measurements are to be developed and collected. Qualitative and quantitative data, such as inputs and outputs of activities, financial figures, operational indicators, organization-level measures and information on external factors, will lead to more insights on various supply chain models. This may include more information on the challenges and constraints of achieving the various school feeding objectives and possible trade-offs among them. Additional insights may also come from private sector examples with similar supply chains, e.g., hygiene products in the same country such as soap supplied by international or local firms. Furthermore, simulation methods may serve as useful tool in future analyses as well due to the time lags from getting completed impact evaluations.

References

Alderman H, Bundy, DAP. 2011. "School Feeding Programs and Development: Are We Framing the Question Correctly?". World Bank Research Observer. Washington, DC: The World Bank.

Bundy D, Burbano C, Grosh M, Gelli A, Jukes M, and Drake L. 2009. Rethinking School Feeding: Social Safety Nets, Child Development, and the Education Sector. Directions in Development. Washington, DC: World Bank.

Commandeur, D. 2011. Procurement Governance in Home-grown School Feeding. Presentation at the HGSF technical meeting in London.

Ghana Institute of Management and Public Administration (GIMPA)/ U. of California at Berkeley Haas School of Business. 2011. "Ghana School Feeding Program: Re-Tooling for a Sustainable Future". London: Partnership for Child Development.

Galloway R, Kristjansson EA, Gelli A, Meir U, Espejo F, and Bundy DAP. 2009. "School Feeding, Cost and Outcomes." Food and Nutrition Bulletin 30(2): 171–82.

Gelli A, Al-Shaiba N, Espejo F. 2009. The costs and cost-efficiency of providing food through schools in areas of high food insecurity. Food Nutr Bull; 30: 68–76.

Gelli A, Cavallero A, Minervini L, Mirabile M, Molinas L, and Regnault de la Mothe, M. 2011. "New Benchmarks for Costs and Cost-Efficiency for Food Provision in Schools in Food Insecure Areas". Food Nutr Bull; 32: 324−332.

Gelli A, Neeser K and Drake L. 2010. Home Grown School Feeding: linking small holder agriculture to school food provision. London: Partnership for Child Development.

Kretschmer A, Spinler S, van Wassenhove L. 2012. "Supply Chain Management at Humanitarian Organizations: A Structuring Framework for Sustainable School Feeding". In: POMS 23rd Annual Conference, pp. 1-39.

Jaffe S, Siegel P, Andrews C. 2010. "Rapid Agricultural Supply Chain Risk Assessment:A Conceptual Framework". Agriculture and Rural Development Discussion Paper (47), Washington, DC: The World Bank.

Jukes MCH, Drake LJ, and Bundy DAP. 2007. School Health, Nutrition, and Education for All: Levelling the Playing Field. Wallingford, Oxfordshire, UK: CAB International.

PCD/WFP. 2011. School feeding Monitoring and Evaluation toolkit. London: Partnership for Child Development..

Pollitt E. 1989. Malnutrition and infection in the classroom. Paris: UNESCO.

Shaad B, Jaisinghani N and Gelli A. 2010. "Osun State Home Grown School Feeding and Health Programme Case Study". London: Partnership for Child Development.

Sumberg J, and Sabates-Wheeler, R. 2011. "Linking Agricultural Development to School Feeding in Sub-Saharan Africa: Theoretical Perspectives." Food Policy 36(3): 341-349.

University of California Berkeley – Haas School of Business. 2006. "Opportunities for Sustainable Development of the Ghana School Feeding Programme through Agricultural Empowerment".

University of California Berkeley – Haas School of Business. 2007. "The World Food Programme: School Feeding in Ghana Supply Chain Assessment and GSFP Integration".

University of California Berkeley – Haas School of Business. 2005. "Analysis of Regional Scalability of School Feeding Programs Using Locally-produced Foods in Ghana".

University of California Berkeley – Haas School of Business. 2007. "Financial & Monitoring Assessment of the Ghana School Feeding Program".

