Hunger and learning: evidence on the costs and effectiveness of providing food through schools in food-insecure areas.

PhD Thesis

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Abstract

Globally, over the last decade primary school access has improved significantly. Yet challenges remain: 67 million primary school-aged children are not in school. Poor nutrition and health among schoolchildren are important barriers in achieving education-for-all goals. School feeding is a popular intervention supporting the education, health and nutrition of children in food-insecure settings. However, school feeding programmes are complex, involving a broad range of stakeholders across different sectors and implementation levels.

This thesis is aimed at providing evidence to support policy-makers in managing trade-offs among alternative targeting approaches, feeding modalities, and costs. This work is also aimed at building an evidence-based framework to guide Governments in managing the inherent complexity of school feeding interventions.

The thesis includes an analysis of a natural experiment involving survey data from 32 countries across sub-Saharan Africa that suggested that school feeding increased enrolment by 10 percent. Enrolment changes varied by modality and gender, with onsite meals having stronger effects in the first year of treatment in lower grades, and onsite combined with take-home rations being effective post-year 1, particularly for girls. Expenditures across 62 countries indicated considerable differences in costs across modalities, ranging from $23 USD for fortified biscuits to $75 USD for take-home rations. This raises important questions of cost-effectiveness and sustainability, also in terms of school-level costs not normally captured in programme expenditures. Findings also suggest that school level costs are substantive, and are a considerable overhead, considering that these costs are generally borne by food-insecure communities. The thesis also highlights that scaling-up school feeding requires significant financing, on average equal to 40 percent of primary education costs. Despite these opportunity costs there is strong buy-in on school feeding from governments in sub-Saharan Africa. The implications of this thesis also suggest that the complexity of school feeding as an intervention has perhaps been underestimated by policymakers. Strengthening the evidence linking outcomes to the design of school feeding and to the quality of the service delivery, including the trade-offs between implementation modalities, remains a critical area of future research. This thesis provides both a foundation and a step towards answering these complex questions in a comparable and meaningful way.

Declaration of originality

The work presented in this thesis is my own unless otherwise referenced.

Statement of accompanying submissions

This research is framed within the key research areas identified in the "Rethinking School Feeding - Social Safety Nets, Child Development and the Education Sector", a joint World Bank, World Food Programme and Partnership for Child Development book, which I co-authored.

This work provides new data on effectiveness, costs and cost-efficiency of school feeding programme, based on a number of publications including:

Chapter 4 uses data from a study I co-authored in 2007 with Francisco Espejo and Ute Meir. In earlier this paper I was responsible for the design, analysis and reporting. FE supported the design and reporting. UM supported the reporting and provided programmatic inputs.

> *Gelli, Aulo, U. Meir, and F. Espejo. "Does Provision of Food in School Increase Girls' Enrollment? Evidence from Schools in Sub-Saharan Africa." Food and Nutrition Bulletin 28, no. 2 (2007): 149-55.*

Chapter 5 is based on a paper published in the Food and Nutrition Bulletin. In this paper I was responsible for the design, data analysis and reporting.

> *Gelli A, Cavallero A, Minervini L, Mirabile M, Molinas L, and Regnault de la Mothe, M. New benchmarks for costs and cost-efficiency for food provision in schools in food insecure areas. Food and Nutrition Bulletin 2011;32(4): 324-332.*

Chapter 6 uses data that was collected by Andrea Cavallero using the survey instrument I developed.

The methodology for **Chapter 7** is based on a paper published on the Food and Nutrition Bulletin. In this paper I was responsible for the design, data analysis and reporting. DB and CB provided the strategic guidance and ensured the policy relevance of the research findings and report. CR provided support on the break-point regression used in the paper but not in Chapter 7. KN supported the data collection.

> *Bundy D, Burbano C, Gelli A, Risley C, Neeser K. On the transition to sustainability: an analysis of the costs of school feeding compared with the costs of primary education. Food and Nutrition Bulletin 2011;32(3):201-5.*

Chapter 8 is based on a paper submitted to Trials co-authored with Edoardo Masset. In this paper I led the development of the school feeding dimension and EM led the development of the agriculture dimension.

> *Masset E and Gelli A. Community participation and the links between agriculture, nutrition and education: design of a randomised field experiment of "home-grown" school feeding in Mali. Submitted. Trials, 2012.*

The **conclusions** chapter includes some material presented in a paper I co-authored with Francisco Espejo. In this paper I was responsible for the approach, analysis and reporting. FE provided insights into policy uptake.

> *Gelli A and Espejo F. School feeding, moving from practice to policy: reflections on building sustainable monitoring and evaluation systems. Accepted. Public Health Nutrition. 2012.*

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Abbreviations

ASAL	Arid and semi-arid lands
BIDPA	Botswana Institute for Development Policy Analysis
BMI	Body mass index
BMR	Basal metabolic rate
CAADP	Comprehensive Africa Agriculture Development Programme
CAP	Centre d'animation pedagogique
CBA	Control before after
CCT	Conditional cash transfers
CFA	West African Franc
CGS	School management committees
CO	Country office
CRS	Catholic Relief Service
CSB	Corn soya blend
DOC	Direct operational costs
DSC	Direct support costs
EFA	Education for all
EMIS	Education monitoring information system
EP	Essential Package
EPS	Existing programme school
FAO	Food and Agriculture Organisation
FFE	Food for Education
FRESH	Focussing Resources on Effective School Health
GDP	Gross domestic product
GoK	Government of Kenya
Gov	Government
HGSF	Home-grown school feeding
IDP	Internally displaced people
IFPRI	International Food Policy Research Institute
ISC	Indirect support cost
Kcals	Kilo-calories
KSh	Kenya Shillings
LIC	Low income country
LIFDC	Low income food deficit country
LTSH	Landside transport shipping and handling
M&E	Monitoring and evaluation
MDG	Millennium Development Goal
MDM	Midday meals
MT	Metric tonne
NEPAD	New Partnership for Africa's Development
NER	Net enrolment ratio
NGO	Non-governmental organisation
ODOC	Other direct operational costs
OLS	Ordinary least squares

OVC	Orphans and vulnerable children
PAL	Physical activity level
PDPF	School Feeding Service
PPP	Purchasing power parity
PPS	Probability proportional to size
PTA	Parent teacher association
RCT	Randomised control trial
SD	Standard deviation
SF	School feeding
SFP	School feeding programme
SNV	Dutch Development Organisation
SPR	Standard Project Reports
SSA	Sub-Saharan Africa
THRs	Take-home rations
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
USD	United States dollar
USDA	United States Department of Agriculture
VAM	Vulnerability analysis and mapping
WB	World Bank
WFP	World Food Programme
WHO	World Health Organisation

Chapter 1: Background and rationale

Globally, access to primary education has improved significantly in the last decade. Yet challenges remain: 67 million children of primary school-age are not in school and 53 percent of them are girls (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., 2008). The irregular school attendance of malnourished and unhealthy children is one of the key factors in poor performance. Even short-term hunger, common in children who are not fed before going to school, can have an adverse effect on learning (Jacoby et al., 1998). Children who are hungry have more difficulty concentrating and performing complex tasks (Grantham-McGregor et al., 1998). In 2006, monitoring data from the World Food Programme (WFP) programmes showed that in newly-assisted schools 63 percent of pupils on average did not have any food before going to school (Gelli, 2007).

Box 1. Millennium Development Goals and Education For All Goals for Basic Education

MDG's related to education include:

- Goal 2: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling (universal primary education).
- Goal 3: Eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education no later than 2015.

EFA goals include:

- Ensure that by 2015 all children, particularly girls, children in difficult circumstances, and those belonging to ethnic minorities, have access to and complete free and compulsory primary education of good quality.
- Ensure that the learning needs of all young people and adults are met through equitable access to appropriate learning and life skills programmes.
- Eliminate gender disparities in primary and secondary education by 2005, and achieve gender equality in education by 2015, with a focus on ensuring girls' full and equal access to and achievement in basic education of good quality.
- Improve all aspects of the quality of education and ensure excellence of all so that recognized and measurable learning outcomes are achieved by all, especially in literacy, numeracy and essential life skills.

The importance of school feeding programmes has been highlighted by the recent food, fuel and financial crises. A joint analysis recently developed by the World Bank, WFP and the Partnership for Child Development (PCD), of which I was a co-author, identified that every country is in some way and at some scale seeking to provide food to its schoolchildren (Bundy et al., 2009). Countries with the greatest needs in terms of education, poverty and food insecurity are those where school

feeding programs are currently least adequate (see Figure 1.1). However, school feeding is a complex intervention and designing effective programs requires careful balancing of trade-offs among targeting approaches, feeding modalities, and costs. The near universality of school feeding, and the inadequacy of programs in low-income settings, suggest an important opportunity to assist governments in improving programme performance. In particular, "Rethinking School Feeding" (Bundy et al., 2009) identified the need for the development of new technical guidance and knowledge management tools to support the design of school feeding.

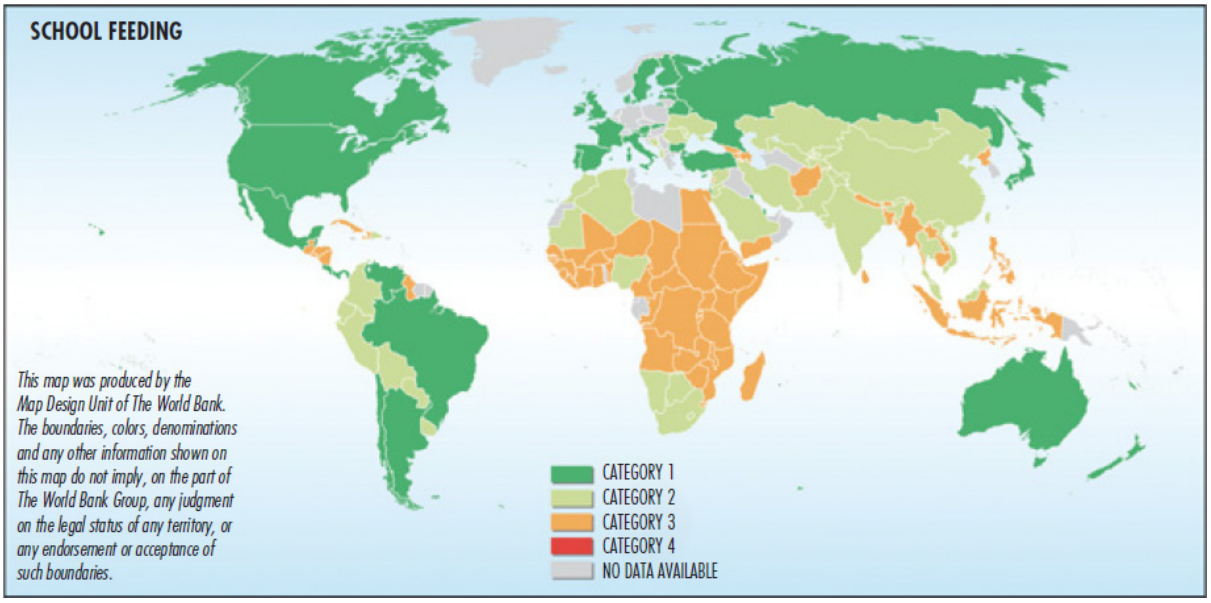


Figure 1.1: School feeding global picture (Source: Bundy et al., 2009). *School feeding programmes are ubiquitous. However, coverage is weakest where the needs are greatest.*

Note: Category 1: Countries where school feeding is available in most schools, sometimes or always; Category 2: Countries where school feeding is available in some way and at some scale; Category 3: Countries where school feeding is available primarily in the most food-insecure regions; Category 4: Countries where there is no school feeding.

Scope of work

This thesis is aimed at providing evidence from a cross-country perspective in key research areas identified in the "Rethinking School Feeding" research agenda. The purpose of this research is also to build an evidence-based framework that can guide national Governments in low-income countries in school feeding design and evaluation. In particular, this research explores explicitly some of the trade-offs associated with the different modalities of school food provision, including costs, benefits and the associated demand for food.

This thesis is structured as follows: Chapter 2 includes a review of the recent literature on the impacts and costs of school feeding. In chapter 3, the findings of the review are used to develop the programme theory for school feeding following a standard programme evaluation approach (Rossi et al., 2005). The approach first sets out to describe the needs of the programme and the

characteristics of the target population, and then develops some of the programme theory for school feeding, covering both impact and process dimensions. In particular, this section will look to unpack the potential benefits in terms of education and education efficiency.

The focus of the thesis then shifts on to the analysis of cross-country school feeding data to examine, in turn, the impact on enrolment, financial and economic costs, and the sustainability of school feeding investments. Chapter 4 examines one aspect of educational efficiency related to school access, including an assessment of cross-country effects of the provision of food and additional take-home rations on student enrolment in schools in food insecure areas. This chapter includes a meta-analysis of the largest school-level dataset collected on school feeding, covering 32 countries across sub-Saharan Africa. This is followed by an analysis across 62 countries estimating the programmatic costs and cost-efficiency associated with providing food through schools in food-insecure, middle- and low-income country contexts. This analysis is complemented by an analysis of school level costs not normally captured in aggregate level cost analyses. Chapter 7 examines the relationship between the costs of school feeding and investments made in primary education, identifying opportunities for cost containment and increasing sustainability. Chapter 8 develops the design of a randomised control trial of school feeding linked to smallholder agriculture, a key intervention aimed at improving programme sustainability. The thesis then concludes with a summary of the trade-offs involved in the design of school feeding.

What is school feeding?

School feeding can be defined as the provision of food to children through schools. The purpose of school feeding programmes in low-income settings is generally to support the education of children living in poverty and food insecurity (Bundy et al. 2009). School feeding programmes are inherently multisectoral in nature, involving mainly education, health and ministries. Recently, school feeding programmes have also seen involvement from the agriculture sector looking to tap into the market for goods and services involved in school food provision. The impact pathways for school feeding are complex, and involve interactions between poverty, health and nutrition status of school children and their participation and learning in school. Developing an improved understanding of the rationale and intent behind school feeding is a key aim of this thesis and these issues will be explored in more detail in subsequent chapters[1].

In terms of service delivery, school feeding programmes come in one of two basic modalities:

[1] Chapter 3 of this thesis will focus on developing the programme theory, capturing the intent behind school feeding programme design.

1. Onsite meals or snacks are generally implemented to support access to education and enhance learning by reducing short-term hunger, and in the case of fortified foods by improving micronutrient status.
2. Take-home rations conditional to attendance are generally used to provide the incentive to support access to education, primarily through an income transfer effect.

In some contexts school feeding programmes combine onsite meals/snack programmes with an extra incentive from take-home rations targeting a specific group of vulnerable children identified in the problem analysis (e.g. orphans, or older girls). By spreading the extra costs of the take-home rations across all the assisted population, benefits to targeted vulnerable groups can be achieved at relatively small additional investment.

Historically, onsite meals have been the most popular modality of school feeding interventions. There are four main options for onsite feeding: breakfast, mid-morning snack, lunch, and dinner (only for boarding schools). The timing and nature of the meal depends on the length of the school day, the local customs, availability of trained cooks and a kitchen, clean water and many other factors. In order to address short-term hunger and support learning in the classroom, the meals have to be provided early in the school day. Providing cooked meals on time is often challenging, as cooks must start their work very early, which is often rather impractical. Cooking food in school also involves considerable costs; it requires amongst other things, suitable water and sanitation, cooking facilities, cooks, stoves, firewood, pots, bowls and spoons, etc.

When facing considerable infrastructure constraints, as in the aftermath of a conflict or natural disaster, some school feeding programmes may choose to implement a school snack consisting of fortified, high-energy biscuits. This choice is aimed at delivering a basic school feeding service whilst minimising school level costs (those that are usually borne by the community, which is generally not in a position to cover the costs over a long period of time, see Chapter 6). Biscuits are usually packed in individual packets that can be easily stored and distributed without too much effort on the part of the schooling authorities, and are therefore usually less disruptive to the school day than cooked lunches. In order to support learning in the classroom biscuits tend to be delivered as snacks early in the school day. School feeding programmes that use biscuits potentially have another advantage over conventional onsite feeding: a biscuit is regarded as a snack rather than a meal, and is therefore unlikely to replace meals given to the child at home. Furthermore, the biscuit is a compact source of nutrients that is easy to store, easy to distribute, and needs no preparation. However, biscuits are not always the preferred choice of children, and may lead to unhealthy eating practices.

Take-home rations are more suitable to target individual students such as girls, and are less complex to implement than conventional school meal programmes that require substantial investments both

in terms of infrastructure and community inputs. For instance, take-home rations in the form of 4 litre vegetable oil cans are fairly easy to store and distribute, and food distribution take place only once per month or less conditional on school attendance rates above a certain threshold, usually set at 80 percent. Take-home rations provide a direct, higher value income transfer to families than school meals, which can provide a strong incentive for increased school participation. From this perspective, each take-home rations provides an immediate, income-based benefit, of the order of about 10-20 percent of monthly household income per child.

In summary

School feeding programmes are key interventions in the response to the global economic and food price crises. School feeding is a simple idea, but implementation is complex and very context specific. School feeding generally comes in two basic modalities: onsite meals and take-home rations with important trade-offs in terms of programme design. Chapter 2 provides a synthesis of the recent literature on costs and benefits of school feeding programmes.

Chapter 2: Reviewing the evidence on the impact and the cost of school feeding

Abstract

Background: School feeding programmes are very common interventions across the world. The popularity of school feeding perhaps hinges on the simplicity of the idea of providing a meal to children whilst in school. Are the investments in school food justified? What is the evidence?

Objectives: To review the recent literature on school feeding programme impact, with a particular focus on summarising the evidence of the educational benefits of school feeding.

Methods: Literature databases, including PubMed, Web of Science and United Nations databases were searched to identify relevant peer reviewed reports, journal articles and other grey literature on the physical and social benefits of providing school feeding to primary school-age children. The studies were screened for inclusion based on criteria including the type of design, study population and outcomes of interest. Educational outcomes included school participation (including enrolment, attendance and drop-out) and school achievement (including intelligence test scores, psychomotor and mental development, attention, memory, reasoning, verbal fluency, vocabulary, on-task behaviour). Physical health outcomes included nutritional status (anthropometry, body mass index, micronutrient status, haemoglobin, and haematocrit) as well as the reduction of hunger and nutrient intake. Primary school age children were the primary subjects of all the studies we considered.

Discussion: The review indicates that school feeding programmes are very common interventions with potential impacts across education, health and nutrition. The review highlights though that in terms of impact on school participation, there is little evidence that different school feeding modalities have different effect sizes; whether we look at enrolment, attendance, or drop-out. The evidence also suggests that the different modalities have very different costs. This raises important questions in terms of cost-effectiveness and sustainability. The review findings highlight the complexity involved in both implementing and evaluation school feeding programmes. School feeding involves a broad range of stakeholders working across different sectors and levels of implementation. Programme activities have both direct and indirect impacts on beneficiaries across the system linking food production to food distribution. Important gaps in the evidence centre on understanding the trade-offs involved in alternative configurations of school feeding implementation. Some of these gaps, including direct assessments of costs and outcomes, will be addressed in subsequent chapters of this thesis.

Introduction

School feeding programmes are very common interventions across the world. The popularity of school feeding perhaps hinges on the simplicity of the idea of providing a meal to children whilst in school. In practice, school feeding programmes are in fact quite complex and costly, with many context specific configurations. Are the investments in school food justified? What is the evidence? This chapter presents a review of the literature used to answer these questions, with a particular focus on summarising the evidence of the educational benefits of school feeding.

Methodology

Literature databases, including PubMed, Web of Science and United Nations databases were searched to identify relevant peer reviewed reports, journal articles and other grey literature on the physical and social benefits of providing school feeding to primary school-age children. The studies were screened for inclusion based on criteria including the type of design, study population and outcomes of interest. In considering the type of outcome measures to assess, I adapted those chosen by a systematic review of school meals (Kristjannsson et al., 2007). Educational outcomes included school participation (including enrolment, attendance and drop-out) and school achievement (including intelligence test scores, psychomotor and mental development, attention, memory, reasoning, verbal fluency, vocabulary, on-task behaviour). Physical health outcomes included nutritional status (anthropometry, body mass index, micronutrient status, haemoglobin, and haematocrit) as well as the reduction of hunger and nutrient intake. Primary school age children were the primary subjects of all the studies we considered. The results of recent studies identified in the review are summarised in the following sections.

Evidence of programme impact

A systematic review of school feeding (Kristjansson et al., 2007) including 8 studies in middle- or low-income countries assessed the impact of onsite meal programs on education and nutritional outcomes[1]. The meta-analysis identified small but significant improvements in attendance, cognition and nutritional status in students receiving onsite meals compared to students in control groups. RCTs showed statistically significant increases in attendance equivalent to 4 to 6 days over a 200 day school year. The effect was much greater but not statistically significant in the control before after studies[2] (CBAs). School feeding had a positive impact on math performance (effect size ~0.3 SDs in CBAs). Positive effects were also identified in short-term cognition, on-task and classroom behaviour. Significant effects were also identified in weight gain (0.25 kg per year in RCTs, 0.73 kg in CBAs) and height (0.25 cm per year in RCTs, 1.47 cm per year in CBAs).

In northern Burkina Faso, a randomised control trial[3] (RCT) assessed the impacts of two alternative school feeding interventions, onsite meal and take-home rations, on enrolment, academic performance, cognitive development and pre-school children nutritional status (Kazianga et al., 2008). The study population consisted of children in 46 villages randomly assigned to three groups (onsite meals, take-home rations and controls) after a baseline survey was conducted in 2006.

[1] The review did not cover enrolment or micronutrient status outcomes.

[2] See section below on impact evaluations for a brief description of control before after studies.

[3] See section below on impact evaluations for a brief description of randomised control trials.

School feeding was then implemented in the following year in the form of cooked lunches served each school day for the onsite meal group, whilst take-home rations which consisted of 10kg of cereal flour were provided to girls conditional to 90 percent school attendance. 48 households selected at random were surveyed around each school, for a total study population of 4140 children aged between 6 and 15 years. Household data was collected on socio-economic status, as well as schooling outcomes and nutritional status for all children. Haemoglobin levels were collected for all children as well as for all women of reproductive age. Both onsite meals and take-home rations were found to increase enrolment by 6 percent. Though there was no difference in raw math scores, small increases in time-adjusted math scores were found for girls. The study found no impact on cognitive development. Students receiving onsite meals on average missed 0.7 more school days than controls, whilst take-home ration beneficiaries missed 0.4 more school days than controls, though differences were not significant. This surprising result was associated with constraints in the supply of household labour and the opportunity costs of schooling. For younger siblings of the student beneficiaries, take-home rations were found to have increased weight for age by 0.38 standard deviations and weight for height by 0.33 standard deviations. Onsite meals had no significant impact on nutritional status of younger siblings.

A RCT set in Internally Displaced People (IDP) camps in Northern Uganda assessed the impact of alternative school feeding modalities, in this case school feeding and take-home rations (Alderman et al., 2010). The study used a prospective, cluster randomized, controlled field experiment carried out between 2005 and 2007, to provide causal estimates of program impact on primary school enrolment, school attendance, age at school entry, grade promotion, and progression to secondary school for a random sample of school-age children living in the service area of the schools. The nutritional benefits of the interventions were also examined (Adelman et al., 2008), assessing impacts on anthropometry and anaemia for primary-school age children. The experimental design was achieved by randomly assigning to three groups (onsite meals, take-home rations and controls) similarly-eligible IDP camps providing the catchment area for the assisted schools. The school feeding interventions were designed to provide food in equal amounts and of the same quality to children in both treatment groups. Two rounds of data were collected over a two year implementation period. Both school feeding interventions had a positive impact on school participation, including enrolment for children not enrolled prior the introduction of school feeding, and on morning and afternoon attendance. Small effects on age at entry and reduction in grade repetition were also identified for both types of school feeding modalities, though no effects were found on progression to secondary school. Measures of anthropometry showed no positive impact of either program on nutritional status of primary school age children. However, large and statistically significant impacts were found on height-for-age of pre-schooler siblings of onsite meal beneficiaries.

One source of field-oriented lessons has come from the WFP standardized school feeding surveys, implemented since 2001, to provide a sound basis for monitoring, evaluation, management, and reporting of school feeding programmes. Findings from a meta-analysis of data from surveys in 32 countries in sub-Saharan Africa, covering over 4,000 WFP-assisted primary schools, indicated that school feeding programmes are associated with positive effects on enrolment (Gelli et al., 2007). In this analysis, schools were grouped according to the type and length of the program: those with existing programs, those that had had the program for less than 1 year, categorized as those with onsite meals or take-home rations, and those that had received no food yet and were going to

initiate a program within the year (used as proxy controls). This study found that during the first year of school feeding assistance, absolute enrolment in WFP-assisted schools increased by 28 percent for girls and 22 percent for boys. After the first year, enrolment trends varied according to the type of school feeding programme that was in place. Where take-home rations for girls were combined with onsite feeding for all pupils, the increase in girls' absolute enrolment was sustained at 30 percent even after the first year. In schools providing onsite feeding alone, changes in absolute enrolment after the first year reverted to those found in the year prior to school feeding implementation. The provision of take-home rations also appeared to reduce the dropout rate of female students, particularly in the higher primary school grades.

In Jamaica, a RCT evaluated the impact of a school feeding program covering 814 school children (Powell et al., 1998). Equal number of children were assigned to receive either breakfast (supplying 576-703 kcal) or a quarter of an orange (18 kcal) as a proxy for placebo within each school and class. Testers were blind to the subject's group, and both groups of children received the same attention throughout the trial. The children receiving school feeding showed small (~2 percent) but significant improvements in attendance. Significant benefits of receiving breakfast were also found in achievement in arithmetic, mainly in grades 2 and 3, but not in spelling or reading. Children in the treatment group also gained more weight and increased in height and Body Mass Index (BMI) compared to the control group. On average, over the 8 month intervention period, compared to the control group, height increased in the treatment group by an additional 0.25 cm and weight increased by 0.4 kg.

A RCT in Kenya (Vermeersch and Kremer, 2004) assessed the impact of school feeding on pre-schoolers. 25 schools were randomly selected from a pool of 50 to receive a school breakfast programme and both group of schools had similar characteristics prior to the introduction of the programme. The breakfast provided about 433 kcals to pupils aged between 4-6 years. Individual level regressions that controlled for child and school level characteristics identified an increase in school participation of 8.5% in the treatment group compared to the control. School feeding also had a positive effect on test scores (~0.4 SDs) but only in schools where teachers were relatively experienced prior to the programme.

In Colombia, an observational longitudinal study examined the influence of providing a school snack on children's health and nutrition status in Bogota (Arsenault et al., 2009). The study population consisted of a random sample of 3202 children (from 3032 households) enrolled in public primary schools selected using a cluster sampling strategy. The clusters were defined as the primary school classes (grades 1-5) of the 361 schools in the capital city. Sampling units were the classrooms (n=8500) and 166 were randomly selected to reach the required sample size. 38 schools were included, and 25 of these were covered by the school feeding programme. The coverage of the school feeding programme was not randomised, and was first introduced in the poorer school districts. The study compared health and nutrition outcomes between children receiving school feeding and those who did not. Micronutrient status outcomes included measures of iron, vitamin B-12 and folate. Growth outcomes included height-for-age and BMI scores calculated using the 2007 WHO reference data. After adjusting for socio-economic status, the provision of school feeding was associated with improved vitamin B-12 status and linear growth, as well as decreased morbidity in the intervention group. School feeding was not associated with significant changes in levels of haemoglobin, ferritin or folate.

An econometric study examined the effects of a wide range of determinants of school participation in rural northern India, focusing on school participation as a household decision (Drèze & Kingdon, 2001). The study analysed data from a survey collecting household data in 122 randomly-selected villages of Bihar, Madhya Pradesh, Rajasthan, Uttar Pradesh, and Himachal Pradesh. In each village, all school facilities were surveyed and a random sample of 12 households was interviewed. Amongst school quality determinants, it was found that female school participation was about 15 percentage points higher when the local school provided a mid-day meal (MDM). Mid-day meals also were found to be associated with improved girls' grade attainment; chances of completing primary education were 30 percentage points higher for girls living in a village with MDM. However, the MDM did not affect the enrolment of boys.

In Bangladesh, in a CBA study, IFPRI evaluated the impact of a school feeding programme implemented by the Government of Bangladesh and WFP that at the time covered approximately 1 million children (Ahmed, 2004). The school feeding programme raised gross school enrolment rates by 14.2 percent (10 percent increase in net enrolment rates), reduced the probability of dropping out of school by 7.5 percent, and increased school attendance by about 1.3 days a month. The calories consumed from the biscuits were almost entirely (97 percent) additional to the child's normal diet. Average energy intake of participating students was 11 percent and 19 percent higher in rural and urban slum areas, respectively, than energy intake of primary school students in corresponding control groups. Participating students also appeared to share the biscuits with younger siblings as energy from the biscuits accounted for 7 percent of total energy intake of children aged two to five in beneficiary households in the rural area. The BMI of participating children increased by an average of 0.62 points, a 4.3 percent increase compared to the average BMI of schoolchildren in the control group. Participation in the school feeding program increased test scores by 15.7 percent points. Participating students performed particularly well in math tests.

The studies set in South Africa focused on identifying the short-term and long-term effects of the provision of fortified biscuits on the micro-nutrient status in primary school-age children (van Stuijvenberg et al., 2000, 2001). The studies assessed micronutrient status in 115 children aged between 6 and 11 year's old before and after consumption of biscuits (fortified with iron, iodine, and b-carotene) for 43 weeks over a twelve month period. The control group consisted of 113 children receiving non-fortified biscuits. Cognitive function, growth, and morbidity were assessed as secondary outcomes. There was a significant improvement in serum retinol, serum ferritin, haemoglobin, transferrin saturation and urinary iodine during the first 12 months of the biscuit intervention. Fewer school days were missed from diarrheal-related illnesses in the intervention group compared to the controls. However, when the school reopened after the summer holidays, all variables, except urinary iodine, returned to pre-intervention levels. Serum retinol increased again during the next 9 months, but was significantly lower in a subsequent cross-sectional survey carried out directly after the summer holidays; this pattern was repeated in two further cross-sectional surveys. Haemoglobin gradually deteriorated at each subsequent assessment, as did serum ferritin (apart from a slight increase at the 42-month assessment at the end of the school year).

In Chile, fortified biscuits were distributed as part of a national school lunch programme that served over 1 million children in 1993. An evaluation of this programme was conducted in order to identify the impact of biscuits fortified with bovine haemoglobin concentrate on school children's iron status (Walter et al., 1993). Significant differences in haemoglobin concentrations were found in the

children from the intervention areas. Low serum ferritin values were also significantly more prevalent in the control group, despite the very low prevalence of anaemia in both the intervention and the control school groups.

An evaluation in southern Vietnam attempted to identify the effect of providing fortified milk and biscuits on school children's height and weight (Hall et al., 2007). The results showed a small but statistically significant difference between intervention and control groups in their average gain in weight and height after one year: 3.19 kg versus 2.95 kg and 8.15 cm versus 7.88 cm respectively. The programme effect was statistically significant after controlling for clustering of children in schools, sex, age and initial underweight. Notably, the most undernourished children benefited the least from the intervention.

In India, WFP provided fortified biscuits to approximately 630,000 school children in the five states of Madhya Pradesh, Chhattisgarh, Orissa, Rajasthan and Uttaranchal. In India, the WFP programme was provided in parallel to the universal national MDM programme. The Institute of Applied Statistics and Development Studies was requested by WFP to evaluate the impact of the fortified biscuit programme in Chhattisgarh, Uttaranchal and Madhya Pradesh. The results showed marked decreases in anaemia prevalence in all the three states and improvements in vitamin A deficiency in two out of the three states.

In Indonesia, the WFP and the Regional Centre for Community Nutrition of the University of Indonesia evaluated the school feeding programme that started in 2004 (Lukito et al., 2006). Results showed no substantive significant improvement in anthropometric indicators. A significant improvement from baseline was found in haemoglobin concentration, resulting in significant decrease in anaemia prevalence (from 26% to 10%). Median cognitive performance expressed as the percentage of maximum test scores increased significantly for verbal fluency, visual processing and concentration.

In Bangladesh, IFPRI and the World Bank evaluated the impact of a Government school feeding programme that covered over 2 million children in 2000 (Ahmed and Del Ninno, 2002). Enrolment in school feeding programme schools increased by 35 percent over the two year period between the programme start and after its first year. This increase was driven by a 44 percent increase in girls' enrolment and by a 28 percent increase for boys. In non-programme schools, enrolment increased by 2.5 percent (5.4 percent for girls and 0.1 percent for boys) during the same period. Attendance in school feeding-assisted schools was found to be 12 percentage points higher than in non-assisted schools (70 percent compared to 58 percent respectively). Drop-out rates were also found to be 9 points lower in school feeding assisted schools than in non-assisted schools (6 percent compared to 15 percent respectively).

A WFP-supported take-home ration programme for girls' education was launched in Pakistan in 1994 and gradually expanded to reach over half a million girl students living in four food-insecure provinces of the country. WFP evaluated the take-home rations programme in seven districts of the North West Frontier Province in a CBA study, surveying all assisted schools and a random sample of non-assisted schools from the same districts (WFP, 2005). This study found that overall enrolment in assisted schools grew by 135 percent between 1998/99 and 2003/04, compared to a more modest 29 percent in control schools during the same period. There was a particularly strong increase in enrolment in the first grade of primary school: 211 percent in programme schools, compared to 5

percent in controls. This suggested that the programme was particularly successful in supporting enrolment of girls who, until then, had never been enrolled. The programme also appeared to increase the awareness of the benefits of girls' education. Before the programme started, 48 percent of households did not send any of their daughters to school; now all parents were found to educate at least one daughter. While 38 percent of families reported that the food incentive was the only reason for sending their daughter to school, 29 percent reported that they would continue educating their daughters even if the programme was stopped. 27 percent of respondents reported that general hostility to girls' education in the community was no longer an issue.

Issues influencing the potential benefits of school feeding

In this section we review a number of issues that have been identified in the literature that mediate the potential to achieve the full benefits of school feeding including food substitution, crowding of classrooms and teachers' time spent in food preparation (Bennett, 2003).

Substitution and household reallocation of food

An important issue that affects the potential impact of school feeding involves the substitution effect, where children consume less at home when they benefit from a meal in school, therefore limiting the overall nutrient intake of participating students. The overall impact of household level reallocation depends on the context. If the children receiving the transfer consume sufficient calories already, then the reallocation may in fact allow the household to address the needs of younger siblings. If children benefitting from school feeding are malnourished, substitution within the household could reduce the potential health and nutrition benefits. The evidence on reallocation in households with beneficiaries of onsite feeding generally indicates that most of the calories provided by the programme "stick" with the beneficiaries (Jacoby, 2002; Ahmed, 2004). Interestingly, the evaluations of fortified biscuits in Bangladesh and Indonesia found that gains in nutritional intake were not limited to the children actually receiving the biscuits at school. The two studies found significant evidence that school children shared the biscuits with their younger sister or brother at home. The recent RCTs in Burkina Faso also found that take-home rations led to an improved of the nutritional status of younger siblings in beneficiary households. This provides emerging evidence of a spill-over effect and a window of opportunity to also affect children during a critical developmental stage when nutritional interventions can have the strongest impact.

