HOMEGROWN SCHOOL FEEDING

Enabling Healthy and Sustainable Food Systems

Briefing Paper 4

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HOMEGROWN SCHOOL FEEDING

ENABLING HEALTHY AND SUSTAINABLE FOOD SYSTEMS

BACKGROUND

The increasingly homogenized contemporary food production system has contributed to undermining the resilience of farming and the ability of agriculture to provide a balanced diet especially in the poorest regions of the world. In Mali, for example, 60 % of local varieties of sorghum have disappeared in one region over the last 20 years.[1] It is estimated that since 1900, 75% of plant genetic diversity has been lost as farmers worldwide have left their multiple local varieties and landraces for genetically uniform, high-yielding varieties.[2] The vulnerability of these homogenised food systems is further exacerbated by climate change through reduced yields and distorted cropping patterns. Rainfed smallholder farming systems in highlands and the tropics which constitute 80% of the world's cropland and 60% of global agricultural output are the most vulnerable.[3]

Promoting nutritionally balanced and ecologically sensitive agriculture is urgently critical for food and nutrition security and improving resilience of

[1] Martins, C. 2015. Agrobiodiversity-The Key to Food Security, Climate Adaptation and Resilience. GIZ: Bonn.
[2] FAO. 1999. Women: users, preservers and managers of agrobiodiversity. In: *Women: the key to food security* [online]. Rome. [Cited 1 May 2020]. www.fao.org/3/x0171e/x0171e03.htm#P181_22270.
[3] Bioversity International, 2017. Mainstreaming Agrobiodiversity in Sustainable Food Systems: Scientific Foundations for an Agrobiodiversity Index. Bioversity International: Rome.

agriculture. Over the past few years there has been an increasing recognition of the pathways between agriculture, nutrition and agrobiodiversity, however agriculture planning and policies, largely continue to view food systems in terms of yields, livelihoods and economic output. It is important to design and evaluate integrated public health-agriculture interventions that can be implemented at scale as part of national government programmes. The evidence from such interventions will provide important inputs to inform policy and practice of national governments and international agencies.

This briefing paper discusses one such intervention, Homegrown School Feeding, which integrates public health, agriculture, and education. Almost every country in the world has a national school feeding program to provide daily snacks or meals to school-attending children and adolescents. In terms of applying public procurement to shape food systems, school feeding programmes provide a credible platform. According to most recent global estimates, 388 million children receive school feeding in at least 161 countries including 53 million in SSA and 107 million in South Asia.[4] These numbers are set to increase as countries such as Nigeria scale up programmes nationally. The global annual investment in school feeding is estimated to be in the range of US$41 billion to US$43 billion.[5] A significant percentage of this amount is allocated for agriculture commodity procurement. HGSF builds on this massive food-based government-led safety net programme.

There are many different elements of HGSF across sectors of education, nutrition, public health, and agriculture. This briefing paper focuses on the specific issue of HGSF food system engagement, i.e. how HGSF can help enable healthy and ecologically sustainable food systems. The paper describes

[4] WFP. 2020. State of School Feeding Worldwide 2020. Rome, World Food Programme.
[5] Ibid.

the main concept and components, discusses evidence on key outcomes and presents some policy implications.

HOMEGROWN SCHOOL FEEDING

There is no one definition of HGSF, broadly speaking it is a government led school feeding programme which seeks to rely on local agriculture production as against food aid or imported commodities. The definition of local and the mechanics of engagement are different for different country contexts, the overarching principle is to support market development for small holder farmers. Whilst the scope and content of HGSF can vary depending on the context and specific objectives, it can be defined as follows; "HGSF constitutes a school feeding model that is designed to provide children in schools with safe, diverse and nutritious food, sourced locally from smallholders".[6]

Main components of HGSF include local food procurement, smallholder engagement, nutritious food, dietary diversity and regularity in meal provision.[7] The concept of HGSF was initiated by NEPAD in 2003 and is now operational in several countries. In 2014, at least 47 countries in sub-Saharan Africa (SSA) were implementing school feeding programmes, of which at least 20 were HGSF or similar models (Drake et al 2016). It is well recognized that HGSF can change dietary habits at household level and can impact smallholder production and markets.[8]