University of California Berkeley – Haas School of Business. 2008. "Food Staples in the Ghana School Feeding Program: Analysis of Markets, Value Chains, and Menus".

University of California Los Angeles. 2010. "Analysis of the Akshaya Patra Foundation programme".

United Nations Educational Scientific and Cultural Organisation. 2011. " The hidden crisis: Armed conflict and education." Education For All Monitoring Report, UNESCO.

World Food Programme. 2006. "World Hunger Series: Hunger and learning". Rome: World Food Programme.

World Food Programme. 2009. "School Feeding: Needs and coverage analysis". Rome: World Food Programme.

World Food Programme. 2011. "Cost Benchmark Manual". Rome: World Food Programme.

World Food Programme 2012. ''Global School Feeding Survey Results'', Rome: World Food Programme.

World Food Programme. 2012. "School feeding model planning tool". Rome: World Food Programme.

World Food Programme. 2012. "Connecting farmers to markets-the P4P experience so far", presentation given by WFP P4P at Global Child Nutrition Forum 2012, Addis Ababa, 2012.

World Food Programme and Boston Consulting Group. 2011. School feeding: A Sound Investment. Rome: World Food Programme.

Acknowledgements

All co-authors contributed to the analysis of the material presented here and were involved in drafting the paper. AG conceived the study and drafted parts of the framework, model descriptions and trade-off sections. AK conceived the study and drafted parts of the framework and most of the figures and tables. LM drafted the vulnerability section and parts of the introduction. MR provided programme and policy perspectives and details on Cote d'Ivoire. All authors read and approved the manuscript.

We would like to thank the following people for their feedback: Carmen Burbano (WFP), Gian Carlo Cirri (WFP), Dick Commandeur (SNV), Salha Hamdani (PCD), Kristi Raube (UC Berkeley), George Scharffenberger (UC Berkeley), Emilie Sidaner (WFP), Stefan Spinler (WHU -Otto Beisheim School of Management). We are also grateful to all the participants of the London HGSF technical meeting for their inputs.

Appendix 1: Example of Metrics and Indicators for School Feeding Activities

- Strategic level
    - Level of local development (capturing value for local economy)
    - Vulnerability to price fluctuations
    - Potential supply disruptions and/or degradation
- Production
    - No. of producers
    - Mix of producers
    - Local producers in %
    - Local production capacity/quality
- Trade
    - No. of intermediaries
    - Supply capacity
- Procurement Activities
    - Purchasing volume
    - Purchasing frequency
    - Cost per child
- Preparation & Distribution
    - Preparation time
    - Efforts needed
    - Meals per day
    - Coverage of beneficiaries
    - Meals per school year
- Flow of Goods, Information, Funds, Warehousing, Processing and Vulnerabilities
    - Delivery volume
    - Delivery frequency
    - Lead time / distance
    - Storage volume
    - Stock level
    - Shelf life/spoilage
    - Service level
- Resources & Management
    - Financial volume
    - Contribution volume
    - Potential misappropriation/mismanagement of funds
    - Capacity and skills requirements at school level
    - Training requirements