Crowded classrooms

In the past, the increase in school enrolment due to school feeding programmes has been associated with crowded classrooms, which in turn may have an effect on learning. Programme experiences also highlight increases in pupil to classroom ratios, particularly in the first year of school feeding assistance. Over the years though, there is evidence that improvements in schooling infrastructure are being made by the assisted school communities to accommodate the extra children (WFP, 2007). One study examined this issue in particular using data from an evaluation of school feeding programme in Bangladesh (Ahmed and Arends-Kuenning, 2003). Classrooms in schools with school feeding had 22 percent more students than classrooms in schools without school feeding. In assisted schools, test scores were lower for beneficiaries of school feeding compared to non-beneficiaries. This may have been because school feeding may be getting the most marginalized children to school, who would likely bring down the test scores initially. In schools without school feeding, average test scores were comparable to those of non-beneficiaries in assisted schools. Class size though was found to have no effect on test scores.

Other potential concerns for school feeding implementation

Field experience has highlighted the important trade-off in terms of teacher's time in preparation and management of school feeding. In India, for example, a survey by the Centre for Equity Studies undertaken in 2003, found that although teachers were not usually involved in cooking meals, they did spend time in organising and supervising the meal provision (Drèze and Goyal, 2003). In addition, the preparation of the cooked meals can be disruptive if the kitchen infrastructure is inadequate, resulting in meals being prepared very close to classrooms and distracting the children during the lessons. One important factor that can address the issues around teachers' time in food management is that of having a school feeding management committee composed of parents, teachers and pupils. Strong management committees can ensure that teachers do not carry the entire burden of running the program. They can also ensure that children—especially girls—are not engaged in cooking, and that eating times are appropriately scheduled so that they do not interfere with teaching. Having strong buy-in from the community, in the form of active school management committees, can also improve the accountability and governance of the programme, strengthening the feedback loops between the beneficiaries, the implementing agencies and donors.

Evidence on the costs of school feeding

A handful of field-based studies, mostly from WFP-assisted programmes provide the most recent information on school feeding programme costs. The studies from WFP programmes use practically identical methodologies, thus making comparisons between the findings more meaningful.

Costs of onsite meals

Estimating the full cost of onsite meal programmes is not always straightforward, as providing cooked meals in schools generally includes a range of school level costs that are normally not included within overall programme expenditures. A recent study (Galloway et al., 2009) estimated the full costs of onsite meal programmes by collecting data from school feeding programme implementers at all levels in 4 countries in Sub-Saharan Africa (Kenya, Malawi, Lesotho and The Gambia). Programme costs were standardised using a typical 200 feeding day school year, a 700kcals daily ration, and also adjusted for breaks in the food delivery pipeline. The costs of school feeding ranged from $28 USD to $63 USD per child per year (weighted average $40 per child per year). On average, commodity costs accounted for 59 percent of total expenditure. The contribution from local communities averaged at 5 percent of total cost (varying from 0 in Lesotho to 15 percent in Kenya), or about $2 USD per child per year on average. WFP costs accounted for 60 percent of total programme costs. Another study covering *only* WFP project expenditures in 42 countries[4] (Gelli et al., 2009) found that in 19 countries providing onsite meals the average cost of the programme, standardised using the same parameters outlined above, was $20.40 USD per child per year. Regional variations in the costs were mostly due to the choice of school feeding modality[5]. Factoring in non-WFP costs, by assuming the same WFP/non-WFP share of full implementation costs as the Galloway et al. study, would imply total costs for onsite meals of approximately $50 USD on average per child per year.

[4] 26 countries in Sub-Saharan Africa, 5 in Asia, 8 in Latin America and the Caribbean, 3 in Middle East and Central Asia. 19 country SF programmes provided on-site meals, 3 provided fortified biscuits, 4 provided take-home rations, and 16 combined on-site and take-home rations.

[5] Notably, in Sub-Saharan Africa, no SF programmes at the time offered fortified biscuits.

Costs of fortified biscuits

Analyses of school level costs for biscuit programmes have generally found these fairly negligible, making cost estimations for this school feeding modality more straightforward. A recent full cost analysis of WFP assisted programmes in three countries[6] found that the weighted average standardised cost of providing fortified biscuits was $12.77 USD per child per year. The cost per beneficiary varied substantially from one country to another, ranging from $10.86 USD in Bangladesh to $17.59 USD in Indonesia. The cost of commodities accounted for an average of 81 percent of total project costs, about 22 percentage points higher than for other cooked meals. Another study in Bangladesh found that the cost of providing biscuits was $18 USD per child per year (Ahmed, 2004).

Costs of take-home rations

As for fortified biscuit programmes, costs at the school level for take-home rations programmes are generally negligible. An analysis of only WFP costs (Gelli et al., 2009) covering four countries (China, Ghana, Pakistan and Yemen) found that the average cost of take-home rations was $52 USD. The higher costs for take-home rations compared to other modalities of school feeding were found to be mostly due to the larger volumes of food distributed to each child; over a school year, take-home rations delivered approximately twice as much food per child compared to onsite meals. Moreover, the standardisation used in this analysis might not always be appropriate for take-home rations programmes, where food is distributed conditional to attendance. Another study on take-home rations in Bangladesh found costs to be US$0.10 per child per day (Ahmed and Del Ninno, 2002).

Other school health and nutrition interventions

Other school health and nutrition interventions are often implemented alongside school feeding. Addressing micronutrient deficiencies, in particular iron and iodine, has been shown to have a positive impact on learning (see Jukes et al., 2008, for a review of studies on nutrition and school performance). Other school-health and nutrition interventions have also been shown to have benefits on learning in the classroom, some for a fraction of the cost of school feeding (see Bundy et al., 2011). A key school health and nutrition intervention within the FRESH framework is helminth control, or deworming. School-age children typically have the highest intensity of worm infection of any age group (PCD, 2003). De-worming interventions have been shown to reduce the prevalence of anaemia and school absenteeism and contribute to the improvement of cognitive function in school age children (Grigorenko et al., 2006), all for a very modest investment of approximately $0.50 USD per child per year (Brooker et al., 2007). The cost per added year of schooling in deworming interventions was estimated to be approximately $3.50 USD per child per year (Miguel and Kremer, 2004). A study examining the long term gains from deworming in Kenya found that participation in the programme increased mean hours worked as an adult by 12 percent. Living standards also improved, with respondents from the treatment group eating one tenth of a meal per day more than controls (Kremer et al., 2011). However, a recent systematic review of deworming on nutrition and school performance found mixed effects (Taylor-Robinson et al., 2012). When infected children were treated, the evidence suggests that the intervention probably improves weight and may improve haemoglobin values. However, when all school children are treated, the evidence was much weaker. Iron deficiency anaemia is thought to affect about 210 million school-age children worldwide, with prevalence of anaemia reaching approximately 40 percent amongst children in

[6] Bangladesh, India and Indonesia.

various parts of Asia and Africa. Research shows that children with iron deficiencies sufficient to cause anaemia are at a disadvantage academically, and their cognitive performance has been shown to improve with iron therapy. Iron supplementation, coupled with deworming, was found to increase per-school participation by 5.8 percent, at a cost of approximately $1.70 USD per child (Bobonis et al., 2008). Conditional cash transfer (CCT) programmes have been shown to have a significant effect on pupils' education, health and nutrition (Rawlings and Rubio, 2005). In Progresa, the CCT programme in Mexico, the costs per added year of schooling were found to be over $4,000USD (Schultz, 2004). On the other hand CCT programmes have also been shown to have contributed to reducing inequality in three Latin American countries, through well targeted, large-scale social transfer programmes. In Brazil, both universal school feeding and a CCT programme have been implemented within an integrated social protection framework.

Discussion

The review of the literature presented in this thesis indicated that school feeding programmes can have positive impacts across education, health and nutrition dimensions. The bulk of the evidence comes from studies of onsite meals programmes, with only a fairly limited number of studies on the impact of fortified biscuits and take-home rations. The findings from the review highlight that in terms of impact on school participation, there is little evidence that different school feeding modalities have substantially different effect sizes; whether we look at enrolment, attendance, or drop-out.

Generally, the costs of school feeding programmes will depend on several different factors, including the choice of modality, the composition and size of the ration, the caloric intake per day, the number of beneficiaries and school feeding days per year. Logistics, security and climatic conditions have an impact on programme expenditures. Remarkably, and despite its popularity as a programme, there is very little evidence on the costs of school feeding. However, the available evidence suggests that the different modalities have very different costs. This raises important questions in terms of cost-effectiveness and sustainability.

Gaps in the evidence

The review findings highlight the complexity involved in both implementing and evaluation school feeding programmes. School feeding involves a broad range of stakeholders working across different sectors and levels of implementation. Programme activities have both direct and indirect impacts on beneficiaries across the system linking food production to food distribution. Important gaps in the evidence centre on understanding the trade-offs involved in alternative configurations of school feeding implementation. In particular, some of the main gaps that will be addressed in this thesis include:

- The programme theory for school feeding programmes, covering both process and impact dimensions, is not well understood. This is a particularly critical gap considering the complexity of the intervention, in terms of getting a better handle of both the intent and actual impact of school feeding.
- The cost-effectiveness of the different school feeding implementation modalities, including evidence on the underlying costs and impacts, remains a critical gap in the current knowledge of school feeding.

- Scaling-up school feeding programmes requires considerable financial investments. Yet there is little data on the financial burden and opportunity cost for countries looking to scale-up school feeding as part of the response to the recent economic crises.
- Emerging evidence suggests that linking the agriculture sector to school food may provide an opportunity for cost-containment and more sustainable developmental outcomes. In practice, there is no evidence, however, that this is the case.

In summary

This chapter highlights that the evidence for the educational benefits of school feeding programmes includes positive impacts on school participation (enrolment, attendance and drop-out), as well as on learning and cognition. The evidence base includes a number of randomised control trials in diverse settings as well as a Cochrane systematic review. However, costing on average $50 USD per child per year in low-income countries, school feeding is a costly intervention and bringing programmes to scale will require considerable financial investments. In the next chapter, the findings of the review will be used to develop some of the programme theory, or theory of change, for school feeding.

Chapter 3: The programme theory for school feeding

"The problem with school feeding is that the impact is so context specific…" [1]

Abstract

Background: The evidence base of programme impact for school feeding is well-established in terms of educational outcomes. The evidence includes a number of randomised control trials in diverse settings.

Objectives: To develop the programme theory, or theory of change, for school feeding and education following a standard programme evaluation approach.

Methods: The chapter sets out to describe the needs of the programme and the characteristics of the target population, and then develops the process maps for the service delivery and the possible impact pathways for school feeding. I then describe the key requirements for school feeding impact evaluations.

Discussion: School feeding programmes are complex interventions with many possible configurations, involving a broad range of activities by different stakeholders at different levels. The benefits of school feeding programmes are also very context specific. Policy makers and implementers can therefore benefit from a careful assessment of the trade-offs associated with different programme designs.

[1] School feeding impact evaluation expert, phone conversation.

Introduction

Chapter 2 of this thesis highlighted that the popularity of school feeding is supported by a well-established evidence base of programme impact, at least in terms of educational outcomes. The evidence includes a number of randomised control trials in diverse settings. This chapter builds on the findings of the review presented in chapter 2 to develop some of the programme theory, or theory of change, for school feeding following a standard programme evaluation approach (Rossi et al., 2005). The approach first sets out to describe the needs of the programme and the characteristics of the target population, and then develops some of the programme theory for school feeding, covering both impact and process dimensions.

Understanding the context and needs for school feeding

School feeding programmes are complex and require coordination across a broad range of stakeholders across different sectors, operating at different levels. A key element of the context analysis involves examining the roles and responsibilities of stakeholders involved in the school feeding system. Recent work by the World Bank and the WFP identified five standards that holistically capture the complex nature of school feeding. These include policy frameworks, institutional capacity and coordination, design and implementation, financing and community participation. In order to keep the scope of this thesis manageable, this section focuses mainly on examining trade-off across the design and implementation standard. More details of other standards are covered in subsequent chapters of this thesis.

The design of an effective school feeding intervention is to a large degree dependent on a thorough problem analysis of the educational and social context in a given country. An assessment of the education sector needs, gaps and priorities (as included for instance in education sector plans) undertaken in close collaboration with Government and partners is essential to understand the nature and magnitude of the problems that can potentially be addressed by school feeding. The needs assessment should include an analysis of the main barriers to education, covering different levels of stakeholders ranging from individual children to communities and Ministry of Education resources. Data covering education, health, nutrition and other relevant vulnerability and food insecurity indicators should be examined to provide a detailed picture of the country situation, and where possible describe relevant in-country variations. Generally, educational indicators that are specifically relevant to school feeding include measures of access and retention (enrolment, attendance, drop-out,etc) and student learning (completion, achievement, etc). Nutrition and health indicators covering micronutrient deficiencies, intestinal parasites, as well as coverage of relevant nutritional and health services currently provided to school-age children should also be included, alongside a range of other socio-economic indicators covering poverty and food insecurity. As school

feeding programmes often involve a wide spectrum of stakeholders and implementers at different levels, from national governments to civil society and NGO's, the assessment should also cover institutional arrangements and capacities with regards to feasibility and implementation.

An important part of the problem analysis involves describing the characteristics of the target population for the school feeding intervention. The risk of not accessing and/or completing primary school, a form of "educational vulnerability" anchored within a context of poverty and food insecurity, may be used to describe the common characteristics shared by the children targeted by school feeding. This idea reflects the reality that household choices regarding education are often a result of complex decision processes, where poverty and hunger play an important role in determining the schooling outcomes (Drèze and Kingdon, 2001). In practice, children do not participate in schooling for different reasons; at the household level, it is often a trade-off between the costs and benefits of schooling that determine whether a child will go to school or not. Costs are not only direct, such as school fees for example. The opportunity cost of sending a child to school would mean foregoing the benefits of any work that the child could be doing instead of attending school. Often, the opportunity costs follow seasonal patterns, or increase with age, meaning that older children might need stronger incentives than younger children in order to remain in school. The opportunity costs of schooling may also be higher for girls. Girls are often kept at home to look after siblings, help with other work, or simply for cultural reasons. Once in school, children may be too ill or hungry to benefit from the classroom activities. It is important to understand the drivers that keep vulnerable children (e.g. girls) from participating in school. It may be that food is not the appropriate solution to the problem. More women teachers, improved sanitation, parent's perceptions of education, alongside many other factors, have been found as possible determinants of schooling.

The school feeding service utilisation plan, summarising programme flow is shown in Figure 3.1. The service utilisation plan can be used to highlight the extent to which school feeding can cover children in need. School feeding and other school level interventions will only directly benefit those children who are enrolled, or who will enrol, in assisted schools. In other words, if a child is excluded from schooling altogether, an alternative type of intervention should be considered in order to reach her. Furthermore, once a child has completed primary school, and will no longer benefit from school feeding, complementary services should be provided to further her development. Seen from this perspective, school feeding is one part of a social protection framework that would ideally follow a child from birth through to full educational development (Martinez, 2010).

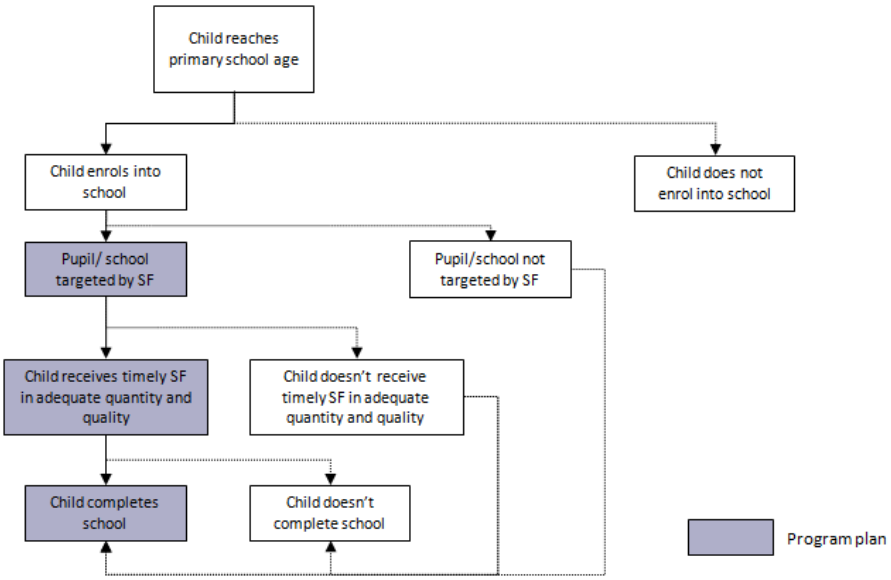


Figure 3.1: Service utilisation plan for school feeding (Source: Gelli A, 2007). *School feeding and other school level interventions will only benefit directly those children who are enrolled, or who will enrol, in assisted schools.*

Targeting the school feeding programme

The choice of the targeting mechanism for school feeding is very important and has considerable implications on both programme costs and implementation. Targeting though also poses important ethical, political and practical questions that often have no easy answer. Generally, school feeding programmes can either target children individually or through schools, where the school becomes the distribution point for the children who are enrolled. In high- and middle-income countries free school meals are generally integrated within social protection programmes targeted to individual children on the basis of vulnerability and well-being proxies. Children not considered at risk would normally pay for the school feeding, though often at subsidised costs. The vast majority of school feeding programmes in low-income countries (LICs) tend to target children living in vulnerable, food insecure contexts (Bundy et al., 2009). Certain school feeding programmes combine both forms of targeting; offering onsite feeding to all pupils in a school within food-insecure areas and providing extra take-home rations to children identified as more "at risk" than others.

Geographical targeting

Schools assisted by school feeding programs in low-income countries are usually targeted on the basis of food insecurity and vulnerability analysis and mapping, as well as an analysis of the educational context in each country. Geographical targeting is usually undertaken in different stages covering multiple administrative levels, involving both primary and secondary data collection. The idea is to progressively profile regions on the basis of vulnerability, education and food insecurity. As the targeting becomes more detailed, vulnerability data are complemented by information that will

affect implementation, such as security, accessibility of schools, and coverage of complementary services and availability of partners (WFP, 2006). Urban areas are sometimes overlooked when poverty and food insecurity is assessed geographically as the lowest level of analysis is usually the district –rural areas are often identified as generally worse off. However, increased urbanisation and the rapid growth of slum dwellings surrounding cities today, has led to urban areas with large populations living in extreme poverty. Targeting urban centres with school feeding may be an efficient way of covering large numbers of vulnerable children (Ahmed, 2004).

Once adequate areas have been identified the next stage involves identifying target schools. Schools in the selected areas are generally screened on the basis of implementation criteria. The selection standards are developed in collaboration with Government, implementing partners and civil society, and depend on the context and the details of the intended school feeding programme. It is important to highlight that schools that do not meet the standards may often be those serving the most vulnerable communities. This tension can be resolved by integrating the necessary support for infrastructure/capacity building as part of the school feeding programme implementation. Local communities can often be key agents of change, and have been successfully mobilised in support of assisted schools in deprived areas, as demonstrated by the CHILD programme in Ethiopia or in the slums surrounding Nairobi.

Individual targeting

Different forms of means and proxy means testing have been developed to target school feeding assistance to individual children, on the basis of vulnerability and well-being indicators. In the west, for example, most school meal programmes are provided for free to children from families on income support (Singh, 2012). Targeting criteria are context dependent, and involve inputs from multiple stakeholders at different levels. The systems and data requirements for individual targeting are generally fairly resource intensive, and to date have generally been considered out of scope for most low-income countries. Individual targeting is also being implemented in several national programmes in middle income countries, such as Chile for example, which is considered a best practice in terms of school feeding design and implementation. In Chile, the targeting mechanisms have been evolving progressively over time, reflecting a deeper understanding of the drivers of poverty and educational exclusion. Schools are provided free school meal allocations on the basis of a vulnerability index built on socio-economic household data of first grade school children. Teachers are then asked to target the free meal allocations to the most vulnerable children in the classroom. Though targeting individual children on the basis of need can have considerable benefits form the point of view of cost-effectiveness, programme experience with individual targeting has also highlighted the issue of stigmatisation. In certain contexts, beneficiaries of targeted school feeding

assistance have been marginalised or picked-on by other children not being assisted. Strong buy-in from the community is needed to ensure that the negative effects of individual targeting are minimised.

School level processes

The provision of different school feeding modalities involves a range of different school level activities. The choice of onsite meals, in sub-Saharan Africa is generally associated with in -school food storage and preparation. As well as having cooks trained to provide adequate meals, preparing food in schools involves providing fuel, pots, pans, dishes for the children and cooking utensils, for example. Ideally, cooks would be trained in hygiene and sanitation, and the kitchen would be 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 3.2 (see also Chapter 6 for more details on school level costs). Biscuits and take-home rations do not require preparation in schools and generally involve only storage, management and monitoring. At the school level, onsite meals are therefore resource intensive relative to other modalities, in terms of cash and in-kind contributions required for adequate service delivery. This difference in complexity is usually reflected in the magnitude of the costs associated with delivering the alternative modalities at school level.[2] Though there is little evidence on the benefits of school service provision at the community level[3], 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.[4] In terms of food preparation, emerging evidence suggests the potential for community development benefits. However, this remains another important area of future research.

[2] See section 2 reviewing the costs of school feeding.

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

[4] 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).

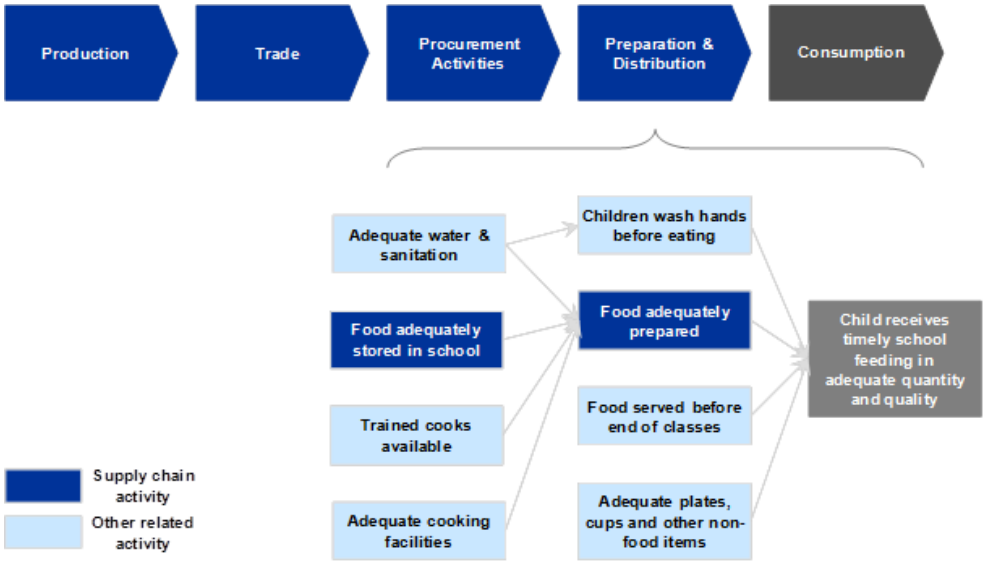


Figure 3.2: Simplified school feeding school level processes (Source: Gelli et al., 2012). *The choice of onsite meals, in sub-Saharan Africa is generally associated with in -school food storage and preparation.*

Impact theory

School feeding programmes in low-income countries are generally aimed at achieving the MDGs and EFA goals, framed within education sector strategies and plans. In food-insecure contexts, household choices regarding education are often a result of complex decision processes where poverty and hunger play an important role in determining schooling outcomes (Drèze and Kingdon, 2001). In building a programme theory for school feeding from the educational perspective, an initial outcome that drives increased school participation is the incentive for households to send children to school. Generally, this incentive is achieved through an income transfer offsetting the financial and opportunity costs of schooling and through an enhancement of the services provided at school. School feeding may also have an incentive effect on pupils actually wanting to go to school to receive food rather than staying at home and missing out. In theory, both of these effects will contribute to shift short-term household decisions towards increased schooling. The specific effect of the incentive will very much depend on the context in which school feeding is operating. Conceptually, the health and nutrition improvements from school feeding actually reinforce the impact on education. Addressing micronutrient deficiencies, in particular iron and iodine, has been shown to have a positive impact on learning, as has the systematic deworming of school-age children in areas of high prevalence of intestinal helminths (Jukes et al., 2008). Extending the school feeding programme theory to explicitly cover other nutritional benefits is an important area of ongoing work (Adelman et al., 2008). The income transfer incentive and the improved health and nutrition status resulting from school feeding service provision would then lead to improved access and learning outcomes. From the educational perspective, these outcomes would then lead to the

long term goals of school feeding programmes as captured by the Millennium Development Goals and Education For All Goals. A basic logic model based on the evidence of the benefits of school feeding is presented in Table 3.1.

Table 3.1: A high level logical framework for fortified school feeding programmes (Source: adapted from Gelli, 2007). *School feeding programmes in low-income countries are generally aimed at achieving the Millennium Development Goals and Education For All Goals.*

			Outcomes		
Inputs	**Activities**	**Outputs**	Initial	Intermediate	Distant
Food provided to school	Food prepared or distributed in school as an early morning snack	Pupils eat snack/ lunch	Incentive for households to send pupils to school Incentive for pupils to go to school	Reduced absenteeism Reduced drop-out Increased enrolment (reduced gender gap)	Improved access, promotion and completion for primary school children (MDG 2 & 3, EFA)
			Improved food consumption, including • Improved macro-nutrient intake • Improved micro-nutrient intake	Improved learning and cognition	

Stylised impact pathways leading to educational goals for school feeding are summarised in Figure 3.3. The causal links are traced between inputs and the desired outcomes.

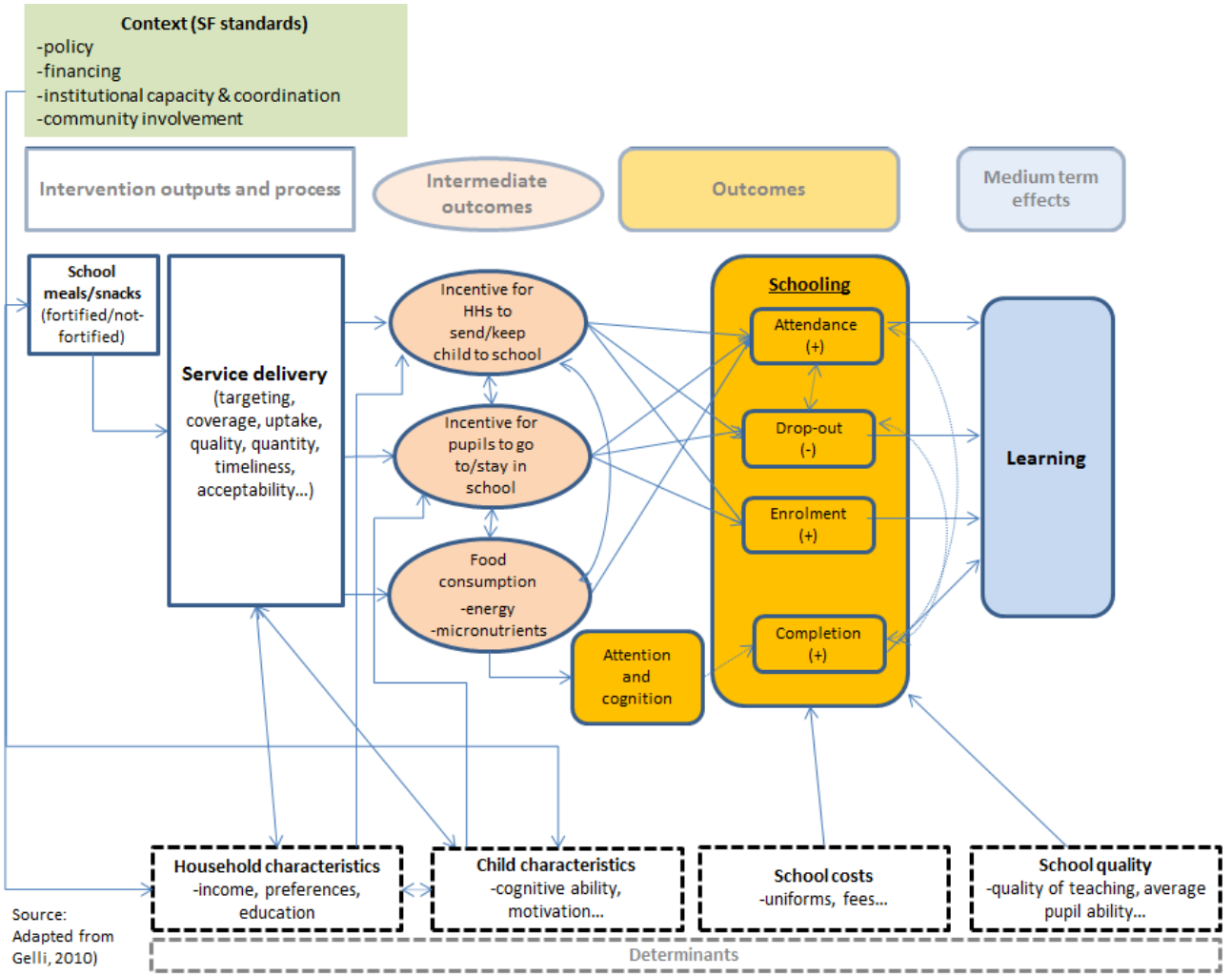


Figure 3.3: A model tracing school feeding impact pathways leading to educational goals. *The main determinants of schooling and learning are child characteristics, schooling costs, households' characteristics and school quality. Children do not participate in schooling for different reasons; at the household level, it is often a trade-off between the costs and benefits of schooling that determine whether a child will go to school or not.*

Impact evaluations

School feeding impact evaluations aim to measure the differences in the outcomes attributable to school feeding. This involves comparing the outcomes for beneficiaries of school feeding to the outcomes for a control group without the intervention. To control for pre-programme characteristics in the beneficiary population, it is necessary to collect data before the school feeding intervention begins and after a period of implementation. As described in Chapter 2, the impacts of school feeding in different contexts are quite heterogeneous. For example, school feeding has been shown to be particularly effective in supporting school participation of girls in rural areas with large gender disparities in access to education (Dreze and Kingdon, 2001). In addition, the impact of school feeding has been found to vary with pupil age, as household schooling decisions are also affected by the opportunity costs of education, that tend to increase with age and gender (Gelli et al., 2007). School feeding programmes have also been found to have spillovers from the nutritional perspective. Younger siblings of school children have been found to benefit in terms of food consumption as school feeding rations were shared by their older siblings (Alderman et al., 2010).

In order to capture the different levels and types of impact, school feeding evaluations can follow a mixed method approach, meaning that both qualitative and quantitative data are collected. Instruments used in the evaluations also generally collect information on context, programme and beneficiary characteristics to enable an analysis of the treatment effect within different groups of interest. Quantitative data are collected at household and school level (see Table 3.2). The pupil household instrument generally includes a household roster and questions exploring issues including the household socio-economic background and children school participation. Nutritional status can also be assessed for all children in the households and their mothers or primary female caretakers, including data collection on height and weight, and measure of haemoglobin status. The school survey will generally cover outcome and process dimensions, including educational indicators, particularly enrolment and attendance, as well as indicators exploring the issue of short-term hunger in the classroom. Though school level surveys are less complex and costly than household data collection, they are also limited in terms of the validity of the findings they can provide. For example, unlike at household level, at the school level it is very difficult to control for children moving schools. Though they may appear as new enrolments in the school feeding schools, they may have in fact migrated from other schools that were not selected for assistance. Participative approaches can also be alongside quantitative surveys used to explore “softer” type changes within rural communities, involving farmer and women groups, small traders and food processors, as well as students, parents and teachers.

Table 3.2: Types of data collection (Adapted from Ahmed, 2004). *In order to measure impact, quantitative data are collected both at household and school level.*

Type of data	Collection method
Community level infrastructure and facilities, provision of basic services, level of education, agriculture production and market prices	Community level survey
School level data on enrolment, attendance, drop-out, learning and completion, teachers qualifications and training, classrooms, sanitation, food management and preparation facilities, other school health and nutrition services, salaries and other costs of school feeding.	School level survey
Household data on demographic composition and gender, socio-economic status including occupation, level of education, food & non-food expenditure, school enrolment, attendance and drop-out, cognition, health and nutrition status (morbidity, anthropometric and micronutrient status), dietary intake by 24-hour recall, programme participation.	Household level survey

The gold standard for impact evaluations is the randomised control trial (RCT), where the experimental design is achieved by randomly assigning similarly eligible children and communities to the intervention and control groups. Children randomly assigned to the control group can then be brought into the programme in subsequent years. Statistical tests are generally used to determine possible bias from household selection effects and sampling errors. This approach accounts for selection bias, or correlations between beneficiary status and impact variables, thus enabling a causal interpretation on "treatment" estimates. The main assumption here is that the difference in the outcomes of interest would have remained unchanged between the two groups in the absence of the programme. Econometric models are then used to control for fixed effects at the community or household level. In the past, random assignment to the school feeding programme, particularly in programmes operating in food insecure areas, has proven difficult to implement for logistical, ethical and political reasons. Insights on the benefits of school feeding can also be gained from programme evaluations of a more operational nature than randomised control trials. Though quasi-experimental design evaluations may provide biased estimates of programme effect, they offer the next best possible option when a randomised design is not feasible. In quasi-experimental designs, school feeding beneficiaries are compared to non-randomly assigned controls that do not receive school feeding. The extent to which a quasi-experimental evaluation will result in unbiased estimates of programme impact will largely depend on how small the differences are between the control and intervention groups.

In summary

This chapter built on the desk review in Chapter 2 to develop some of the programme theory for school feeding, laying the foundation for the in-depth analysis that will follow in the rest of the thesis. The focus now shifts on to examining data, beginning with Chapter 4, which includes an assessment of cross-country effects of the provision of food and additional take-home rations on primary school enrolment in a programmatic, food-insecure setting.

Chapter 4: School feeding and school enrolment: evidence from Sub-Saharan Africa

Abstract

Background: School feeding programmes are common interventions with potential impacts across education, health and nutrition. In terms of impact on school participation, there is little evidence to show that different school feeding modalities have different effect sizes.

Objective: To examine the influence of different school feeding modalities on primary school enrolment, particularly for girls, in 32 countries across sub-Saharan Africa.

Methods: An observational study was developed to examine programme effect. Schools were divided according to the type and length of the program: those with existing programs, those that had had school feeding for less than 1 year, and a counterfactual including schools without a programme but that were going to initiate school feeding within the survey year. The intervention consisted of two different types of school feeding: onsite meals alone or onsite meals plus take-home rations. Changes in enrolment, both total and disaggregated by grade and gender, over a one-year period, were used to assess effects of school feeding. To control for pre-programme characteristics in the beneficiary population, data on covariates were also examined before the school feeding intervention began and after one year of implementation. Using this design a comparison of enrolment levels was made between the types of treatment schools and controls schools during the period school feeding was first introduced. Standard multiple regression models were used to analyse programme effect.

Results: School feeding programmes were found to have statistically significant increases in enrolment, with effect size of about 10 percent. The changes on enrolment varied by modality of school feeding provision and by gender, with onsite meals appearing to have stronger effects in the first year of treatment in the lower primary grades, and onsite combined with take-home rations also being effective post-year 1, particularly for girls that were receiving the extra take-home rations.

