NUTRITION AND LIVESTOCK
Technical guidance to harness the potential of livestock for improved nutrition of vulnerable populations in programme planning
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The livestock sector plays a crucial role in the social and economic development of a country, especially in low- and middle-income countries. It directly supports the livelihoods of 600 million poor smallholder farmers in the developing world (Thornton et al., 2006; HLPE, 2016). Livestock are a direct and indirect source of food for rural and urban households. It is estimated that livestock-derived foods, or animal-source foods (ASF), contribute 18% of global food energy consumption and 34% of global protein consumption (FAOSTAT, 2016). ASF are a unique source of high-quality proteins and bioavailable essential vitamins and minerals. Livestock are also a powerful safety net for the poor, particularly women and pastoralist groups.

ASF are an important component of diverse diets, but consumption varies widely. For example, annual meat consumption ranges from less than 4 kg per person in some countries to more than 100 kg per person, in others. High consumption of some ASF is correlated with non-communicable diseases such as cardiovascular disease and certain types of cancers and contributes to the public health burden of disease. However, poor people often consume little or no ASF for various reasons, including poor availability, accessibility (including price), dietary patterns that may result from customs, religious taboos and lack of knowledge about their nutritional importance. The high potential of ASF to improve diets of vulnerable population groups makes livestock an important sector for national policies and development partners’ programmes aiming to improve food security and nutrition.

Leveraging the potential of livestock and optimizing efficiency in production systems is now more important than ever before given the current global food security and nutrition situation. In 2018, the number of chronically undernourished people in the world was estimated to have increased to 821 million (FAO, IFAD, UNICEF, WFP and WHO, 2018). Multiple forms of malnutrition coexist within countries, households and individuals. The rising prevalence of both child undernutrition and adult and child obesity are increasingly evident across many developing countries. Addressing this situation requires integrated, nutrition-sensitive actions across the entire food system. Specific actions are subsequently required to improve the diets of vulnerable population groups by increasing their intake of nutrient-dense foods (including ASF) in order to achieve healthier diets for all.
The Food and Agriculture Organization of the United Nations (FAO), responding to the mandate to improve diets and raise levels of nutrition enshrined in its Constitution (FAO, 2017a), works to mainstream nutrition objectives, activities and considerations in food and agriculture policies and programmes. As a knowledge provider, FAO works to equip countries and stakeholders with the technical capacities and skills needed to develop interventions and programmes that improve nutrition outcomes. This technical guidance brief, *Nutrition and Livestock: Technical guidance to harness the potential of livestock for improved nutrition of vulnerable populations in programme planning*, has been developed to highlight the role of livestock in nutrition-sensitive approaches for vulnerable populations. It emphasizes the linkages between livestock and nutrition that address the nutritional needs of vulnerable households and groups, with a particular focus on impact pathways, and provides recommendations for designing and implementing livestock interventions to leverage nutrition outcomes. It captures experiences and advice of experts from both livestock and nutrition sectors and is based on activities developed by the United Kingdom Royal Veterinary College, the International Livestock Research Institute and FAO.

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# Abbreviations and acronyms

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ADB</td>
<td>Asian Development Bank</td>
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<tr>
<td>ASF</td>
<td>Animal-source foods (referring to livestock-derived foods in this brief)</td>
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<tr>
<td>ESN</td>
<td>Nutrition and Food Systems Division, FAO</td>
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<td>FAO</td>
<td>Food and Agriculture Organization of the United Nations</td>
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<tr>
<td>ILP</td>
<td>Intensive livestock production</td>
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<tr>
<td>KAP</td>
<td>Knowledge, attitudes and practices</td>
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<tr>
<td>MDD</td>
<td>Minimum dietary diversity</td>
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<tr>
<td>MDD-W</td>
<td>Minimum dietary diversity for women</td>
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<tr>
<td>MIYCN</td>
<td>Maternal, infant and young child nutrition</td>
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<tr>
<td>NCD</td>
<td>Non-communicable diseases</td>
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<td>ND</td>
<td>Newcastle disease</td>
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<td>NSVC</td>
<td>Nutrition-sensitive value chain</td>
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<tr>
<td>RVC</td>
<td>Royal Veterinary College, United Kingdom</td>
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<tr>
<td>SDG</td>
<td>Sustainable Development Goal</td>
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<tr>
<td>TCE</td>
<td>Emergency and Rehabilitation Division, FAO</td>
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<tr>
<td>VC</td>
<td>Value chain</td>
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<tr>
<td>VSF</td>
<td>Vétérinaires Sans Frontières</td>
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<td>WFP</td>
<td>World Food Programme</td>
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About this paper