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[6] FAO & World Food Programme (WFP). 2018. *Home-grown school feeding. Resource framework. Technical document*. Rome. 170 pp. (also available at www.fao.org/3/ca0957en/CA0957EN.pdf).
[7] Singh, S. & Fernandes, M. 2018. Home-grown school feeding: promoting local production systems diversification through nutrition sensitive agriculture. *Food Security*, 10: 111−119.
[8] Drake, L., Fernandes, M., Aurino, E., Kiamba, J., Giyose, B., Burbano, C., Alderman, H. et al. 2017. School feeding programmes in middle childhood and adolescence. In D.A.P. Bundy, N. de Silva, S.

It has just been over a decade since the first HGSF programme was piloted in Ghana. Since then, the programme has become operational by some estimates in over 30 countries in Asia, Africa, and South America. Amongst the donor community, the Gates foundation was the first champion of HGSF and provided significant grants to develop and implement the concept. UN agencies such as WFP and FAO have now adopted the HGSF model as one of their flagship interventions.

Source: Photo by Bill Wegener on Unsplash

Horton, D.T. Jamison & G.C. Patton, eds. Disease Control Priorities, Third Edition: Volume 8. Child and Adolescent Health and Development, pp. 147–164. Washington, DC, World Bank.

THE EMERGENCE OF THE HGSF CONCEPT

2003: School feeding from locally smallholder sourced local foods is included in African Union's Comprehensive Africa Agriculture Development Programme (CAADP). HGSF is recognized by NEPAD-AUDA (New Partnership for Africa's Development) as an initiative that promotes food security and rural development. NEPAD launches homegrown school feeding pilots in Cote d'Ivoire, Ghana, Kenya, Mali, Nigeria, Tanzania, Ethiopia, Malawi, Mozambique, Senegal, Uganda, and Zambia

2003: The government of Brazil launches the Zero Hunger Strategy that includes the Food Acquisition Programme (PAA).

2005: The Community of Latin America and Caribbean States (CELAC) recognizes HGSF as a key intervention in its plan for Food Security Nutrition and Hunger Eradication 2025.

2009: The government of Brazil includes a local food procurement mandate in National School Feeding Programme (PNAE), requiring that 30% of the food is purchased from family farms.

2010-2015: Ghana School Feeding Programme transitions to HGSF model.

January 2016: African heads of state declare that "Homegrown School Feeding is a strategy to improve education, boost local economies and smallholder agriculture, and advance the Sustainable Development Goals".

1 March 2016: The first Africa Day of School Feeding is dedicated to home-grown school meals, to promote HGSF as a key strategy to achieve the Sustainable Development Goals.

June 2016: Government of Nigeria launches the Nigeria Homegrown School Feeding Strategic Plan (2016-2020) that envisages a countrywide universal HGSF programme.

9 September 2016: The declaration of the Global Child Nutrition Forum in Yerevan states that "Home-Grown School Meals should be pursued as priority programmes by governments, ensuring adequate ring-fenced budget allocation as appropriate for the country context and based on studies and analyses".

2019: Nepal School Feeding Programme is made universal by the Government of Nepal with a mandate to adopt the HGSF approach.

POLICY PRIORITIES

1. Regulations and laws to enable local community based agricultural commodity procurement by schools or local government bodies.
2. Policy for identification of appropriate Neglected and Underutilized Species (NUS) and other local foods through participatory methods.
3. Create incentive mechanisms for farmer cooperatives or other rural cooperatives to produce NUS and climate smart foods.
4. Policies to enable effective food governance decentralization in terms of agriculture extension, storage infrastructure and markets.
5. Develop multi-sectoral platform including departments of health, agriculture, and education to provide strategic guidance to HGSF intervention.
6. Investment in HGSF design and research.

