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FEED THE FUTURE INNOVATION LAB FOR LIVESTOCK SYSTEMS

Nutrition-sensitive livestock interventions

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Sustainably intensifying smallholder livestock systems to improve human nutrition, health, and incomes

Background

Nutrition-sensitive interventions (See Box 1) have been identified as a promising strategy for improving household dietary diversity and local production of agricultural products. In contrast to nutrition-specific interventions (See Box 1), nutrition-sensitive interventions focus on the underlying determinants of malnutrition (Ruel & Alderman, 2013). Additionally, nutrition-sensitive interventions that focus on local production answer the larger question of food insecurity: how will we provide sufficient food resources for our exponentially increasing global population? The 2007/2008 global food crisis illustrated the fragility of the current agro-food system, particularly with respect to the neoliberal-oriented grain economy. Such agricultural trends have led to increased focus on large-scale grain production (Jaenicke & Virchow, 2013).

Jaenike and Virchow (2013) propose a restored focus on locally adapted agricultural systems, which respond more flexibly to climate variation and socio-economic insecurity. Such locally-oriented production modes have been shown to provide diverse nutrients through integrated crop-livestock systems and intercropping with the added benefit of developing and conserving agrobiodiversity (Jaenicke & Virchow, 2013), which improves dietary diversity in the household (Masset, Haddad, Cornelius, & Isaza-Castro, 2012). Increasingly, livestock production has emerged (or reemerged) as an adaptive feature of local food systems that can protect against economic shock and food scarcity. This is in part due to the dual benefit of livestock ownership: as a source of nutrient-dense food and source of economic resilience (Leroy & Frongillo, 2007; Randolph et al., 2007).

This report reviews the types of nutrition-sensitive livestock programs (NSLP), challenges of integrating livestock and nutrition, and the future of NSLPs. In accordance with the objectives of the Innovation Lab for Livestock Systems Nutrition Cross-cutting Theme, we are specifically interested in the potential for improvements in the nutritional status of women and children through such interventions.

Box 1: Definitions

Nutrition-sensitive interventions are designed to address the underlying causes of malnutrition. As nutrition is affected by access, availability, and quality of food, a nutrition-sensitive intervention may focus on increasing agricultural productivity for own-consumption or sale. Such interventions may serve as an effective platform for nutrition-specific interventions (Ruel & Alderman, 2013).

Nutrition-specific interventions are designed to address the immediate causes of malnutrition in a population. A common form of nutrition-specific intervention is micronutrient fortification; for example, adding iodine to salt (Ruel & Alderman, 2013).

Animal source food refers to any food item derived from animal sources, including eggs, milk, meat, and fish (Murphy & Allen, 2003).

Agrobiodiversity refers to the variety of crop species in a garden or farm, typically with respect to indigenous or locally adapted species (Trinh et al., 2003).

Livestock-Oriented Nutrition-Sensitive Interventions

Traditionally, nutrition-sensitive interventions have focused on plant-based dietary improvement through kitchen garden practices. Livestock-oriented interventions, meanwhile, traditionally involve livestock transfers for the primary purposes of income generation and poverty reduction and secondarily for nutritional improvement through consumption of animal source food (ASF) (Ruel, Quisumbing, & Balagamwala, 2018). However, three recent impact evaluations of livestock

transfer programs in Nepal (Darrouzet-Nardi et al., 2016; Miller et al., 2014) and Rwanda (Rawlins, Pimkina, Barrett, Pedersen, & Wydick, 2014) have demonstrated the promise for more specific targeting of nutrition outcomes in livestock projects due to evidence supporting the benefits of ASF consumption to nutrition outcomes (Iannotti et al., 2017). Livestock ownership is connected to human health and nutrition through economic gains via livestock sale, own-consumption of ASF, and nutrient cycling of livestock waste into food crop production (Randolph et al., 2007). Furthermore, ASF is nutrient and protein-rich, meaning that consumption of even a small quantities of such foods can have a large impact on nutritional status (Leroy & Frongillo, 2007). These connections have encouraged global efforts within the development and research community to refine current practices in nutrition-sensitive intervention to better target consumption of ASF.