Conclusions: School feeding programmes had a positive impact on school enrolment. The operational nature of the survey data used in the meta-analysis, however, limits the robustness of the design and validity of the findings. Nevertheless, this analysis is the first to study possible links between enrolment and length of programme duration using multivariable models, examining whether programmes reach a saturation point or steady state beyond which school feeding may in fact have no further benefits on school enrolment. Further research is required to examine this issue in more detail.

Introduction

The review of the literature of school feeding presented in chapter 2 indicated that school feeding programmes are very common interventions with potential impacts across education, health and nutrition. The review also highlighted that in terms of impact on school participation, there is little evidence to show that different school feeding modalities have different effect sizes, whether we consider enrolment, attendance, or drop-out. The evidence also suggests that the different modalities have very different costs. This raises important questions in terms of cost-effectiveness and sustainability. This chapter includes an attempt to capture differences in programme effect through a meta-analysis of perhaps the largest school-level dataset collected on school feeding programmes across sub-Saharan Africa, covering 32 countries. It builds on a previous descriptive study undertaken in 2007 that examined average effect sizes in different types of programmes (Gelli et al, 2007). The analysis published in 2007 focussed on describing average changes in schools with and without school feeding, and using these changes to simulate enrolment trends.

In this chapter, the original data set is developed to include more school-level variables and an analysis of programme effect is undertaken using a new design and estimation strategy. As described in detail in this chapter, a number of critical issues in the design of the surveys analysed strongly limit the validity of the estimates of programme effects. Nevertheless, data from this natural experiment provide an important opportunity to gain insight into school feeding effects from a programmatic perspective.

Objectives

This chapter is aimed at examining the influence of different school feeding modalities, namely onsite feeding or onsite feeding combined with take-home rations, on primary school enrolment, particularly for girls, in 32 countries across sub-Saharan Africa.

Methodology

The starting point for the data used in this analysis was the database used in the study I undertook at WFP five years ago (Gelli et al., 2007). The original data set consisted of school-level surveys collected from a centralised database based at WFP head-quarters in Rome. The study population consisted of all WFP-targeted primary schools, which are generally located in areas vulnerable to food insecurity and poor access to education.

Data

In each of the surveys included in this study, the sample of schools was selected either by simple random sampling or by using random sampling with probabilities proportional to school size. In some countries with small programmes a census was undertaken. Sample frames were stratified by program duration: schools with recently introduced school feeding programs and schools with school feeding programs that had been operating for 1 year or more. Details of survey implementation are published elsewhere (Gelli et al., 2007). A number of different questionnaires were used throughout the survey period that spanned 2002 to 2005, though core sections covering enrolment information were retained in all versions. In order to examine short-term trends, each survey collected enrolment data over 3 years. Surveys involved structured, school-level questionnaires that included interviews with school heads, teachers, parents and pupils, covering educational indicators, particularly enrolment and attendance. Data on school infrastructure, classrooms, teaching, and other school quality-related indicators were also collected to monitor the programme context.

Data extraction

Data from the different surveys were exported from a centralised WFP database and merged. As the questionnaires used in the different countries varied throughout the survey period, the first step in the data analysis involved a harmonization of the different data to match variable definitions. A number of additional school- and country-level variables were added to the data set used in the previous analysis (Gelli, et al., 2007). School-level variables included number of classrooms and number of teachers. Country-level variables were added to examine cross-country variability, including indicators that are linked to the main aims of school feeding programmes, covering measures of poverty, hunger and education. Poverty was captured by per capita Gross Domestic Product (GDP), (Source: World Bank), hunger was captured through the prevalence of undernourishment (Source: FAO), and levels of education were measured through the primary school net enrolment ratio (NER), (Source: UNESCO). In practice, due to inconsistencies in the indicator definitions it was not possible to aggregate all the data collected throughout the 5 years. As a result, in this study we focus mainly on the analysis of trends in absolute enrolment observed throughout the survey years; full results for each of the different surveys have been published elsewhere (WFP, 2007). Table 4.1 shows details of the surveys included in this analysis.

Table 4.1: Survey details, in 32 countries in sub-Saharan Africa. (Source: Gelli et al., 2007).

	Assisted schools	Beneficiaries in 2004[1]	Number of schools in sample	Total pupils in sample	Survey start	Survey End
Angola	718	37,189	224	56,760	10/10/2003	19/05/2004
Burkina Faso	210	40,384	51	4,933	02/06/2003	11/07/2003
Burundi	73	24,669	66	35,446	04/06/2003	05/06/2003
Cameroon	386	134,648	146	33,466	08/02/2004	17/02/2005
Cape Verde	417	107,477	59	12,150	02/10/2003	09/10/2003
C. A. R.	143	104,023	83	17,904	17/01/2004	09/02/2004
Chad	350	73,539	104	14,279	18/11/2002	19/02/2003
Congo Republic	72	16,608	72	14,567	13/10/2003	13/11/2003
D. R. Congo	170	95,521	170	109,834	02/10/2003	22/11/2003
Djibouti	50	10,963	48	10,561	01/05/2003	17/12/2003
Eritrea	212	126,848	122	46,308	07/10/2003	27/11/2003
Ethiopia	626	736,305	188	122,635	04/11/2002	19/12/2002
Ghana	323	34,368	60	9,461	26/01/2003	27/02/2003
Guinea	435	175,365	185	24,223	04/10/2003	22/10/2003
Guinea Bissau	487	124,537	124	11,577	07/06/2003	02/07/2003
Kenya	4,388	1,491,433	330	100,070	03/11/2003	28/11/2003
Lesotho	1281	176,393	206	60,008	02/03/2003	30/04/2003
Liberia	602	387,630	211	41,122	01/03/2004	03/08/2004
Malawi	201	219,017	122	102,081	11/02/2003	10/04/2003
Mali	330	91,318	123	28,992	31/03/2003	22/06/2003
Mauritania	1,122	78,200	176	20,548	07/12/2003	28/12/2003
Mozambique	164	275,474	127	91,872	10/03/2003	11/04/2003
Niger	242	38,777	110	11,929	05/03/2003	15/05/2003
Rwanda	338	179,165	124	88,802	21/05/2003	16/06/2003
S. Tome & Principe	74	28,280	42	10,193	27/10/2003	11/12/2003
Sénégal	998	250,680	277	32,457	16/02/2004	24/02/2004
Sierra Leone	729	277,386	256	78,526	15/06/2003	19/11/2003
Somalia	31	7,220	31	5,180	09/03/2003	18/03/2003
Tanzania	215	170,843	60	23,916	10/12/2002	22/01/2003
The Gambia	340	132,902	84	37,082	21/04/2004	04/05/2004
Uganda	432	470,956	199	95,290	14/02/2003	26/03/2003
Zambia	180	92,409	104	45,589	16/10/2003	31/10/2003

The sample covered a total of 4,175 schools, including 903 schools without a school feeding program, 593 schools that had just started school feeding, and 2,680 schools that had received school feeding for over a year (Gelli, et al., 2007). The data did not differentiate schools with only take-home rations from those providing take-home rations combined with onsite feeding; as a result, an assumption was made in this analysis that all programs with

[1] The number of beneficiaries was taken from the WFP 2005 Standardized Project Reports (SPRs) is in some cases be greater than the number of students in the sample. This is due to the fact that the survey year of reference does not correspond with that of the SPRs.

take-home rations also offered onsite feeding. This assumption is justified by the fact that WFP programs in sub-Saharan Africa that provide take-home rations do so in combination with regular onsite feeding (Gelli et al., 2011). It is important to note that in combined programmes take-home rations are provided to girls only, whilst meals are provided to all children regardless of gender.

Estimation strategy

As described in Chapter 3 of this thesis on impact evaluations, the ideal strategy for estimating the impact of school feeding programmes would involve randomly assigning similarly eligible children and communities to the intervention and control groups. However, random assignment to WFP school feeding programmes, particularly in programmes operating in food-insecure areas, has proven difficult to implement for logistical, ethical and political reasons. This is an observational study, where a quasi-experimental design was developed as a next best possible option to examine programme effect (Rossi et al., 2005). In quasi-experimental designs, school feeding beneficiaries are compared to non-randomly assigned controls that do not receive school feeding. In this analysis schools were divided according to the type and length of the program: those with existing programs, those that had had school feeding for less than 1 year, and a counterfactual including schools without a programme but that were going to initiate school feeding within the survey year.

The intervention consisted of two different types of school feeding: either onsite meals alone or onsite meals plus take-home rations. Schools were selected by WFP for school feeding programmes using very similar criteria across countries, primarily on the basis of geographical targeting based on food security and education indicators. Changes in absolute enrolment, both total and disaggregated by grade and gender, over a one-year period, were then used to assess possible effects of school feeding.

To control for pre-programme characteristics in the beneficiary population, data on covariates were also examined before the school feeding intervention began and after one year of implementation. Using this design a comparison of enrolment levels was made between the two types of treatment schools and controls schools during the period school feeding was first introduced. Comparisons were also made between the schools that had the two different types of treatments at baseline.

Standard multiple regression models were used to analyse programme effect, using the following equation:

$$\frac{y_{t2}-y_{t1}}{y_{t1}} = \propto_0 + \sum_{i=1}^{4} \propto_i P_i + \propto_5 g + \sum_{i=2}^{5} \propto_{i+4} gr_i + \sum_{i=1}^{4} \propto_{i+9} P_i * g + \propto_{14} P_1 * gr_2 + \propto_{15} P_1 * gr_3 + \cdots + \propto_{29} P_4 gr_5 + \propto_{30} pcr + \propto_{31} ptr + \propto_{32} e_{t1} + \propto_{33} GDPc + \propto_{34} NER + \propto_{35} UND + \varepsilon$$

where y_t is the absolute enrolment at time t; P_i a is a dummy variable for programme type ($P_1 = 1$ for onsite meal first year, $P_2 = 1$ for onsite meal plus take home ration programmes first year, $P_3 = 1$ for onsite meal after first year, $P_4 = 1$ for onsite meal plus take home ration programmes first year, else $P_i = 0$); g is a dummy variable for gender (g=1 for girls, 0 for boys) gr_i is a dummy variable for primary school grade ($gr_2 = 1$ for grade 2, $gr_3 = 1$ for grade 3, $gr_4 = 1$ for grade 4, $gr_5 = 1$ for grade 5, else $gr_i = 0$); pcr is the pupil-to-classroom ratio; ptr is the pupil-to-teacher ratio; and $e_{t1}$is the enrolment level at baseline. $GDPc$ is the country-level GDP per capita, NER the country-level primary net enrolment ratio, and UND is the country-level prevalence of undernourishment.

Validity of estimation strategy

There are a number of important concerns regarding the validity of the estimation strategy in this analysis. The extent to which this quasi-experimental evaluation will result in unbiased estimates of programme impact will largely depend on whether the allocation of treatment to the different groups was independent of characteristics that are correlated with the outcome measurements, and also on observable (and unobservable) differences between the control and intervention groups pre-intervention. Considering the issue on internal validity and selection bias, schools assisted by WFP school feeding programs are generally targeted using similar criteria based on food insecurity and vulnerability analysis and mapping, as well as an analysis of the educational context in each country. As the intervention was not undertaken for the purpose of research and the assignment to the different treatment arms was not randomised, this analysis design can be characterised as a natural experiment (MRC, 2011). As a result, it is important to identify confounders and minimise bias when estimating programme effect. With regards to the comparability of the schools, table 4. summarises the available school-level characteristics. Only a small number of covariates at “baseline” (t1 in the estimation strategy) could be extracted from the survey

data, as most of the questionnaires collected data for the survey year (or t2 in the estimation strategy). The school-level covariates included the pupil-to-classroom ratio (the number of children enrolled in a school, as listed in the school register at the beginning of the school year, divided by the number of classrooms in the school) and the pupil-to-teacher ratio (the number of children enrolled in a school, as listed in the school register at the beginning of the school year, divided by the number of teachers registered to work in the school). A broader set of school-level indicators were available at "follow-up" (t2). A comparison of the observable school characteristics of the two groups at (t1) shows a statistically significant difference in pupil-to-classroom ratios (Table 4.2).

Table 4.2: Public primary school-level characteristics at study "baseline" (t1), sub-Saharan Africa, 2002-2005.

	Control			School feeding			Difference		
School characteristics	Mean	[95% Conf.	Interval]	Mean	[95% Conf.	Interval]	Coef.	Std. Err.	P
Total enrolment	613	539	687	602	539	666	10	50	0.840
Girls enrolment	299	263	336	278	248	309	21	24	0.386
Boys enrolment	313	275	352	324	290	359	-10	26	0.681
Pupil-to-teacher ratio	59	57	62	58	55	62	1	2	0.556
Pupil-to-classroom ratio	67	62	72	84	77	90	-17	4	<0.001

Similarly, a comparison of school-level characteristics between schools with one year of either onsite meals or a combination of onsite and take-home rations shows a number of statistically significant differences that limit the internal validity of the analysis (Table 4.3). In this case, differences in school size, or school enrolment, are significantly different across the two groups.

Table 4.3: Public primary school-level characteristics at study "baseline" for schools with existing school feeding programmes, sub-Saharan Africa, 2002-2005.

	Onsite meals more than 1 year			Onsite & THRs more than 1 year			Difference		
	mean	[95% Conf.	Interval]	mean	[95% Conf.	Interval]	Coef.	Std. Err.	P>t
Total enrolment	945	819	1071	666	597	734	279	73	<0.001
Girls enrolment	426	365	487	304	268	341	122	36	0.001
Boys enrolment	519	452	585	361	325	397	157	39	<0.001
Pupil-to-teacher ratio	63	61	66	71	67	75	-7	2	0.002
Pupil-to-classroom ratio	106	99	113	97	80	115	8	10	0.368

Results

Due to a combination of different versions of questionnaires and survey years, only a very small number of school-level covariates were available alongside the outcome variables, including pupil-to-classroom and pupil-to-teacher ratios. The regressions were run using

estimation weights, equal to the inverse of inclusion probabilities, using the "svy: reg" command in STATA. The results of the regressions model with enrolment as the dependent variable and the available school-level and country-level variables are shown in Table 4.4.

Table 4.4: Effects of school feeding and other school-level variables on changes in school enrolment in public primary schools, sub-Saharan Africa, 2002-2005.

Variable	Coef.	Std. Err.	t	P	[95% Conf.	Interval]
school feeding	0.0961	0.0212	4.54	<0.001	0.0546	0.1376
baseline enrolment	-0.0002	0.0000	-11.22	<0.001	-0.0002	-0.0002
pupil-to-teacher ratio	-0.0022	0.0005	-4.59	<0.001	-0.0031	-0.0012
pupil-to-classroom ratio	-0.0004	0.0001	-3.02	0.003	-0.0006	-0.0001
undernourishment	-0.0042	0.0013	-3.14	0.002	-0.0068	-0.0016
net enrolment ratio	0.0060	0.0008	7.45	<0.001	0.0044	0.0076
gdp per capita	-0.0006	0.0001	-7	<0.001	-0.0007	-0.0004
constant	0.6384	0.1098	5.81	<0.001	0.4231	0.8537
R-squared	0.0335					

School feeding programmes were found to have statistically significant increases in enrolment, with effect size of about 10 percent. The coefficient for the enrolment levels at baseline showed a small, statistically significant association such that larger proportionate changes in enrolment are found in schools with lower baseline levels, a finding that is consistent with programme experience. The negative coefficients on pupil-to-classroom and pupil-to-teacher ratios also highlight this effect.

In terms of country-level variables, the prevalence of undernourishment and GDP per capita showed consistent and statistically significant negative effects on enrolment. The coefficients for primary net enrolment ratio were consistently positive and statistically significant, suggesting that changes in enrolment were higher in countries that were performing better in terms of schooling access.

The regression model generally explained only just over 3 percent of the variability in the data, which is not surprising considering that the determinants of schooling tend to be driven by household-level characteristics not covered in the models. This finding highlights the inadequacy of school feeding impact evaluations limited to school level data collection.

In order to examine the effects of school feeding in more detail, regressions were also run for enrolment controlling for type and duration of programme (see Table 4.5).

Enrolment levels in schools with onsite meal programmes during the first year of treatment showed statistically significant increases of over 15 percent. Combined programmes were found to increase enrolment after the first year of treatment, by about 8 percent.

Table 4.5: Effects of school feeding and other school-level variables on changes in school enrolment in public primary schools, controlling for programme type, sub-Saharan Africa, 2002-2005.

Variable	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
onsite, 1st year	0.1537	0.0302	5.10	<0.001	0.0946	0.2128
combined, 1st year	0.1083	0.0635	1.70	0.088	-0.0162	0.2329
onsite, 2nd year	0.0291	0.0208	1.40	0.162	-0.0117	0.0698
combined, 2nd year	0.0770	0.0245	3.14	0.002	0.0290	0.1251
baseline enrolment	-0.0002	0.0000	-10.38	<0.001	-0.0002	-0.0001
pupil-to-teacher ratio	-0.0023	0.0004	-5.34	<0.001	-0.0032	-0.0015
pupil-to-classroom ratio	-0.0003	0.0001	-2.71	0.007	-0.0006	-0.0001
undernourishment	-0.0033	0.0013	-2.47	0.014	-0.0058	-0.0007
net enrolment ratio	0.0053	0.0008	6.84	<0.001	0.0037	0.0068
gdp per capita	-0.0006	0.0001	-6.84	<0.001	-0.0007	-0.0004
constant	0.6777	0.1132	5.99	<0.001	0.4559	0.8996
R-squared	0.0369					

Regressions were also run to control for gender and school grade (see Table 4.6). The increases in enrolment in schools in the first year of onsite meals were found to vary mainly with primary school grade and not by gender. On the other hand, the effect of combined programmes after the first year of treatment was driven by an increase in girls' enrolment, which was found to be about 12 percent greater than the change in boys' enrolment, with no statistically significant interactions across grades. The F-tests for the type of school feeding and gender interactions (F= 2.89, Prob. > F= 0.0209) and the type of school feeding and grade interactions (F= 2.96, Prob. > F= 0.0001) reject the hypotheses of zero coefficients at 5 percent significance level.

Table 4.6: Effects of school feeding and other school-level variables on changes in school enrolment in public primary schools, controlling for programme type, gender and grade, sub-Saharan Africa, 2002-2005.

Variable	Coef.	Std. Err.	t	P	[95% Conf.	Interval]
onsite, 1st year (sfy1)	0.4082	0.0935	4.36	<0.001	0.2249	0.5915
combined, 1st year (thry1)	0.2003	0.3398	0.59	0.556	-0.4659	0.8664
onsite, 2nd year (sfy2)	0.0634	0.0399	1.59	0.112	-0.0148	0.1415
combined, 2nd year (thry2)	-0.0046	0.0421	-0.11	0.912	-0.0871	0.0778
baseline enrolment	-0.0002	0.0000	-10.64	<0.001	-0.0002	-0.0001
pupil-to-teacher ratio	-0.0023	0.0004	-5.37	<0.001	-0.0032	-0.0015
pupil-to-classroom ratio	-0.0003	0.0001	-2.81	0.005	-0.0006	-0.0001
gender	0.0337	0.0328	1.03	0.305	-0.0306	0.0979
grade 2	0.1086	0.0421	2.58	0.010	0.0261	0.1912
grade 3	0.0503	0.0377	1.34	0.182	-0.0235	0.1242
grade 4	0.3289	0.0626	5.25	<0.001	0.2061	0.4516
grade 5	0.1417	0.0425	3.34	0.001	0.0584	0.2249
gender * sfy1	-0.0077	0.0603	-0.13	0.898	-0.1258	0.1104
gender * thry1	-0.0329	0.1487	-0.22	0.825	-0.3243	0.2586
gender * sfy2	0.0273	0.0388	0.71	0.481	-0.0487	0.1034
gender * thry2	0.1144	0.0406	2.82	0.005	0.0349	0.1940
sfy1*grade 2	-0.3660	0.0995	-3.68	<0.001	-0.5611	-0.1710
sfy1*grade 3	-0.2469	0.1010	-2.44	0.015	-0.4449	-0.0489
sfy1*grade 4	-0.2428	0.1156	-2.1	0.036	-0.4694	-0.0163
sfy1*grade 5	-0.3929	0.1067	-3.68	<0.001	-0.6021	-0.1836
thry1*grade 2	0.1052	0.3160	0.33	0.739	-0.5143	0.7246
thry1*grade 3	-0.1495	0.3080	-0.49	0.627	-0.7533	0.4542
thry1*grade 4	-0.3384	0.3086	-1.1	0.273	-0.9433	0.2665
thry1*grade 5	-0.0460	0.3103	-0.15	0.882	-0.6543	0.5623
sfy2*grade 2	-0.0924	0.0529	-1.75	0.081	-0.1962	0.0113
sfy2*grade 3	0.0333	0.0487	0.68	0.495	-0.0623	0.1288
sfy2*grade 4	-0.1530	0.0708	-2.16	0.031	-0.2918	-0.0142
sfy2*grade 5	-0.0213	0.0545	-0.39	0.696	-0.1282	0.0856
thry2*grade 2	0.1085	0.0610	1.78	0.075	-0.0111	0.2281
thry2*grade 3	-0.0336	0.0502	-0.67	0.503	-0.1321	0.0648
thry2*grade 4	-0.0156	0.0670	-0.23	0.815	-0.1469	0.1157
thry2*grade 5	0.0687	0.0596	1.15	0.249	-0.0481	0.1855
undernourishment	-0.0032	0.0013	-2.49	0.013	-0.0057	-0.0007
net enrolment ratio	0.0052	0.0008	6.83	<0.001	0.0037	0.0067
gdp per capita	-0.0006	0.0001	-6.94	<0.001	-0.0007	-0.0004
constant	0.5395	0.1142	4.72	<0.001	0.3157	0.7634
R-squared	0.0499					

Conclusions

This chapter included the analysis of a natural experiment designed to explore the influence of school feeding programs on school enrolment, based on a meta-analysis of survey data collected in 32 countries in sub-Saharan Africa. The results indicate that school feeding programmes had a positive impact on school enrolment, on the order of about 10 percent. As per my earlier study (Gelli et al., 2007), the changes on enrolment varied by modality of school feeding provision and by gender, with onsite meals appearing to have stronger effects in the first year of treatment in the lower primary grades, and onsite combined with take-home rations also being effective post-year 1, particularly for girls that were receiving the extra take-home rations.

Unlike the earlier study, this analysis provides estimates of programme effect, comparing two treatment arms (onsite feeding alone and onsite feeding combined with take-home rations) to a control without intervention. The estimates of programme effect are much lower in this study, and consistent to those from other studies in the literature (Adelman et al., 2007), suggesting that the estimation strategy provided in this chapter, including school- and country-level covariates, provides a more robust estimation framework.

As these programmes have very different programme costs (see chapter 5), these findings are potentially very relevant to policymakers looking to scale-up school feeding programmes. However, the findings in this study are limited by a number of important factors and will need to be validated by further research. As highlighted in recent reviews (Alderman and Bundy, 2011), including an earlier chapter in this thesis, measuring impact of school feeding on enrolment would require an analysis at the household level. At the school level it is not possible to control for household characteristics that are known to shape schooling decisions, such as mother's level of education, for example (Drèze and Kingdon, 2001). In addition, enrolment effects at the school level may in fact include both newly enrolled children but also transfers from other schools, making it very difficult to isolate programme effects.

The operational nature of the survey data used in this meta-analysis also limits the robustness of the design and validity of the findings. The data were collected as part of WFP's school-level monitoring of school feeding programs and not as part of an impact evaluation. Nevertheless, this analysis is the first to study possible links between enrolment and length of programme duration using multivariable models, examining whether

programmes reach a saturation point or steady state beyond which school feeding may in fact have no further benefits on school enrolment. Further research is required to examine this issue in more detail.

In summary

This chapter was aimed at capturing the impact of school feeding on enrolment using a meta-analysis of the largest school-level dataset collected on school feeding, covering 32 countries across sub-Saharan Africa. The analysis found that school feeding programmes increased enrolment by about 10 percent. The changes in enrolment were dependent on the school feeding modality and varied by gender, with onsite meals appearing to have stronger effects in the first year of treatment in the lower primary grades, and onsite combined with take-home rations also being effective post-year one, particularly for girls that were receiving the extra take-home rations. The next chapter examines the costs of providing food through schools, with a focus on differentiating the costs by modality and on identifying the main drivers of cost-efficiency.

5. Estimating the costs of school feeding

Abstract

Background: The recent food, fuel and financial crises have highlighted the importance of school feeding programmes. Though the benefits of school feeding are well documented, the evidence base on the costs of such programs is remarkably thin.

Objective: To address the need identified in the recent World Bank and World Food Programme (WFP) review of school feeding for systematic estimates of the cost of the different school feeding modalities, and of the determinants of the considerable cost variation among countries.

Methods: WFP project data, including expenditures and number of school children covered, were collected for 78 projects in 62 countries through project reports and validated through WFP Country Office records. Yearly project costs per school child were standardized over a set number of feeding days and the amount of energy provided by the average ration. Output metrics, such as tonnage, calories, and micronutrient content, were used to assess the cost-efficiency of the different delivery mechanisms.

Results: The standardised yearly average school feeding cost per child, not including school level costs, was found to be $48 USD. The yearly costs per child were lowest at $23 USD for biscuit programmes reaching school going children and highest at $75 USD for take-home rations programmes reaching families of school going children. The average cost of programs combining onsite meals with extra take-home rations for children from vulnerable households was $61 USD. Commodity costs were on average 58 percent of total costs, and were highest for biscuit and take-home rations programmes (71 and 68 percent respectively). Fortified biscuits provided the most cost-efficient option in terms of micronutrient delivery, whilst take-home rations were found to be more cost-efficient in terms of food quantities delivered.

Conclusions: The average costs of school feeding estimated here are higher than those found in earlier studies, but fall within the range of costs previously reported. The benchmarks presented here reflect the centralised WFP implementation model that is not always relevant in terms of Government school feeding programmes, particularly those procuring within national boundaries using “home-grown” approaches. This remains an important area for future research.

Introduction

The recent rethinking of school feeding jointly undertaken by the World Bank and WFP highlighted that *"more accurate estimates of costs are an important area for future research. An even more important omission is a meaningful estimate of the cost efficiency of the different modalities and targeting approaches".* The review adds that "*the apparent variation in costs among low-income countries implies that there is considerable opportunity for cost containment, provided that the drivers of costs are better understood. The relevance of the modality is an important issue, and there is a particular lack of information on fortified biscuits (no data for Africa) and for take-home rations*".

Objectives

This chapter is aimed at addressing the need identified in the recent World Bank/WFP review for "systematic estimates of the cost of the different school feeding modalities, and of the determinants of the considerable cost variation among countries". More specifically, the analysis is aimed at

- updating current benchmarks for school feeding costs and cost efficiency,
- understanding the cost drivers and cost-containment opportunities of school feeding programmes

Methodology

The diversity and complexity of different school feeding operations poses a major challenge in terms of obtaining a standardised methodology that can be meaningfully applied in different country and operational settings. School feeding costs depend on several different factors, including the composition and size of the ration, the caloric intake per day, the number of beneficiaries and the school feeding days per year. Logistics, supply chain set-up, security and climatic conditions will have an impact on programme expenditures. The geographical context will also affect the programme cost; operations in landlocked countries for examples will generally face greater operational costs than in countries implementing the same type of programme that have easy access to a sea port.

School feeding programmes exhibit different, context-specific models or supply chain configurations. Different approaches can even co-exist within the same country, where, for instance, programme implementation is owned 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). Figure 5.1 shows stylised supply chain linking food

production to food distribution in schools shown alongside examples of five different implementation models.

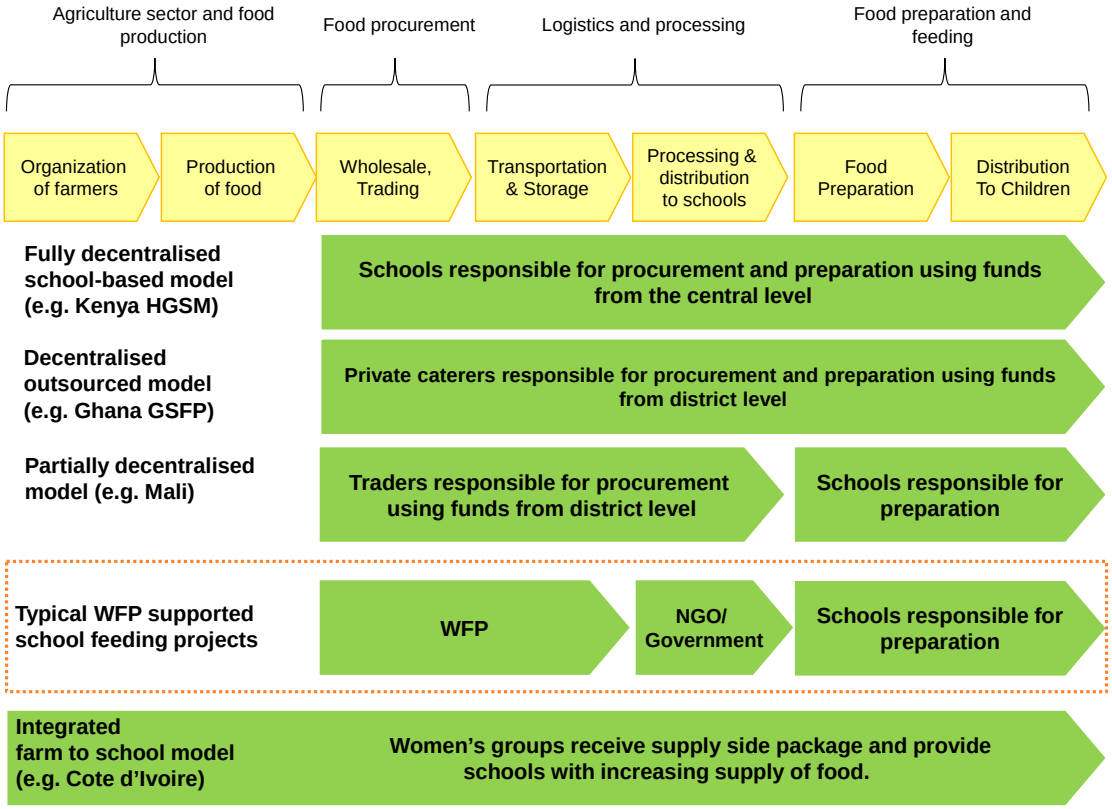


Figure 5.1: Stylised school feeding supply chains and example country models. *This analysis focusses on centralised models traditionally implemented by WFP.*

This analysis focuses on the WFP centralised procurement model, and builds on the previous analyses and cost framework developed for WFP programmes (Gelli et al., 2009). Two data sources were used in this exercise: The first includes data from WFP project reports, including expenditures, beneficiaries and food distribution collected through WFP's data-warehouse system. The second source is WFP Country Offices' estimated yearly expenditure by beneficiary, generally collected through the WFP statistics office. WFP project expenditures are captured on an annual basis in the Standard Project Reports. As the expenditures though are not broken down by project activity, the core of this exercise included an estimation of the amount of expenditures within a project that is accountable only to school feeding activities.

Generally, WFP project level expenditures in the project reports include direct operational costs (DOC) and support costs. DOC includes costs of commodities, transport, landside transport storage and handling (LTSH), and other direct operational costs (ODOC). Support costs include direct support costs (DSC) and indirect support costs (ISC) overhead. ISC are equal to the sum of direct operational and support costs multiplied by a fixed rate, which is

usually 7 percent. Beneficiary and food distribution data are usually reported on by activity within each country programme or development operation.

In this exercise, when school feeding expenditures were not known, different estimation methodologies were developed based either on the proportion of food distributed in school feeding activities over the total food distribution in each project, or the Country Office share of school feeding expenditures over total project expenditures as submitted to WFP Headquarters for the Annual Performance Report. Countries where large differences in the two estimates are found were investigated in more detail. Once validated, the cost estimates were standardised across the different types of school feeding modality (namely onsite meals, biscuits, take-home rations and combined school meals plus take-home rations). This study examined financial cost data only and did not factor the depreciation of fixed assets.

Estimating full implementation costs

Estimating the full cost of school feeding programs is not always straightforward because a range of different stakeholders are generally involved in the distribution chain, including National Governments, private sector and non-governmental organisations with different accounting and monitoring standards. Providing children with food through schools also generally includes a range of school-level costs that are normally not included within school feeding program expenditures. To account for this, this study systematically attempted to include elements of Government contributions to the school feeding operations as captured in the WFP systems. However the databases used in this analysis did not include data on school level costs (see Figure 5.2), making the estimates in this analysis lower bounds for full implementation costs, particularly for onsite meals[1].

[1] See following chapter for additional school level data collection was undertaken to provide first-pass estimates for full implementation costs of onsite meals.

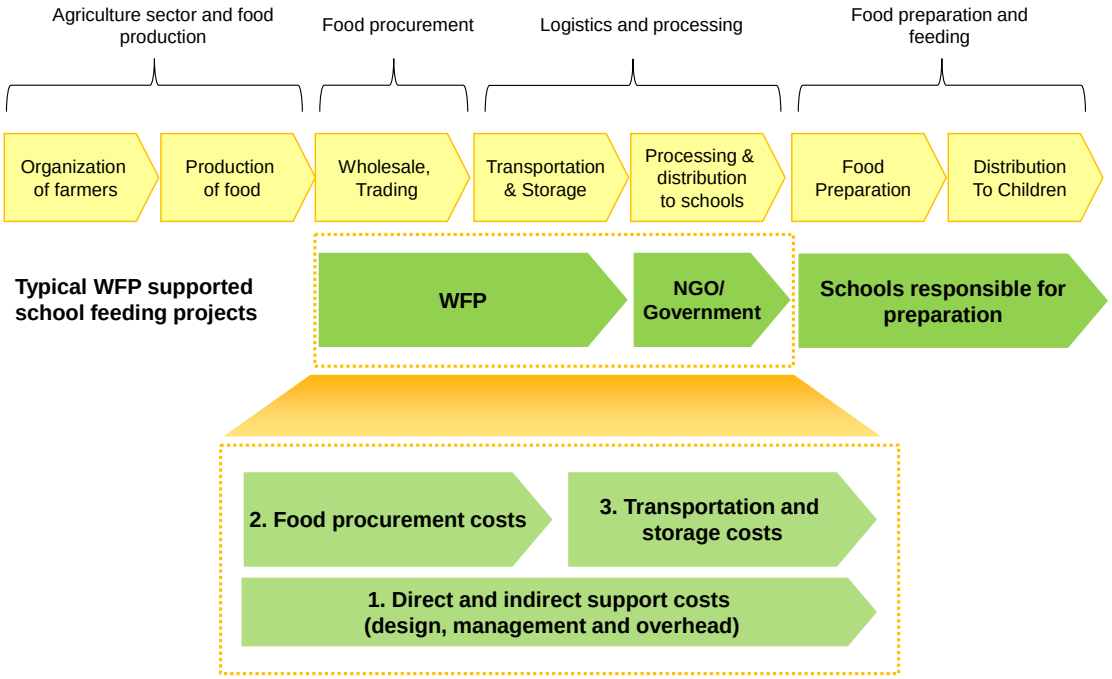


Figure 5.2: Subset of school feeding supply chain activities covered in this analysis. *Community level costs associated in service delivery in schools are not captured in this model.*

Yearly project costs per schoolchild were then standardized over a set number of feeding days and the amount of energy provided by the average ration in each modality. The details for the standardisation calculations for the different modalities, namely onsite meals, biscuits, take-home rations, and combined onsite and take-home rations are captured in turn in the following sections.