DEVELOPING LOCALIZED FOOD SYSTEMS THROUGH HGSF

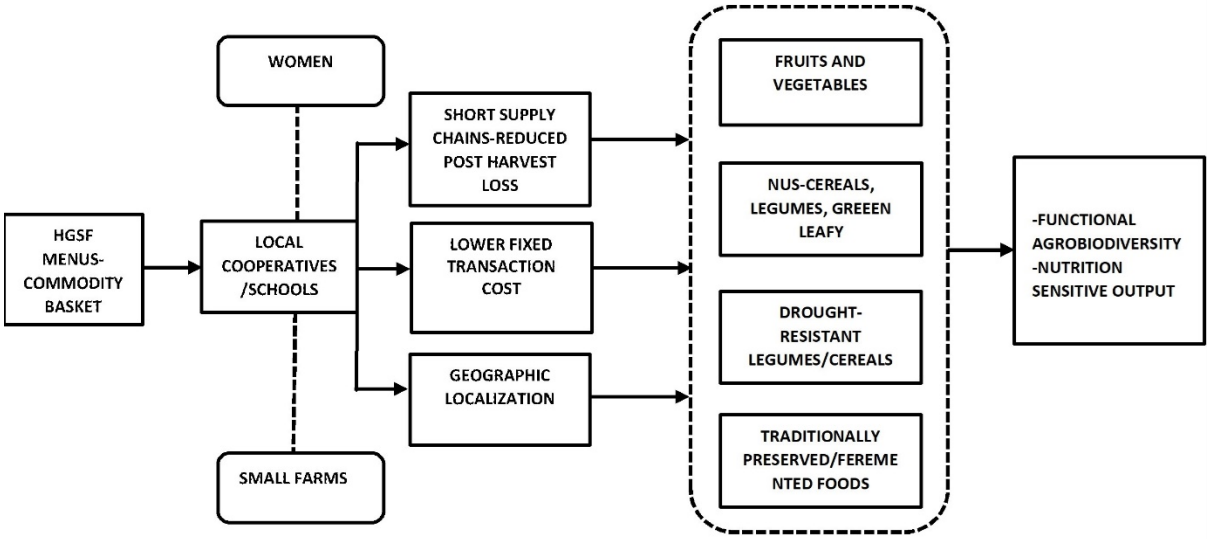
Whilst the definition of local, and scale and type of farmer engagement varies significantly depending on the country context, conceptually, in terms of farmer engagement, HGSF procurement creates mediated markets. The structured demand is explicitly shaped by considerations of geographic localization and a diversified commodity basket based on menus which are based on local nutrition needs and agriculture production.[9] These mediated markets can help make food networks more resilient, sustainable and nutrition sensitive.

HGSF has significantly evolved since its conceptualization over 15 years ago, in terms of overall food system engagement. The original objectives were focussed on rural development and improving farmer incomes. Applying the scale of school feeding commodity procurement to provide direct or indirect support to farmers was a key focus of initial programmes in SSA. More recently, programmes in Nigeria and Nepal are being designed to realize the catalytic value of school feeding supply chain in enabling nutritionally and ecologically healthy food systems. This is a continuing process which seeks to engage with aspects of food as a public good including its cultural, ecological and economic components. Some specific elements include (i) Emphasis on NUS (ii) Farmer/cooperative support and (iii) Community participatory engagement.

The figure below illustrates the key pathways and processes through which HGSF can create mediated markets for improved nutrition and agrobiodiversity. The details of the key components are described through this paper.

[9] Conway, G., Badiane, O., Glatzel, K., Chavez., E. & Singh, S. 2017. Creating resilient value chains for smallholder farmers. *In* Alliance for a Green Revolution in Africa (AGRA). *Africa agriculture status report: the business of smallholder agriculture in sub-Saharan Africa*, pp. 89−109. Nairobi.

FIGURE 1. HGSF- FOOD SYSTEM PATHWAYS



Source: Figure adapted from Singh 2021a, forthcoming.[10]

FOOD PROCUREMENT STRATEGY

The principal procurement strategy of HGSF is directed towards local small farms or family farms, with a specific focus on women farmers. The rationale for this strategy is that besides providing a structured market to small farmers, procurement should enable both direct and indirect pathways to improved nutrition and agrobiodiversity. Direct procurement with small farms is not feasible due to costs and issues of aggregation, therefore the recommended standard practice is to procure commodities through farmer cooperatives or multi-purpose cooperative or

[10] Singh, S. 2021a(forthcoming) Home-grown school feeding: promoting the diversification of local production systems through nutrition-sensitive demand for neglected and underutilized species. *In* FAO. *Public food procurement for sustainable food systems and healthy diets*. Rome.

other Farmer Based Organization. Procurement is also undertaken through other intermediaries such as traders in Kenya, 'Market Queens' in Ghana, women's groups in Cote d'Ivoire and caterers in Nigeria. Ideally, the link between local farmer and the procurement intermediary should be proximate and credible to ensure that the intended pathways of the procurement strategy are functional.

