

Feasibility of using AI-assisted monitoring to improve school meal programs

A pilot study in southern Malawi

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Background

Reaching over 400 million children for investments of \$50 billion a year, school meals are popular safety nets with documented impacts across social protection, education and nutrition dimensions¹. Governments have linked school meals to food system transformation, where public procurement is used as an outlet for farmers, through Home-Grown School Meal Program (HGSMP) approaches. HGSMPs have the potential to improve children's diets, whilst also providing a market for farmers. Implementing school meals that meet quality standards, including food, nutrition, smallholder sourcing and environmental requirements is critical. In practice, data on the quality of school meal delivery is scarce. There is also an opportunity to improve HGSMP menus, optimizing on foods that are nutritious, locally available and "climate-smart".



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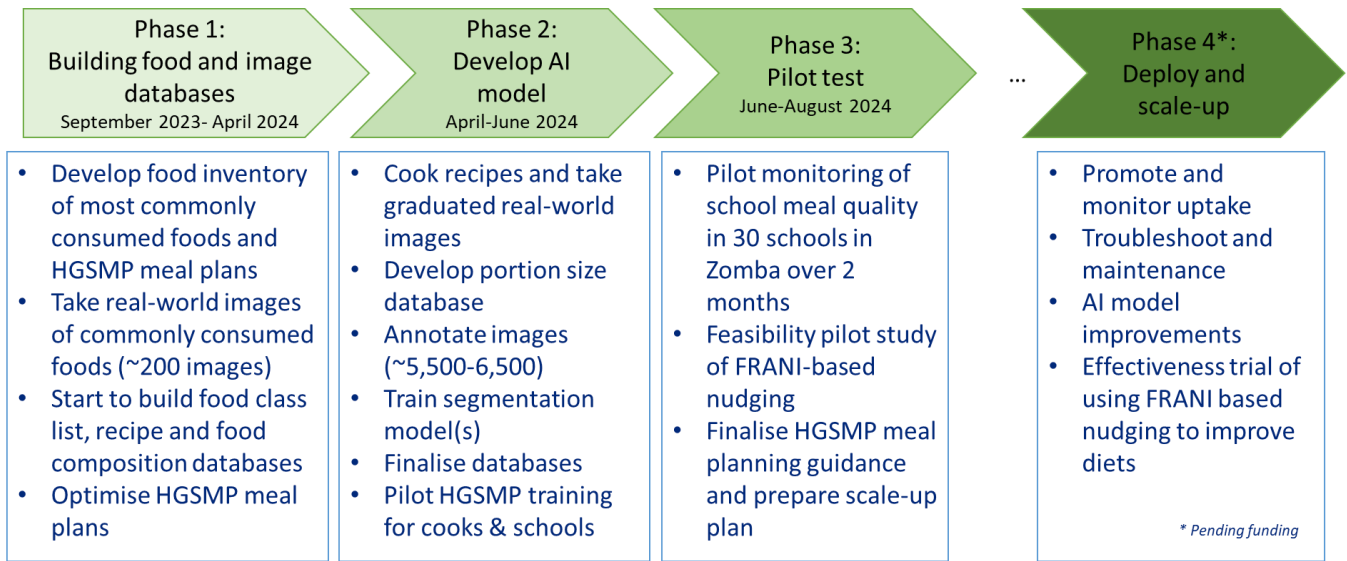
In parallel, monitoring the quality of school meal programs remains challenging. The PlantVillage Food Recognition Assistance and Nudging Insights (FRANI) app can recognize foods, display food-consumption statistics and estimate nutrient intakes in children and youth at least as accurately as a dietician undertaking a 24HR recall at a fraction of the cost^{2,3,4}. Evidence generated in Ghana also suggests that FRANI can be used to provide accurate and cost-efficient real-time data of school meals. The ability to collect real-time data on school meals using FRANI is a breakthrough for improving the quality of school meal programs, especially in areas where traditional data collection is difficult or expensive.