Standardising onsite meal and biscuit programme costs

For onsite feeding, project costs were standardised using a 200 school feeding day year alongside a fixed parameter of 700 kilocalories. The ratio of theoretical food tonnage divided by the actual tonnage delivered was used to account for breaks in the food pipeline, as described in previous analyses (Gelli et al., 2009). The standardised cost per beneficiary, c_s, was calculated using

$$c_s = \left(\frac{E}{b}\right) \cdot \left(\frac{200}{d_{sf}}\right) \cdot \left(\frac{k_{st}}{k_{pl}}\right) \cdot \left(\frac{T_T}{T_a}\right) \qquad (1)$$

where

E = actual project expenditure

b = number of beneficiaries

d_{sf} = number of onsite feeding days

k_{st} = standardisation parameter for ration kilocalories per modality (onsite=700 kcals, biscuits= 300 kcals)

k_{pl} = planned ration kilocalories

T_T = theoretical food tonnage

T_a = actual food tonnage delivered

The theoretical tonnage was calculated by multiplying the daily ration by the number of actual school feeding days and the number of beneficiaries, or

$$T_T = \frac{d_{sf} \cdot r_{kg} \cdot b}{1000} \qquad (2)$$

Where r_{kg} = daily ration size in kilograms.

The standardised cost per beneficiary, c_s, was therefore calculated using

$$c_s = \left(\frac{E}{b}\right) \cdot \left(\frac{200}{d_{sf}}\right) \cdot \left(\frac{k_{st}}{k_{pl}}\right) \cdot \left(\frac{d_{sf} \cdot r_{kg} \cdot b}{T_a 1000}\right) = \frac{1}{5} \cdot \left(\frac{k_{st}}{k_{pl}}\right) \cdot \left(\frac{E \cdot r_{kg}}{T_a}\right) \qquad (3)$$

Standardising take-home ration programmes costs

Standardising take-home ration programmes is not as straightforward as for onsite meal or biscuit programmes. This is mostly because take-home rations, unlike onsite meal programmes, are generally targeted to reach the families of school children and also act as direct income transfers. For comparability with the standardisation approaches for the other

modalities, the approach used in this analysis focussed on average calories delivered (though in this case over a year period) and adjusting for potential breaks in the food pipeline. The theoretical tonnage was calculated by multiplying the take-home rations quantities by the number of yearly distributions (d_{THR}) and the number of beneficiaries (assuming perfect attendance), or

$$T_T = \frac{d_{THR} \cdot r_{kg} \cdot b}{1000} \qquad (4)$$

Where r_{kg} = ration size in kilograms.

Standardising combined onsite and take-home ration programmes costs

Unlike previous studies, a new standardisation methodology was devised to attempt to capture the variation in the share of children receiving both onsite meals and take-home rations, a major cost driver for these type of programmes. The theoretical tonnage was calculated by adding the theoretical tonnage from the onsite meal component to that from the take-home rations component. For combined programs the standardised costs were given by

$$c_s = \left(\frac{E}{b}\right) \cdot \left(\frac{k_{cst}}{k_y}\right) \cdot \left(\frac{T_T}{T_a}\right) \qquad (5)$$

where

$$k_{cst} = 0.98 \cdot (700 \cdot 200) + (0.15 \cdot 345235) = 188{,}971$$

is equivalent to the yearly kilocalories delivered to the average proportion of children in combined programmes receiving onsite meals at 700 kilocalories, added to the average proportion of children receiving take-home rations multiplied by the average yearly kilocalories delivered by take-home rations programmes, and

$$k_y = \frac{\lfloor (b_{os} + b_c) \cdot d_{sf} \cdot k_{pl} \rfloor + [(b_{thr} + b_c) \cdot k_{thr}]}{b_T} \qquad (6)$$

where

d_{sf} = number of onsite feeding days

k_{pl} = planned ration kilocalories

b_{os} = onsite beneficiaries

b_{thr} = take-home rations beneficiaries

b_T =total school feeding beneficiaries

Cost efficiency

Output metrics, such as food quantity, calories, proteins and micronutrient content delivered were then used to assess the cost-efficiency of the different modalities. Linear regression with standardised costs as the dependent variable and number of beneficiaries as explanatory variable was used to assess economies of scale. Unless otherwise specified, averages weighted by total beneficiary numbers were used throughout the analysis.

Results

18 projects were excluded from the final data set due to incomplete project data, or because the school feeding costs were more than 3 z-scores from the mean, as in the case of Guatemala. As a result, data on school feeding activities could only be obtained from 78 WFP projects, covering over 16 million beneficiaries in 62 countries. In this data set, 55 percent of WFP school feeding beneficiaries belonged to projects distributing onsite meals, 28 percent a combination of onsite meals and take-home rations, 10 percent a fortified biscuit snack, and 7 percent for take-home rations. 47 percent of beneficiaries were reached through development or country programmes, 41 percent through relief and recovery, 7 percent through emergency operations (and 5 percent through operations in response to the food price crisis[2]. The total expenditure for school feeding in the data set was approximately $480 million USD. 50 percent of school feeding expenditures were incurred in projects distributing onsite meals, 35 percent in projects distributing a combination of onsite meals and take-home rations, 5 percent in projects distributing a fortified biscuit snack, 10 percent in projects distributing take-home rations. The percentage shares of beneficiaries and expenditures are fairly similar for combined school feeding and onsite programmes, but are substantially different for take-home rations and biscuits. In combined programmes, 14 percent of beneficiaries, or 27 percent of assisted girls, received both onsite meals and take-home rations. Notably, the proportion of children receiving both modalities varied considerably from country to country (from 1 percent in Chad to 100 percent in Laos), reflecting the targeted, context specific, nature of the extra take-home rations assistance.

Overall the average standardised cost of school feeding was $48 USD per child per year. The cost of onsite meals standardised over a 200 feeding day period and a 700 kilocalories ration was $44 USD per child per year, and ranged from $17 USD in Sao Tome and Principe to $122 USD in Cape Verde (see Figure 5.3).

[2] Expenditures across the different project categories followed very similar patterns.

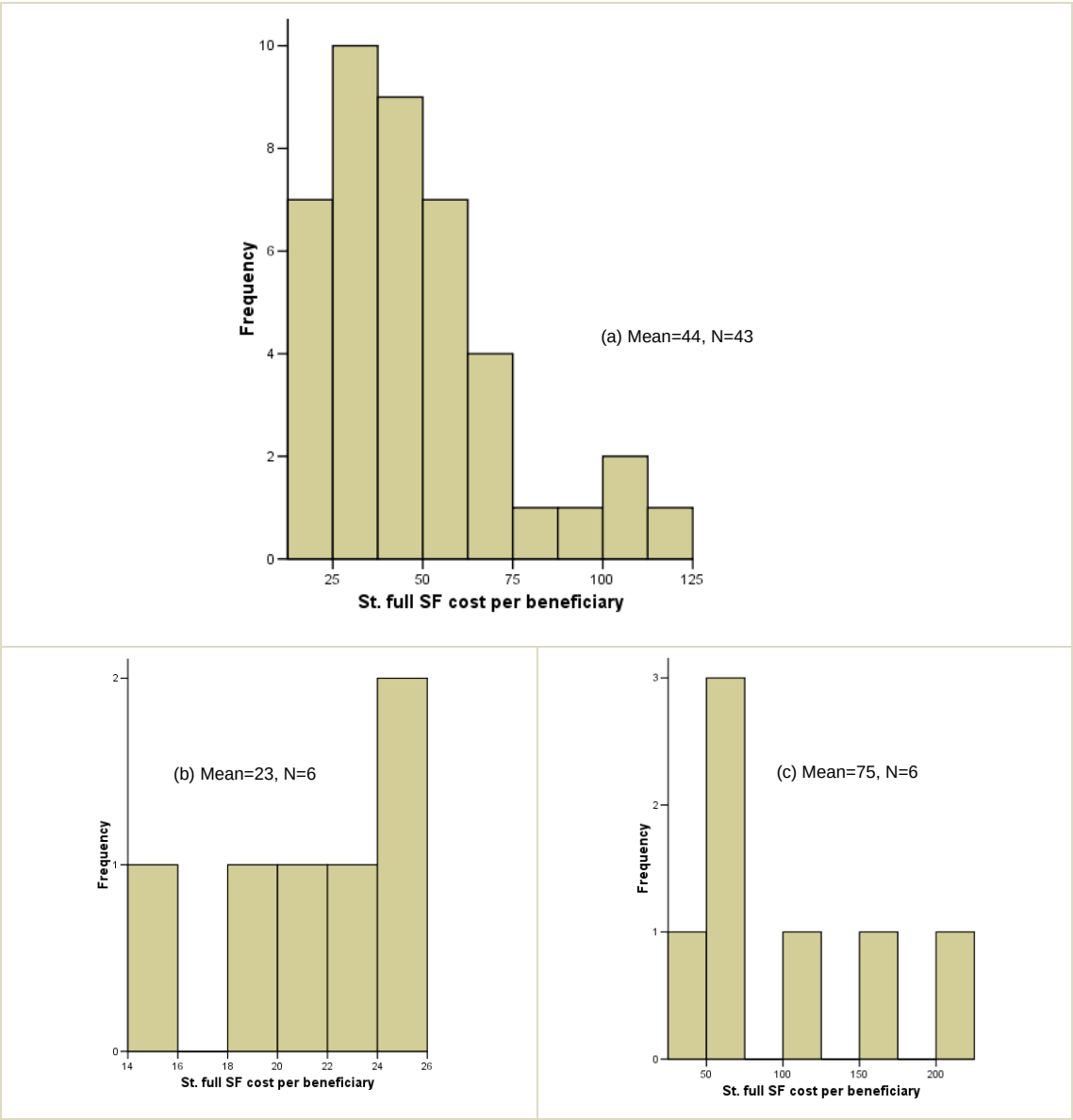


Figure 5.3: Distributions of standardized costs per child per year for countries with (a) onsite meal, (b) biscuits and (c) take-home ration programs. *Large variations in costs per child were found across all modalities.*

The average standardised cost for fortified biscuits was $23 USD and ranged between $15 USD in the Bangladesh development programme and $25 USD in the emergency operation in the same country. The difference in costs between the two projects was mostly due to higher commodity costs in the emergency operation. Whilst food purchases for the development programme were undertaken at the beginning of 2008 when food prices had not peaked yet, purchases for the emergency operation, planned as a response to the food price crisis, were timed when prices were peaking. Take-home rations programs were found to be the most expensive of all school feeding modalities, with an average standardised cost of $75 USD per child per year and costs ranging from $30 USD in Iran to $213 USD in Yemen.

The average cost for combined programs was $61 USD, ranging from $33 USD in Uganda to $140 USD in Liberia. Standardised costs were on average 67 percent greater than unstandardised costs, with the largest differences in biscuit and take-home rations programmes (see Table 5.1 for details).

Table 5.1: School feeding costs in $ USD (including WFP and Government contributions) and per child cost-efficiency metrics by modality, *excluding school level costs*.

Modality	Project cost / child	Standardised cost / child	St. cost / child range (min-max)	St. cost / 100 kcals	St. cost / (g) protein	St. cost / (mg) iron	St. cost / 100 (mcg) vitamin A	St. cost / 100 (mcg) iodine
Onsite meals (N=43)	27	44	17-122	6.2	2.4	7.2	23	1742
Biscuits (N=6)	11	23	15-25	7.5	2.9	2.9	9.4	34
THRs (N=6)	43	75	29-213					
onsite meals & THRS (N=22)	36	61	23-140					
Total (N=77)	29	48	15-213					

The average energy content per daily ration was found to be approximately 726 kcals for onsite meals, 271 kcals for biscuits and 617 kcals for the onsite component of combined programmes. The average costs per 100 kcals delivered were $6 USD for onsite meals and $9 USD for biscuits. Onsite meal programmes were also most cost-efficient in terms of protein content compared to other modalities. However, findings on costs per unit of micronutrient output (in this analysis micronutrient content included iron, vitamin A and iodine) across the different modalities indicated that fortified biscuits are more cost-efficient in terms of micronutrient delivery than onsite meals.

A breakdown of the school feeding expenditure by aggregate cost category[3] showed that on average 58 percent of project expenditures are due to commodity costs, 22 percent to transport and 20 percent to support costs (see Table 5.2). At approximately 55 percent, the share of commodity cost over total cost was lowest for onsite meal and programmes combining onsite meals and take-home rations, 16 points lower than for biscuits and 13 points lower than take-home rations programmes. Considering that the data in this analysis doesn't include school level costs these findings are a first indication that larger overheads are associated with onsite meals programmes compared to biscuits and take-home rations.

[3] For simplicity, transport and LTSH costs were grouped within an aggregated transport category, whilst DSC, ODOC and ISC costs were aggregated within a support cost category.

Table 5.2: School feeding (SF) cost components by modality

Modality	Share of commodity expenditures SF (%)	Share of support expenditures SF (%)	Share of total transport expenditures SF (%)
onsite meals	56	21	23
Biscuits	71	14	15
THRs	68	19	13
onsite meals & THRS	55	21	24
Total	58	20	22

At $1,168/MT delivered, take-home rations were the most efficient modality in terms of food quantities distributed, compared to biscuits which were the most expensive modality at $1,973/MT. Take-home rations were also found to be more cost-efficient across the transport and support cost components (see Table 5.3). This finding suggests that take-home rations are logistically very cost-efficient in terms of actual food quantities distributed. However, because take-home rations are designed to benefit households rather than individual children their objective is not directly comparable with in-school programs. When comparing biscuits with school meals, the former offer a more compact and cost-efficient alternative in terms of actual nutritional input to children in the classroom.

Table 5.3: Cost per metric tonne (MT) weighted average estimates, total and by cost component, by modality.

Modality	Total cost ($)/ MT	Commodity cost ($)/MT	Transport cost ($)/MT	Support cost ($)/ MT
onsite meals	1205	685	254	265
biscuits	1973	1213	342	417
THRs	1168	797	139	234
onsite meals & THRS	1325	731	314	280
Total	1324	765	275	284

Linear regression models found no economies of scale effects across the different cost components. However, detailed analysis of the cost drivers was limited by the aggregate nature of the cost categories available in the WFP databases and will likely require further country specific analyses.

Conclusions

The purpose of this study was to address the need identified in the recent World Bank and WFP review for systematic estimates of the cost of the different school feeding modalities, and of the determinants of the considerable cost variation among countries. The project aimed to update the current benchmarks for school feeding costs and cost efficiency, and provide a framework to understand the cost drivers and cost-containment opportunities of

school feeding programmes. Unlike previous studies, this analysis attempted to also capture the costs of school feeding in emergency and protracted relief operations. In addition, a revised methodology was developed to standardise costs across programmes that combined onsite meals and take-home rations.

The standardised yearly average school feeding cost per child was $48 USD. The yearly costs per child were lowest at $23 USD for biscuit programmes and highest for take-home rations programmes at $75 USD. The average cost of programs combining onsite meals with extra take-home rations for children from vulnerable households (e.g. girls in areas with large gender disparities) was $61 USD. The range of costs is such that there is considerable overlap across the modalities, highlighting the opportunities for cost containment. Commodity costs were on average commodity 58 percent of total costs, and were highest for take-home rations and biscuit programmes (68 and 71 percent respectively). As this analysis does not include school level costs[4] these findings highlight the higher non-transfer costs for programmes delivering cooked meals in schools compared to other school feeding modalities. Comparisons between unstandardised and standardised costs indicated that because of pipeline breaks, funding shortfalls or other operational issues, WFP operations on the ground on average spend about 67 percent of what they would be spending to deliver the full cost of school feeding over a 200 day period. This finding is consistent with previous analyses.

The costs per 100 kilocalories delivered ranged from $6 USD for onsite meals and $8 USD for biscuits and combined programs. Comparisons of costs across the different choices of school feeding modalities confirm findings from previous studies where fortified biscuits provided the most cost-efficient option in terms of micronutrient delivery. In addition, onsite meals generally have a significant community cost component unlike biscuits which at the school level simply require storage and handing out of the pre-packed daily rations (Galloway et al., 2009, see chapter 6). Adding the school level costs to our analysis will likely shift comparisons of the cost-efficiency ratios further towards the fortified biscuits option. This finding highlights the potential strategic importance of fortified biscuits to school feeding programs targeting operations in contexts where communities are not well suited to provide the necessary support to onsite meal interventions, as for example in the aftermath of an emergency or in cases of high food insecurity.

The average costs of school feeding estimated in this analysis are higher than those found in the literature, but fall within the range of costs previously reported (Gelli et al., 2009, Horton,

[4] School level costs tend to be considerably greater for onsite meal programmes compared to biscuits and take-home rations that involve no preparation before they are distributed to the children. This will be the subject of the following chapter.

1992). This study though is the first to estimate the costs of school feeding during the food price crisis of 2008. In addition, unlike previous studies, this analysis also captured the costs across the different WFP operations, including development programmes, protracted relief and recovery and emergency operations. To complement the current analysis, WFP and partners are undertaking a set of school level surveys in a sample of WFP assisted countries to capture the scale of the school level costs and community contributions for the different school feeding modalities.

Though this study adopted a costing framework consistent with that used in the recent literature, comparisons across these studies must be made with care for a number of reasons. Firstly, the data used in earlier studies covers different portions of the school feeding supply chain. For example, an analysis of 2005 WFP project data estimated that the average standardised cost per child per year was $22 USD (Gelli et al., 2009) though this data however did not systematically include Government data; in the current study, for example, Government contributions were on average 13 percent of total project cost. Similarly, a full cost analysis of onsite meals in four countries in Sub-Saharan Africa found that the cost of school feeding ranged from $28 USD per child per year to $63 USD per child per year, with an average cost of $40 USD per year (Galloway et al., 2009). Though this estimate appears to validate the results in our analysis, the four country study also includes estimates of school level costs (found to be on average approximately 10 percent of total cost), that are not captured in this chapter.

Fortified biscuit programmes were found to be more expensive than in 2006, where average standardised costs were under $20 USD per child per year (Gelli et al., 2006). This difference was driven by more expensive commodity prices in the Bangladesh programmes. The findings include data from a biscuit programme in Algeria, a first step in building the evidence base on costs for such programs in Africa. Take-home rations programmes were also more expensive than in a previous analysis (Gelli et al., 2009) but were comparable to those found in a full cost study in Pakistan (Ahmed et al., 2007). There is still a need to study the costs and cost drivers of school feeding programmes at country level, and take-home rations programmes in particular.

Limitations

Several important issues and assumptions made in this analysis limit the validity of the findings. Firstly, as different stakeholders are involved in the school feeding supply chain to different extents in the different countries and WFP reporting systems to date do not always record these contributions, the cost data in the WFP systems is not always complete. This

issue is compounded by the fact that there was little systematic information available on where the gaps in the data were in the school feeding supply chain, other than costs at the school level which were not included in this analysis. Therefore the cost-efficiency benchmarks presented here do not portray the full picture and should be used with caution. Another important consideration is that school level costs are not uniform across the different school feeding modalities. As outlined above, for example, though onsite meals appear to be more cost efficient in terms of 100 kilocalories delivered, however, factoring in the difference in school level overheads which are not insignificant for this particular school feeding modality is likely to shift the balance of cost-efficiency towards biscuits. In addition, where school feeding was part of a series of activities within a project a set of assumptions were made to estimate the share of project expenditures incurred by school feeding alone. These estimations used figures generated by WFP Country Offices to scale the overall project tonnage and project expenditures, unless the Country Offices could provide validated data, which introduced a fairly significant error in the cost estimates. In addition, for take-home rations elements the theoretical tonnage standardisation is likely to over-estimate the total costs as the take-home ration distribution is conditional to pupils' attendance. Also for take-home rations, standardizing for calories may also not be representative of the take-home rations design in so far as the rations are generally designed on the basis of the transfer value to the household rather than on the calories they would deliver. Another important limitation arises from the fact that the data used in this analysis covers a centralised implementation model that is not always the most relevant in terms of Government school feeding programmes, particularly those geared towards food procurement in more "home-grown" approaches.

In summary

This chapter was aimed at examining the costs of providing food through schools, with a focus on differentiating the costs by modality and on identifying the main drivers of cost-efficiency. The average cost of school feeding was $48 USD per child per year, and was lowest for biscuit programmes ($23 USD) and highest for take-home rations ($75 USD). The next chapter focusses on the "hidden costs" incurred at the community level that are not captured in this study, and are only very vaguely examined in the literature. Chapter 5 develops a methodology to capture both financial and economic school level costs that was piloted in Kenya.

Annex- Table 5.4: Country level data and cost per beneficiary estimates in $ USD.

Modality	Country	Type	Beneficiaries	SF days	Ration (Kcals)	WFP cost / beneficiary	Gov. cost / beneficiary	Full SF cost/ beneficiary	St. full SF cost / beneficiary
Onsite meals	Armenia	PRRO	22,004	80	1134	12.95	0.36	13.32	20.18
	Benin	DEV	73,384	165	950	32.34	.	32.34	21.57
	Bhutan	DEV	40,441	271	1304	64.61	49.3	113.9	50.67
	Bolivia	DEV	148,478	160	631	21.77	.	21.77	44.28
	Burundi	PRRO	262,450	189	1410	23.07	.	23.07	30.03
	Cape Verde	DEV	75,460	156	597	18.18	15.03	33.22	121.7
	Central African Republic	PRRO	58,978	120	1267	52.85	0.06	52.91	67.2
	Central African Republic	DEV	107,436	121	804	48.65	.	48.65	66.57
	Colombia	PRRO	147,259	160	700	45.86	11.3	57.16	63.82
	Congo D. R.	PRRO	367,150	152	573	28.05	.	28.05	53.51
	Congo Republic	PRRO	28,856	90	740	10.78	0.96	11.74	43.53
	Côte d'Ivoire	PRRO	661,087	93	731	15.54	.	15.54	44.43
	East Timor	PRRO	98,759	62	621	7.43	.	7.43	26.05
	East Timor	PRRO	173,662	62	621	8.43	0.79	9.22	64.3
	Ghana	DEV	40,935	54	689	19.58	5.64	25.22	100.26
	Ethiopia	PRRO	5,483	96	480	32.02	.	32.02	32.69
	Gambia	DEV	110,392	159	549	26.05	0.15	26.2	38.57
	Haiti	PRRO	320,562	112	507	77.69	0.01	77.71	54.98
	Honduras	DEV	104,176	140	507	25.01	1.09	26.1	54.24
	Kenya	DEV	1,210,624	142	703	17.52	3.15	20.67	27.81
	Lesotho	DEV	81,009	180	738	23.63	0.22	23.85	26.82
	Madagascar	DEV	156,996	158	1087	26.62	15.15	41.76	109.17
	Mauritania	DEV	150,174	120	913	48.99	2.14	51.12	61.42
	Nicaragua	DEV	299,669	150	490	22.89	4.13	27.02	51.51
	Niger	CP	107,907	175	679	81.56	20.1	101.66	40.87
	Occupied Territories	PRRO	57,497	141	540	122.05	.	122.05	28.41
	Russia	EMOP	113,390	163	631	12.54	.	12.54	26.69
	Rwanda	DEV	322,106	163	537	41.92	.	41.92	91.7
	Sao Tome and Principe	DEV	31,814	170	732	15.97	.	15.97	17.49
	Senegal	DEV	172,942	94	617	7.22	.	7.22	20.77
	Senegal	PRRO	157,637	134	711	27.06	0.15	27.21	79.61
	Sierra Leone	PRRO	184,283	190	539	16.25	0.05	16.3	41.35
	Sri Lanka	PRRO	383,520	198	516	18.13	4.81	22.94	38.05
	Sudan	DEV	297,880	169	780	17.1	.	17.1	17.92
	Swaziland	PRRO	77,970	142	792	8.98	.	8.98	34.37
	Tanzania	DEV	205,317	195	725	20.53	0.87	21.4	32.72
	Tanzania	PRRO	2,136	196	657	210.74	.	210.74	18.65
	Uganda	PRRO	545,427	124	1078	14.3	.	14.3	19.69
	Uganda	PRRO	450,763	124	788	25.17	.	25.17	35.48
	Yemen	PRRO	4,110	183	616	45.51	0.67	46.18	48.08
	Zambia	DEV	251,959	154	489	11.01	1.46	12.47	54.19
	Zimbabwe	PRRO	191,706	131	689	16.4	.	16.4	40.5
Biscuits	Algeria	PRRO	25,000	168	225	10.14	.	10.14	23.64
	Bangladesh	PRRO	7,179	250	225	11.03	.	11.03	15.05
	Bangladesh	DEV	550,000	240	338	19.87	0.29	20.16	19.57
	Bangladesh	IEFR	553,229	67	338	7.01	.	7.01	25.33
	Cuba	DEV	290,731	114	221	2.27	1.76	4.03	24.97
	Indonesia	PRRO	493,538	140	225	10.25	.	10.25	21.35
Take-home rations	Georgia	PRRO	4,750	120	.	90.97	3.69	94.66	118.16
	Ghana	DEV	34,365	.	.	39.33	23.89	63.22	170.75
	Iran	PRRO	2,212	.	.	5.3	.	5.3	29
	Myanmar	PRRO	228,742	.	.	17.17	.	17.17	66.89
	Pakistan	DEV	419,822	.	.	36.11	.	36.11	55.52
	Pakistan	IEFR	323,711	.	.	51.55	.	51.55	69.22
	Yemen	DEV	63,138	.	.	96.18	24.82	121	213.38

Modality	Country	Type	Beneficiaries	SF days	Ration (Kcals)	WFP cost / beneficiary	Gov. cost / beneficiary	Full SF cost/ beneficiary	St. full SF cost / beneficiary
onsite meals and take-home rations	Burkina Faso	DEV	76,262	108	1177	36.73	2.69	39.42	43.51
	Cambodia	PRRO	473,269	200	593	24.51	.	24.51	48.03
	Cameroon	DEV	53,681	165	729	33.21	4.61	37.82	90.53
	Chad	DEV	132,677	120	742	36.4	1.94	38.34	54.52
	Djibouti	DEV	9,307	192	1074	95.67	.	95.67	41.44
	Ethiopia	DEV	421,692	74	653	39.15	1.49	40.64	101.12
	Guinea	DEV	120,925	168	731	29.03	0.29	29.32	57.09
	Guinea	PRRO	118,465	150	969	20.5	0.09	20.59	44.29
	Guinea Bissau	PRRO	110,702	113	529	22.35	0.02	22.37	59.46
	Kenya	PRRO	47,689	186	287	10.65	.	10.65	48.23
	Laos	DEV	89,859	152	329	63.26	1	64.26	70.51
	Liberia	PRRO	506,699	180	313	46.5	.	46.5	49.46
	Liberia	DEV	57,242	81	716	40.48	.	40.48	139.99
	Malawi	DEV	642,109	173	400	20.45	.	20.45	48.03
	Mali	DEV	120,663	180	599	45.23	20.91	66.14	117.22
	Mozambique	DEV	230,300	180	714	45.73	.	45.73	49.95
	Nepal	DEV	231,712	214	441	22.27	.	22.27	56.15
	Philippines	IEFR	124,806	40	449	18.09	.	18.09	45.41
	Sierra Leone	DEV	89,100	195	539	43.6	.	43.6	96.46
	Somalia	PRRO	88,800	250	1330	54.61	.	54.61	45.62
	Sudan	EMOP	935,517	169	775	38.36	.	38.36	61.12
	Tajikistan	PRRO	319,061	164	792	41.45	.	41.45	55.56
	Uganda	DEV	52,006	113	1034	49.04	.	49.04	32.74

Chapter 6: What about community contributions? Estimating the school level costs of school feeding

Abstract

Background: Cost estimates of school feeding programmes generally do no capture contributions made by the community at the school level. In fact, only one study in the literature includes community level contributions.

Objectives: To develop and test a methodology to capture financial and economic school level costs for school feeding, focussing on the "hidden costs" not generally captured in programme expenditures.

Methods: A survey covering a purposive sample of 30 schools in Kenya undertaken in December 2009. The schools were distributed in 11 districts across the arid and semi-arid regions of the country, reflecting different socio-economic and infrastructure contexts. Cost data were collected retrospectively following an ingredients approach using a semi-structured questionnaire. The survey was based on a standardised costing framework capturing capital and recurrent costs incurred at the school level. The questionnaire also covered both cash and in-kind contributions and was used to estimate both financial and economic costs.

Results: The average costs per child at the school level for school feeding programmes was $8.72 USD, including in-kind contributions and annuitized capital costs. The school level costs translated into a demand for community level goods and services, including approximately $1.33USD per child per year spent on procuring fresh fruit and vegetables and $2.18 USD per child were spent on salaries for cooks and security staff at the school level. Using the average figure for school size in the sample, this would equate to approximately $1,035 USD for procuring food through smallholder producers in the community, and to approximately $1,565 USD to use for employment within the community. Costs varied considerably by context, ranging from $5.98 USD to $10.55 USD in rural and urban schools respectively.

Conclusions: School level costs for school feeding are substantive, and are a considerable overhead, considering that these costs are generally borne by the community. However, they also represent a steady stream of resources that are being channelled into the village level economy, providing an entry point for employment and income generation, two elements critical to programme sustainability.

Introduction

Cost estimates of school feeding programmes generally do no capture contributions made by the community at the school level. In fact only one study in the literature includes community level contributions (Galloway et al., 2009). This study that I co-authored analysed on-site meal programmes in 4 countries in sub-Saharan Africa, namely Kenya, Lesotho, Malawi and the Gambia. Community contributions to school feeding ranged from 0% in Lesotho[1] to 15% in Kenya. This study was the first to systematically examine this issue. 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].

Objectives

The purpose of this analysis was to provide a detailed methodology to estimate school level costs for onsite meals, and to test this in a pilot in Kenya.

Methodology

A simplified breakdown of the main processes aimed at providing timely school feeding services of adequate quantity and quality was used to develop a school level costing framework (see Figure 6.1). The provision of different school feeding modalities involves a range of different school level activities that are not normally captured in programme expenditures. The choice of onsite meals, in sub-Saharan Africa is generally associated with in-school food storage and preparation. As well as having cooks trained to provide adequate meals, preparing food in schools involves providing fuel, pots, pans, dishes for the children and cooking utensils, for example. Ideally, cooks would be trained in hygiene and sanitation, and the kitchen be equipped with fuel efficient stoves and chimneys as well as a source of potable water.

[1] In Lesotho, the government absorbed costs that communities were previously paying, so there were no community costs for school feeding.

[2] A detailed analysis on the food procurement dimension, and potential benefits to small-holder 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.

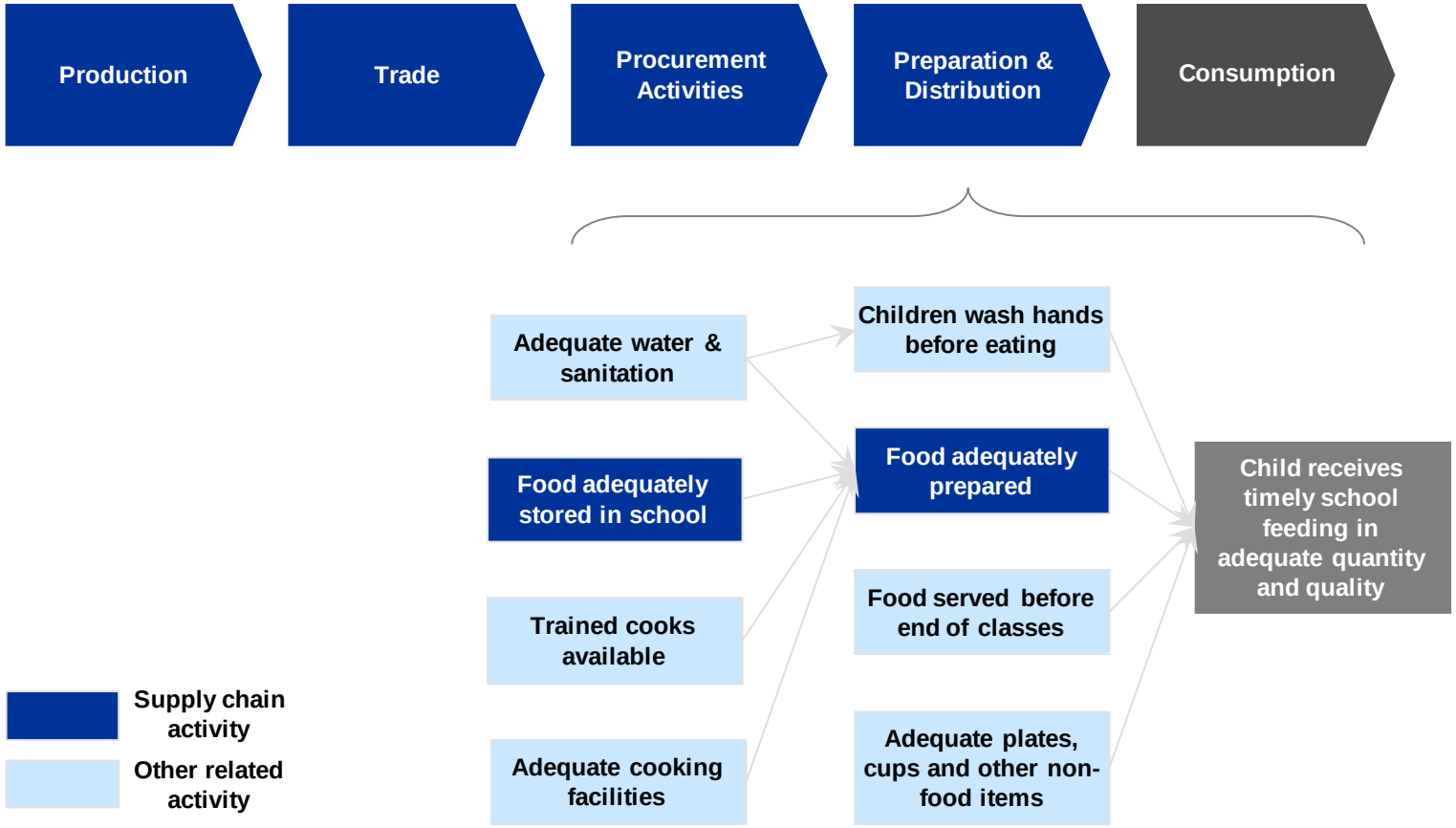


Figure 6.1: Simplified school feeding school level processes (Source: Gelli et al., 2012). *Onsite feeding, unlike biscuits or take-home rations, requires considerable school level support activities.*

Biscuits and take-home rations do not require preparation in schools and generally involve only storage, management and monitoring. At the school level, onsite meals are therefore resource intensive relative to other modalities, in terms of cash and in-kind contributions required for adequate service delivery. This difference in complexity is usually reflected in the magnitude of the costs associated with delivering the alternative modalities at school level.