The procurement system is forward contract, where prices and quantities for all key commodities are negotiated with the supplying entity in advance, for a specified period. Management and transportation costs are added as a standard percentage. Given high levels of intra-annual price volatility, a price negotiation exercise can be undertaken every 3-6 months.

The three main elements of the procurement strategy are described below.

SMALL FARM ENGAGEMENT: Small farm systems are reservoirs of agrobiodiversity, associated indigenous knowledge and primary supplies of essential micronutrients.[11] Most countries in Asia and Africa are dominated by small landholdings, as per one estimate, 85% of family farms in SSA are smallholdings, with a farm size of less than 2 hectares[12] and in most cases less than 1 hectare.[13] Given that nutritionally ,focussed school menus form the basis of the commodity demand, HGSF has the unique potential, as a national programme, to contribute towards creating sustainable and healthy local food systems.

[11]Herrero,M.,Thornton,P.K.,Power,B.,Bogard,J.R.,Remans,R.,Fritz,S.,Gerber,J.S.,Nelson,G.,See,L.,Waha, K.,Watson,R.A.,West,P.,Samberg,L.,Steeg,J.,Stephenson,E.,Wijk,M. and Havlil,P.(2017). Farming and the Geography of Nutrient Production for Human Use: A Transdisciplinary Analysis. Lancet Planetary Health,1(1), e33-42.

[12] CIRAD, 2013. Les Agricultores familiales du monde – définitions, contributions et politiques publiques [Family farmers of the world – definitions, contributions and public policies]. Montepellier: CIRAD.

[13] Rapsomanikis, J. 2015. The Economic Lives of Smallholder Farmers-An analysis based on household data from nine countries. FAO:Rome.

WOMEN FARMERS: Whilst there is wide variation across regions, overall women and small farms led production contribute specifically to output of non-staple food groups such as fruits, vegetables, and legumes.[14,15] For example, most of the production and marketing activities for cowpea in SSA is undertaken by women farmers.[16] In most contexts, women are the primary decision makers on household consumption diversity and also tend to be more responsive to nutrition sensitive production incentives.[17, 18]

LINKAGE TO NATIONAL FOOD RESERVES: National food reserve systems are operational in many countries in Asia and SSA, mostly in the form of parastatals. As these systems are mandated with national wide procurement, HGSF programmes can be linked to food reserves for certain commodities. Such linkages can enhance efficiencies by integrating markets and can also improve the commodity diversity of national public procurement. Whilst such linkages were designed in a few countries in SSA, Ghana is perhaps the only country which linked National Food Buffer Stock Company (NAFCO) with the national HGSF, for supplying local parboiled rice.

[14] Joshi, P., Joshi, L. & Birthal, B. 2006. Diversification and its impact on smallholders: evidence from a study on vegetable production. Agricultural Economics Research Review, 19: 219−236.
[15] Malapit, H. & Quisumbing, A. 2015. What dimensions of women's empowerment in agriculture matter for nutrition in Ghana? Food Policy, 52: 54–63.
[16] FAO. 2004. Cowpea post harvest operations. In Post-harvest compendium. Rome: FAO.
[17] Malapit, H. & Quisumbing, A. 2015. What dimensions of women's empowerment in agriculture matter for nutrition in Ghana? *Food Policy*, 52: 54–63.
[18] Rukmani, R., Gopinath, R., Anuradha, G., Sanjeev, R. & Yadav, V. 2019. Women as drivers of change for nutrition-sensitive agriculture: case study of a novel extension approach in Wardha, India. *Agricultural Research*, 8: 523–530.

SUPPLY CHAIN- PROCESSES AND OUTPUTS

The forward contract modality between farmer cooperatives and schools creates three distinct and interrelated market incentive pathways for production systems, which are briefly described below.