Types of interventions

The underlying determinants of malnutrition include a vast range of factors that influence the availability of and access to diverse, nutritious food, as well as appropriate consumption of food; thus, the potential target areas for nutrition-sensitive interventions are accordingly diverse. Table 1 illustrates a variety of nutrition-sensitive interventions in livestock along with the intended underlying determinant it targets. Note that Table 1 does not represent an exhaustive list of potential projects and that, most often, NSLPs will focus on several underlying determinants of malnutrition simultaneously, as many indirect drivers are related (Ruel et al., 2018). Finally, while the following table is useful for understanding the *intended* nutrition outcomes of targeting the underlying determinants of malnutrition, it is critical to note that the outcomes and impact associated with nutrition-sensitive interventions depend strongly on effective tailoring to the socio-cultural, economic, agro-ecological, and political context of the project site (Ruel et al., 2018; SPRING, 2014).

The table below is adapted from the findings of Jaenike and Virchow (2013), van den Bold et al. (2015), and various other relevant literature, to a lesser extent. Three primary approaches for NSLPs were identified from this body of work: capacity building, creating or improving the enabling environment, and targeting the food chain. Capacity building in this context refers to technical skill-building or education that improves the knowledge and practice of intervention participants surrounding livestock production and nutrition. Gender considerations are particularly key to these approaches as "the involvement of both men and women in health education and interventions [is] shown to be an important determinant of their successful uptake (Vlassoff, 2007, p. 57)."

Interventions that seek to create or improve the enabling environment for NSLPs target improvements in intersectoral collaboration and policy change that support the needs of local smallholders from both a production and consumption standpoint (Jaenicke & Virchow, 2013). Within this approach, understanding the existing political and institutional environment and how institutions interact and coordinate their efforts are critical factors (Gillespie & van den Bold, 2017). The third approach aims to address needs within the livestock value chain at each stage of livestock rearing from breeding, production, through marketing and consumption. This approach addresses the mutual influence of production patterns on consumption and consumer demand and vice versa (Jaenicke & Virchow, 2013). Though nutrition activities may not appear the

Table 1: Types of nutrition-sensitive interventions in livestock

Approach	Intervention type	Example	Targeted underlying determinant	Intended outcome for nutrition
Capacity-building	Training	Participatory extension services on elements of livestock production	Poor livestock production efficiency.	Increased local availability of ASF.
		Gender-sensitive inclusion of women in trainings[1]	Intrahousehold inequality in access to livestock and ASF.	Women experience increased control over assets and earnings from livestock, which is connected to improved child health and nutrition and has been linked to ASF consumption (Quisumbing, Agnes R., 2003; Workicho et al., 2016b).
		Food preparation demonstration	Lack of knowledge and/or lack of traditional knowledge and practice regarding preparation of nutritious foods.	Increased ASF consumption; Increased dietary diversity.
	Education	Integrate messages on ASF within nutrition training (example: food demonstrations)	Lack of nutrition knowledge.	Increased ASF consumption; Increased dietary diversity; Share knowledge of nutrition within the family and community.
		Include men and women in nutrition education	Gender dynamics that limit men's access and	Improve nutritional knowledge of men and women;

[1] Gender-sensitive strategies can alleviate barriers to women's empowerment. The role of women's empowerment in stimulating improved nutritional outcomes is unequivocally supported in the literature. However, interpretations and experiences of empowerment are highly diverse and context dependent. That said, keeping in mind the specific domains of empowerment relevant to the intervention community can be a crucial element of all three approaches in the above table (Ruel et al., 2018).

			receptivity to nutrition knowledge and linkages between nutrition and production agriculture	increase men's engagement in household health and nutrition
		Create livestock production units at schools	Low local availability of ASF; low consumption frequency by children.	Contribute to healthier school meals, increase children's exposure to ASF and nutritional knowledge.
		Inform households of proper WASH practices relating to ASF and livestock ownership and ASF (prevention of water contamination due to livestock, management of livestock waste, and hygiene practices for handling livestock and ASF) (Randolph et al., 2007).	High incidence of food borne disease.	Reduced risk of food borne disease.
Improving the enabling environment	Facilitate intersectoral collaboration	Public and private institutions set up funding streams for nutrition-sensitive agriculture and livestock	Lack of funding for nutrition-sensitive agriculture.	Increased access to supportive programs for beneficiary communities.
		Create incentives to build partnerships between health and agriculture institutions/ programs	Disconnect between health and agriculture, separating production and consumption.	Build systems that address consumption and production mechanisms of food insecurity.
	Facilitate policy change	Strengthen smallholder farms	Poor distribution of ASF unaffordability; focus on export-bound products.	Improved local availability and accessibility ASF.
		Establish nutrition-focused intuitions within the agriculture sector	Limited understanding of links between nutrition and	Emphasized production of nutritious foods.