Data collection

A survey covering a purposive sample of 30 schools in Kenya undertaken as part of a supply chain analysis of the WFP programme conducted in December 2009. The schools were distributed in 11 districts across the arid and semi-arid (ASAL) regions of the country, reflecting different socio-economic and infrastructure contexts. Cost data were collected retrospectively following an ingredients approach using a semi-structured questionnaire. The survey was based on a standardised costing framework capturing capital (fixed) and recurrent costs incurred at the school level. The questionnaire also covered both cash and in-kind contributions and was used to estimate both financial and economic costs (see annex 6.1). Financial costs capture actual expenditures in terms of programme implementation on an annual basis. Economic costs included the opportunity costs of community members, teaching staff and other school level stakeholders involved in the school feeding service provision. The range of capital and recurrent costs the survey captured is shown in Table 6.1. Inevitable, a number of activities represent indirect costs, or cost entries shared across activities not directly relevant to school feeding (e.g. toilet block maintenance). Opportunity costs of school staff and community members were calculated using local pay scales. The assumed useful life of all relevant school level assets was set to 10 years and capital costs were annuitized over this period using a discount rate of 3% as per World Bank recommendations. Annuitisation enables an equivalent annual cost to be estimated and reflects the value in-use of capital items, rather than reflecting when the item was purchased (Brooker et al., 2007). All costs were incurred in Kenya Shillings (KSh) and converted to US dollars using official exchange rates, based on average yearly exchange rate: 1 US$ 70.92 KShh in January 2009.

Results

The 30 schools had a total of 23,430 school children enrolled. 18 out of the 30 schools were found in urban settings. Average school size was 778 children overall, whilst urban schools had on average 947 children enrolled, compared to 532 children in rural settings. The School Management Committee (SMC) managed the school feeding programme in each of the surveyed schools. The SMC generally agreed a fee that was charged to each child enrolled in the school to support school

feeding operations. If parents could not afford to pay the fee in cash, they could also provide in-kind contributions (e.g. fresh fruit and vegetables) or support services (e.g. cooking).

The average costs per child at the school level for school feeding programmes was $8.72 USD, including in-kind contributions, annuitized capital costs and indirect activities. The school level costs translated into a demand for community level goods and services, including approximately $1.33USD per child per year spent on procuring fresh fruit and vegetables and $2.18 USD per child were spent on salaries for cooks and security staff at the school level. Using the average figure for school size in the sample, this would equate to approximately $1,035 USD for procuring food through smallholder producers in the community, and to approximately $1,565 USD to use for employment within the community (see Table 6.1). Costs varied considerably by context, ranging from $5.98 USD to $10.55 USD in rural and urban schools respectively. Both capital and recurring costs in urban schools were on average greater than in rural schools. Recurrent costs for water, fresh vegetables and salt were lower in urban schools.

Table 6.1: School level capital and recurrent costs per child for school feeding programmes in 30 primary schools in Kenya, 2009.

Cost type	Variable	Obs.	Mean cost per child per year ($USD)	Mean % of total cost
Capital	Annuitised infrastructure costs	30	2.53	25
Recurrent	Kitchen	15	0.49	8
	Fuel efficient stoves & chimney	9	0.82	10
	Store room & fumigation	17	0.28	3
	Toilet block*	16	0.55	5
	Water pump	11	0.38	7
	Hand washing facilities	11	0.14	1
	Fire wood	26	1.35	16
	Electricity	17	0.28	3
	Water	23	0.97	12
	Fresh vegetable condiments	6	1.33	11
	Salt	11	0.18	3
	Cooks salary	30	1.24	17
	Food management	6	0.14	1
	Security staff*	25	0.94	14
	Meal Distribution	2	0.15	
	Vehicle fuel*	1	0.68	
	Vehicle maintenance*	0		
	Monitoring & evaluation*	1	0.02	
	Canteen (Refectory)	0		
Total cost		*31*	*8.72*	

**These costs are only partially incurred through the school feeding service provision.*

The relationship between total cost and the different cost components was examined in more detail. The main cost drivers were the annuitized capital costs (on average 25 percent of total costs), followed by cooks salaries (on average 17 percent of total costs) and firewood (on average 16 percent of total costs). A number of cost entries were not relevant, including canteen and vehicle maintenance. Meal distribution and monitoring and evaluation were relevant in a very small number of schools. Total cost per child were found to be significantly negatively associated with the recurrent costs of water (Spearman's rho: -0.64, p=0.04), and with the salaries of cooks (Spearman's rho: -0.54, p=0.002) and security staff (Spearman's rho: -0.53, p=0.007). These associations require more detailed examination. Scatter plots of cost per child versus number of children covered suggested no effects from economies of scale (see Figure 6.2).

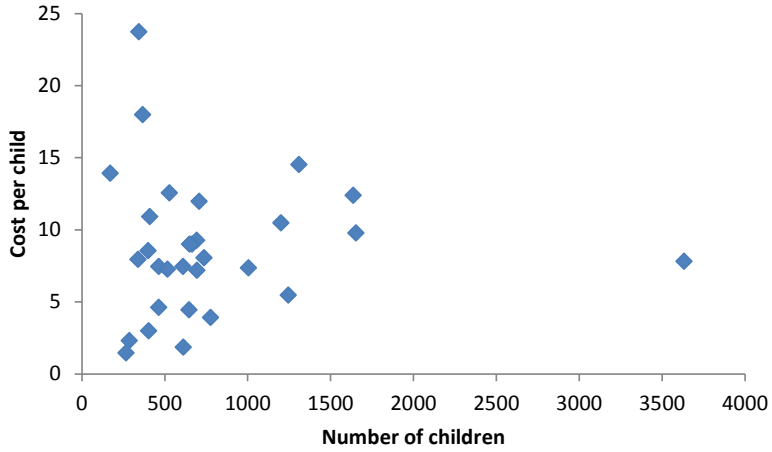


Figure 6.2: The relationship between cost per child versus number of children covered in 30 primary schools in Kenya, 2009. *The scatter plot suggests no apparent economies of scale.*

Conclusions

The provision of school feeding involves a range of school level activities including both capital and recurring expenditures not normally covered in programme costing exercises. Only one study in the literature documents these school level costs (Galloway et al., 2009), where I had contributed to the analysis by developing a basic cost framework. In this chapter, I build on my earlier work by developing a detailed methodology to estimate school level costs for onsite meals that was field tested in a pilot study in Kenya. The economic school level cost of providing onsite meals was $8.72 USD, ranging from $5.98 USD to $10.55 USD in rural and urban schools respectively. These estimates are above the estimates provided by the earlier study that reported average community level costs of just over $2 USD per child per year. The earlier study included only a very basic school level cost framework based on fees charged by the school management committee to support school feeding programme implementation that was applied to a very small number of schools (less than 5 per

country). It is likely that the current work provides a more complete analysis, including both annuitised capital costs and an exhaustive set of recurring expenditures. In Kenya the programme level costs for the WFP programme in 2008 were $27.81 USD (see chapter 5, or Gelli et al., 2011). The full cost of programme implementation would therefore total $36.53 USD. School level costs amount to approximately 24 percent of total costs, an estimate that is above the range reported in the earlier study (Galloway et al., 2009).

There are a number of important limitations of this work. The field work included a small number of schools and the sample was not representative for the national programme in Kenya, nor was it large enough for meaningful comparisons across different school groupings. In addition, it was also challenging to retrospectively place a value on the time spent by community stakeholders in supporting the programme. The assumptions made to estimate the opportunity costs will require validation from more in-depth studies.

A number of policy implications arise from these findings. The provision of onsite meal programmes requires a considerable amount of resources at the school level, nearly a quarter of total programme costs, not normally accounted for in programme expenditures. This omission is bound to underestimate true financial requirements necessary to implement an onsite meals. Secondly, a number of these "hidden costs" are generally borne by the community. It is important to recognise these community contributions when designing programmes, considering that school feeding in low-income countries are generally targeted on the basis of poverty and food insecurity. Though these contributions are an important reflection of buy-in from the community in the programme, they also represent a considerable financial burden that is often overlooked.

In Summary

This chapter involved the development of a methodology to capture financial and economic school level costs for school feeding, focussing on the "hidden costs" not generally captured in programme expenditures. These costs amounted to $8.72 USD in a pilot study in Kenya, a total of 24 percent of the full school feeding programme costs. This is a considerable overhead, considering that these costs are generally borne by the community. However, they also represent a steady stream of resources that are being channelled into the village level economy, providing an entry point for employment and income generation, two elements critical to programme sustainability. In the next chapter, we will examine the issue of sustainability in more detail, focussing on benchmarking the country level investments in school feeding compared to other development investments.

Annex 6.1: School level costs module

3. Costs incurred in implementing School Feeding, including contributions from parents of pupils enrolled at the school, people living in the surrounding community, and other actors to the programme														School ID:
Note for the surveyor: Ask the following questions to the head teacher.														
		3.1 What is the total cost per school on:	**What is the frequency of the expendi--ture?**	**How is the contribution made?**			**Who makes the contribution?** *(Please tick all that apply)*							
		(Please specify value in Kshs)		*(Please estimate a % share of total cost)* Cash	In-kind	*If relevant, estimate time spent on task*	Parents of pupils enrolled at the school (outside the PTA and SMC)	The PTA	The SMC	People living in the surrounding community	The local elected authority	The Ministry of Education	Others (please specify)
Capital costs	Spoons, forks, plates etc.													
	Cooking pots													
	Kitchen construction													
	Fuel efficient stoves construction													
	Canteen (Refectory) construction													
	Store room construction													
	Toilet block construction													
	Water pump construction													
	Hand washing facilities construction													
	Vehicles													
Recurrent costs	Kitchen maintenance													
	Fuel efficient stoves & chimney maintenance													
	Canteen (Refectory) maintenance													
	Store room maintenance & fumigation													
	Fire wood													
	Electricity													
	Water													
	Fresh vegetable condiments													
	Salt													
	Cooks salary													
	Medical examination for cooks													
	Toilet block maintenance													
	Hand washing facilities maintenance													
	Hand pump maintenance													
	Security/watchman													
	Meal distribution													
	Managing food stocks													
	Monitoring and evaluation													
	Vehicle fuel													
	Vehicle maintenance													

Chapter 7: Are school feeding programmes in low-income settings sustainable? Insights from an analysis of the costs of school feeding compared to the costs of primary education.

Abstract

Background: School feeding programmes are ubiquitous. Benchmarking expenditures in school feeding is an important component of programme accountability and sustainability.

Objective: Analyse the costs of school feeding, and the cost relative to education expenditure and other measures of economic growth.

Methods: Data on the costs of school feeding were collected from multiple sources, including United Nations databases, grey literature and published reviews. Relationships between costs of school feeding, costs of education, and GDP per capita were analysed through standard linear regression.

Results: Data on costs of school feeding were obtained for 74 countries, including 12 high-income, 39 middle-income and 23 low-income countries. School feeding programmes were found to cost $173 USD per child per year, ranging from $56 USD in low-income countries to $693USD in high-income countries. In high-income countries school feeding per capita costs were on average equivalent to 11 percent of the per capita investments in primary education, compared to 19 percent in middle-income countries and 68 percent in low-income countries.

Conclusions: School feeding investments are targeted in low- and middle-income settings, reaching only a portion of primary school children, with total costs only a fraction of the overall investment in education. As countries get richer school feeding costs become a much smaller proportion of education costs. The findings provided in this study provide an updated framework for benchmarking school feeding programmes.

Introduction

The recent analysis of school feeding programs undertaken by PCD, the World Bank and the WFP highlighted that many countries for which data are available do not seem to seek to cease providing food to their schoolchildren (Bundy et al., 2009). Many countries in fact appear to seek to expand the coverage of their programs and establish them as national programs mainstreamed into national policy (Bundy et al., 2011). Monitoring financial investments in school feeding is important to ensure accountability, equity and transparency. Assessing the costs of school feeding relative to expenditure in education is also key element in the analysis of the transition from externally funded programmes to nationally owned, sustainable programs. In general, in low and middle income settings school feeding programmes are designed with educational goals and are framed within educational sector policies and plans. From this perspective, the comparison between per capita expenditures on education and the per capita costs of school feeding offers useful insights on the financial capacity in low and middle income settings to fund programme implementation.

Objectives

Provide an analysis of the costs of school feeding in terms of the absolute cost per child, and the cost per child relative to overall education expenditure and GDP in low, middle and high income countries.

Methods

The methodology used in this chapter builds on that reported in a previous study (Bundy et al., 2011). Data on the costs of school feeding in different countries were collected from multiple sources, including previously published WFP project data, reports from government ministries, grey literature and published reviews. Countries were categorised by income groups as per the World Bank classification. For low and middle income countries, the bulk of the cost data were used as reported in a comprehensive study using data from Chapter 5 (Gelli et al., 2011). In this case, programme costs were adjusted in order to estimate school level costs using scaling parameters from previous studies (see (Galloway et al., 2009) for onsite meals, (Gelli et al., 2007) for biscuits and (Ahmed et al., 2007) for take home rations).

Data from high income countries were obtained from a recent review of Government programmes (Harper et al., 2008). Costs for Botswana (BIDPA, 2011), Nigeria (Shaad et al, 2010), South Africa (Bastia, 2007) and Thailand (Kanemasu, 2007) were obtained from recently published case studies. Estimated daily costs per onsite meal were converted to annual costs per child using a fixed 200 feeding day school year. All estimates were converted to $USD using an internet based currency converter set to a fixed reference date set to the 1st of June 2008. The reference year for all data was 2008, or the next closest year with data available. Data on the expenditure per primary school student (as a percentage of gross domestic product (GDP) per capita) and GDP per capita[1] were obtained from the World Bank Development Indicators data base and cross checked with the UNESCO Institute of Statistics database. The reference year was 2008 and missing values were estimated using a simple algorithm that retrieved the most recent data point (looking backwards first). Estimates of the per capita costs of education were obtained by multiplying the per student share of GDP expenditure on primary education by the per capita GDP. The relationships between costs, of school feeding costs and of education, and GDP per capita were analysed through a standard linear regression model given by

$$y = mx + c$$

where y is the dependent variable (in turn either the per capita cost of school feeding or the per capita cost of education), x the independent variable (in both cases GDP per capita), m is the gradient or slope of the fitted line and c is the intercept. The relationship between the ratio of the absolute cost of school feeding to the absolute cost per child of primary education and GDP per capita was examined in more detail, where the fit was estimated using the ratio of the two regression models described above. The data were tested for heteroskedasticity visually by plotting residuals and by performing the Breusch-Pagan/ Cook-Weisberg test using STATA (Table 7.1). The robust regression command in STATA was also used as an alternative to ordinary least squares (OLS). Stata's rreg command[2] first runs

[1] To maximise comparability GDP per capita, purchasing power parity constant 2005 international $ USD as used in previous studies was selected in this analysis.
[2] See http://www.ats.ucla.edu/stat/stata/dae/rreg.htm

the OLS regression, gets the Cook's D for each observation, and then drops any observation with Cook's distance greater than 1.

Table 7.1: Testing for heteroskedasticity using the Breusch-Pagan / Cook-Weisberg test for fitted values of per capita costs of primary education and per capita costs of school feeding.

Fitted values of per capita cost of education	Fitted values of per capita cost of school feeding
$chi^2(1)$ = 98.37	$chi^2(1)$ = 104.46
Prob > chi^2 < 0.0001	Prob > chi^2 < 0.0001

Results

Data on the costs of school feeding were obtained for 73 countries, including 12 high-income, 38 middle-income and 23 low-income countries (see table in annex 1). The summary statistics for absolute costs of school feeding per child per year, ratio of the cost of school feeding per child to the per capita cost of education, and the ratio of the cost of school feeding per child to per capita GDP are shown in Table 7.2.

Table 7.2: Mean and range of per capita costs of school feeding per year, the per capita cost of school feeding as a proportion of the per capita cost of primary education, and the per capita cost of school feeding as a proportion of the per capita GDP.

Income group		Costs of school feeding ($USD)	Cost of SF/ per child cost of education	Cost of SF/ GDP per capita
Low	Mean	57.18	0.907	0.067
	Min	19.98	0.110	0.012
	Max	117.22	5.090	0.255
Middle	Mean	77.35	0.184	0.018
	Min	20.00	0.020	0.003
	Max	472.00	0.890	0.098
High	Mean	693.05	0.113	0.022
	Min	225.00	0.040	0.009
	Max	1,586.07	0.290	0.052
Total	Mean	171.87	0.395	0.035
	Min	19.48	0.020	0.003
	Max	1,586.07	5.090	0.255

Large variations were found in the costs of school feeding in general and across the three income groups, ranging from a minimum of under $20 USD in South Africa to a maximum of over $1,500 USD in France. In high-income countries school feeding costs are on average equivalent to 11 percent of the investments in primary education, compared to 87 percent in low income countries. There were also very

large variations in the ratio of the per capita cost of school feeding over the per capita cost of education, ranging from 0.09 in Cote d'Ivoire to 5.09 in Liberia. Seven countries were found to spend more on school feeding than on primary education, namely Central African Republic (ratio=2.01), Liberia (5.09), Madagascar (1.51), Mali (1.05), Myanmar (2.3), Rwanda (1.22) and Sierra Leone (1.37). These findings appear to be driven by a combination of below average GDP per capita and above average costs of school feeding. In middle and high income countries the range was considerably narrower (from 0.02 to 0.89 and from 0.04 to 0.29 respectively). Similarly narrow ranges across income categories were observed when comparing the costs of school feeding to GDP per capita. Scatter plots, with fitted linear regression models of the costs of school feeding per child, and the costs of education, against GDP are shown in Figure 7.1.

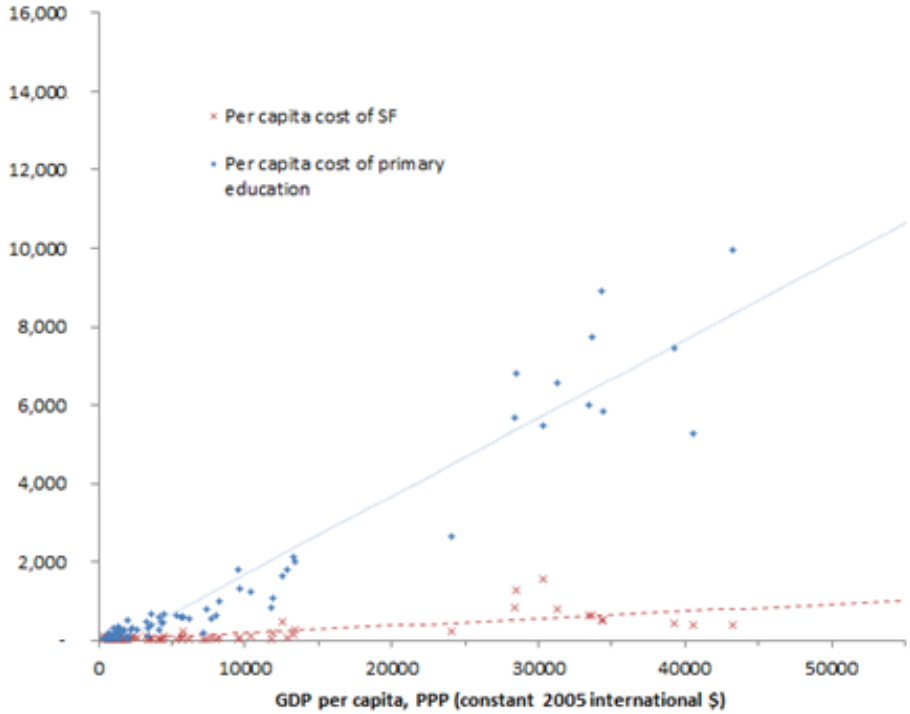


Figure 7.1: Scatter plots of costs per child of school feeding and primary education, and fitted linear regression models, against per capita GDP. *The linear regression models highlight how education costs increase more with GDP growth than do school feeding costs.*

The results show that the per capita costs increase with GDP. Tables 7.3 and 7.4 show the relevant linear regression statistics for the two different models. No differences were observed in the R^2, estimated slope or estimated constant coefficients in both models when robust regression was applied.

Table 7.3: OLS and robust linear regression models for per capita costs of school feeding as the dependent variable and GDP per capita as the independent variable.

OLS regression		Robust regression	
N (obs)	73	N (obs)	73
F(1, 71)	93.25	F(1, 71)	26.86
Prob > F	<0.001	Prob > F	<0.001
R-squared	0.5677	R-squared	0.5664
Adj R-squared	0.5616	Root MSE	189.41
Root MSE	188.93		

Regression		Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
OLS	GDP per capita	0.0184	0.002	9.63	<0.001	0.015	0.022
	constant	8.746	27.866	0.31	0.755	-46.817	64.308
Robust	GDP per capita	0.018	0.004	5.18	<0.001	0.011	0.025
	constant	8.746	14.777	0.59	0.556	-20.719	38.210

Table 7.4: OLS and robust linear regression models for per capita costs of primary education as the dependent variable and GDP per capita as the independent variable.

OLS regression		Robust regression	
N	73	N	73
F(1, 71)	893.68	F(1, 71)	226.33
Prob > F	<0.001	Prob > F	<0.001
R-squared	0.9264	R-squared	0.9264
Adj R-squared	0.9254	Root MSE	661.89
Root MSE	661.89		

Regression		Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
OLS	GDP per capita	0.199	0.007	29.890	<0.001	0.186	0.212
	constant	-288.645	97.621	-2.960	0.004	-483.295	-93.994
Robust	GDP per capita	0.199	0.013	15.040	<0.001	0.173	0.225
	constant	-288.645	69.461	-4.160	<0.001	-427.146	-150.144

The linear regression models for the school feeding costs and education costs show that GDP per capita is a fairly good predictor of school feeding costs and a very good predictor of costs of primary education. The regression results also highlight how education costs increase more with GDP growth than do school feeding costs. The constant for the primary education model is estimated to be negative, which is clearly incorrect. An alternative non-linear model, with a minimum cut-off value for education investment would probably be more realistic. The education data are for

primary education only and no attempt is made here to standardize education provision (for example, years of education) between countries. The school feeding costs are per beneficiary estimates, and make no allowance for differences in coverage, which is typically much lower in low-income countries.

Figure 2 shows the ratio of the per child cost of school feeding over the cost per child of education, plotted against GDP per capita. The ratio model was estimated using the parameters from the linear regression models, using

$$y = \frac{SF\ costs}{education\ costs} \approx \frac{[(0.0184 * \text{ gdp per capita}) + 8.75]}{[(0.199 * \text{ gdp per capita}) - 289]}$$

Linear regression models were also examined separately by income group (see table 7.5), where the linear effect of GDP per capita was significant only for middle income countries. However, the estimated slopes were negative for all three regression models.

Table 7.5: OLS linear regression models, by income group, of the per child cost of school feeding in relation to per child cost of basic education as the dependent variable and GDP per capita as the independent variable.

High income countries		Middle income countries		Low income countries	
N (Obs.)	12	N (Obs.)	38	N (Obs.)	22
F(1, 10)	3.53	F(1, 36)	6.91	F(1, 20)	3.57
Prob > F	0.0897	Prob > F	0.0125	Prob > F	0.0734
R^2	0.2609	R^2	0.1611	R^2	0.1515
Adj R^2	0.187	Adj R^2	0.1378	Adj R^2	0.109
Root MSE	0.06284	Root MSE	0.19323	Root MSE	1.0586

Regression		Coef.	Std. Err.	T	P>t	[95% Conf.	Interval]
High	GDP / capita	-6.44E-06	3.43E-06	-1.88	0.09	-0.0000141	1.20E-06
	constant	0.3278821	0.1160517	2.83	0.018	0.0693027	0.5864614
Middle	GDP / capita	-0.0000224	8.53E-06	-2.63	0.013	-0.000039	-5.13E-06
	constant	0.3108833	0.057483	5.41	<0.001	0.1943023	0.4274643
Low	GDP / capita	-0.0011786	0.0006238	-1.89	0.073	-0.0024799	0.0001226
	constant	2.095324	0.668093	3.14	0.005	0.7017066	3.488942

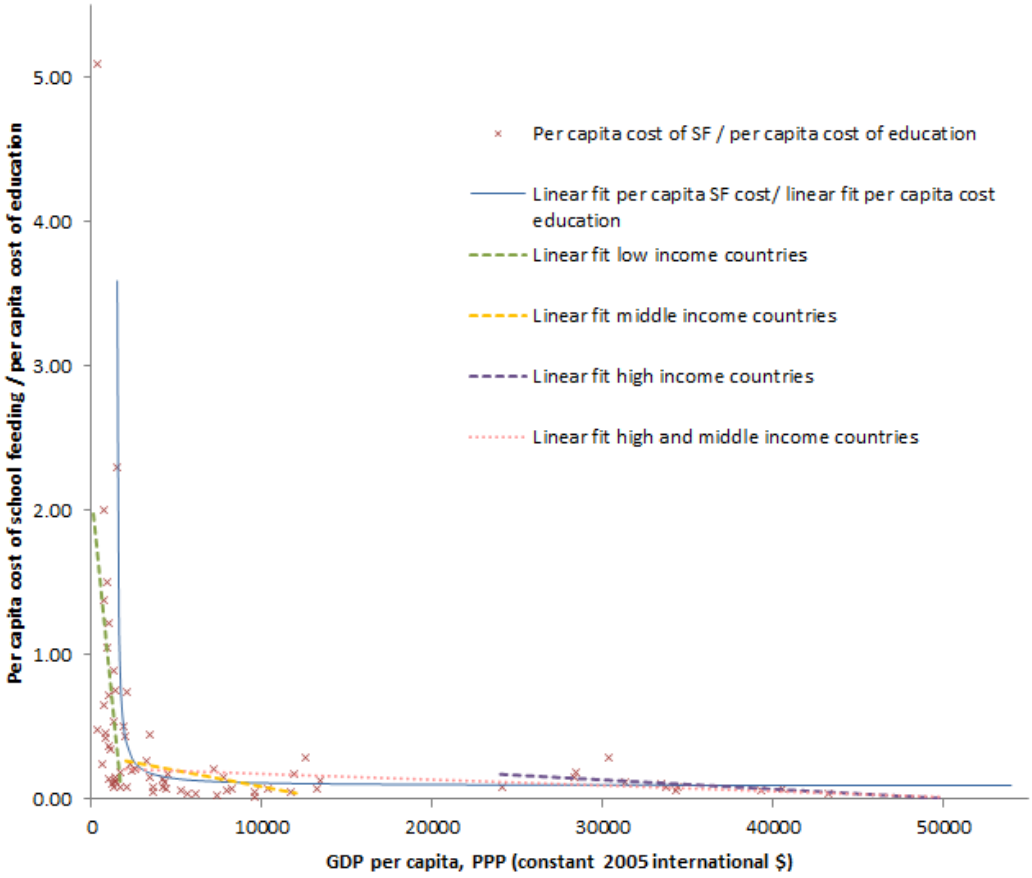


Figure 7.2: Ratio of per child cost of school feeding in relation to per child cost of basic education, versus GDP per capita. *School feeding programs in low-income countries exhibit large variation in cost and the per capita costs of feeding relative to education decline nonlinearly with increasing GDP.*

Figures 7.1 and 7.2 highlight considerable variation in the per capita cost of school feeding and the ratio between this and the per capita cost of primary education, largely in the low income countries. Figure 7.2 also shows how the relative cost of school feeding versus education becomes consistently low as GDP rises.

Conclusion

This analysis examined the most recent available data on the costs of school feeding, in relation to the cost of education and in GDP. A number of conclusions are apparent: First, as described in earlier studies (Gelli et al., 2009, 2011), school feeding programs in low-income countries exhibit large variation in cost, with concomitant opportunities for cost containment. Second, the per capita costs of feeding relative to education decline nonlinearly with increasing GDP. These analyses suggest that the main reason for this is a greatly increased investment per

child in primary education as GDP rises, but a fairly flat investment in food. As countries get richer, school feeding costs become a much smaller proportion of the investment in education.

Note that these analyses are based on absolute per beneficiary costs, and that feeding in low-income countries is typically at levels of coverage of less than 5 percent, whereas basic education will probably benefit more than 50 percent of the population. Thus, the actual per child costs of school feeding, even in these settings, is relatively much lower than for primary education. This result for the lower-income countries contrasts with the frequent anecdotal claim that per capita school feeding costs are often the same as those for education: they certainly are in some countries, and there are seven examples here where per child school feeding costs are actually higher than the costs of education (Central African Republic, Liberia, Madagascar, Mali, Myanmar, Rwanda and Sierra Leone), but there are also many examples where the costs of feeding are much lower. This raises the important issue of what causes these differences, apart from the contribution of differing accounting rules. Modality is certainly important, with the costs of biscuits or snacks being generally lower than other options. But this is not the only explanation—the data also show that there are meal plus take-home rations programs that are less costly than meals-alone options. The underlying explanation for the cost variation cannot be addressed here, but is clearly a very important area for research given that it implies that there is considerable opportunity for cost containment in precisely those countries where the potential for scale-up is greatest. There is also emerging evidence from other studies that as countries grow economically the school feeding programmes include in many cases a move towards procuring food at more decentralized levels, which has been shown in modelling exercises to potentially reduce overall costs quite considerably (Brinkman et al., 2007).

Comparisons with 2005 benchmarks

The trends reported in this analysis are very similar to those reported in earlier studies. There are however some important differences in absolute terms. The new results reported in this study are generally higher than the benchmarks reported in 2005, as described in Table 7.6. The average costs of school feeding increased overall

by 43 percent. This finding is not surprising considering that on average 58% of school feeding expenditures are due to commodity costs (Gelli et al., 2011) and that at the height of the food crisis experienced between 2005 and 2008, the prices of maize and wheat had tripled, and that of rice had increased fivefold (von Braun, 2008).

Table 7.6: Comparison of the benchmarks across income groups from 2008 and 2005, in $ USD.

		Costs of school feeding			Per child cost of education			Cost of SF/ per child cost of education		
		2008	2005	% change	2008	2005	% change	2008	2005	% change
High	Obs	12	8		12	8		12	8	
	Mean	693.05	584	19	6535.33	6399.30	2	0.11	0.1	13
	Min	225.00	60	275	2649.00	5199.73	-49	0.04	0.01	300
	Max	1586.07	1392	14	9957.00	8657.32	15	0.29	0.26	12
	Range	1361.07	1332.00	2	7308.00	3457.59	111	0.25	0.25	0
Middle	Obs	39	36		39	27		38	27	
	Mean	77.35	73	7	704.21	656.30	7	0.18	0.13	42
	Min	20.00	8	150	19.00	110.85	-83	0.02	0.02	0
	Max	472.00	354	33	2124.00	1625.39	31	0.89	0.33	170
	Range	452.00	346.00	31	2105.00	1514.54	39	0.87	0.31	181
Low	Obs	22	27		22	22		22	22	
	Mean	57.18	45	27	121.50	142.07	-14	0.91	0.4	127
	Min	19.98	11	82	19.00	334.00	-94	0.11	0.04	175
	Max	117.22	160	-27	317.00	63.30	401	5.09	1.14	346
	Range	97.24	149.00	-35	298.00	-270.69	-210	4.98	1.10	353
Total	Obs	73	57		73	57		72	57	
	Mean	172.48	120	44	1487.14	1263.86	18	0.39	0.23	71
	Min	19.98	8	150	19.00	63.30	-70	0.02	0.01	100
	Max	1586.07	1392	14	9957.00	8657.32	15	5.09	1.14	346
	Range	1566.09	1384.00	13	9938.00	8594.02	16	5.07	1.13	349

One of the main findings of previous work was the very large range of costs in low income countries that indicated opportunities for cost containment (Bundy et al., 2011). Interestingly, in low income countries, the range of costs decreased between 2005 and 2008 by about 35 percent. This finding suggests that some cost-containment measures had been implemented during this period. Benin, for example, had the highest school feeding to cost of education ratios in the 2005 data, mostly due to extremely high school feeding costs (approximately $160 USD per child per year). The costs of school feeding in 2008 were found to be less than USD$ 25 per child per year. This was a result of programming changes, involving a

rationalisation of the school feeding menu that led to considerable savings in terms of food costs following the publishing the 2005 data. This anecdotal example of evidence based decision making will be discussed in more detail in the conclusions of this thesis.

It is important to note that some of these differences must be interpreted with caution as they are also likely to be a result of improved data quality in this analysis compared to previous work. This is due to the well documented dearth of data on the costs of school feeding prior to 2008 that made the 2005 data collection very difficult (Bundy et al., 2009). A more detailed analysis examining the drivers of changes in costs over the 2005-2011 period is currently underway.

The analysis also indicates that there appears to be a transitional discontinuity at the interface between the lower- and middle-income countries, which, as described in the joint World Bank and WFP analysis (Bundy et al., 2009), tends to coincide with changes in the capacity of governments to take over the management and funding of programs. Further analysis is required to define these relationships, but an initial conclusion is that supporting countries to maintain an investment in school feeding throughout the transition from externally funded programmes to nationally funded programmes may emerge as a key role for development partners. If true, this is a particularly important conclusion because it suggests that external support for school feeding is a transitional and time-bound requirement in national development.

In summary

This chapter was aimed at exploring the sustainability school feeding programmes, analysing the costs of school feeding in terms of the absolute cost per child, and the cost per child relative to overall education expenditure and GDP. The results show that scaling-up school feeding requires considerable financial investments, equal to 40 percent of the costs of primary education across all countries, and increasing to 90 percent in low-income countries. In terms of sustainability, these findings highlight the important role played by development partners to support national government investments. The next chapter focusses on one promising area in terms of sustainability, involving the links between school feeding and smallholder farmer production.

Annex 7.1: Costs of school feeding, ratio of the cost of SF/ per child cost of education and ratio of the cost of SF/ GDP per capita, by country for 2008.