SHORT SUPPLY CHAINS: Short supply chain reduce the need for storage which minimizes the risk of post-harvest loss and storage costs.[19] This is relevant for all foods but especially for fruits and vegetables and green leafy vegetables which are most at risk of spoilage during storage and transportation. In developing countries with weak and segmented supply chains, post-harvest losses are very high as storage of vegetables except roots and tubers is minimal and commercial processing is almost non-existent.

LOWER TRANSACTION COSTS: The structured demand of school feeding through forward contracts lowers the fixed transaction cost such as finding a buyer, price negotiation, etc. The element of proportional transaction cost such as transport is included in the forward contract costing. Whilst both components are equally important in market development, studies show that that fixed transaction costs (FTC) play a significant role in market participation decision making process.[20] This is particularly critical in the context of neglected crops.

GEOGRAPHIC LOCALIZATION: Localization has been a prominent theme in food sovereignty and alternate food network movement and was also a central

[19] Conway, G., Badiane, O., Glatzel, K., Chavez., E. & Singh, S. 2017. Creating resilient value chains for smallholder farmers. In Alliance for a Green Revolution in Africa (AGRA). Africa agriculture status report: the business of smallholder agriculture in sub-Saharan Africa, pp. 89−109. Nairobi.
[20] Key, N., Sadoulet, E. & Janvry, A. 2000. Transactions costs and agricultural household supply response. American Journal of Agricultural Economics, 82: 245−259.

element of the HGSF narrative.[21] Recent HGSF experience shows that localization with its ecological, cultural, political, and economic components is critical for effective and sustainable HGSF intervention. The scale and nature of localization depends on a range of country specific factors including governance system, political ecology, agriculture markets etc. In low-income countries agriculture markets can be very segmented, especially for non-cereal foods, therefore, traditional institutional support mechanisms premised on integrated markets and volumes are likely to have limited impact. Moreover, diets and agrobiodiversity are deeply rooted in local socioecological and political contexts in terms of both production and consumption. The interventions find that dietary norms and food traditions substantially influence the promotion of nutrition and agrobiodiversity especially in the context of localized food systems.

FOOD PATHWAYS

The procurement system described above, which is based on HGSF menu, and targets food sourcing from women farmers, small farmers and local geographies, affects the farm output by directly and indirectly incentivizing certain foods and food groups. Emerging evidence suggests that the nature of incentives is both monetary and non-monetary. Non-monetary incentives relate to the idea at the community level, of preserving and promoting local food production and dietary heritage and providing local nutritious food to children through school feeding. The main foods which are affected by HGSF can be categorised in 3 categories. It is important to note that some foods in these categories can be overlapping, a fruit or vegetable can be NUS and thus falls in both category 1 and 2.

[21] Singh, S. 2021a(forthcoming) Home-grown school feeding: promoting the diversification of local production systems through nutrition-sensitive demand for neglected and underutilized species. *In* FAO. *Public food procurement for sustainable food systems and healthy diets*. Rome.

1. Fruits and vegetables- This includes a range of seasonal foods in this food group including green leafy vegetables, the primary focus is foods rich in micro-nutrients.
2. Neglected and Underutilized Species- This includes orphan crops across food groups, specific to each agroecological zone. It also includes Future Smart Foods (FSF), FSF are a subset of NUS that are nutrition rich, climate resilient, economically viable and locally accessible. Examples of FSF include buckwheat, taro, cowpea and chayote.
3. Fermented or preserved foods- This includes local foods preserved through traditional fermentation and preservation techniques such as Gari in West Africa, gari is traditionally fermented and dried cassava flour, and gundruk in Nepal, which is made by fermenting and drying leafy vegetables.

OUTCOMES AND EVIDENCE

Through the pathways, processes and linkages described above, HGSF mediated markets can enable nutritionally and ecologically sensitive and sustainable food systems. The operationalization of these specific HGSF linkages is a recent development. Thus, whilst the conceptual framework has been field tested and found to be compelling, the current evidence on these impacts is limited to field reports, project briefs and simulations. However, there are on-going studies in Nigeria and Nepal which will provide more detailed evidence on these pathways and processes. Here we present recent findings to illustrate the main outcomes.