			agriculture at institutional level.	
Targeting the livestock value chain	Production	Improve access to veterinary services	High burden of livestock disease and poor animal health.	Improved production efficiency of animals, lower susceptibility of animals to disease.
		Improve feed and fodder	Poor animal nutrition and health.	Improved production efficiency of animals, lower susceptibility of animals to disease.
		Improve native species through selective breeding	Inefficient breeding causing lapses in production and availability of ASF.	More consistent meat and milk availability.
	Homestead and community livestock	Livestock transfers and community husbandry	High barrier to entry for women farmers (economic or cultural).	Source of cash for women; increased ASF consumption in the household; social mobilization (Ruel et al., 2018).
			High cost of ASF.	Source of income and direct access to ASF.
		Community livestock production project	Low investment capacity, access to capital, or knowledge of livestock production; low community access.	Increase community access to nutrient-dense food; demonstrate production methods.
	Processing and marketing	ASF transformation through drying, salting, and other forms of preservation	Poor shelf life, limited access to refrigeration.	Sustained access to ASF in community and household.
		Improved slaughter practices by producers and abattoirs (Didanna, 2015)	Unsafe/ contaminated food (Gillespie & van den Bold, 2017)	Reduced risk of food borne disease (Gillespie & van den Bold, 2017)

Source: Adapted from the findings of Jaenike and Virchow, 2013; and van den Bold et al., 2015 unless otherwise cited.

primary objective of interventions utilizing this approach, addressing the food chain may be the most commonly utilized method in livestock-oriented projects (Jaenicke & Virchow, 2013; Ruel et al., 2018). The production-oriented projects exemplified in Table 1 are those that impact nutrition through the income pathway, improving the efficiency of livestock production for the purpose of increasing purchasing power, or the consumption pathway, improving the use of livestock for own-use consumption of ASF. Alternative methods of the food value chain approach include: alleviating or lowering barriers to entry into livestock production through livestock transfers or access to capital, increased access to consistent ASF supply through improved preservation and processing techniques, and increased access to safe ASF through improved WASH practices for homestead processing and abattoirs (Didanna, 2015).

Addressing challenges

Globally, several key challenges relating to integrating nutrition into livestock-oriented programs have been observed and experienced by researchers and practitioners. This calls for overcoming common barriers in political leadership and accountability of programs, balancing public and private sector interests, and making nutrition-sensitive programs accessible to rural and remote livestock holders (Randolph et al., 2007).

The following section of this report presents the major challenges facing nutrition-sensitive agriculture and NSLPs. As NSLPs are still emerging in the development and agriculture literature, limited studies have analyzed the specific challenges facing nutrition-sensitive livestock interventions. This section therefore reviews the challenges faced by NSLPs and nutrition-sensitive agriculture in general.

According to a sample of case studies across several contexts[2] and literature reviews addressing NSLPs and/or nutrition-sensitive crop agriculture (Ruel et al., 2018; Keding, Schneider, and Jordan, 2013; Jaenicke and Virchow, 2013; Sage, 2012), we identify several major challenges common to these efforts. The themes addressed across the sample of studies include operational, epidemiological, and cultural challenges. Surmounting these challenges will require significant increase in the volume of high caliber evidence-based research on the nutrition impacts of livestock-oriented programs and effectively communicating findings to policy makers. Additionally, improvements in accountability of programs can be positively influenced through pressure from civil society organizations and media (van den Bold, Quisumbing, & Gillespie, 2013).