Country	Income group	Costs of school feeding	Cost of SF/ per child cost of education	Cost of SF/ GDP per capita
Algeria[1]	Middle income	23.64	0.03	0.003
Argentina[2]	Middle income	157.50	0.07	0.012
Armenia[1]	Middle income	21.19	0.03	0.004
Australia[3]	High income	511.51	0.09	0.015
Bangladesh[1]	Low income	19.98	0.15	0.015
Benin[1]	Low income	22.65	0.13	0.016
Bhutan[1]	Middle income	53.20	0.11	0.012
Bolivia[1]	Middle income	46.49	0.08	0.011
Botswana	Middle income	472.00	0.29	0.038
Brazil[2]	Middle income	29.75	0.02	0.003
Burkina Faso[1]	Low income	43.51	0.14	0.041
Burundi[1]	Low income	31.53	0.49	0.088
Cambodia[1]	Low income	48.03	0.51	0.025
Cameroon[1]	Middle income	90.53	0.74	0.044
Cape Verde[1]	Middle income	127.79	0.26	0.039
Central African Republic[1]	Low income	70.23	2.01	0.100
Chad[1]	Low income	54.52	0.54	0.043
Chile[2]	Middle income	260.00	0.13	0.019
Colombia[1]	Middle income	67.01	0.07	0.008
Congo, Rep. [1]	Middle income	45.71	0.44	0.013
Costa Rica[2]	Middle income	95.00	0.08	0.009
Cote d'Ivoire[1]	Low income	20.00	0.09	0.012
Djibouti[1]	Middle income	41.44	0.08	0.020
Dominican Republic[1]	Middle income	80.87	0.15	0.010
Ecuador[2]	Middle income	45.00	0.21	0.006
El Salvador[2]	Middle income	22.00	0.04	0.004
Ethiopia[1]	Low income	66.91	0.46	0.082
Finland[3]	High income	658.22	0.11	0.020
France[3]	High income	1,586.07	0.29	0.052
Georgia[1]	Middle income	118.16	0.17	0.026
Ghana[1]	Middle income	135.51	0.76	0.098
Guatemala[2]	Middle income	29.90	0.07	0.007
Guinea[1]	Low income	50.69	0.72	0.050
Honduras[1]	Middle income	56.95	0.08	0.016
Hong Kong SAR, China	High income	408.41	0.08	0.010
Indonesia[1]	Middle income	21.35	0.05	0.006
Ireland[3]	High income	435.38	0.06	0.011
Italy[3]	High income	1,278.14	0.19	0.045
Japan[3]	High income	799.04	0.12	0.026
Kenya[1]	Low income	38.02	0.12	0.026
Lesotho[1]	Middle income	28.16	0.08	0.021

Country	Income group	Costs of school feeding	Cost of SF/ per child cost of education	Cost of SF/ GDP per capita
Liberia[1]	Low income	94.73	5.09	0.255
Madagascar[1]	Low income	114.63	1.51	0.121
Malawi[1]	Low income	48.03	0.66	0.066
Mali[1]	Low income	117.22	1.05	0.126
Mauritania[1]	Middle income	64.49	0.24	0.029
Mexico[2]	Middle income	59.25		0.005
Mozambique[1]	Low income	49.95	0.43	0.064
Myanmar[1]	Low income	66.89	2.3	0.046
Nepal[1]	Low income	56.15	0.37	0.055
Nicaragua[1]	Middle income	54.09	0.21	0.021
Niger[1]	Low income	42.91	0.24	0.066
Nigeria[4]	Middle income	45.00	0.43	0.023
Pakistan[1]	Middle income	62.37	0.19	0.027
Panama[2]	Middle income	36.07	0.04	0.003
Peru[2]	Middle income	37.00	0.06	0.005
Philippines[1]	Middle income	45.41	0.15	0.013
Rwanda[1]	Low income	96.29	1.22	0.097
Senegal[1]	Middle income	52.70	0.18	0.031
Sierra Leone[1]	Low income	68.91	1.37	0.096
South Africa[5]	Middle income	64.00	0.05	0.007
Spain[3]	High income	844.59	0.15	0.030
Sri Lanka[1]	Middle income	39.95	0.14	0.010
Swaziland[1]	Middle income	36.09	0.06	0.007
Sweden[3]	High income	535.30	0.06	0.016
Tanzania[1]	Low income	26.97	0.11	0.022
Thailand[6]	Middle income	84.88	0.05	0.012
Trinidad and Tobago[2]	High income	225.00	0.08	0.009
Uganda[1]	Low income	29.30	0.34	0.027
United Kingdom[3]	High income	646.33	0.08	0.019
United States[3]	High income	388.59	0.04	0.009
Venezuela[2]	Middle income	189.30	0.18	0.016
Zambia[1]	Middle income	56.90	0.89	0.045

Legend for data sources:

[1] Gelli et al., 20011.

[2] Espejo et al., 2011.

[3] Harper et al., 2008.

[4] Shaad et al., 2010.

[5] Bastia, 2007.

[6] Kanemasu, 2007.

Annex 7.2 Examining scale and scale-up explicitly

In order to understand the specifics about the magnituted of the absolute investment in school feeding, rather than just the per capita perspective, in this annex I explore the issue of scale of school feeding programmes more explicitly.

Methods

The original data was extended, where the per capita cost of school feeding was multiplied by the number of programme beneficiaries in each country to obtain the absolute amount spent on school feeding in 2008. A set of country level indicators described above were used to provide crude estimates of the number of school children in each of three hypothetical target groups. The first target group included all children that were enrolled in primary school, the second group consisted of all children enrolled in primary school living under the $1.25 a day poverty line, and the third target group comprised all children enrolled in primary school that were undernourished. The population of children in each of these target groups was multiplied by the cost of school feeding per beneficiary to obtain the theoretical total cost of school feeding for each of these groups in 2008. The total costs were then divided by an estimate of the total public expenditure on primary education in each country, calculated using per capita expenditure figures and number of primary school children enrolled, to obtain the ratio of total school feeding costs to expenditure on education.

Results

Data on programme scale was not available for high-income countries. School feeding programmes covered on average 13 percent of the children enrolled in primary school in low-income countries, compared to 18 percent in middle-income countries. The budget for school feeding estimated using 2008 programme beneficiary figures was found to be on average 7 percent of the estimated primary school education budget, peaking at 11 percent in low-income countries compared to less than 4 percent in middle income countries (Table 7.7).

The range in school feeding costs versus the costs of primary education was considerably lower when considering total costs compared to per capita costs. No country was found to spend more on school feeding than on primary education as a whole. Scaling-up school feeding programmes to cover all children enrolled in

primary school would have required the equivalent of 76 percent of the estimated primary education expenditure in low-income countries, compared to less than 30 percent of the primary education expenditure in middle-income countries. In low-income countries, targeting beneficiaries using poverty and hunger indicators could reduce the financial investment to 44 percent and 23 percent of total primary education expenditure respectively (compared to 10 percent and 4 percent in middle-income countries).

Table 7.7 : Mean and range of coverage of school feeding as a proportion of children enrolled in primary school, the total cost of school feeding as a proportion of the total cost of primary education in 2008, as well as in projections of alternative scale-up approaches based on a. universal programme; b. poverty headcount; and c. undernourishment.

Income group	Variable	SF actual coverage / primary enrolled population	SF budget (actual coverage) / primary education budget	a. Projected SF budget (all enrolled) / primary education budget	b. Projected SF budget (enrolled poor) / primary education budget	c. Projected SF budget (enrolled under-nourished) / primary education budget
All	Obs.	37	34	56	47	48
	Mean	0.15	0.07	0.40	0.22	0.11
	Median	0.09	0.03	0.17	0.05	0.04
	Min.	0.01	0.001	0.02	0.001	0.001
	Max.	0.99	0.66	2.33	1.47	0.80
Low	Obs.	19	17	17	17	17
	Mean	0.13	0.11	0.76	0.44	0.23
	Median	0.11	0.07	0.51	0.31	0.16
	Min.	0.03	0.01	0.12	0.05	0.01
	Max.	0.33	0.66	2.30	1.26	0.80
Middle	Obs.	17	16	29	29	29
	Mean	0.18	0.04	0.28	0.10	0.04
	Median	0.09	0.02	0.13	0.014	0.015
	Min.	0.01	0.001	0.02	0.001	0.001
	Max.	0.99	0.26	2.33	1.47	0.39
High	Obs.	0	0	9	0	1
	Mean			0.13		0.01
	Median			0.11		0.01
	Min.			0.06		0.01
	Max.			0.29		0.01

Conclusions

If we factor in the actual scale of school feeding the findings of this analysis are quite explicit: In all countries the total investment in school feeding is only 11 percent of

the overall primary education expenditure. If school feeding were to become universal in low-income countries, then programme expenditure would on average be equal to 70 percent of total expenditure in primary education.

The issue of targeting is also relevant in high-income countries where partial cost-recovery is achieved through means or proxy-means testing for free school meals. Remarkably, the literature on the costs of school feeding is far richer in low- and middle-income countries than in high-income countries. The data and details the costs of school food in high income countries, including breakdowns on free school meals, were generally not available, highlighting a lost opportunities to provide insights in this key area or programme design.

Chapter 8: Community participation and the links between agriculture, nutrition and education- design of a randomised field experiment of "home-grown" school feeding in Mali

Abstract

Background: Providing food through schools has well documented effects in terms of the education, health and nutrition of school children. However, there is limited evidence in terms of the benefits of providing a reliable market for small-holder farmers through "home-grown" school feeding approaches.

Objectives: This study aims to evaluate the impact of school feeding programmes sourced from small-holder farmers on small-holder food security, as well as on school children's education, health and nutrition in Mali.

Design: This is a field experiment planned around the scale-up of the national school feeding programme, involving 116 primary schools in 58 communities in food insecure areas of Mali. The randomly assigned interventions are: 1) a school feeding programme group, including schools and villages where the standard government programme is implemented; 2) a "home-grown" school feeding and social accountability group, including schools and villages where the programme is implemented in addition to training of community based organisations and local government; and 3) the control group, including schools and household from villages where the intervention will be delayed by at least two years, preferably without informing schools and households. Primary outcomes include small-holder farmer income, school participation and learning, and community involvement in the programme. Other outcomes include nutritional status and diet-diversity. The evaluation will follow a mixed method approach, including household, school and village level surveys as well as focus group discussions with small-holder farmers, school children, parents and community members.

Discussion: "Home-grown" school feeding programmes have the potential to link the increased demand for school feeding goods and services to community-based stakeholders, including small-holder farmers and women's groups. Alongside assessing the more traditional benefits to school children, this evaluation will be the first to examine the impact of linking school food service provision to small-holder farmer income, as well as the link between community level engagement and programme performance.

Introduction

Today, every country for which we have information is seeking to provide food, in some way and at some scale, to its schoolchildren. However, where the need is greatest, in terms of hunger, poverty and poor social indicators, the programmes tend to be the smallest (Bundy et al., 2009). Past experience shows that countries do not seek to exit from providing food to their schoolchildren, but rather to transition from externally supported projects to nationally owned programmes (Bundy et al., 2009). Countries that have made a successful transition have often explored linking school feeding programmes to agriculture development –an approach also known as "Home Grown School Feeding" (HGSF) (Sumberg & Sabates-Wheeler, 2011).

In 2003, the New Partnership for Africa's Development (NEPAD) included HGSF as a key intervention within the food security pillar of the Comprehensive Africa Agriculture Development Programme (CAADP) framework. Several countries, including Cote d'Ivoire, Ghana, Kenya, Mali and Nigeria are already implementing national programmes. From this perspective HGSF provides an integrated framework with multiple impacts across agriculture, health, nutrition and education (NEPAD, 2003).

Mali country context

Mali is, according to the FAO definition, a Low-Income Food Deficit Country (LIFDC) with a population of 14 million people, over half of whom are under 15 years of age. According to UNDP, Mali is ranked 178th in the Human Development Index table, with an average life expectancy at birth of 48 years, adult literacy rate of 26 percent and a GDP per capita (PPP) of $1083 USD. At country level, Mali has seen remarkable progress in terms of access to school (net enrolment ratios increased from 20 percent in 1990 to 66 percent in 2007) but the levels of enrolment are still well below the average for Sub-Saharan Africa and completion rates are very poor[1]. A large proportion of children and girls in particular, are excluded from the schooling system. There are also large disparities within Mali, in the regions of Koulikoro and Mopti for example, girls' enrolment was estimated at 44 percent in 2005.

Agricultural productivity in Mali is among the lowest in the world (USDA, 2009). In Mali, the majority of farmers are involved in the production of food crops, with the main cereals being millet and sorghum. Production is carried out using a low level of technology: fertiliser use is minimal and access to credit is limited. Crop yields are not only low but also highly variable due

[1] UNESCO Institute of Statistics Mali country profile, 2009.

to the fact that most farmers depend on rain fed farming while rainfall fluctuates considerably from year to year and season to season (USDA, 2009).

According to the 2005 WFP food security and vulnerability analysis, an estimated 4 million people, or 40 percent of the population live in food insecurity or are highly vulnerable to food insecurity. According to this assessment, the regions most at risk are Kayes, Koulikoro, Mopti, Tombouctou, Gao and Kidal. The food security assessment also showed that food access is a primary constraint: food is available at market when harvests are good but that populations face constraints in food access and utilisation.

In children under five years of age, 38 percent of children are chronically malnourished or stunted in their growth (low height for age), 15 percent are acutely malnourished or wasted (low weight for height), and 27 percent are underweight (low weight for age) which is a composite measure of stunting and wasting[2]. The majority (81 percent) of children 6-59 months are anaemic[3], caused mainly by iron deficiency, malaria and helminth infections. Anaemia prevalence in school-age children is lower but still unacceptably high with 56 percent of school children affected (PCD, 2001). 37 percent of five year olds, when they will soon be entering primary school, are stunted in their growth and 8 percent are wasted.

Objectives

How best can the potential of school feeding be maximised to support multi-sectoral integrated frameworks linking agriculture, health, nutrition and education? Can HGSF be a win-win for agriculture, education and health? The purpose of this chapter is to develop the design of a field experiment of the HGSF programme in Mali that will be examining these questions operationally.

Design of the intervention

The interventions involve school feeding implemented by the Government of Mali. The national programme was launched in 2009 and currently targets 651 schools located mainly in the 166 most vulnerable communes (official data report that currently 10% of the 9,400 primary school in the country have a school canteen run by the state or by partners including WFP and CRS). The targets of the school feeding intervention are public primary schools of rural villages and

[2] Mali Demographic and Health Survey, 2006.
[3] Ibid, MDHS, 2006.

children attending school. Compulsory basic education in Mali is composed of 6 years of primary and 3 years of lower secondary. The schooling age for primary is 7 to 12 and it is 13 to 15 for lower secondary. Considering the high repetition rate (15-20%), early and delayed entrants, and uncertainties and misreporting of age, the target group of intervention consists of children aged 5-17 and their families.

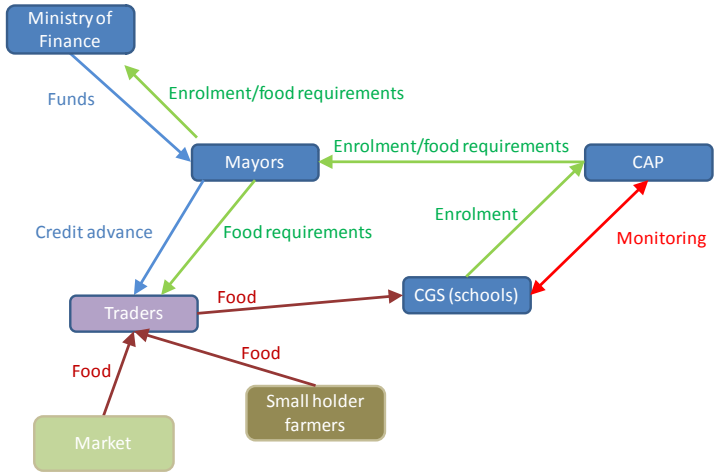
The National School Feeding Programme in Mali

In line with the National Decentralisation Policy and the 2009 National School Feeding Policy, programme implementation is decentralised to the community level, involving the Communes and School Management Committees (CGS). The central government allocated nearly 5 million USD (2.6 billion CFA) in 2010 and 5.8 million USD in 2011 (3.1 billion CFA) from the national budget for food, cooking equipment and infrastructure rehabilitation and construction[4]. Funds are channelled directly through the Ministry of Finance to its Regional Offices which in turn send to the Communes. Food commodities are procured on local markets by the Communes or by the CGS. To date, there is no fixed food basket nor fixed ration specification. The budget allocated for food procurement is based on student enrolment figures obtained by the Ministry of Education and price estimates for staples at the beginning of the school year. The budget covers staples, including cereals and pulses and oil. Fresh vegetables to complement the school feeding ration are contributed by parents and the community through cash or in-kind contributions. Cooks are generally organised on a voluntary basis (also considered as the contribution to the program from the community) through the CGS.

Food provision consists of a school lunch meal served at noon (school is from 8am to 12am and then again from 3pm to 5pm). The food mainly consists of staples (rice, millet or sorghum) enriched with condiments, vegetables, vitamins and minerals depending on the source of provision. Figure 8.1 captures the key activities in the food procurement process currently in use in the national programme. Enrolment figures are collected by the CAP through the CGS and passed on to the mayors to estimate the food requirements for school feeding. Mayors, who receive budget from the Ministry of Finance on the basis of the enrolment/food requirements, then issue tenders, on the basis of a credit advance, to certified service providers (traders) to procure the food. The service providers (traders) then purchase the food from the market or from smallholders, and deliver it to the relevant schools.

[4] School feeding in Mali situation analysis, WFP/PCD/WB 2011.

Figure 8.1: Stylised food procurement process in the national programme



The purchase of food by mayors has a number of problems (Johnson and Janoch 2011):

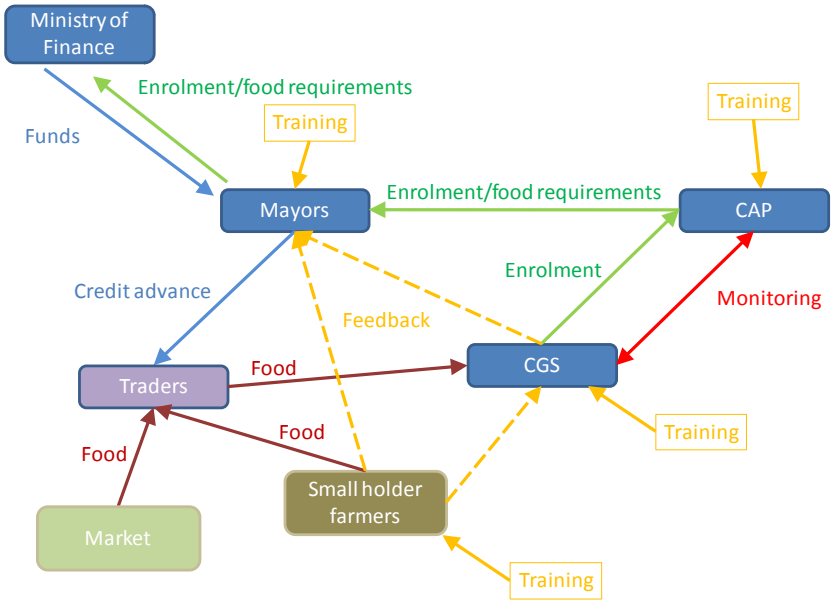
- Food is mostly purchased from traders rather than from smallholder farmers
- Food purchased by mayors is often unrelated to food habits of the beneficiary communities, it does not follow any specific nutritional advice, and its quality is uncertain
- Food is delivered to communities with delays and CGS are uncertain about deliveries
- Food can be easily in excess or deficit of needs because purchases are based on rough estimates of enrolment.[5]

The HGSF pilot

An innovative capacity building component will be integrated alongside the national school feeding programme and will constitute one of the treatment arms of the experiment (see Figure 8.2). The HGSF pilot intends to promote purchases from smallholder farmers through training, monitoring and communication activities between the actors involved. Mayors and CAPs will be instructed, and encouraged, to involve smallholder farmers in the transactions. Currently, mayors purchase food from one or more traders following government guidelines regarding contracts and bidding process. Under the project, and in coordination with the Ministry of Agriculture, mayors and traders will be requested to enforce the purchase of food from local producers at least in a minimum percentage. On the other hand, the CGSs will be assigned the task of identifying local suppliers, possibly at the village level, and of establishing contacts between these suppliers and the traders.

[5] Notice that there is a potential nutritional downside on nutrition following from this. If parents believe a child is fed in school when he/she is not, then the child is worse off after the intervention, though possibly just for one or few days.

Figure 8.2: Stylised food procurement process in the HGSF+ programme



A working group composed of in-country stakeholders including SNV, CRS, WFP (SF and P4P teams) is currently working on the details of the package of "software" interventions to improve overall programme performance. This package will include:

- Training of mayors and CAPS. At the beginning of each school year a number of training events will be organised for commune level stakeholders including mayors and CAP. The purpose of the training events is to improve service delivery on several accounts:
  - The establishment of a monitoring system of programme activities
  - The identification of formulas for the allocation of food to schools (currently the allocation is based on rough enrolment estimates, but enrolment is endogenous as it is driven by food provision, hence a flexible system of funds and food allocation based on 'predicted' enrolment needs to be put in place)
  - The illustration of methodologies for purchasing from smallholder farmers rather than from traders (formulation of bids, contracts, contingency plans etc.)
  - Nutrition education and the importance of adequate nutrition for school children and smallholder farmers e.g. how to use the foods they grow or purchase to improve the nutritional status of all family members, including diet diversification, availability of staple and nutrient rich foods by season, food storage and safety, food processing and preparation.

- Training of CGS. Training events for CGS at the village level will be held periodically, on a monthly or quarterly basis, in every intervention village:
  - Members of CGS will be given the instruments to efficiently implement the programme including basic accountancy skills, information on their rights and entitlements, and information on methods to raise complaints
  - Participatory monitoring events will be periodically held at the village level. Members of CGS, PTAs, and parents will be involved in participatory events where the programme performance will be monitored in close detail, suggestions for improvement will be proposed and complaints brought to the attention of project staff and CAPs.
  - Nutrition education and the importance of adequate nutrition for school children and smallholder farmers e.g. how to use the foods they grow or purchase to improve the nutritional status of all family members, including diet diversification, availability of staple and nutrient rich foods by season, food storage and safety, food processing and preparation.

Programme theory of the intervention

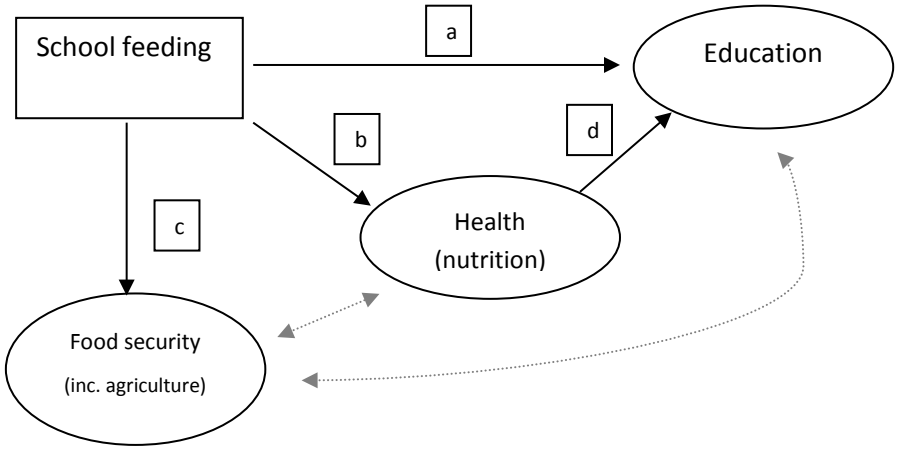
School feeding interventions linked to smallholder agriculture can have multiple goals in the following areas:

- Food security: supporting incomes of recipient households (those consuming food) and farmer households (those providing the food)
- Education: increasing school enrolment, attendance and reducing drop-out, and improving cognition and learning achievement
- Health: improving nutritional status of school age children

The impact of the intervention in each of the above areas occurs through a number of complex pathways. This section describes the pathways through which the programme is expected to operate. Though the evaluation of all potential effects of the intervention is beyond the scope of this study, a subset of outcome indicators for the evaluation will be selected based on: a) knowledge gap specific to school feeding in Mali; b) knowledge gaps in the school feeding literature in general; c) feedback from peer reviewers and technical partners; and d) budget constraints. Figure 8.3 illustrates in very broad terms the impact theory of school feeding on food security, education, and health. School feeding affects educational outcomes directly by

increasing enrolment, attendance and completion (line 'a' in the figure). It affects health directly by improving nutritional status (line 'b'), this in turn has an indirect impact on education, as improving nutrition status has a positive impact on learning outcomes (line 'd'). The intervention can also affect income directly by increasing households' food security (line 'c'). Finally, there are effects running through increased income and health and nutrition and vice versa, as richer families are investing more in human capital and more educated and healthier adults are more economically productive. However, these latter effects only occur in the long term and certainly not before children have left school, therefore we will not discuss them in the following design.

Figure 8.3: Overall programme theory of school feeding interventions



It must be emphasised that the ability of the school feeding intervention to deliver the effects depicted in Figure 3 critically depends on the appropriate implementation of the programme. The management and implementation of the intervention involves several actors, and scoping visit sand a preliminary study undertaken by PCD (Johnson and Janoch 2011) have shown that in Mali there are several problems of communication, supervision and monitoring between these different stakeholders. Programme success will also depend on the ability of communities to actively engage in the programme and in the strengthening of the public institutions involved. The issues of social accountability, 'good governance' and the links between accountability and programme effectiveness are important areas that this impact evaluation will explore in more detail.

Impact on food security and smallholder agriculture

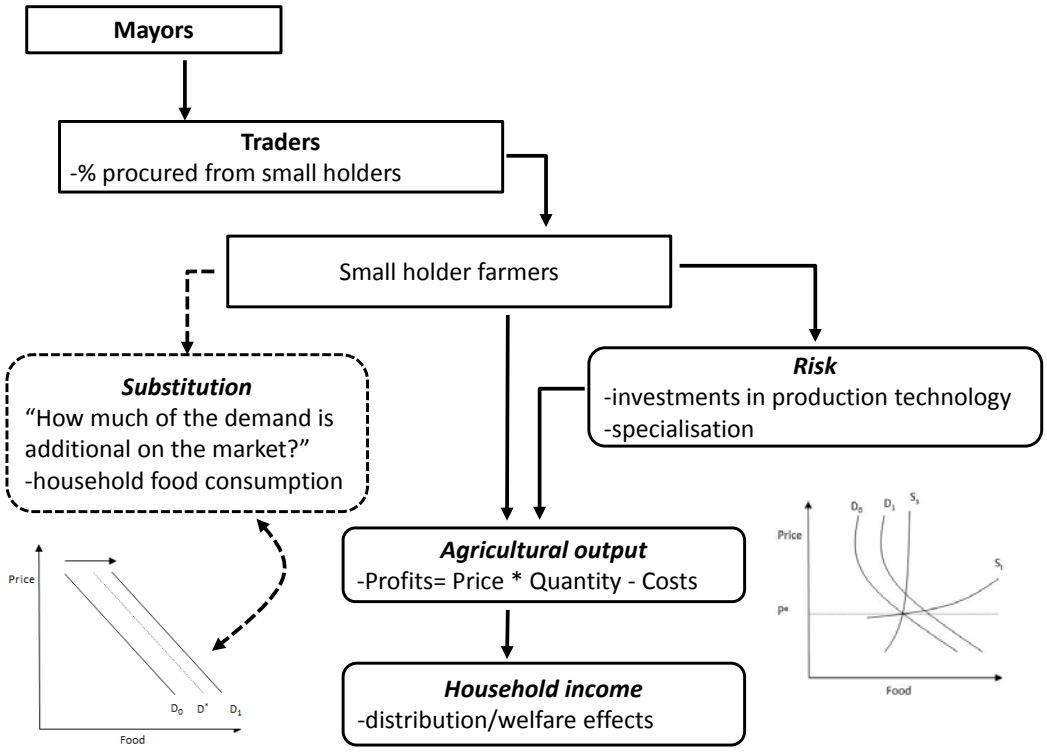
The intervention is designed to stimulate the economy at community level by purchasing food from smallholder farmers. Food for the school feeding programme is currently purchased from

traders by mayors of the communes of intervention. Traders in turn purchase food from smallholder producers though these do not need to be resident of the villages targeted by the project. The capacity building, or HGSF+ component supported by PCD is intended to confer community-based organisation more decisional power and will increase their ability to purchase from individual farmers or farmers' associations residing in the project villages. On the smallholder farmer production side the programme can have three main effects that are summarised in Table 8.1 and schematically in Figure 8.4, including output effects, distributional effects and stabilisation effects. In addition to these effects the programme can also have some wider effects on the local economy by generating employment.

Table 8.1: Programme impact on smallholder farmers

Effects	Impact on smallholder farmers	Spill-over effects
Output effects	Increase in farm profits	Increase in consumer prices
Distributional effects	Increase in farm profits	Decrease in large farmers' profits
Stabilisation effects	Risk reduction	none

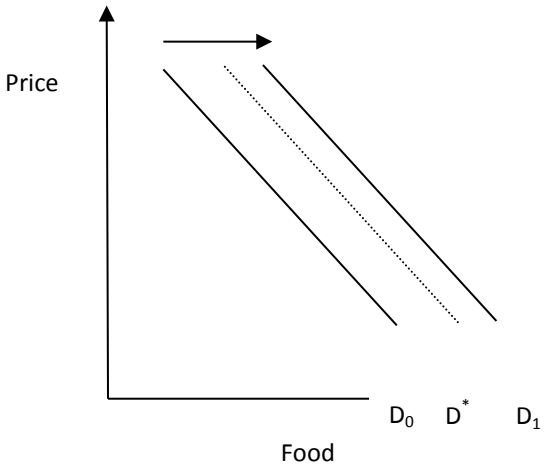
Figure 8.4: Programme theory of school feeding and smallholder agriculture



The programme introduces additional demand on the market. In Mali, the school feeding programme purchases food for schools at the commune level, which includes several villages.

Most communes have food markets. Mayors purchase from traders in the commune. Traders in turn purchase food from, among other sources, local farmers. The effect of the food purchases is a shift of the demand curve for food to the right (movement from D_0 to D_1 in Figure 5).

Figure 5: Impact of HGSF on commune food demand

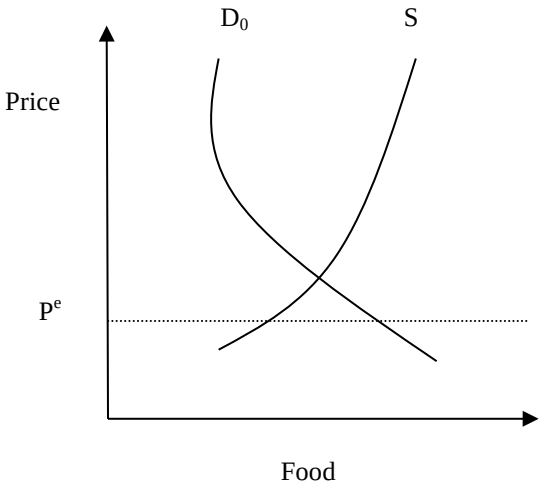


The size of the shift depends on the extent of substitution effects and on the size of the market considered. Substitution occurs when households reduce the domestic consumption of food because children are fed in school. At one extreme there is full substitution: families do not provide any additional food to children fed in school or any other household member in excess of the school food ration. Food provided in school entirely substitutes for food normally consumed in the home. The result is an increase in household's savings and consumption of non-food items. In this case there is no shift of the demand function (D_0) and HGSF does not have price or output effects. There is still a distributional effect of the intervention if food is purchased from smallholder rather than large farmers. Profits of large farmers will in this case decrease whilst profits of small farmers increase. Full substitution however is unlikely to occur. The largest substitution is likely to occur when households interpret the school food ration as a cash transfer. In this, theoretical, case the income equivalent of the ration is spent following income elasticities. Considering that the areas of intervention are very poor, assuming an income elasticity of food of 0.6-0.8 and a food share of .8, we obtain that only about half of the HGSF transfer would eventually be spent on food and the food demand function shifts to D^*. However, studies show that rarely people interpret food transfers as cash transfers and that people tend to attach some preference to the food received and thus consuming food beyond what the income elasticities would suggest. Therefore the final shift in the demand curve is likely to happen somewhere between the curves D^* and D_1.

The size of the demand shift also depends on the size of the market considered. If we are considering the national rice market, the shift is extremely small and the price and output effects are likely to be negligible (see Ahmed and Sharma, 2008). The effect is larger at the commune level if food is procured locally. However, some of the food may be purchased outside the commune and therefore the shift of the demand function at the commune level would be smaller than the one depicted in Figure 8.5.

The impact of HGSF on output and prices at the commune level will depend on the slopes of the demand and supply functions. Welfare effects on producers and consumers can be calculated using changes in consumer and producer surpluses. We do not know the values of the supply and demand elasticities of food items, which need to be estimated econometrically. For convenience, we consider constant elasticities around the equilibrium point (a logarithmic form provides this type of elasticity $\ln(q) = a + bln(p) + cln(y)$).

Figure 8.6: Stylised view of the commune food demand market and HGSF



Consumer surplus is the area between the market equilibrium price line (P^e) and the demand curve (D_0). Producer surplus is the area between the market equilibrium price line (P^e) and the supply curve (S). Producers and consumers surpluses can be calculated provided we know the initial equilibrium price level (P^e), the quantities of food produced and consumed at this price, and the own price elasticity of food demand (the shape of the demand and supply curves in Figure 8.6).

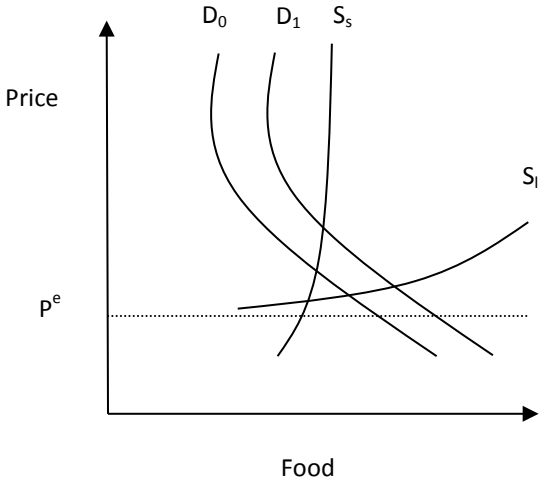
Two extreme cases of small and large supply elasticities are shown in Figure 8.7. The size of supply elasticity will depend on three main factors such as yield risk, market failures and rigidity of fixed factors. High income risk and missing markets are likely to be present in the communes

of intervention, thus reducing the size of supply elasticity. Farmers are not likely to respond promptly to price changes. In addition, while farmers may be able to vary the amount of variable inputs used (labour and fertiliser for example), they might not be able to change the amount of fixed input in the short run (like equipment, land and livestock).

The two supply curves in Figure 8.7 can be seen as short and long term supply curves or elastic and inelastic with respect to risk and market factors. In any case, they illustrate the differential impact of HGSF on prices and output.

- If farmers are not able to provide the additional food demanded by HGSF (small supply elasticity – curve S_s), then most of the effect of HGSF goes into prices and little impact on output. From a welfare perspective, producer surplus increases (farmers win), while consumer surplus may decrease (consumers may lose).
- If farmers provide any additional food demanded by using current input more intensively and by quickly changing use of fixed inputs (large supply elasticity – curve S_l), then HGSF would have a large impact on output and negligible on prices. From a welfare perspective producer surplus increases (farmers win) and consumer surplus increases as well (consumers win). For the benefit of both producers and consumers therefore a high supply elasticity is needed.

Figure 8.7 Impact of HGSF with small and large supply elasticities



In general we should expect the supply elasticity to be between the two extreme depicted and therefore the programme to have an impact on both prices and output. The impact on prices depends on the level of spatial market integration. In principle, if markets are efficient, prices for the same food items should be the same everywhere after an adjustment for transport

costs. However, the literature on market integration suggests that transfer costs may create a wedge between prices at different locations, which allow prices in the two locations to vary in an uncorrelated way within a band (Baulch et al., 2008). In other words, if transport costs for an isolated commune are very high, food prices may increase up to a point when trade between the two locations takes place and prices are equalised. There is therefore a real possibility that food prices increase at the commune level and that this price effects are transmitted to consumers.

Based on this theoretical model, the programme will have a positive impact on farmers income via an increase in prices and food quantities produced. The impact on consumers is less obvious. Depending on the size of the increase in prices, some households may have they welfare reduced as a result of the intervention. This observation suggests that the evaluation in addition to assess impact on farmers income should also monitor price levels and model, by simulations, if not observe, their impact on consumers. Note also that the intervention will have other minor positive effects at the village level by creating additional employment (cooks, treasurers and stock keepers) and demand. This suggests that a micro-simulation at the village level should be conducted in order to assess the potential impact through general equilibrium effects.

The programme also has a distributional impact as it shifts demand from large to smallholder farmers. As described in earlier sections, even if households are fully substituting the school meal, the programme generates a demand shift from large to smallholder farmers. While small local farmers see an increase in their income, larger farmers suffer a reduction. This effect can be observed to the extent that the evaluation will be able to collect income data from a large number of farmers, with and without the programme, large and small.