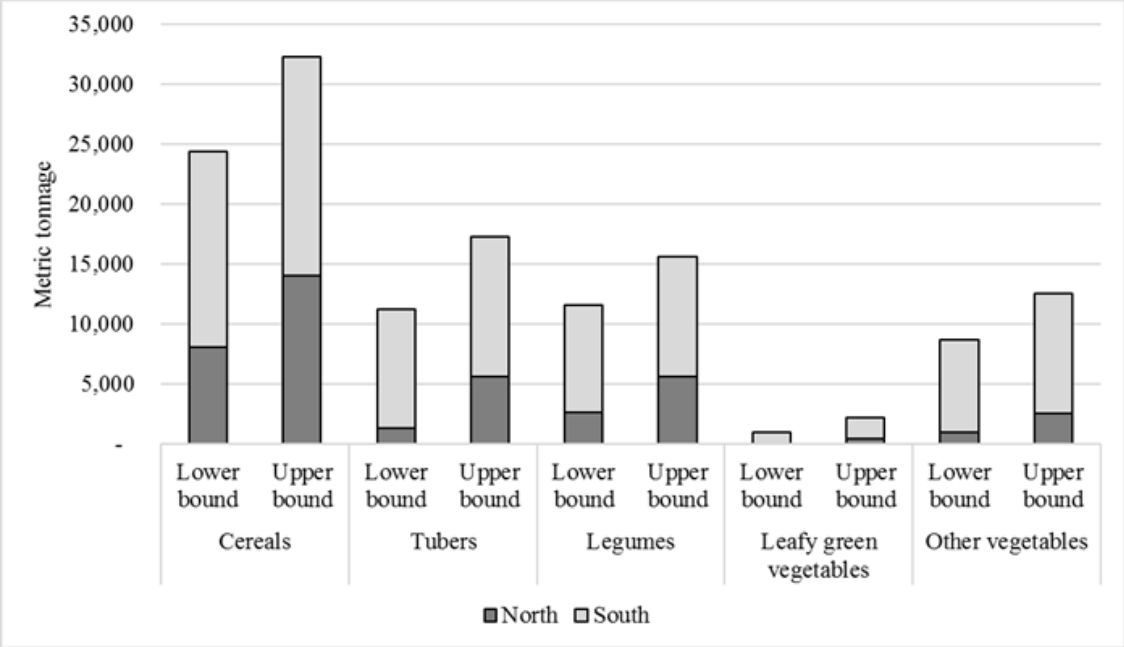
FOOD GROUP DIVERSITY

HGSF interventions create a diverse aggregate structured demand for all key food groups. The scale and extent of the diversified demand is an important factor in driving production diversity. A simulated demand analysis from a study on the Ghana School Feeding Programme provides an idea about the scale of diversified demand by food group that can be generated by a HGSF intervention.[22] This simulation was based on school feeding menus from 24 districts, which were extrapolated to compute national demand.[23] As the figure below shows, the demand for all food groups is significant. Demand is highest for cereals (24 376 to 32 306 metric tonnes), followed by legumes (11 532 to 15 588 metric tonnes), tubers (11 235 to 17 279 metric tonnes) and other vegetables (8641 to 12 531 metric tonnes).

[22] Singh, S. & Fernandes, M. 2018. Home-grown school feeding: promoting local production systems diversification through nutrition sensitive agriculture. *Food Security*, 10: 111−119.

[23] "North" includes Northern, Upper East and Upper West regions, while "South" includes the other seven regions of Ghana. The lower bound is the result of the extrapolation of the numbers for the menu from the region with the lowest quantity of each food group; the upper bound is the result of the extrapolation of the numbers for the menu from the region with the highest quantity of each food group.

FIGURE 2. HGSF ANNUAL DEMAND BY FOOD GROUP (GHANA)



Source: Singh and Fernandes, 2018.