According to van den Bold et al. (2015), nutrition-sensitive interventions require investment in the enabling environment because they require coordination of health, agriculture, and livestock sectors. Operational challenges from the literature relate to the natural complexity that accompanies multisectoral programs and the environment that enables or challenges the overall success of the project. A continuing area of debate in the operationalization of LNSPs relates to whether the "integration" or "co-location" approach better serves the objectives of nutrition-sensitive programs (Ruel & Alderman, 2013; Ruel et al., 2018). This debate relates to whether multisectoral programs should *integrate* interventions from different sectors into a single program or *co-locate* or layer sectoral interventions to the same beneficiary communities, households, and individuals. The integration approach calls for much more intensive cross-sectoral collaboration, while co-location allows sectors

[2] Tajikistan (Tamer et al., 2012), Malawi (Msiska, 2013), and Nepal (Harris-Coble, 2018)

to execute their programs more-or-less independently. The risk of the former is the complex level of collaboration required, leading to greater difficulty in implementation, while the risk of the later is that sectors fail to communicate sufficiently or forgo needed collaboration altogether (Ruel et al., 2018). Research is needed to address which approach meets the needs of intervention participants in their given context.

Epidemiological challenges of LSNPs, specifically, pose a challenge to any livestock interventions reviewed in Table 1, above. Inherent in any livestock production unit, large or small, the presence of livestock inherently increases the risk of exposure to food borne and zoonotic disease. Livestock ownership has been shown to carry both positive and negative outcomes for human health, particularly for children. According to Heady and Hirvonen (2016), negative outcomes are associated with exposure to animal feces, which may occur due to regional practices of corralling animals inside the household dwelling. Other studies show a possible connection between burden of disease among children and livestock husbandry (see Mosites et al., 2016), though additional research is needed to identify whether increased disease burden is a result of direct transmission between livestock and children or whether lower household wealth is a greater determinant of childhood disease.

Nutrition-sensitive livestock and agriculture as a whole are subject to several cultural challenges spanning gender norms, agricultural practice, beliefs and value systems that can affect production and consumption. These challenges, potentially, can impact the effectiveness of any nutrition-motivated intervention targeting capacity, the enabling environment, or livestock value chains. In this paragraph, we specifically review challenges relating to gender due to the increasing recognition of the gender dynamics in food access and decision-making around food at the household level (Ruel et al., 2018). Women in some contexts spend more time on domestic tasks and unpaid labor compared to men. Therefore, all interventions must consider the time constraints of women participants and prioritize avoidance of increases in women's time burden (Vlassoff, 2007). Additionally, more research is needed on mechanisms for mitigating the risk of increased burdens on women's time, including labor-saving technologies and gender-sensitive strategies that not only involve but target men to alleviate those risks (Johnston, DeborahStevano, SaraMalapit, Hazel J.Hull, ElizabethKadiyala, 2015). Finally, emerging discourse relating to the marginalization of men from nutrition-related programs (and development as a whole) calls into question the assumption that "women are always the losers." An intersectional approach to NSLPs may mitigate such consequences by considering the overlap of privilege and vulnerability along the spectrum of gender, ethnicity, socioeconomic status, time, and geography (Paulson, 2016).

Conclusion

According to Ruel et al., "even if implemented at scale, [nutrition-specific] interventions will not meet global targets for improving nutrition" (2018, p. 1). Nutrition-sensitive interventions address the gaps of nutrition-specific interventions by addressing the underlying causes of malnutrition as opposed to the immediate causes. Such an approach requires intersectoral collaboration from a variety of institutions including government, NGO, private enterprise, and community groups (van den Bold et al., 2013). While nutrition-sensitive agriculture programs are well established in the literature and practice, the importance of nutrition-sensitive livestock programs is still emerging (Ruel et al., 2018). NSLPs offer additional pathways to improved nutrition through improved livelihoods and consumption of ASF. Livestock-owning households may experience improved

nutrition through a greater power to purchase diversified diets using livestock-related income or by direct consumption of what they produce (Workicho et al., 2016a). Furthermore, ASFs are dense in micronutrients, meaning consumption, even small amounts, can have a large impact on nutrition outcomes (Murphy & Allen, 2003).

While the potential for nutritional improvement is considerable, it is important to expand the body of evidence on NSLPs to identify best practices for implementation and to mitigate any unintended negative consequences stemming from livestock production (Ruel et al., 2018). Nutrition-sensitive programs, within both agriculture and livestock subsectors, are gaining momentum in research and applied practice. Such actions will contribute to a greater understanding of the potential for nutrition-sensitive programs to improve nutritional outcomes of women and children and will indicate to researchers, policy makers, and other institutions where innovation is still needed to address this global challenge.

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