Finally: the programme potentially reduces household risk. The programme can stabilise smallholder farmers' incomes by offering a stable demand and price. A number of positive effects follow from risk reduction including: an increase in expected utility, a reduction in the use of inefficient mitigating and coping strategy (such as lower yielding crops and precautionary savings), and an increase in productive investments. This impact can be observed indirectly by observing farmers' risk mitigating and risk coping behaviours. However, it is quite possible that yield risk dominates price risk. In addition, whatever the price effects these may take a long time before having an impact on farmers' expectations. The programme impact on risk behaviour therefore is unlikely to be large.

It is less obvious that a stabilisation of income variability at the aggregate level is needed or is an obstacle to the implementation of the programme. According to an USDA report (USDA, 2009) the success of HGSF initiatives in Mali is potentially compromised by the insufficiency and instability of food production in the aggregate, by the inability of vulnerable regions and areas to produce food in the desired quantity, and at the desired time, and by the inability of farmers to respond to the incentives provided by the project. Our analysis of FAO data on aggregate cereal production in Mali over the period 1961-2007 suggests that, at current growth rates, by year 2017 agricultural production in the country will be sufficient to bring malnutrition below 5% of total population (see Figures 8.8 and 8.9). It is also clear that cereal production has not only dramatically increased from the mid-80s but has also become more stable, accompanied with reduction in undernutrition rates during the same period.

Figure 8.8: Cereal production in Mali 1960-2007, Source: Data from FAO.

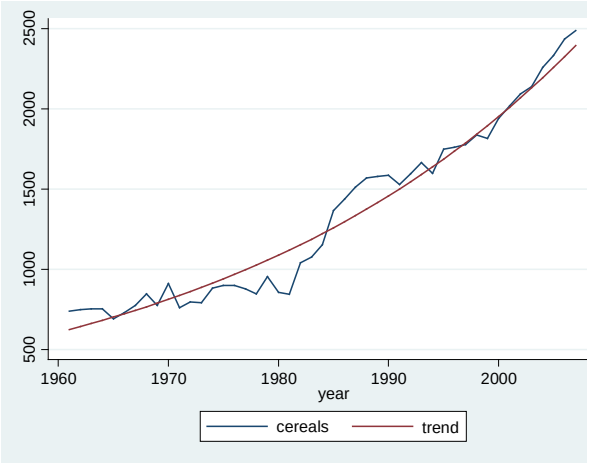
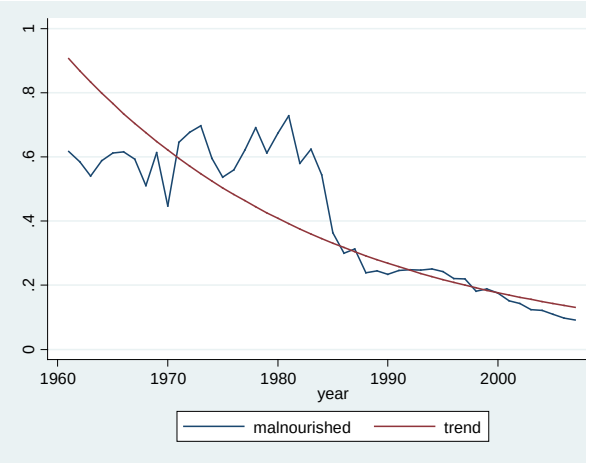


Figure 8.9: Malnutrition in Mali from 1961-2007, Source: Calculated from FAO data.



The sufficiency and stability of food supply in the aggregate may hide seasonal stress, regional differences and the presence of chronically poor groups. However, in each village the pool of farmers from which the project will purchase food is rather small and the ultimate sellers will be traditionally surplus farmers who in the absence of the programme would sell to traders. Two other factors may facilitate a stable supply of food at the community level. First, the involvement of community based organisation in the management of the intervention will help the identification of farmers able to provide food at the desired time and in desired amounts. Second, following a model adopted by the *Purchase for Progress* programme of WFP, purchases may be organised through contracts with farmers' associations rather than with individual farmers thus increasing the likelihood of providing a stable supply.

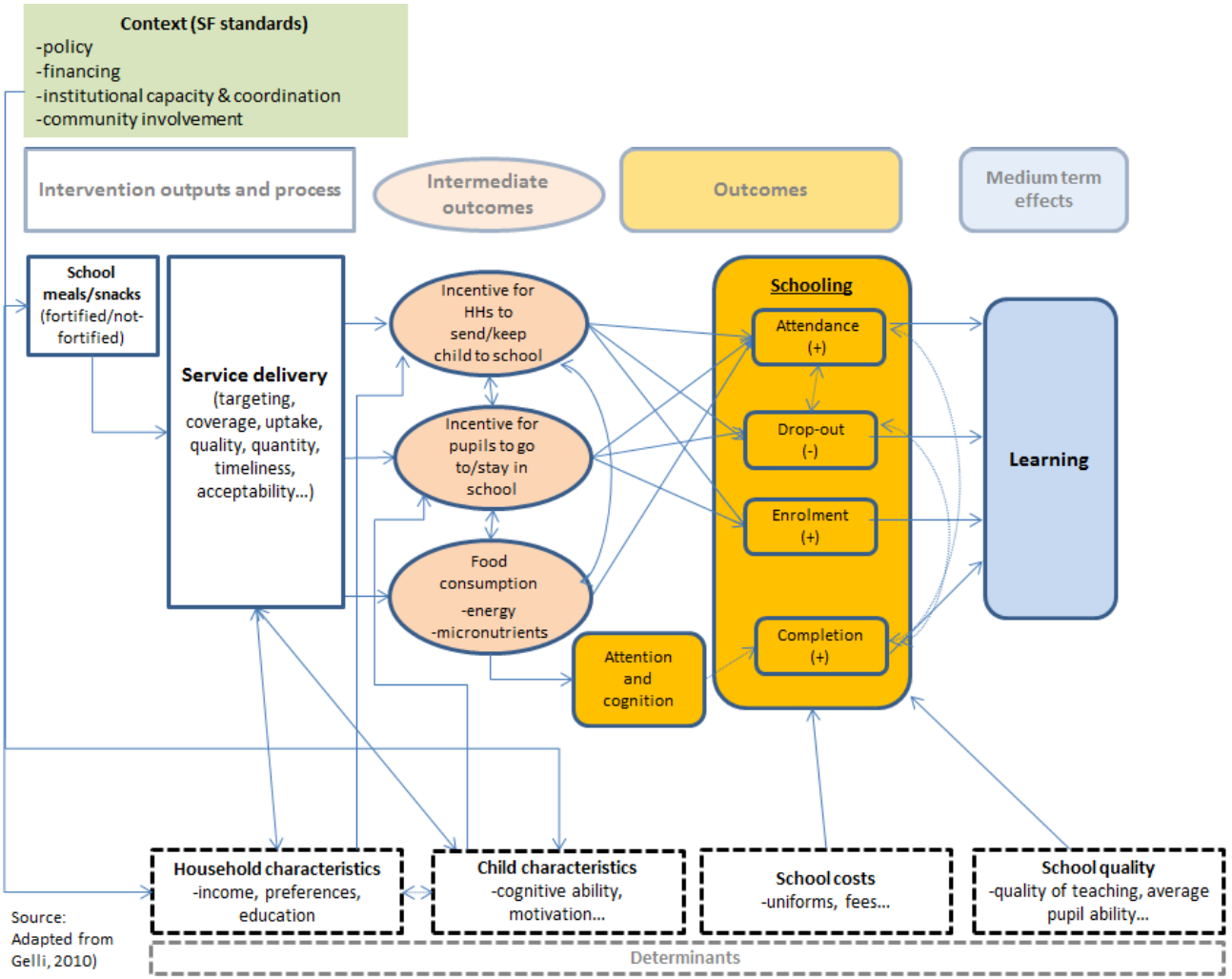
Impact on education

We formulate hypotheses regarding the impact of school feeding on child schooling and learning starting from an economic model of parental educational choices in developing countries adapted from Glewwe (2002). Figure 8.10 below illustrates the determinants of schooling and learning, as also captured in chapter 3 of this thesis. Schooling produces learning which in turn has welfare effects. Schooling can be thought of as enrolment, attendance, drop-put or school completion. Learning is the acquiring of basic skills such as language and mathematics. These skills are valued in the markets and educated children are expected to generate higher income and wages. In addition, more educated individuals may conduct healthier lives.

In this model[6], the main determinants of schooling and learning are child characteristics, schooling costs, households' characteristics and school quality. Cognitive ability and motivation facilitate learning and encourage families to send children to school. Children do not participate in schooling for different reasons; at the household level, it is often a trade-off between the costs and benefits of schooling that determine whether a child will go to school or not. Costs are not only direct, like school fees for example: The opportunity cost of sending a child to school would mean foregoing the benefits of any work that the child could be doing instead of attending school. Often, the opportunity costs follow seasonal patterns, or increase with age, meaning that older children might need stronger incentives than younger children in order to stay in school. The opportunity costs of schooling may also be higher for girls- girls are often kept at home to look after siblings, help with other work, or simply for cultural reasons. These costs have a direct effect on schooling but should not affect learning. Household characteristics like income and preferences (including attitudes towards education, and time discounting) affect schooling directly, while other characteristics may affect learning directly (for example more educated parents may improve learning by helping children with their homework). School quality affects learning directly through the quality of the teaching, the teaching environment (supplies and facilities) and schooling by affecting households schooling decisions.

[6] For the detailed econometric model see Masset and Gelli, 2011.

Figure 8.10: Programme theory of school feeding and education. *The main determinants of schooling and learning are child characteristics, schooling costs, households' characteristics and school quality. Children do not participate in schooling for different reasons; at the household level, it is often a trade-off between the costs and benefits of schooling that determine whether a child will go to school or not.*



An initial outcome that drives increased school participation is the incentive to households to send children to school. Generally, this incentive is achieved through an income transfer offsetting the financial and opportunity costs of schooling, and also through an enhancement of the services provided at school. School feeding may also have an incentive effect on pupils actually wanting to go to school to receive food rather than staying at home and missing out. In theory, both of these effects will contribute to shift short-term household decisions towards increased schooling. The specific effect of the incentive will very much depend on the context in which school feeding is operating. Conceptually, the health and nutrition improvements from school feeding can also reinforce the impact on education. Addressing micronutrient deficiencies, in particular iron and iodine, has been shown to have a positive impact on learning (see section 3.3), as has the systematic deworming of school-age children in areas of high prevalence of intestinal helminths (Jukes et al., 2008). The income transfer incentive and the improved health and nutrition status resulting from school feeding service provision would then lead to improved access and learning outcomes.

Learning increases as a result of schooling. In addition, the same factors affecting parents decisions also affect learning directly. In this model school feeding affects schooling and learning in two ways:

- School meals reduce financial and opportunity costs of schooling and therefore increase schooling directly which in turn affects learning positively
- School meals increase cognitive ability. This in turn increases child learning in school and affects parents schooling decisions (learning increases expected income and therefore parents' interest in schooling)

Note that the reduction in school costs can be partially outweighed by additional programme costs. In particular, the programme may require community participation in two ways (PCD, World Bank, and WFP 2011). First, communities are sometimes required to provide fire-wood for cooking and other items like fresh fruit, vegetables and other condiments (Galloway et al., 2009). In addition, they are expected to provide cooks and storekeepers (though participants in these activities often receive compensation in the form of a daily meal). Second, school

management committees (CGS) may collect contributions from parents either in monetary form or in-kind. All these contributions increase the costs of schooling. [7]

There may also be feedbacks from increased schooling and learning to school quality. Firstly, learning in school may increase because the average cognitive ability of pupils has increased (peer effect) or because teachers become more motivated to teach. Secondly, cost reduction may bring to school children of poorer background thus reducing average cognitive ability and reducing overall performance via the same peer effects. Thirdly, schools may become overcrowded because of increased attendance, though the effects of crowded classrooms on learning are still unclear (Ahmed and Arends-Kuenning, 2003).

Impact on nutrition

School feeding interventions can potentially have an impact on nutritional status of school children and their younger siblings, as summarised in Figure 8.11.

a) The nutritional impact is mediated by the extent of food substitution effects within the household, and the use of the energy intake by the child and her siblings.

b) The reduction in malnutrition via diet diversification and the absorption of micronutrients in the body can have direct effects on cognition.

c) Better nourished children may be best positioned to learn while in class and outside class.

These three issues will now be discussed in turn:

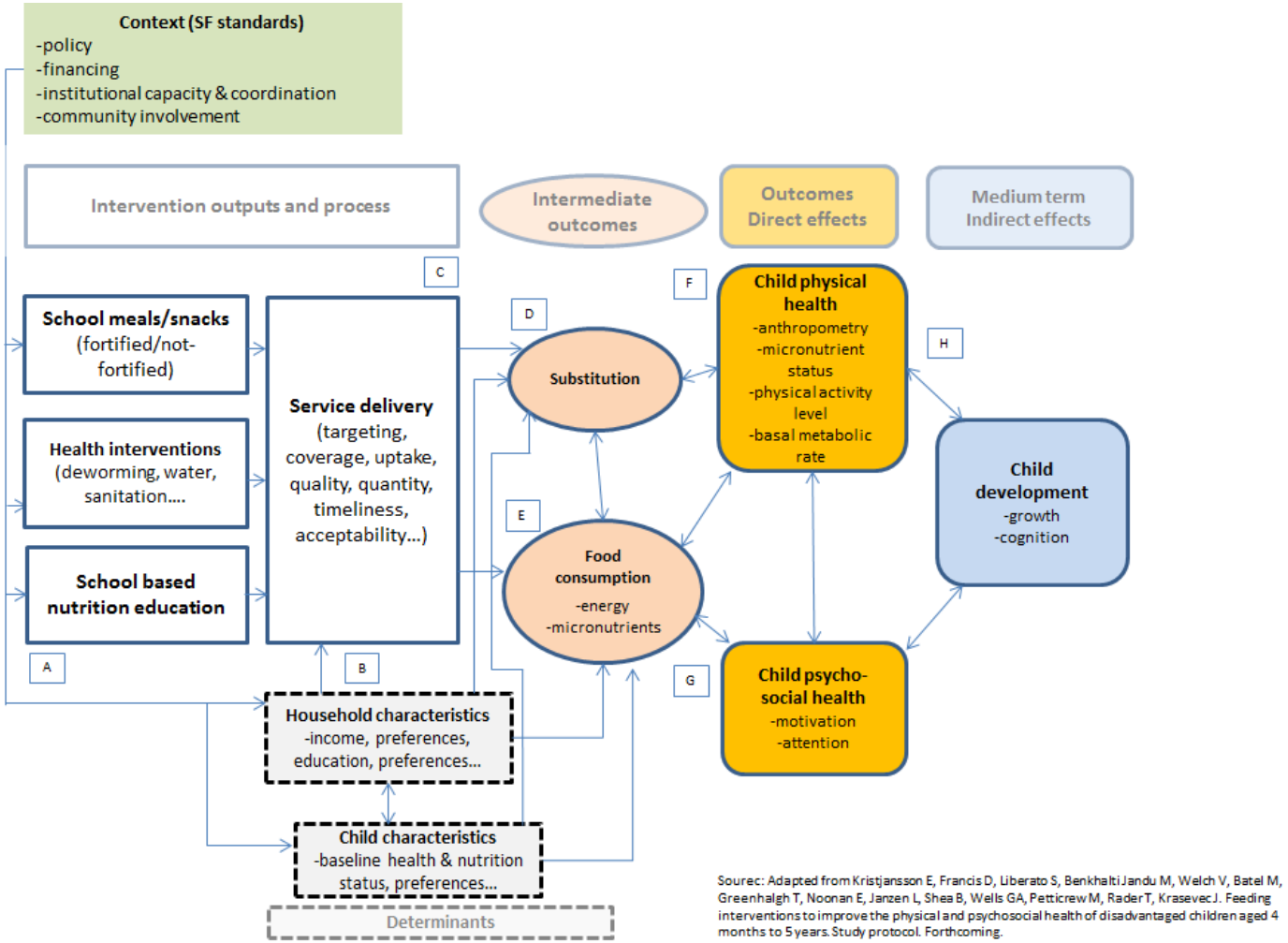
a. Substitution effects

Building on Beaton and Ghassemi (1982) and Svedberg (2000) we provide a simplified programme theory of the nutritional impact of school feeding. The school meal can be shared by children with other household members or can substitute (at least partly) for food normally consumed in the home. This is obvious in the case of take-home-rations, whereby children take home a quantity of food on a regular basis, but also applies to any school feeding programme, because households may in principle use the school meal as a substitute for food normally

[7] Note that in the econometric model we assumed that the schooling choice was made entirely by the parents ignoring the emotional effect of school feeding on children. School fed children may become more motivated and this could lead to higher attendance directly or indirectly (via parents' decisions). This suggests that the model should include the utility function of children, not just the parents (see Dreze and Kingdon, 2001).

consumed and spend the monetary equivalent otherwise. Evaluations of fortified biscuits programmes in Bangladesh and Indonesia found that gains in nutritional intake were not limited to the children actually receiving the biscuits at school. The two studies found significant evidence that school children shared the biscuits with their younger sister or brother at home. A recent RCT in Burkina Faso also found that take-home-ration programmes led to an improved of the nutritional status of younger siblings in beneficiary households. In Uganda, an RCT also found significant improvements for pre-schooler siblings of children receiving school feeding. This provides emerging evidence of a spill-over effect and a window of opportunity to also affect children during a critical developmental stage when nutritional interventions can have the strongest impact. From a strategic perspective, these spill-overs though important nevertheless do alter the main point that school feeding is not a high-priority intervention for addressing nutrition, as captured in the recent Lancet series on maternal and child health (Bhutta et al., 2008).

Figure 8.11: Programme theory of impact on nutrition. *The nutritional impact is mediated by the extent of food substitution effects within the household, and the use of the energy intake by the child and her siblings. The reduction in malnutrition via diet diversification and the absorption of micronutrients in the body can have direct effects on cognition. Better nourished children may learn better while in class and outside class.*



Ingested foods contribute to three outcomes, of which physical growth is only one:

- Physical growth. Food can help physical growth in terms of height and weight. It is normally believed that catching-up by stunted children after the age of five is limited. However, food intake should increase storage of fat and therefore weight.
- Physical Activity Level (PAL). Energy intake is spent in work after school or in more activity and play.
- Basal Metabolic Rate (BMR). Energy is required to maintain the healthy functioning of the body while at rest.

Catch-up growth in children and adolescent may be possible though the process is slower than catch-up in weight and it is not certain up to what age it takes place (probably up to the end of the adolescent growth spurt) (FAO/WHO 1985). All malnutrition indicators could change after the intervention (stunting, wasting and underweight) though the impact will depend on the extent of substitution effects and on whether children are increasing the use of energy for PAL and BMR. A child may have normal height and weight and still be undernourished because he does not expend enough energy in activity and play to maintain health and develop his cognitive abilities. Assessment of malnutrition should also measure PAL, particularly in adolescents who engage in considerable work and play. Unfortunately there is no accepted theory, nor evidence, on whether children adapt to nutritional stress by reducing weight or PAL. There is also uncertainty on the definition of a minimum acceptable level of PAL (an arbitrary factor of 1.5 of BMR is often used for example by FAO). Finally, there is no standardised way to measure PAL. Observation of behaviour in class and questionnaires for parents and teachers could be used to measure PAL.

Finally, highly deprived children may use additional energy intake from school meals simply to restore the original BMR. In addition, higher weight requires more energy, therefore BMR is a function of body weight and the BMR requirement increases as weight increases.

Because of the complex pathways described in this section, we should not expect a strong impact of the programme on nutritional status of children. However, we might expect an improvement in children activity and play and an improvement in nutritional status of siblings (if substitution effects are strong).

b. Diet diversification, micronutrients and cognition

Micronutrients may have a direct impact on cognitive abilities. It is not well understood how iron affects brain functioning and the central nervous system, but there is ample evidence that reduction in iron deficiency improves mental functions across all age groups (Grantham-McGregor and Ani 2001; Pollitt 1993). Iron interventions were found to have a positive impact on infant development scales, IQ tests and school achievement.

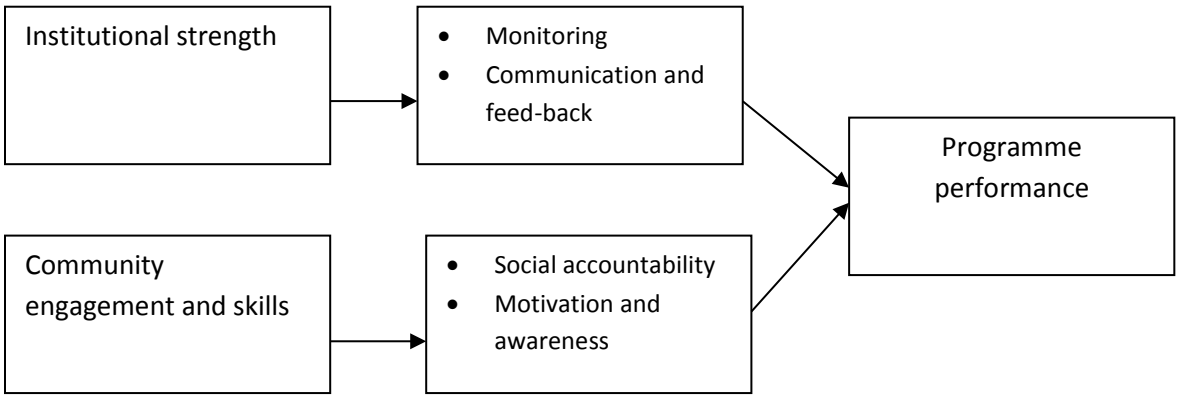
c. Indirect effects of better nutrition on cognition

Restoration of micronutrient requirements and energy intake can also have an impact on attention and motivation. Energy intake (Polliltt, Gersowitz, and Gargiulo 1978) and iron intake (Grantham-McGregor and Ani 2001) can have an impact on hyperactivity, withdrawal, nervousness, hostile behaviour and happiness. The emotional status of children affects the attention span and has other spill-over effects. The quality of teaching in class is likely to be affected as teacher may become more motivated and as the quality of students performance in class improves (think of the different impact on learning of improving attention of 10%, 50% or 100% of students in class).

Role of social accountability

The effectiveness of the programme could be considerably improved by improving the communication mechanisms between the actors involved, by strengthening the monitoring system, and by introducing elements of social accountability. On the institutional side, the introduction of a monitoring system and the creation of communication mechanisms between the different actors would likely have the effect of improving the programme performance (see Figure 8.12). Similar effects could be expected from a stronger engagement of the CGSs. The delegation of certain responsibilities to the CGSs could increase motivation and awareness of the programme among beneficiaries while at the same time ensuring a better implementation of activities (such as monitoring of public officers performance and food procurement from smallholders in the community). These effects would have a positive impact on all the intermediate and final outcomes of the intervention.

Figure 8.12: Impact of institutional and community strengthening on programme performance



Main hypotheses and outcome indicators

We summarise here the expected impact of the intervention on education, nutrition and social protection discussed in Section 3.

- The intervention will have an impact on a small number of farmers in the intervention villages. Other persons in the village may benefit either directly or indirectly via an increase in income.
- The intervention will have a positive impact on enrolment, attendance and drop-out rates.
- The intervention will have an impact on cognitive abilities and class behaviour including attention
- The impact on learning (test scores) will be moderate as school quality is unlikely to change in the short term
- The intervention will have a limited impact on physical growth of children because of the increase in PAL, substitution effects and the age range (6 to 17 years) of the targeted population. An impact on siblings of school-going children is possible if substitution effects are strong.
- The intervention will have a moderate impact on the diet because food purchases by communities and mayors do not follow nutritional guidelines and nutrition education is absent.
- The intervention will have little or no impact on micronutrient status as the food provision is not fortified and only moderate effects on diet diversity are expected.

- The overall impact of the programme will increase through the introduction of social accountability mechanisms and the strengthening of the monitoring and communication system.

Table 8.2 includes a list of the main outcome indicators of the study. Section 8.4.3 describes how data will be collected using different survey instruments. All outcomes, including school attendance and test scores, will be obtained at the household level.

Table 8.2: Main outcome indicators of the intervention

Indicator	Metric
Income	Farm profits
Distributional effects	Smallholder farmers participating in programme
Schooling	Enrolment, attendance, and completion
Attention	Digit span or other test
Learning achievements	Scores on language and maths tests
Physical growth	Anthropometric measures of height and weight
Diet diversity	Household consumption
Social accountability	Parental monitoring and motivation

Note that in addition to outcome indicators we will also observe the programme impact on intermediate indicators, particularly for those outcomes that are more difficult to observe directly: income and social accountability. In the case of income, we will look at intermediate outcome such as input use (labour, land, seeds and fertiliser), investments (farm capital like tools and machinery), and market access (marketed surplus, prices and markets). In the case of social accountability, we will observe the impact of the programme on knowledge and practices of mayors and CGSs members as they result from the training activities. The quantity, quality, and timely preparation and delivery of food in school will also be examined.

Design of the randomized evaluation

The national school feeding programme will be expanded in the regions of Mopti, Koulikoro and Kayes. These areas are among the most vulnerable of the country and offer a diversity of agro-climatic conditions and cropping patterns. Areas that are inaccessible for most of the year or in which there are serious security concerns were excluded from the study. The MoE (Ministere de l'Education 2009) has set clear criteria for the selection of the intervention areas. Priority is

given to areas of food insecurity and vulnerability, poor enrolment rates (particularly of girls), poor presence of donors and of high community involvement. Similarly, criteria for the selection of schools include: schools with poor retention and completion rates (particularly of girls); schools with children from nomad and destitute families; schools with children with special needs; schools where one third of class has to travel at least 3km to reach the school; schools demanding canteens.

The impact evaluation is an integral component of the monitoring and evaluation activities of the national school feeding programme. The baseline survey is planned in intervention and control sites in 2012 and a follow-up is planned in 2014. By 2015 the control schools and community will be fully integrated in the intervention. The possibility of conducting further surveys in the following years will be considered, building matched control groups in order to detect long term effects of the intervention on farmers' productivity.

We discuss here two main elements of the evaluation approach: random assignment and manipulation of treatment; and threats to validity.

Random assignment and manipulation of treatments

The evaluation will measure outcomes at child, household and school level. Households and schools will be randomly assigned to the intervention. Three treatment arms are envisaged:

1) Control group. These are schools and household from villages were the intervention will not be implemented. The intervention will be delayed by at least two years in these villages, preferably without informing schools and households.
2) Regular school feeding programme group. These are schools and villages where the standard Government programme is implemented, with Mayors responsible for the food procurement.
3) Home grown school feeding and social accountability group (HGSF+). These are schools and villages were the programme is implemented in addition to a capacity building component including training of community based organisations and local government on food procurement, nutrition education, and feedback monitoring.

Note that the HGSF+ intervention is conducted at the commune level. Training and monitoring systems involve Mayors and exert their effects at the commune level, affecting outcomes in schools where the HGSF+ programme is not implemented. On the other hand, the number of

communes where the programme is implemented is rather small, which reduces the statistical power of the analysis, and the effect of the school feeding intervention against the control group are best observed at the school level. Hence, we opted for a design that compares outcomes of school feeding and control group at the school level, and that compares outcomes of HGSF+ and regular school feeding at the commune level. The MOE will select 58 communes in which the programme will be implemented. In each of these communes Mayors will select two schools and each school will be randomly assigned to the treatment or to the intervention. A protocol will be designed in order to ensure that contamination between the two schools in each commune is avoided. This will allow comparison of outcomes of the intervention against the control group at the school level in 58 communes. The 58 schools assigned to the intervention will then be randomly assigned to regular school feeding and HGSF+. In this way the randomisation of the HGSF+ intervention will occur at the commune level.

Power calculations (Masset and Gelli, 2011) and resource availability suggested the adoption of a sample of 25 households from the village areas of the 58 schools receiving the intervention and of 20 households in the village areas of the 58 control schools. Farmers will be oversampled in both areas in the following way: 10 out of the 25 households in the 58 intervention villages will be farmer households and 5 out of the 20 households in the 58 control villages will be farmer households. This distribution of the sample between farmers and non-farmer households and between project control groups allows the construction of comparable samples (see Table8.3).

Table 8.3: Summary of sample sizes

	Communes	Schools	Households	Farmers	Children[1]
Control	58	58	870	290	2,700
HGSF	29	29	435	290	1,500
HGSF+	29	29	435	290	1,500
TOTAL	58	116	1,740	870	5,700

Note: 1) the number of children in an estimate based on an average of 2.6 children per family in families with children and 1.5 children per family in farmer households

Households will be randomly selected in the catchment areas of the selected schools for the survey interviews.[8] In practice, the sampling of households will not be conducted via a previous census as this was considered too costly in terms of time and resources. We opted for interviewing village chiefs and building a list of enlarged households in the villages covered by the sample school. The listing will also include an approximation of the size of the enlarged households. 10 farmer households will be sampled in each village: Chiefs (and members of the CGSs) will also be asked to list which farmers they would contact if they were to purchase food within the village for the provision of school meals. This latter information will be used to single out the surplus farmers in the area (up to 10 in the project villages and up to 5 in the control villages that will be interviewed).

Enlarged households will be randomly selected (with inclusion probability proportional to size) from the list provided by the village chiefs, and listings of the restricted households within each selected enlarged households will then be developed through interviews with household heads. A restricted household with children aged 5-15 was then randomly selected within each selected enlarged non-farmer household, and we estimate that each household will have at least two children in this age group. A similar selection procedure will be used for farmer households when these exceed the numbers of 10 and 5 in the project and control villages respectively. In farmer households though, no age criteria will be used and the household will be identified around the main agricultural holding unit of the enlarged household. This consists of the family members involved in the main production unit (land and livestock) in the enlarged household.

Threats to validity

The main potential threats to the internal validity of the study, including contamination, spill-over effects and Hawthorn-like effects were examined for each of the outcome indicators summarised in Table 8.2. From table 8.4 it seems that most threats could be avoided by:

i. assigning treatments to communes rather than to villages within communes in order to avoid contamination effects;

[8] We suggest a random selection of households in the villages. This approach has also been successfully adopted, for example, by (Adelman et al. 2008; Adelman, Gilligan, and Lehrer 2008; Buttenheim, Alderman, and Friedman 2010). One additional advantage of this approach is that it allows the identification of the determinants of enrolment/attendance and provide estimates of the relative relevance of school cost reduction effects produced by the programme.

ii. avoid informing teachers and households of the control villages that the programme will be implemented after two years in order to avoid expectancy effects;

iii. adopt strategies in conducting cognitive and achievement tests that prevent teachers and children from over-performing.

Table 8.4: Threats to internal validity

Indicator	Metric	Spill-over and contamination	Hawthorn and placebo effects
Schooling	Enrolment, attendance, drop-out and completion	Children may attend school from neighbouring communities to have access to meals	Expectation of coming programme in control villages
Cognitive ability	Raven's matrices or other test	Very unlikely	Teachers' and children's attempt to over-perform in both project and control villages
Attention	Digit span or other test	Very unlikely	Teachers' and children's attempt to over-perform in both project and control villages
Learning achievement	Scores on language and maths tests	Very unlikely	Teachers' and children's attempt to over-perform in both project and control villages
Physical growth	Anthropometric measures of height and weight	Children from other villages may access school meals	Very unlikely
PAL	Parents perceptions	Very unlikely	Very unlikely
Diet diversity	Household consumption	Very unlikely	Very unlikely
Micronutrient intake	Iron status, anaemia	Children from other villages may access school meals	Very unlikely
Income	Farm profits	Unlikely, if food purchases are made in control villages	Very unlikely
Social accountability	Parental monitoring and motivation	None at household level, possible at local Government level	Possible

Given the panel structure of the data there is a potential risk of differential attrition. However, it is difficult to predict why households or farmers from the control groups should respond to the interviews in different ways. Refusal to take part in the interview by households not benefiting from the project seems to be main threat. However, as shown in the table above, the project has limited impact on households expectations in both project and control groups and therefore should have limited impact on response rates.

One issue with impact on cognitive development is that the observed impact can be the result of:

- Increased attention in school resulting from the energy meal (short term effect)
- Increased overall cognitive abilities resulting from protracted school feeding, school attendance, play time, social interactions …etc... (long term effect)

Kristjannsson et al. (2007) have observed that most evaluations have not been able to distinguish the two effects. This could be achieved through careful design of the intervention as the one shown in Table 8.5. Half of the project children are not given the meal on the day of the test until after the test, while half of the control children are given the meal before the test. The differences across columns (a-c and b-d) should produce the long term effect, while the differences across rows (a-b and c-d) should produce the short term effect. This approach will possibly be tested as a case study in a sub-sample of schools.

Table 8.5: Teasing out short-term and long-term impact on cognitive development

	Meal	No meal
Project	a	b
Control	c	d

Survey instruments

The impact evaluation will include household, school, farmer, village and commune level data collection:

Household questionnaire: This will collect data at the household level and for each household member separately. The definition of 'household' in Mali is not straightforward as many families share the same living compound and polygamous families are common. A study by Beaman and Dillon (2009) found that adding descriptions to a restricted definition of household (a group of people who normally live in your household – adopted by the DHS) increases the number of adult male members reported during the interview. This however does have a very limited impact on household characteristics such as per capita food consumption, assets and agricultural production. We recommend the use of the restricted definition adopted by the Rapid Household Survey 2006 which reflects the LSMS experience in collecting data in developing countries. According to this definition, a household is a group of people who normally live and eat together. Members spending less than three

months with the household within a year should be excluded. Families living in the same compound should be considered as different households, though the consumption section of the questionnaire needs to be carefully designed in order to take into account the common use of food resources. Polygamous households should be treated as distinct households if wives live and cook in separate houses.

The household questionnaire will include the following modules:

- Household roster (main demographic characteristics, including of children residing elsewhere)
- Education (school attendance, education of all household members, time spent in class and working, distance and transport to school, meals while in school, parents' aspirations, PTA membership and involvement)
- Household assets and farm assets (household facilities and durables including land and livestock holdings)
- Economic activities (simple income questionnaire on time spent working by household members in wage work, own business and own farm)
- Expenditure (monetary expenditure and own production of food, education, health, durables, and non-food expenditure)
- Anthropometry (height and weight of parents and children above 6 months of age – parents measurements are taken to assess the genetic potential)
- Cognitive and achievement tests (test scores on maths, language and digit span test),
- Farm income (agricultural production and revenues, input expenditure and depreciation of farm assets)
- Other income (a simplified income questionnaire for other income sources like microenterprises, transfers, remittances, gifts etc.)

School questionnaire: In each school a questionnaire will be administered to head teachers and teachers and will include the following modules:

- School facilities (school characteristics including boards, toilets, furniture, books and all school-feeding related characteristics – kitchen, storage room etc.)
- School participation (school-level data on enrolment, attendance and drop-out)
- School management and food procurement

- Teachers (qualifications, living conditions and aspirations)
- Training and monitoring activities

Mayors' questionnaires: Mayors will be interviewed in each of the 58 communes during the baseline and follow-up surveys. The purpose of the questionnaire is twofold. First, it will collect information at the village level that will be used in the multivariate analysis when analysing the project outcomes at the household level. Second, some project outcomes, like for example the number of smallholder farmers involved in the project, will be observed through this instrument. The tool will include the following modules:

- Funding of school canteens (instalments received and payments made)
- Food deliveries (quantities and characteristics of delivery to each school)
- Food procurement (details of all procurement over the calendar year)
- Monitoring and supervision (supervision of correct procurement and deliveries)
- Knowledge and practices (training and knowledge acquired)

Other relevant research

Complementary qualitative research will be conducted in three areas: tracking expenditure survey; parental perceptions of schooling; assessment of programme characteristics that cannot be observed through standard surveys.