NEGLECTED AND UNDERUTILIZED SPECIES

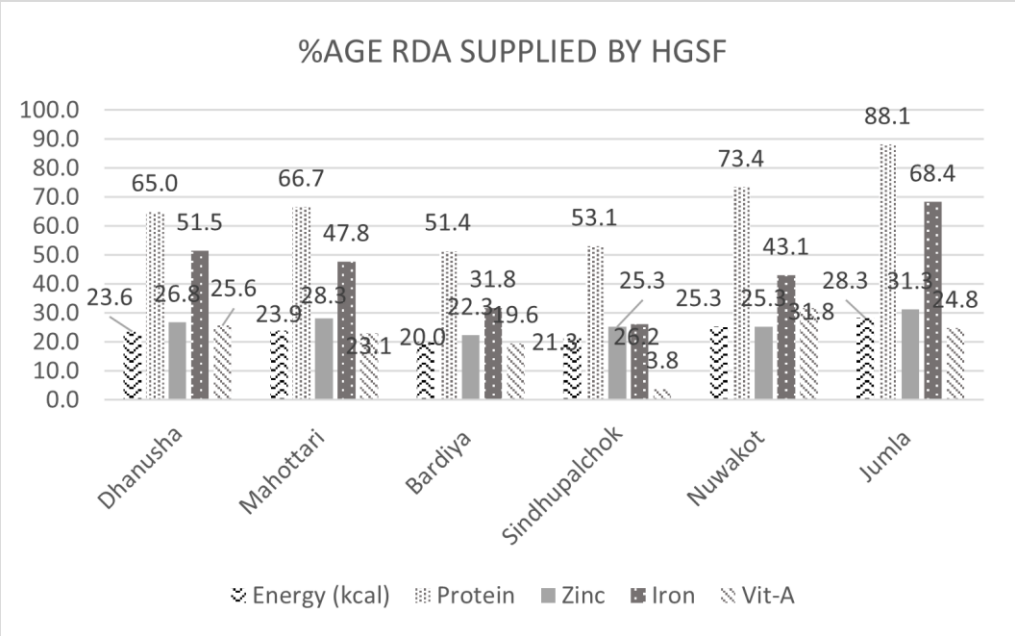
Based on the localized meal design and procurement strategy, HGSF interventions can provide a unique platform to catalyze NUS foods. A review of the Nepal HGSF supply chains in each of intervention districts found a total of 18 NUS commodities in significant volumes.[24] Nine foods are specifically identified as Future Smart Foods (FSF) by the Government of Nepal. Many of the crops included in the supply chain such as amaranth and finger millet are also known as 'Himalayan Superfoods' owing to their ecological and nutritive properties.

[24] Singh, S. 2021b. Mediated markets through Homegrown School Feeding: A case study of Nepal. Working paper. Imperial College London.

NUTRITION SESNITIVITY

The improved nutrition sensitivity of HGSF mediated supply chains includes macro nutrients and micronutrients such as zinc, iron, and vitamin A, it is a direct function of school feeding menu design which is based on nutrient targets for each meal. The figure below summarizes the average daily nutrient content of HGSF supply chains for 6 districts of Nepal, as a percentage of RDA for different nutrients.[25] For macro nutrients, protein supply is above 50% RDA in all intervention districts and energy supply varies from 20- 26% range. In terms of micro-nutrients, zinc supply is similar across the intervention districts, in the 25%-28% range, iron is 25%-66% and vitamin A supply 5%-32%.

FIGURE 3. HGSF SUPPLY CHAIN NUTRIENT CONTENT (NEPAL)[26]



[25] Ibid.
[26] Singh, S., 2021b. Mediated markets through Homegrown School Feeding: A case study of Nepal. Working paper. Imperial College London.

CONCLUSION

To ensure sustainable food and nutrition security, food systems need to be understood and evaluated in the context of their dietary, ecological and cultural qualities. Whilst no single intervention provides the answer to the complex food and nutrition security challenges, interventions such as HGSF provide a unique operational framework to understand supply chain mechanisms and policies for localized small farmer support since it embeds multiple components of smallholder farms, food habits, nutrition, and production diversity. Emerging data from different country contexts provides compelling evidence on the potential for HGSF to enable nutrition sensitive agriculture and agrobiodiversity. However much more evidence is required, there is an urgent need for investment in design and research of HGSF to explore different modalities and better understand the different pathways and impacts on food systems.

The ongoing Covid-19 pandemic has also brought into sharp relief the fragilities of food production and supplies and its impact on public health, especially in developing countries with poor infrastructure and segmented markets. This underlines the need to have integrated public health-food system approach in response to such crisis. Furthermore, in developing countries localized food networks based on HGSF concept can prove to be more resilient to shocks and disruptions. This is not to suggest the creation of segmented markets and food systems deliberately delinked from larger regional and national markets, it is about creating ecologically and nutritionally functional and sustainable food systems.