This technical guidance brief summarizes some of the current thinking on how livestock can address the nutritional needs of vulnerable households and groups, with a particular focus on impact pathways. It outlines recommendations for designing and implementing livestock interventions to leverage nutrition outcomes, based on activities developed by the United Kingdom Royal Veterinary College, the International Livestock Research Institute (ILRI) and the Food and Agriculture Organization of the United Nations (FAO) and a paper compiling the experiences and advice of experts from both the livestock and nutrition sectors.

It is intended for use by programme planners and managers working for government, humanitarian and development agencies involved in designing and implementing livestock-related policies and programmes, with the objective of helping in integration of nutrition outcomes in their work. Additionally, it is aimed at those involved in developing nutritional policies and strategies, to take into consideration the potential of livestock-based strategies to improve nutrition.

It provides guidance and recommendations relevant to a diversity of contexts (e.g. emergency, resilience, long-term investments), ecosystems (e.g. arid, semi-arid, humid tropics) and production systems (e.g. pastoralism, intensive farming, mixed farming) and highlights when specific aspects need to be considered depending on the context.
INTRODUCTION: WHY TECHNICAL GUIDANCE ON LIVESTOCK AND HUMAN NUTRITION?

Leveraging livestock for human nutrition

Globally, the demand for animal source foods (ASF) is on the increase and the contribution for improved nutritional outcomes is enormous. ASF are good sources of high-quality and bioavailable proteins and essential micronutrients such as iron, zinc and vitamins A and B12 (folate). Their consumption can improve diet quality, hence contributing to balanced and healthy diets. They are particularly relevant for nutritionally vulnerable population groups whose diet quality and protein intake are sub-optimal and where ASF consumption is low or negligible (Randolph et al., 2007; Gibson, 2011).

Livestock are a key resource for economic growth in many countries, both at national and household level. Animals are important assets and an essential source of income for livestock-keeping households. Moreover, livestock can also significantly influence the livelihoods of other households that do not have livestock, as well as supplying inputs for crop production such as fertilizer or animal traction.

At the same time, livestock production has been implicated in climate change through greenhouse gas emissions and land and water depletion, and in threats to human health associated with zoonotic and food-borne diseases and an increase in antimicrobial resistance caused by inappropriate and overuse of antimicrobials in livestock production. Overconsumption of ASF such as red meat and processed meat has been correlated with increased risk of some cancers and non-communicable diseases. Therefore, livestock development efforts should be based on nutrition-sensitive approaches that consider dietary gaps and promote consumption of ASF in moderation, in line with identified nutritional needs and in accordance with available food-based dietary guidelines. It should also take into account the possible health and environmental risks.
Well-managed and utilized livestock can play an important role in achieving the Sustainable Development Goals (SDGs), including poverty eradication (SDG1), promoting food and nutrition security through sustainable agricultural production (SDG2), ensuring healthy lives and well-being (SDG3), achieving gender equality and empowering women (SDG5), encouraging sustainable production and consumption practices (SDG12) and combatting climate change (SDG13) (FAO, 2016a).

Appropriately designed livestock interventions can positively impact the nutritional status of vulnerable groups and households through increased consumption of nutritious animal-source products, as well as through several other indirect pathways.

What is malnutrition and what are its causes?