Appendix 2: Detailed comparisons of supply chain models

Dimensions	Kenya Decentralised	Mali Semi-decentralised	Botswana Centralised*	Cote d'Ivoire Integrated farm to school	Ghana Third party
Strategy					
Education	High	High	High	High	High
Nutrition	Low-Medium	Low-Medium	Low-Medium	Low-Medium	Low-Medium
Value Transfer	Low-Medium	Low-Medium	Low-Medium	Low-Medium	Low-Medium
Agricultural Development	Low	Low	Low (Medium)	High	Low
Community Engagement and Development			Low-Medium		
...		Aspirational – programmatic gap		Aspirational – programmatic gap	
Production					
Inherent production risks (seasonality, losses,...)	Medium	Low-Medium	Low	Medium-High	Medium
Primary sources					
International	No	No	No	No	No
National	Yes	Yes	Yes	Yes	Yes
Regional/District	Yes	Yes	No (Yes)	Yes	Yes
ImmediateVicinity/School	No	No	No (Yes)	Yes	No
Agricultural Support					
Productivity Improvements (inputs & training)	No	No	No (Yes)	Yes	No
Regulatory & Financial Support (credit & legal)	No	No	No (Yes)	Yes	No
Market Access (rules, aggregation)	No	No	No (Yes)	Yes	No
Backup Supply Chain	No	No	?	Yes	No
Effective production risk (incl. countermeasures)	Medium	Low-Medium	Low	Low-Medium	Medium
...					
Trade					
Inherent trade risks	?	?	?	?	?
Intermediaries used	Yes	Yes	Yes/No	Yes/No	Yes
No. of intermediaries	Medium	Medium	Low-Medium	Low-Medium	Medium
Market power of intermediaries	High	High	Low-Medium	Medium	High
Level of market integration					
Price control mechanisms					
Effective trade risk (incl. countermeasures)	Medium	Medium	n.a./Low(no trade)	Low-Medium	Medium
...					
Procurement Activities					
Inherent procurement risk	?	?	?	?	?
Centralisation of procurement	Low	Medium	High	Low	Low
Responsible/implementer	School	Mayor	Central government	School	Service provider/caterer
Supplier requirements (government/donor)	Yes/Medium	Yes/Medium	?	Yes/Medium	No/Low
Smallholder specific measures (quota etc.)	No	No	(Yes)	High	No
Formality of tendering & pricing	Low	Medium	High	Low	Low
Scale	Low	Medium	High	Low	Low
Frequency of tendering/purchasing	High	Medium	Low	High	High
Lot size	Low	Medium	High	Low	Low
Effective procurement risk (incl. countermeasures)	?	?	?	?	?
...					
Preparation & Distribution					
Inherent preparation & distribution risk	?	?	?	?	?
Centralisation of meal preparation	Low	Low	Low	Low	Low
Responsible/implementer	School	School	School	School	Service provider/caterer
Outsourced/managed by service provider	No	No	No	No	Yes
Community involvement	High	High	Medium	Medium	Medium
Effective preparation & distribution risk (incl. cour	?	?	?	?	?
...					

Table 4: Detailed comparison of supply chain models (1/2)

Dimensions	Kenya Decentralised	Mali Semi-decentralised	Botswana Centralised*	Cote d'Ivoire Integrated farm to school	Ghana Third party
Processing					
Inherent processing risk	?	?	?	?	?
Centralisation of processing	Low	Low	Low	Low	Low
Responsible/implementer	School	Mayor	District government	School	Service provider/caterer
Valued adding activities (milling, defumagation, pasteurisation etc.)	No	No	Yes	No	No
Fortification	No	No	No	No	No
Effective processing risk	?	?	?	?	?
...					
Transportation					
Inherent processing risk	?	?	?	?	?
Responsible/implementer - to intermediate storage/distribution points	n.a.	n.a.	Suppliers/ producers	n.a.	n.a.
Responsible/implementer - final destination	Trader	Trader	Government/ service providers	?	Caterer
Transport volume/ distances	Low	Low/Medium	High	Low	Low/Medium
Effective processing risk	?	?	?	?	?
...					
Stocks					
Inherent stock risk	?	?	?	?	?
At production level	?	?	?	?	?
At intermediary/trade level	Medium	Medium	Medium	Low/Medium	Medium
Intermediate storage/distribution points	n.a.	n.a.	Medium	n.a.	n.a.
At final destination	Low	Low	Low	Low	Low
Effective stock risk	?	?	?	?	?
...					
Resources					
Inherent management & oversight risk	?	?	?	?	?
Government contribution	Medium	Medium	High	Medium/High	Medium
Donor contribution	?	?	?	?	?
Community contributions: labor, in-kind, funds	Low/Medium	Low/Medium	Low/Medium	Low/Medium	Low
Effective resources risk	?	?	?	?	?
...					
Oversight & Quality Control					
Inherent management & oversight risk	?	?	?	?	?
Transparency	Low	Low/Medium	High	Low/Medium	Low/Medium
Oversight/control	Low	Low/Medium	High	Low/Medium	Low/Medium
Food management & quality control	Low	Low/Medium	High	Low/Medium	Low/Medium
Effective oversight & quality control risk	?	?	?	?	?
...					
Summary					
Key Issues	Product availability, pricing	Similar/better than decentralised, but more distance of beneficiaries/ less socical control	Accountability/ distance from beneficiaries, (management) capacity of implementer (logistics know how)	Risk/ vulnerabilities of smallholders, costs/efforts needed to include smallholders	Accountability of service provider, capacity/ capabilities of of service provider
Key Insights/Solutions	tbd	tbd	tbd	Backup supply chain counters negative effects from smallholder sources	tbd
...					