REFERENCES

1. Bioversity International, 2017. Mainstreaming Agrobiodiversity in Sustainable Food Systems: Scientific Foundations for an Agrobiodiversity Index. Bioversity International: Rome
2. CIRAD, 2013 Les Agricultores familiales du monde – définitions, contributions et politiques publiques [Family farmers of the world – definitions, contributions and public policies]. Montepellier: CIRAD.
3. Conway, G., Badiane, O., Glatzel, K., Chavez., E. & Singh, S. 2017. Creating resilient value chains for smallholder farmers. *In* Alliance for a Green Revolution in Africa (AGRA). *Africa agriculture status report: the business of smallholder agriculture in sub-Saharan Africa*, pp. 89−109. Nairobi.
4. Drake, L., Fernandes, M., Aurino, E., Kiamba, J., Giyose, B., Burbano, C., Alderman, H. *et al.* 2017. School feeding programmes in middle childhood and adolescence. *In* D.A.P. Bundy, N. de Silva, S. Horton, D.T. Jamison & G.C. Patton, eds. *Disease Control Priorities, Third Edition: Volume 8. Child and Adolescent Health and Development*, pp. 147–164. Washington, DC, World Bank.
5. FAO & World Food Programme (WFP). 2018. *Home-grown school feeding. Resource framework. Technical document*. Rome. 170 pp. (also available at www.fao.org/3/ca0957en/CA0957EN.pdf).
6. FAO. 2004. Cowpea post-harvest operations. In Post-harvest compendium. Rome: FAO.
7. FAO. 1999. Women: users, preservers and managers of agrobiodiversity. In: *Women: the key to food security* [online]. Rome. [Cited 1 May 2020]. www.fao.org/3/x0171e/x0171e03.htm#P181_22270
8. Herrero,M.,Thornton,P.K.,Power,B.,Bogard,J.R.,Remans,R.,Fritz,S.,Gerber, J.S.,Nelson,G.,See,L.,Waha,K.,Watson,R.A.,West,P.,Samberg,L.,Steeg,J.,Step henson,E.,Wijk,M. and Havlil,P.(2017). Farming and the Geography of Nutrient Production for Human Use: A Transdisciplinary Analysis. Lancet Planetary Health,1(1), e33-42.
9. Joshi, P., Joshi, L. & Birthal, B. 2006. Diversification and its impact on smallholders: evidence from a study on vegetable production. *Agricultural Economics Research Review*, 19: 219−236.
10. Malapit, H. & Quisumbing, A. 2015. What dimensions of women's empowerment in agriculture matter for nutrition in Ghana? *Food Policy*, 52: 54–63.
11. Martins,C. 2015. Agrobiodiversity-The Key to Food Security, Climate Adaptation and Resilience. GIZ: Bonn.

12. Key, N., Sadoulet, E. & Janvry, A. 2000. Transactions costs and agricultural household supply response. *American Journal of Agricultural Economics*, 82: 245−259.
13. Rapsomanikis, J. 2015.The Economic Lives of Smallholder Farmers-An analysis based on household data from nine countries. FAO: Rome.
14. Rukmani, R., Gopinath, R., Anuradha, G., Sanjeev, R. & Yadav, V. 2019. Women as drivers of change for nutrition-sensitive agriculture: case study of a novel extension approach in Wardha, India. *Agricultural Research*, 8: 523–530.
15. Singh, S. 2021a(forthcoming) Home-grown school feeding: promoting the diversification of local production systems through nutrition-sensitive demand for neglected and underutilized species. *In* FAO. *Public food procurement for sustainable food systems and healthy diets*. Rome.
16. WFP. 2020. State of School Feeding Worldwide 2020. Rome, World Food Programme.
17. Singh,S. 2021b. Mediated markets through Homegrown School Feeding: A case study of Nepal. Working paper. Imperial College London.
18. Singh, S. & Fernandes, M. 2018. Home-grown school feeding: promoting local production systems diversification through nutrition sensitive agriculture. *Food Security*, 10: 111−119.