Malnutrition is the abnormal physiological condition caused by deficiencies, excesses or imbalances in intakes of macronutrients (protein, carbohydrates and fats) and/or micronutrients (vitamins and minerals) necessary for an active and healthy life. Malnutrition includes undernutrition, micronutrient deficiencies, overweight and obesity. These conditions can arise separately or coexist (see Box 1). Disease can also lead to malnutrition by reducing appetite and hence the intake of nutrients, as well as by reducing the body’s ability to absorb nutrients (e.g. diarrhoea). Malnutrition, in turn, increases susceptibility to disease because it compromises the body’s immune defences.
### Box 1. Types of malnutrition

The following are the main types of malnutrition:

- **Wasting** (or ‘acute malnutrition’) is a form of undernutrition that indicates in most cases recent and severe weight loss, which is often associated with acute starvation and/or severe disease. Children under five years of age are the most exposed to risks of acute malnutrition, in particular when transitioning from exclusive breastfeeding to complementary feeding. A child is described as ‘wasted’ when its weight in relation to its height is much lower than it should be. The occurrence of wasting often varies seasonally or increases following natural disasters such as droughts or floods.

- **Stunting** (or ‘chronic malnutrition’) is a form of growth failure that causes both physical and cognitive delays in growth and development. It arises when the body does not absorb sufficient amounts of nutrients over a prolonged period. This can be the result of lack of access to adequate foods and/or disease. A child is described as ‘stunted’ when its height in relation to its age is much less than it should be. Stunted children also have elevated risk of death, as well cognitive deficits.

- **Micronutrient deficiency** (or ‘hidden hunger’) refers to lack of vitamins, minerals and/or trace elements that are essential for the proper functioning, growth and metabolism of a living organism. Usually caused by poor diets, it is often referred to as ‘hidden hunger’ because its physical symptoms are not obvious, while its consequences can be devastating. It can, and often does, coexist with undernutrition, overweight and obesity.

- **Overweight and obesity** refer to a body weight that is above normal for height as a result of excessive accumulation of fat. These conditions result mainly from an excess of energy consumed relative to energy expended. Both conditions increase the risk of non-communicable diseases.

*Source: WHO (2017)*

Different forms of malnutrition can coexist in the same community, household and even in the same individual. For example, stunting is associated with multiple micronutrient deficiencies; stunted children have increased risk of adult obesity; an obese individual can be anaemic and have other micronutrient deficiencies. Additionally, pregnant women who are themselves undernourished are likely to give birth to babies of low birthweight and ultimately have children with stunted growth and development, creating an intergenerational cycle of malnutrition.
There are numerous factors that increase vulnerability to malnutrition, including physiological and socio-economic factors. These predispose households and individuals to food and nutrition insecurity. For example, within a single household, family members have different nutritional needs: pregnant and lactating women, children under five years of age, adolescent girls, and elderly and sick people are the most nutritionally vulnerable and require specific nutritional attention. Malnutrition experienced during the first 1,000 days of life (between conception and the child’s second birthday) has the greatest adverse long-term effects on the individual’s health, educational achievement and earning potentials. In addition, a growing body of evidence points to the need to pay more attention to adolescent girls’ nutritional needs. Therefore, adopting a life-cycle approach to nutrition is essential.

Malnutrition has consequences both for the individual (in terms of both health and physical and mental growth and development) and for society as a whole (in terms of expenditure on health, impaired cognitive achievement and reduced economic activity).
THE POTENTIAL OF ANIMAL-SOURCE FOODS FOR HUMAN NUTRITION

Contribution of animal-source foods to nutrition

The generic term ‘animal-source foods’ (ASF) refers to all foods of animal origin, including fish and wild animals (game/bush meat). However, this brief focuses only on products derived from farm mammals (cattle, buffalo, camels, sheep, goats, pigs and poultry).

Dietary diversity indicators are commonly used to provide information about diet quality and its nutritional adequacy. Among the 7–12 food groups that are commonly considered (the total number of food groups depends on the indicator), three or four are ASF: dairy products, eggs, meat and/or organ meat. This preponderance of ASF groups reflects the great nutritional value of these food products, which provide highly bioavailable nutrients that are essential for growth and health and that may be difficult to obtain from plant-source foods alone (Murphy and Allen, 2003).