Table 5: Detailed comparison of supply chain models (2/2)

Appendix 3: System Assessment and Benchmarking for Education Results (SABER), School Feeding Sub-System, Draft Framework Rubrics

The System Assessment and Benchmarking for Education Results (SABER) for School Feeding is part of a larger exercise by the Education Department of the World Bank's Human Development Network (HDNED), which aims to benchmark all of the education sub-systems. Geared towards improving the advice and operational support offered by the Bank to its partner countries, this exercise seeks to provide a standards of good practice against which countries can rate themselves. The expectation is that such a resource will facilitate comparative policy analysis, identify the key areas to focus investment, and assist in disseminating good practice.

In determining "what matters" for the School Feeding sub-system, a set of framework rubrics have been developed, identifying key domains within a policy framework along with metrics for domains, performance drivers, and policy actions, including stages of development. These four stages have been standardized across the policy actions according to levels of implementation: *latent* being very little implemented, *emerging* being implementation between the levels of latent and established, *established* being minimum implementation, and *advanced* being comprehensive implementation. These framework rubrics have built on experience from benchmarking other education sub-systems, existing international consensus[4], as well as advice from an Advisory Committee of experts[5].

As a high-level, general assessment, this document is aimed at stimulating dialogue and identifying key areas for focusing support for school feeding within a country's basic education system. These areas themselves may have more in-depth tools that can be utilized in strategic planning moving forward. Another next step might be a survey of country activities, the details of which these framework rubrics are not aimed at capturing.

Domain	Performance Driver
1. Policy frameworks	Overarching policies for school feeding - sound alignment with the national policy
2. Financial capacity	Governance of the national school feeding program - stable funding and budgeting
3. Institutional capacity and coordination	School feeding coordination - strong partnerships and inter-sector coordination
	Management and accountability structures, including staffing - strong institutional frameworks for implementation
4. Design and implementation	Quality assurance of programming and targeting, modalities, and procurement design, ensuring design that is both needs-based and cost-effective
5. Community roles – reaching beyond schools	Community participation and accountability - strong community participation and ownership (teachers, parents, children)

[4] Guiding principles have included the joint World Bank and World Food Programme publication and the standards therein.

[5] Including representatives of GlaxoSmithKline, International Food Policy Research Institute, London School of Hygiene and Tropical Medicine, Partnership for Child Development, Save the Children, UNICEF, World Bank, World Food Programme, and World Health Organization.

Other articles in the PCD working paper series:

- Linking Agricultural Development to School Feeding: HGSF Working Paper 1
- Developing Rations for Home Grown School Feeding: HGSF working Paper 2
- Home-Grown School Feeding & Social Protection. HGSF Working Paper 3
- Food provision in schools: developing an evidence-based programme. HGSF working paper 4
- Home-Grown School Feeding & Social Protection. HGSF Working paper 5

The working paper series and a wide range of HGSF resources are available for download from www.hgsf-global.org