Public expenditure tracking. As the national programme is relatively new and in the process of scaling-up, there might be inefficiencies or leakages in the flow of funds running from the Ministry of Finance down to the school management committees. We suggest conducting research following the flow of funds from its initial allocation at the central level, to the regional offices, the mayors, the CGSs and the traders or smallholder farmers involved. The research will allow a careful examination of all the stages of the financial transactions involved, highlighting the characteristics of the procurement system and identifying entry points for improved efficiency.

Focus groups with farmers, parents, children, teachers and local authority stakeholders. These focus groups are designed to obtain insights on the challenges and opportunities in terms of engaging smallholder farmers in the food procurement process, determinants of parents' and children's decisions to attend school, as well as related issues linked to hunger and seasonality. Teacher attitudes and motivation will also be assessed.

Programme monitoring and process analysis. Survey data collection will be integrated in the regular project monitoring activities also supported by PCD that include school level monthly and quarterly data collection. Periodic visits (in some cases unannounced) will also be made to the project communities in order to observe nutritional characteristics of the meal served in school; pupils' behaviour in class after the meals; modalities of cooking and storage; other aspects of project implementation that cannot be observed though a quantitative survey.

Methods of analysis

The analysis will be conducted on the average treatment effect (ATE), the average treatment effect on the treated (ATT) and econometric and simulation analysis.

ATE will be calculated for all relevant final outcomes of the intervention, and particularly for schooling outcomes. Impact will be assessed for the two treatment arms using regression analysis. A set of control variables will be selected to improve efficiency of the estimates.

ATT will be calculated for outcomes such as cognitive ability and nutritional status. The reason for this is that enrolment rates in Mali are very low in rural areas (around 30%). The main problem in conducting this analysis is that school feeding may bring to school children of very poor backgrounds with poor nutritional status and cognitive abilities to start with. This problem can be overcome econometrically by using matching techniques during the analysis of the data.

Markets

We are not aware of studies of market integration in Mali. The Observatoire du Marche Agricole (OMA) collects agricultural prices on a weekly basis from more than 50 locations around the countries. In principle, their data could be used to assess the extent of market integration, but not having access to the data we will assume in the following that markets are not fully integrated. If markets of staple foods (millet, sorghum, and rice) are not fully integrated, prices can vary from one location to the other and the additional demand introduced by the project may increase prices.

There are several markets of producer and consumer prices along the supply chain of staple foods. These markets are linked by complex relations and involve several actors: producers, collectors, bulkers, traders, retailers and consumers. The markets where the programme may have an impact are the *foire* (village, or group of villages, level market), the bulker market and

the retailer markets. Foire markets in particular are markets where foods are purchased from local farmers by collectors and where local consumers make their purchases. If the project has an impact on prices it is likely to occur at this level. In practice, the impact on prices can happen a maximum of 3 times per year when purchases by the mayors are made and only in the HGSF+ programme sites.

Impact on prices could in principle be observed through the household level questionnaires. The farm gate price could be observed at the household level by including in the questionnaire questions related to prices paid and time of sales. This however would complicate the income section of the farmer questionnaire. Consumer prices are more difficult to observe in a standard household survey because the recall time is seven or 30 days and there is only one survey per year.

As part of the programme monitoring activities, price data will be collected on a monthly basis for millet, sorghum and rice in the local foire next to each of the selected schools. The work could be assisted by the OMA through the provision of training given its long experience in the field. Collection of prices does not even require visits to markets if stable contacts can be established with collectors in each of the markets and prices could be communicated by phone.

Other general equilibrium effects

There is a possibility that some of the outcomes of the programme cannot be observed because of the type of the intervention and the sampling design. In particular, the programme is likely to benefit only few farmers in each of the project villages and the number of project villages for the study may not be sufficient to perform project-control comparisons that are highly powered. If this is the case we will assess the programme impact on farmers using econometric analysis and simulations. Two exercises in particular can be conducted. The first is a micro-simulation of the farm-level impact of the intervention. Using household data we can estimate production and profit functions and then simulate the impact on farmers' income, factoring in the additional demand and changes in food prices. Changes in prices can be simulated or observed directly through surveys. Similarly, the impact on consumption can be simulated after the estimation of a consumption function using household data. The second exercise consists of a village level simulation using a computable general equilibrium model. In this case, data are collected in one or two villages in order to build a social accounting matrix (SAM) to be used to simulate the impact of the injection of liquidity in the village economy. The advantage of this

approach is that it allows the simulation of the impact on the entire community via price and demand effects. This method could also be used to simulate the differential impact of the programme in a drought and in a surplus year.

Heterogeneity of impact

Gender, age and geographic area are other relevant categories to analyse impact. The impacts of school feeding in different contexts are quite heterogeneous (Adelman et al., 2008) School feeding, for instance, has been associated with marked improvements school participation of girls in rural areas with large gender disparities in access to education (Gelli et al., 2007). Smallholder farmers targeted by the program will in large proportions be women. From the educational perspective, school feeding impact has also been found to vary with pupil age, as household schooling decisions are also affected by the opportunity costs of education, that tend to be greater for girls and older children (Dreze and Kingdon, 2001).

The programme is targeted to disadvantaged groups. Main beneficiaries are:

- Children aged 6-17 attending primary school
- Poor, rural districts of the country
- Smallholder farmer households

The programme has a potential poverty inequality reduction impact at the national level. At the local level the intervention has a potential poverty reduction impact, but the inequality reduction impact will depend on whether:

- The project will increase enrolment. Children going to school are likely to be from richer background and more accessible areas
- The project will involve smallholder farmers. The programme might rely on large farmers or traders for the provision of food.

Cost effectiveness

Actual expenditures incurred during implementation of school feeding and HGSF+ interventions will be collected, reviewed and analysed from project reports, and other sources. Cost data will be collected retrospectively at the different levels of implementation. Full financial and

economic costs will be estimated. Cost data will be used to provide costs per achievement of one unit of outcome, such as per cent increase in enrolment or income. The figures obtained in this way will then be compared to figures calculated for other interventions.

Of particular interest is the cost-effectiveness of the community level/social accountability component of the intervention. The comparison between the HGSF+ and the regular school feeding component is roughly equivalent to the comparison between a home grown school feeding project and a standard school feeding project. Many would expect HGSF+ to be cheaper and more cost effective because of lower transport costs. However, the alternative procurement source, its distance and affordability is unknown, and hence the difference in costs between the two programmes is an empirical question.

Ethical clearance

Ethical clearance was obtained from the appropriate boards in Mali and at Imperial College London. Meetings were held from early stages in the study development with relevant Government Ministries both at central and decentralised levels to discuss the purpose, procedures and risks involved in the study. Informed consent was obtained from parents/guardians of children through written and verbal information provided before interviews.

Discussion

National Governments in sub-Saharan Africa have demonstrated strong leadership in the response to the recent food and financial crises by scaling-up school feeding programmes. “Home-grown” school feeding programmes have the potential to link the increased demand for school feeding goods and services to community based stakeholders, including smallholder farmers and women groups. However, there is a dearth of evidence on the costs and benefits of school feeding programmes linked to smallholder agriculture and community development. This evaluation will be the first to examine the impact of linking school food service provision on smallholder farmer income, as well as the link between community level engagement and programme performance, alongside assessing the more traditional benefits to school children.

The impact evaluation follows a theory based approach and is underpinned by the development of the programme theory for the intervention. It includes a process evaluation component that will enable policymakers to not only understand if the intervention works or not, but also why and how it is working. By using a mixed-methods approach (combining quantitative and qualitative data), the evaluation will explore both hard outcomes (e.g. enrolment, income, welfare) but also perceptions on softer elements of programme performance (e.g. community ownership and accountability).

This study will also be the first evaluation designed around the scale-up of a national school feeding programme in sub-Saharan Africa. It is a prime opportunity to provide policy relevant evidence. To ensure that this was the case, policymakers across Education, Health, Agriculture and Local Government Ministries were engaged from the early design stages through to survey design and implementation. In particular, this study is anchored in the framework provided by the Ministry of Education's recently developed national school feeding policy. In Mali, the national policy on decentralisation also meant that policy makers at regional and commune level be engaged in design process. A number of meetings were held to sensitise stakeholders at the different levels, also including them in the randomisation process.

Conducting this type of research in the Malian context also raises a number of practical issues, including logistics, security and local political constraints. A set of contingency plans were developed to tackle foreseen challenges, however, the major upheaval currently taking place in the country clearly poses a major challenge to the intervention itself. The scale-up areas however remain under Government control, and recent news provide encouraging signs that the work will continue. Despite these challenges, the study is underway, and the baseline survey will provide some important new data on the links between education, health and smallholder agriculture in food insecure areas of Mali.

In summary

This chapter was aimed at exploring the links between school feeding and smallholder farmer production. Though the evidence for education and school health and nutrition is quite well established, there are still a number of gaps in terms of food security and agriculture. The randomised control trial presented in this chapter will hopefully provide evidence in these focus areas. In the next chapter we will draw on the evidence presented in this thesis to explore the multiple trade-offs across school feeding design and implementation and conclude.

Chapter 9: Conclusions

School feeding programmes are popular interventions designed to support the education of children living in poverty and food insecurity. In this thesis I have sought to develop an evidence-based rationale for school feeding, exploring the links between food service provision in schools and the associated trade-offs between benefits and costs. The programme theory on the educational benefits of school feeding is generally well established and underpinned by an increasingly robust evidence base: School feeding programs can help to get children into school and help to keep them there, increasing enrolment and reducing absenteeism; and once the children are in school, the programs can contribute to their learning, through avoiding hunger and enhancing cognitive abilities. In practice however, school feeding programmes are complex interventions with many possible configurations, involving a broad range of activities by different stakeholders at different levels. The benefits of school feeding programmes are also very context specific. Policy makers and implementers can therefore benefit from a careful assessment of the trade-offs associated with different programme designs.

School feeding improves enrolment

The review of the literature presented in this thesis indicated that school feeding programmes are very common interventions with potential impacts across education, health and nutrition. The review also highlighted that in terms of impact on school participation, there is little evidence that different school feeding modalities have different effect sizes; whether we look at enrolment, attendance, or drop-out. The evidence also suggests that the different modalities have very different costs. This raises important questions in terms of cost-effectiveness and sustainability.

I then designed a study to capture differences in programme effect through a meta-analysis of perhaps the largest school-level dataset collected on school feeding programmes. This analysis builds on a previous descriptive study I undertook in 2007 that examined average effect sizes in different types of programmes (Gelli et al, 2007). The analysis published in 2007 focussed on describing average changes in schools with and without school feeding, and used these changes to simulate enrolment trends. Chapter 4 of this thesis included the detailed analysis of a natural experiment designed to explore the influence of school feeding programs on school enrolment, based on a meta-analysis of survey data collected in 32 countries in sub-Saharan Africa. The results indicate that school feeding programmes had a positive impact on school enrolment, of the order of about 10 percent. As per my earlier study (Gelli et al., 2007), the changes on enrolment varied by modality of school feeding provision and by gender, with onsite meals appearing to have stronger effects in the first year of treatment in the lower primary grades, and onsite combined with take-

home rations also being effective post-year 1, particularly for girls that were receiving the extra take-home rations.

Unlike the earlier study, this analysis provides estimates of programme effect, comparing two treatment arms (onsite feeding and onsite feeding combined with take home rations) to a control without intervention. The estimates of programme effect are much lower in this study, and consistent with those from other studies in the literature (Adelman et al., 2007), suggesting that the estimation strategy provided in this chapter, including school- and country-level covariates, provides a more robust estimation framework.

The operational nature of the survey data used in the meta-analysis, however, limits the robustness of the design and validity of the findings. The data were collected as part of WFP's school-level monitoring of school feeding programs and not as part of an impact evaluation. Nevertheless, this analysis is the first to study possible links between enrolment and length of programme duration using multivariable models, examining whether programmes reach a saturation point or steady state beyond which school feeding may in fact have no further benefits on school enrolment. Further research is required to examine this issue in more detail.

The costs of providing food through schools

The recent rethinking of school feeding jointly undertaken by the World Bank and WFP highlighted that "more accurate estimates of costs are an important area for future research. An even more important omission is a meaningful estimate of the cost efficiency of the different modalities and targeting approaches". The review adds that "the apparent variation in costs among low-income countries implies that there is considerable opportunity for cost containment, provided that the drivers of costs are better understood. The relevance of the modality is an important issue, and there is a particular lack of information on fortified biscuits and for take-home rations".

Chapter 5 of this thesis was aimed at updating current benchmarks for school feeding costs and cost efficiency, and at understanding the cost drivers and cost-containment opportunities of school feeding programmes. The data covered school feeding activities from 78 WFP projects, including over 16 million beneficiaries in 62 low and middle income countries. The standardised yearly average school feeding cost per child was $48 USD. The yearly costs per child were lowest at $23 USD for biscuit programmes and highest for take-home rations programmes at $75 USD. The average cost of programs combining onsite meals with extra take-home rations for children from vulnerable households (e.g. girls in areas with large gender disparities) was $61 USD. The range of costs is such that there is considerable overlap across the modalities, highlighting the opportunities for cost containment. Commodity costs were on average 58 percent of total costs, and were highest for take-home rations and biscuit programmes (68 and 71 percent respectively). As this analysis does

not include school level costs, these findings highlight the higher non-transfer costs for programmes delivering cooked meals in schools compared to other school feeding modalities. Comparisons between unstandardised and standardised costs indicated that because of pipeline breaks, funding shortfalls or other operational issues, WFP operations on average spend about 67 percent of what they would be spending to deliver the full cost of school feeding over a 200-day period. This finding is consistent with previous analyses.

Capturing hidden costs

The provision of school feeding involves a range of school level activities including both capital and recurring expenditures not normally covered in programme costing exercises. Conceptually, school feeding services also direct financial resources to the school community through two main channels, funds for food procurement and funds for support services in terms of food management and preparation. There is a dearth in the evidence on the costs and benefits of school service provision at the community level. Only one study in the literature documents these school level costs (Galloway et al., 2009), where I had contributed to the analysis by developing a basic cost framework. In this thesis, I build on my earlier work by developing a detailed methodology to estimate school level costs for onsite meals that was field tested in a pilot study in Kenya. The average economic school level cost of providing onsite meals was $8.72 USD, ranging from $5.98 USD to $10.55 USD in rural and urban schools respectively. These estimates are above the estimates provided by the earlier study that reported average community level costs of just over $2 USD per child per year. The earlier study included only a very basic school level cost framework based on fees charged by the school management committee to support school feeding programme implementation that was applied to a very small number of schools (less than 5 per country). It is likely that the current work provides a more complete analysis, including both annuitised capital costs and an exhaustive set of recurring expenditures. In terms of food sourcing and preparation, emerging evidence suggests the potential for community development benefits. However, this remains another important area of future research.

Are investments in school feeding sustainable?

The analysis of school feeding programs undertaken by PCD, the World Bank and the WFP also highlighted that many countries for which data are available do not seem to seek to cease providing food to their schoolchildren (Bundy et al., 2009). On the contrary, many countries appear to seek to expand the coverage of their programs and establish them as national programs mainstreamed into national policy (Bundy et al., 2011). Monitoring financial inputs into school feeding is important in terms of accountability, equity and transparency. Assessing the relative costs of school feeding relative to expenditure in education is a key element in the analysis of the transition from externally

funded programmes to sustainable, nationally owned programs. In general, in low and middle income settings school feeding programmes are designed with educational goals and are framed within educational sector policies and plans. From this perspective, the comparison between per capita expenditures on education and the per capita costs of school feeding offers useful insights on the financial capacity in low and middle income settings to fund programme implementation.

Chapter 7 in this thesis examined the most recent available data on the costs of school feeding, in relation to the cost of education and GDP. A number of conclusions are apparent: First, as described in earlier studies (Gelli et al., 2009, 2011), school feeding programs in low-income countries exhibit large variation in cost, with concomitant opportunities for cost containment. Second, the per capita costs of feeding relative to education decline nonlinearly with increasing GDP. These analyses suggest that the main reason for this is a greatly increased investment per child in primary education as GDP rises, but a fairly flat investment in food. As countries get richer, school feeding costs become a much smaller proportion of the investment in education. The trends reported in this analysis are very similar to those reported in earlier studies. There are however some important differences in absolute terms. In particular, the new results reported in this study are generally higher than the benchmarks reported in 2005. The average costs of school feeding increased overall by 43 percent during a three year period. This finding is not surprising considering that on average 58% of school feeding expenditures are due to commodity costs (Gelli et al., 2011) and that at the height of the food crisis experienced between 2005 and 2008, the prices of maize and wheat had tripled, and that of rice had increased fivefold (von Braun, 2008).

Exploring some of the trade-offs of alternative school feeding designs

The findings captured in this thesis highlight how the design of the school feeding intervention has considerable implications across the supply chain in terms of specifying the quality and quantity of the demand for food from school feeding, including the following issues, for example:

- **School feeding modality**: the choice between biscuits, cooked meals and take-home rations.
- **Food ration specifications and daily menus**: in terms of quantity and nutritional composition (macro and micronutrients), as well as selection of foods produced in the communities surrounding the schools.
- **Feeding days**: covering every school day, or specific periods in the school year (e.g. hunger season in areas of food insecurity), seasonality.
- **Targeting criteria**: geographic distribution of beneficiaries, for example selecting particular areas on the basis of food insecurity may limit the opportunities to link with agricultural production.

- **Scale of the school feeding coverage**: the number of children receiving school feeding assistance.

The choices of specific design parameters involve important trade-offs in terms of costs, efficiency (with respect to outputs), effectiveness (with respect to outcomes) and equity.

Examining costs, cost efficiency and food demand

These trade-offs can be illustrated more explicitly by combining data from different the different sections of this thesis. This particular example was developed for illustrative purposes only and requires validation from more rigorous empirical studies. In terms of schooling outcomes, as described in the literature review section of this paper, there is to date little evidence in terms of difference in size of the relative impacts of the different school feeding modalities and this remains an important area of future research. In terms of food quantity requirements, using data from WFP programmes in 72 countries in 2008 (Chapter 5), biscuit programmes delivered, on average, about one third of the food delivered by onsite meals, and approximately one ninth of the food delivered by take-home ration programmes. The same study reported average programme costs per child per year of US$ 25 for biscuit programmes, or half the cost found for onsite meals and one third of the costs found for take-home rations. According to the latest analysis, in terms of cost per nutrient output delivered to children in school (and not considering take-home rations), biscuits are nearly twice more cost-efficient than on-site meals in terms of the delivery of energy and protein content, and over three times more cost efficient in terms of micronutrient delivery (in particular for iron, iodine and vitamin A).

Table 9.1: Examples of different school feeding design choices and trade-offs in shaping the demand for food

	Biscuits	**Cooked meals**	**Take-home rations**
Outcomes (enrolment, attendance, drop out)	Evidence base suggests only small differences in *size* of relative impact on education outcomes		
Food quantity per child per year[1]	8 kg	25 kg	75 kg
Cost per child per year	$25	$50	$75
School level cost per child per year[2]	~$2.5	$8	~$2.5
Relative cost/protein or energy output	~0.5	1	NA
Relative cost/micronutrient output	~0.3	1	NA

School level costs are also considerably higher for onsite meals (of the order of $8 USD per child per year) compared to biscuits and take-home rations. However, as described in chapter 7, about 25 percent of the school level costs for onsite meals are spent on buying fresh fruit and vegetables,

[1] Based on analysis in 72 countries using 2008 data (Gelli A. et al., 2011).

[2] Based on pilot studies in Cote d'Ivoire, Ghana and Kenya (Gelli et al., unpublished).

providing clear income generating opportunities for smallholder farmers in the community. Another 33 percent of the onsite cost at school level is spent on employment of cooks and other stakeholders within the school community.

Cost effectiveness: Gaps in the evidence

The evidence presented in this thesis highlights that scaling-up school feeding programmes requires considerable financial investments on the part of national government and development partners. The answer to a critical question for policy makers, on whether these investments in school feeding are justified in terms of cost-effectiveness of educational goals, for example, remains a critical gap in the evidence. Other school health and nutrition interventions, like deworming, for example, can have considerable benefits in terms of attendance of school children at a fraction of the cost of school feeding. However, school feeding, unlike deworming, also has potential impact on enrolment and retention. Comparisons across interventions are therefore not as straightforward as might seem. Providing credible answers to the question of cost-effectiveness of school feeding has in my view been a challenge mainly due to the complexity of aggregating impacts across the possible different causal pathways. Moreover, the example presented in Table 9.1 highlights that though the choice of school feeding modality may not necessarily affect the effectiveness of the intervention in terms of educational outcomes, it could translate into sizeable differences in both costs and additional demand for food from the programme. Both costs and food demand issues have considerable consequences in terms of budget and sustainability, as well as potential to provide a sizeable additional demand on the agricultural market, or income generating opportunities in the school community. Broadening the scope of school feeding programmes, though, also adds other layers of complexity in terms of boundaries for outcomes to be included in the estimations of cost-effectiveness. School feeding design options in essence shape the demand for agricultural production including food quantities, food types and nutritional composition, processing requirements and standards. Multiple other trade-offs are involved in managing the school feeding supply chain that are beyond the scope of this work[3]. Providing decision support to policy makers and programme implementers on how to manage these important trade-offs remains a key item for future work.

Linking school food to small holder agriculture

An important area that this thesis has helped to frame analytically, providing the basis for future research, involves the linkages with agriculture and health. National Governments in sub-Saharan Africa have demonstrated strong leadership in the response to the recent food and financial crises

[3] Analysing these other trade-offs is the focus of the ongoing HGSF work of PCD and partners (see Gelli et al., 2010).

by scaling-up school feeding programmes. HGSF programmes have the potential to link the increased demand for school feeding goods and services to community based stakeholders, including small-holder farmers and women groups. As documented in this thesis, providing food through schools has well documented effects in terms of the education, health and nutrition of school children. However, there is limited evidence in terms of the benefits of providing a reliable market for small-holder farmers through HGSF. Chapter 8 of this thesis includes the design of a new study, the first of its kind, aimed at evaluating the impact of school feeding programmes sourced from small-holder farmers on small-holder food security, as well as on school children's education, health and nutrition in Mali. In addition, the study also examines the links between social accountability and programme performance.

The study involves a field experiment around the scale-up of the national school feeding programme, involving 116 primary schools in 58 communities in food insecure areas of Mali. The randomly assigned interventions are 1) school feeding programme group, including schools and villages where the standard Government programme is implemented; 2) "home-grown" school feeding and social accountability group, including schools and villages where the programme is implemented in addition to training of community based organisations and local government; and 3) control group, including schools and household from villages were the intervention will be delayed by at least two years, preferably without informing schools and households. Primary outcomes include small-holder farmer income, school participation and learning, and community involvement in the programme. Other outcomes include nutritional status and diet-diversity. The evaluation will follow mixed method approach, including household, school and village level surveys as well as focus group discussions with small-holder farmers, school children, parents and community members. Monthly process monitoring visits, spot checks and quarterly reporting will be undertaken as part of the regular programme monitoring activities. The baseline surveys were completed in January 2012 and evaluation surveys are planned for 2014.

Uptake of evidence into policy?

We have seen that bringing national school feeding programmes to scale requires considerable resources and a steady flow of funds: in low-income countries, school feeding programmes on average cost about US$50 per child per year. In this context, strengthening monitoring and evaluation (M&E) systems is of paramount importance to maximize programme impact and minimize costs. Recent experience, however, indicates that during the scaling-up of school feeding programmes in low- and middle-income countries, investments in M&E are often overlooked (Gelli & Espejo, 2012). In sub-Saharan Africa for example, over the last 5–10 years, only two randomized controlled trials, the gold standard for impact evaluations, have been implemented (in Burkina Faso

and Uganda), and none of these covered government programmes. A number of quasi-experimental evaluations have been undertaken across the region mostly by WFP, however these studies are limited by the systematic lack of baseline data collection and difficulties in setting up adequate control groups (Burrows, 2011).

An on-going review of M&E systems for school feeding in the 10 countries with national school feeding programmes in the continent shows that where M&E systems for school feeding exist, they generally operate under the Ministry of Education, with other Ministries (e.g. Health, Agriculture, Local Development) usually part of a cross-ministerial technical steering group supporting programme implementation (Gelli & Espejo, 2012). In countries where M&E data collection is underway, the focus is mostly on process data and service delivery and not on child education or health outcomes (Figure 9.1). As a result, cost data have recently become more readily available, but there is a dearth of evidence on cost-effectiveness of programmes[5]. There is generally no dedicated budget line at national level: M&E is usually part of the administration, support or overhead costs for the programme. Moreover, in most countries examined, the M&E system is not underpinned by a national policy, plan or project document. In terms of indicators, there is to date no internationally accepted standardized framework for the M&E of school feeding programmes, reflecting the varied and complex set-up of school feeding programmes worldwide. At regional and country levels though, the United Nations Educational, Scientific and Cultural Organization (UNESCO) Institute of Statistics has recently been making efforts aimed to harmonise monitoring systems across the education sector, including for school feeding, whilst also strengthening the Ministry of Education 'Education Management Information Systems' (EMIS). To date however, there have been few examples, including Tanzania, of functioning M&E systems that are integrated into EMIS.

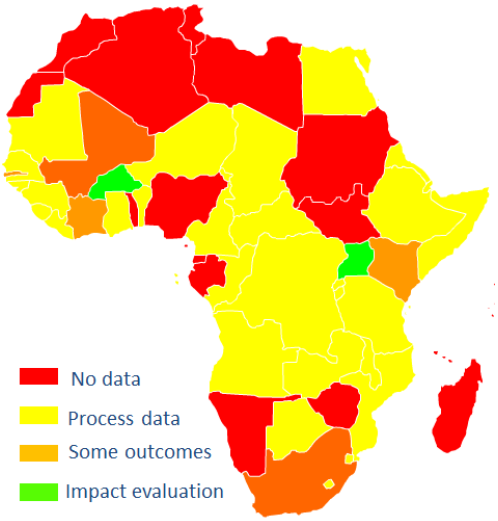


Figure 9.1: M&E data of school feeding, sub-Saharan Africa. (Source: Gelli & Espejo, 2012). *Where M&E data collection is underway the focus is on process data and service delivery and not on child education or health outcomes.*

This preliminary snapshot of school feeding M&E points to a number of lost opportunities to improve programme responsiveness, efficiency, and effectiveness. The lack of investment in M&E has also provided a constraint in terms of learning from the considerable experiences in-country and across the region, both in the programme and in the policy sphere. There have been some examples where evidence on programme performance has influenced policy and programme, most notably in terms of cost efficiency where data are more readily available. For example, the publishing of cross country comparisons and benchmarks of school feeding programmes using 2005 data resulted in the country at the most costly end of the spectrum (in this case Benin) redesigning its food basket and reducing costs by a factor of 4 when the benchmarking exercise was repeated in 2008. Considering the popularity and the size of the investment in school feeding, these cases though are more anecdotal than the norm, highlighting the opportunity for more systemic changes in the policy support processes.

Influencing policy processes

Can the recent rethinking of school feeding programmes across the world provide an opportunity to strengthen evidence-based policy making and build sustainable M&E systems? Emerging trends suggest that programmes in low- and middle-income countries are in a transition to sustainability and national ownership (Bundy et al., 2009). From the policy perspective, governments in sub-Saharan Africa have included school feeding programmes linked to agriculture development within the African Union Comprehensive Africa Agriculture Development Programme (NEPAD, 2003). School feeding programmes are being financed with investments of the order of millions of dollars per year by national governments in at least 10 countries in the continent. In response to this opportunity and policy level engagement, the World Bank, WFP, PCD and other stakeholders have been working together to strengthen national school feeding programmes. The partnership has been undertaking analyses in a number of countries designed to develop a better understanding of the school feeding system in its different, context-specific configurations. One of the key themes in the dialogue on strengthening M&E with national governments was to highlight the opportunity to understand the cost-efficiency and effectiveness of school feeding, with a view to increase the impact and value for money of the investment in the programme.

Policy processes for school feeding are complex and can be influenced by a number of factors. The present discussion reflects over a decade of experience with building M&E systems for policy and programme support for school feeding by WFP and PCD in over 30 countries in sub-Saharan Africa. Figure 9.2 describes four elements for influencing policy that have emerged from this experience. Awareness of the particular policy processes in each country context is paramount: building the knowledge base on school feeding is only one piece of the policy-uptake puzzle, which involves

interactions between a wide range of stakeholders across different sectors, appropriate use of the context (i.e. elections, incoming ministers, political commitments, and economic opportunities), and inclusion of school feeding in relevant policy discussions (Figure 9.2).

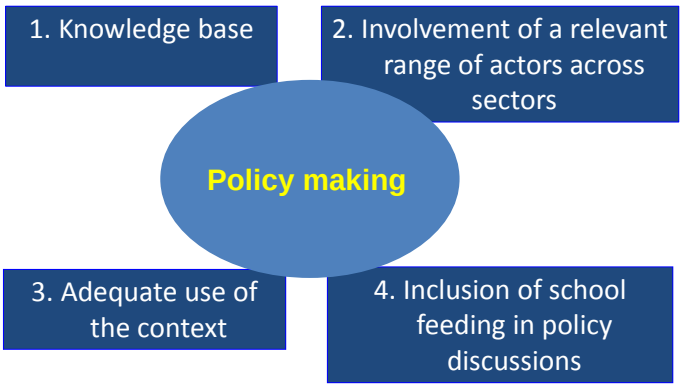


Figure 9.2 Elements of policy making process. (Source: Gelli & Espejo, 2012). *Policy processes for school feeding are complex and can be influenced by a number of factors.*

Adapting the work on evidence-informed policy making in the health sector, we captured some of the key interactions between actors, context and content involved in the policy making process and identified three important entry points (Figure 9.3):

1) *Obtaining a mandate from government to address the issue of weak M&E:* a first step to ensure legitimacy and long-term sustainability of the process and an opportunity to begin engaging with policy makers.
2) *Providing technical support:* context-driven (e.g. short-term capacity gap filling and medium-term capacity development activities based on assessment of gaps in the current system).
3) *Facilitating inclusive South-South partnerships:* politicians listen well to what other politicians are doing. The school feeding experience in Latin America and South Asia provides a wealth of opportunities for innovations that are more likely applicable to the low-income context than experiences in the North. In addition, such South-South partnerships have less "political baggage" in terms of the recent history in the continent, and may act as catalysts for more conducive environments for policy uptake.

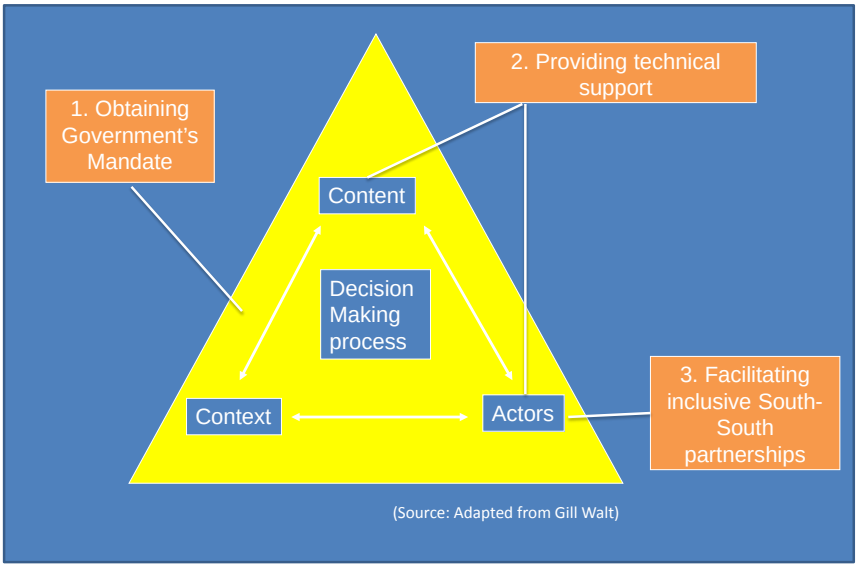


Figure 9.3: Entry points in policy making process. (Source: Gelli & Espejo, 2012). *Key interactions between actors, context and content involved in the policy making processs.*

Ensuring a valid mandate before initiating action, validating the value added of the initiative to strengthen M&E systems by providing meaningful technical assistance, and promoting awareness on successful experiences through South-South cooperation have been successful ways to influence decision making in the supported countries. This process is illustrated in a recent example highlighted in Box 9.1.

Box 9.1: Building sustainable M&E systems in Mali

In Mali, the National programme is currently covering 651 primary schools located in food insecure areas, with over $5 million USD committed per year from the national budget. One of the focus areas of the PCD-WFP-World Bank partnership activities has been to strengthen the M&E of the national programme as it scales up. As a first step in the process, a Memorandum of Understanding was signed in late 2010 with policy makers in the Ministry of Education that outlined the mandate and the scope of the work. This paved the way for stakeholder engagement activities during 2011, working across the traditional disciplines of agriculture, education, health, and nutrition, including policy makers, practitioners, researchers, and civil society. The country level activities fed into the development of an integrated assessment that followed a standard approach to examine school feeding programmes across five international quality standards, namely: design and implementation; policy frameworks; institutional capacity and coordination; funding; and community participation. The scoping analysis also provided the basis to understand the key gaps in the evidence base and shape a structured research agenda. As a result, a national school feeding M&E plan is currently being developed in Mali under the leadership of the national school feeding centre in the Ministry of Education. The national M&E plan will describe the national M&E strategy to be implemented over the national school feeding programme cycle, detailing the different

components of the M&E system in place or planned for to monitor and evaluate the programme performance. A key element of the M&E plan is a randomized control trial that was designed around the scale up of the national programmes (see Chapter 8).

This experience in Mali suggests that policy making was influenced and a concrete plan for change was obtained through a participatory process. Stakeholders across sectors are now engaged in the systems strengthening activities covering broader elements of programme design, management and implementation, adding to the sustainability of the plan and supporting the transition to national ownership. The challenge is now to maintain the momentum on implementation, ensuring the value added to the process materializes through the provision of meaningful feedback into the programme, improving impact whilst reducing losses and costs. These elements remain important areas for future research.

Way forward

A number of recent studies and reviews, including the ones presented in this thesis, have identified a growing evidence base on school feeding including a broad range of benefits that can be delivered to vulnerable school age children simultaneously across education, health and nutrition dimensions. The complexity of school feeding as an intervention has been clearly underestimated. Strengthening the evidence linking outcomes to the design of school feeding and to the quality of the service delivery, including the trade-offs between implementation modalities, remains a critical area of future research. Another important gap centres on the issue that there is no single metric that captures the cost-effectiveness of school feeding combining the different benefits making comparisons with other interventions incomplete. Despite the evidence provided in this thesis, there is still a dearth in the evidence on the costs of Government school feeding, and the associated cost-efficiency and cost-effectiveness trade-offs implicit in the different choices of school feeding design, including home-grown approaches. Building the evidence base on the agricultural benefits of school feeding, as well as tackling the issue of cost-effectiveness and metrics, are important areas of on-going and future research. This thesis provides both a foundation and a step towards answering these complex questions in a comparable and meaningful way.

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