ASF are energy-dense foods. They are a good source of high-quality proteins: the proteins they contain are highly digestible and have a good profile of essential amino acids. For example, ASF generally contain high concentrations of threonine, lysine and sulphur-containing amino acids, which are in relatively short supply in most plant-based foods. They are also a good source of several critical micronutrients, such as iron, zinc and vitamins A and B12 that are often lacking in the diets of nutritionally vulnerable populations. The bioavailability of these micronutrients is also higher in ASF than in many plant-derived foods. For example, red meat and offal (such as liver) contain high levels of haem iron and provide it in an easily absorbable form. Livestock-derived foods are also relatively rich in lipids, particularly saturated fatty acids and cholesterol. These are important components of a balanced diet but have been linked with many health concerns including increased incidence of non-communicable diseases (NCDs) when consumed in excess of dietary needs.

1 Including Household Dietary Diversity Score, Minimum Dietary Diversity-Women, Individual Dietary Diversity Scores and Minimum Acceptable Diet (see FAO (2016b)).
The good amino acids profile and high micronutrient density and bioavailability make ASF very efficient for improving the quality of diets, especially during periods of high nutritional demand such as pregnancy, lactation, early infancy and childhood, and adolescence (Iannotti, Barron and Roy, 2008). Relatively small amounts of ASF can substantially increase the nutrient adequacy of the diet.

It should also be noted that about two-thirds of the world’s adult population do not produce the enzyme lactase, which is needed to digest lactose, the sugar found in milk and other dairy products to a lesser extent. While lactose intolerance can create symptoms such as bloating and diarrhea, consumption of dairy products is increasing in regions with lactase deficiency due to colon microbiome adaptation (Forsgård, 2019) and lower lactose contents in products such as cheese and yogurts.

**Taboos and cultural factors related to animal-source food intake**

Numerous cultural and religious beliefs and taboos influence consumption of ASF, including restrictions on which ASF can be eaten or by whom. Women and children, in particular, are often subject to such restrictions. Meat is more likely to be subject to food taboos than any other food. Examples are included in Box 2.

☑️ **Box 2. Beliefs, taboos and practices related to consumption of animal-source foods**

These examples of beliefs, taboos and/or practices are context-specific:

- Women do not consume meat during pregnancy because of the risk of excessive _in utero_ growth of the baby, leading to difficult delivery (Hassan Tahir, Elawad Mohammed Ahmed and Ahmed Ali Mohammed, 2018).
- Women do not consume meat during pregnancy for fear of a discoloration of the foetal body (Leslie, Pelto and Rasmussen, 1988).
- Gizzards and thighs of ducks are eaten by the elderly, while children can only have the lower legs or the head. (Ogbeide, 1974).
- Frequently, coconut milk and liver are taboo for children, because it is believed that the milk renders them unintelligent, whereas the liver causes abscesses in their lungs (Ogbeide, 1974).
• Milk represents a particularly wholesome food for young men and warriors (Fontefrancesco, 2018).
• Milk makes women strong and insubordinate to their husband. (Meyer-Rochow, 2009).
• The consumption of eggs during pregnancy is believed to develop bad habits for the child such as stealing or being bold (Ogbeide, 1974).
• Some ASF are also considered to be remedies, e.g. the meat from small ruminants is thought to have medicinal or prophylactic properties in areas of Ethiopia; goat milk is believed to cure AIDs; traditional healers use zebra meat and fat to treat tuberculosis and other diseases (Haasnoot et al., 2010); raw beef is soaked in the drink of an alcoholic person to induce vomiting and nausea and cure alcoholism (Ubani, 2011).