Approach

Formative research was undertaken in 30 schools in Zomba district in Southern Malawi to examine the feasibility of improving school meals and children's diets through the provision of nutritious and climate smart foods. The PlantVillage FRANI application was also adapted for use in Malawi and used to provide

real-time data on meals and diets and program feedback loops, filling a critical evidence gap on HGSMF operations. Project activities kicked-off in September 2023 and involved 3 main phases, including 1) building food and image databases; 2) developing the AI model and improved menus; and 3) pilot testing (Figure 1). The AI model was trained to recognize and categorize foods based on a database of real-world images collected and annotated by the University of Malawi, including calibrated images from the food science laboratory as well as images collected in schools and in the targeted communities.

Figure 1: High-level project activities



The FRANI databases in Malawi covered over 700 foods, including 205 foods used in AI model trained from a database of over 5,000 images (Figures 2 & 3).

Figure 2: Malawi food and image database

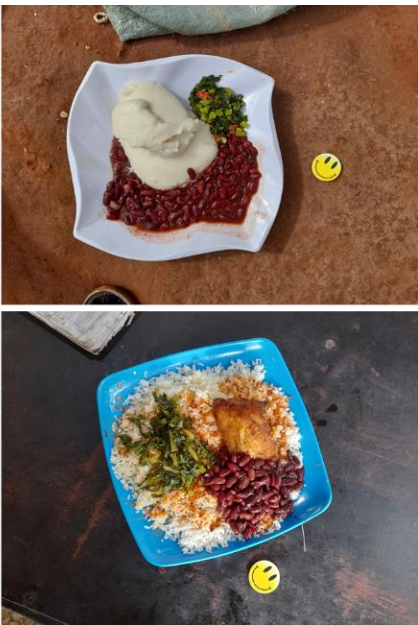
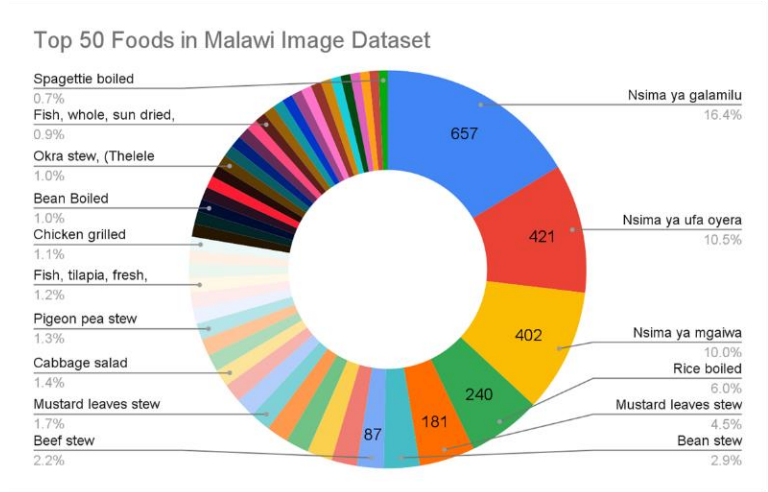
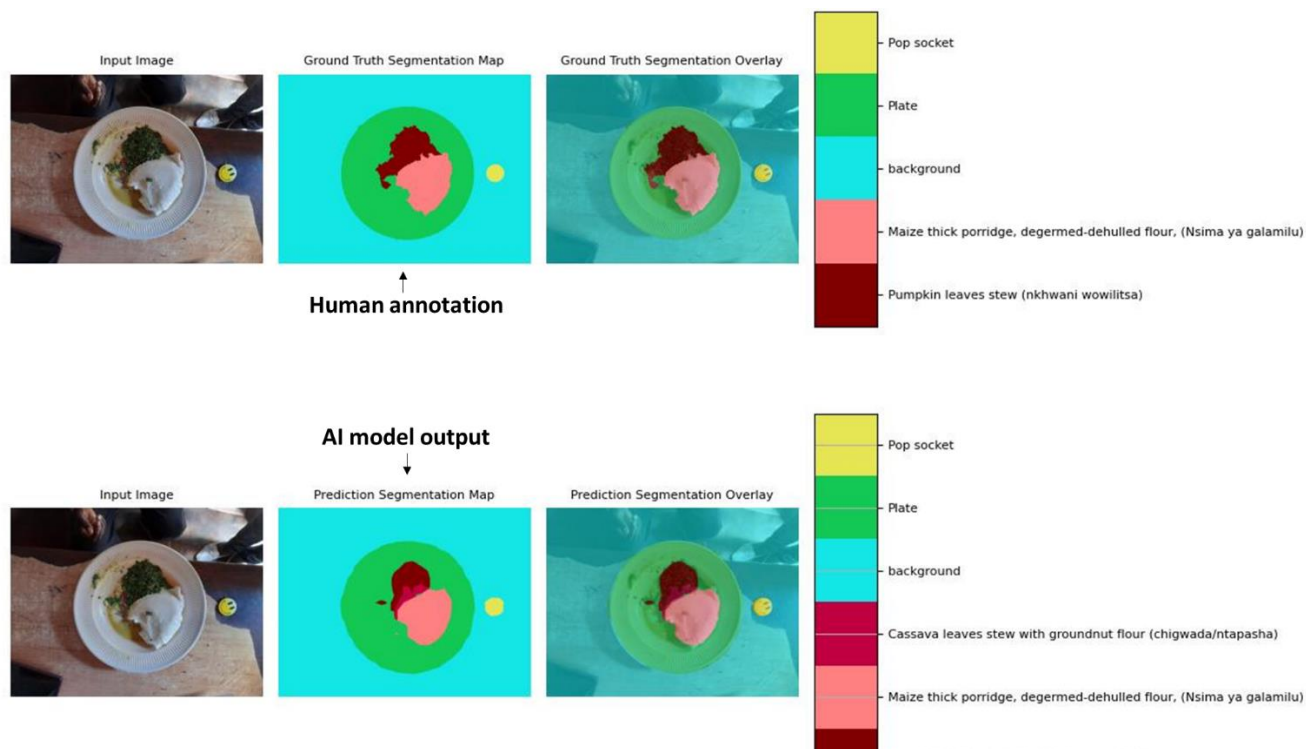


Figure 3: Example of AI-model input and output in Malawi



The field-testing phase included trainings of cooks in 15 schools randomized for intervention on improved meal planning, including simple methods for processing, preservation and preparation of orange fleshed sweet potatoes (OFSP) and moringa leaves. Improved recipes also incorporated OFSP flour and puree, through a partnership with CIP to supply OFSP vines to farmers within the area to enhance sustainability of sweet potato supply. The training was attended by 15 school health and nutrition teachers and 45 cooks, 2 school health nutrition coordinators and 3 from District Agriculture Office and 3 from District Health Office responsible for nutrition. In addition, 30 teachers and 60 students were trained on how to record foods using three different FRANI applications adapted for use in Malawi. Data collection using FRANI applications began following the training completion, with school level data collection undertaken by teachers using the school level FRANI app until school closed in July. Individual level data collection took place until late August, with students recording food consumption on a daily basis. Data analysis is underway, with results expected at the end of 2024.

Implications and scale-up considerations

This innovative project examined the feasibility of improving school meals and children's diets through the provision of nutritious, climate smart foods and the real-time data collection on the quality of school meals using AI-assisted technology. Detailed data analysis is underway and preliminary results are encouraging. Further work is also being planned, including a validation study of the new FRANI technology in Malawi. Similar work is underway in Ghana and Vietnam, highlighting the potential for this that could provide a breakthrough for improving the quality of school meal programs in Malawi and across the region.

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