These factors and taboos must be understood and taken into account in planning any intervention relating to consumption of ASF.
IMPACT PATHWAYS FROM LIVESTOCK TO HUMAN NUTRITION

Livestock-related activities can influence the nutritional status of the community through multiple impact pathways (Figure 1). Not all of these pathways are relevant in all contexts but understanding how they work and how they may coexist or compete can help inform the design of livestock programmes and highlight opportunities to enhance positive nutrition impacts while minimizing potential negative impacts.
Figure 1: Impact pathways from livestock to nutrition

- **Nutrient adequacy of the diet**
- **Health status**

**PATHWAYS TO NUTRITION**
- **Consumption of ASF**
- **Crop production**
- **Income generation**
- **Women’s Empowerment**
- **Disease transmission**
- **Labour for animal rearing**
- **Physical activity**

**UNDERLYING CAUSES**
- **Access to potable water and sanitation, and access to health services**
- **Income**
- **Decision-making and control over resources**
- **Provision of inputs and services (e.g., manure, animal traction, transport)**

**IMMEDIATE CAUSES**
- **Disease transmission**
- **Income generating activities**
- **Sales of ASFs and by-products**

**LIVESTOCK**
- **Source of essential macro- and micronutrients**
- **Livestock as a source of capital insurance**
- **Access to livestock-related job opportunities and IGA**
- **Labour for animal rearing**

**NUTRITIONAL STATUS**
- **Household food availability and access for a diversity of nutritious foods**
- **Increased crop productivity**
- **Reduced time allocation for family care**
- **Maternal and child care**
- **Access to potable water and access to health services**
- **Income**

**Zoonoses and foodborne diseases**
Consumption of animal-source foods

Figure 1 shows impact pathways from livestock production to nutrition outcomes. ASF could be derived from different sources such as own-production or purchase from other households or from markets. Adding small amounts of ASF to nutrient-poor diets can considerably improve the nutrient adequacy of those diets, but the impact of this on individuals depends on a number of factors including intra-household food distribution dynamics. The benefits also depend on avoiding overconsumption of ASF. The manner in which ASF are produced, preserved, prepared and consumed matters in so far as minimising food safety and health risks is concerned.

Consumption of home-produced ASF is the most direct way to improve household nutrition and was traditionally the main incentive for households to keep animals. However, this has been displaced in a number of contexts by the income pathway, and livestock products are sold to provide income that is then spent on food and other requirements. ASF consumption is commonly associated with wealth profiles, with the likelihood of high-income households consuming more ASF than poor households.

Crop production

FAO (2009) estimates that about 60% of rural households raise livestock. Animals provide essential inputs for crop agriculture, including organic fertilizer and draught power for sowing, ploughing and harvest activities. They also constitute a good source of transport of agricultural products to markets. Animals thus contribute in many ways to enhance crop production and trade of other foods, which have implications for household nutrition directly or indirectly through income-generation. Conversely, livestock can also compete with crops for productive resources such as land, water, labour and investment and, if not adequately managed, can have negative effects on air, land and water quality that can affect productivity, quality of life or health.
**Income-generation**

Livestock activities generate income for livestock keepers in various ways. These include:

- sale of live animals
- sale of ASF such as meat, milk, cheese and eggs
- sale of non-food products such as skins, wool, horns, bones and manure
- provision of various paid services such as draught power.

Livestock production can also provide wages for other households in the community. For example, smallholders often rely on family members for livestock-related work, but they may also employ non-family members to do this work. It also supports other value-chain actors, such as slaughter-houses and retailers.

It is generally assumed that increased income will lead to better food and nutrition security, but this is not always the case. Income can be used for various purposes that may have positive or negative impacts on nutrition. These purposes include:

- buying ASF, as well as other nutritious foods (e.g. pulses, nuts, fruits and vegetables) resulting in improved dietary diversity;
- buying other less nutritious food items. This can have detrimental impacts on diet quality if for example, households sell nutritious fresh milk to buy less nutritious but cheaper and more filling foods such as biscuits and fried doughnuts;
- buying non-food items that contribute to improved food preparation and hygiene (e.g. soap and cooking fuel);
- buying services for improved health and welfare (e.g. vaccinations, medicines, medical fees, education);
- accumulating assets as a form of capital and risk management. For example, livestock can act as ‘savings’ that can be realized during times of need. This might include purchase of foods during the hunger gaps, payment of medical bills when a family member is ill, payment of school fees, or social capital expenses to maintain and create social networks such as dowry for marriage and child-naming ceremonies. Keeping animals rather than saving cash in financial institutions can provide a much better return on investment, through reproduction or services provided. In addition, livestock are a mobile asset, which is convenient in areas prone to food shocks and crises; and
are investing in the livestock business (e.g. animal feed, veterinary drugs and vaccines). This may or may not lead to better nutrition, depending on the uses given to the business.

Household decisions on spending income depend on the interplay of many factors, including knowledge and value placed on nutrition and on the nutritional value of ASF, the terms of trade for ASF, the socio-economic status of the household, and the way the household perceives the future. It will be important to consider all these factors when designing nutrition-sensitive livestock programmes. It is also important to note that livestock activities can compete in terms of time and investment with other income-generating activities (agricultural or non-agricultural) that may also be important for the household economy.

Women’s empowerment

If women had greater decision-making power over household expenditures and control over resources, and had appropriate knowledge on nutrition, it is likely that households would allocate larger proportions of their income and resources to improve their household diets, and particularly those of children. Certain types of livestock production and activities are typically carried out by women (e.g. dairy goats, some types of dairying and poultry). Supporting women-led livestock activities may positively affect various dimensions related to women’s empowerment, for example by increasing women’s income and control over resources. However, as these activities start to generate large profits, men may take over control of them.

Women’s involvement in labour-intensive livestock activities may pose negative effects on diets and family welfare, in particular when these activities increase demands on their time and thus interfere with other important tasks such as childcare. For example, time-consuming responsibilities involving women going to markets to sell ASF may require that they leave their children with other family members, thus interrupting the exclusive breastfeeding period. In addition, they may allocate less time to preparing nutritious complementary foods for young children.

Therefore, existing gender constraints and opportunities could potentially pose negative impacts. These gender dynamics need to be assessed when designing nutrition-sensitive livestock programmes to make them gender friendly.
Physical activity

Livestock-related activities such as herding, milking and providing water during dry seasons are labour intensive and may involve intense physical effort. Such labour and time-intensive activities increase the nutrient demands of those involved, which ought to be offset by healthy diets. In addition, the extra nutritional demands of livestock-related tasks vary between production systems, e.g. from very low for free-range poultry to high for zero-grazed cattle fed cut-and-carry fodder. The impact on nutrition can be particularly detrimental during periods of drought, when increased husbandry activity may be required while household food stocks are at their lowest. Households may attempt to cope with the shortfall by rationing the food available, for example by reducing portion sizes or the number of meals per day or by favouring certain household members over others. This may be of particular concern for nutritionally vulnerable groups and individuals such as pregnant and lactating women and young children.

The likely impacts of livestock activities should be identified and taken into account when planning, designing and implementing livestock-based interventions aimed at improving food and nutrition security.

Disease transmission

Transmission of diseases from livestock to humans has negative consequences for nutritional status of those affected.

Pathogens can be transmitted from animal to human (i.e. zoonoses such as cysticercosis and brucellosis) via direct animal contact, via consumption of contaminated ASF and via environmental contamination (through soil, water, utensils or foods, in combination with poor hygiene practices). Many of these transmissible diseases are well known, but there are also emerging diseases (such as highly pathogenic avian influenza) that can affect large numbers of animals and people.
Inappropriate and overuse of antimicrobials in livestock production contributes to an increase in antimicrobial resistance in pathogens causing human infections.

Disease can impair nutrient absorption and/or cause the body to lose nutrients, such as through diarrhoea. Pathogens of animal origin can be particularly harmful to young children or pregnant and lactating women, whose immune system is still developing or has been partially suppressed. In addition to microbial and parasitic contamination, ASF has been associated with other food-safety issues such as contamination of milk with aflatoxins or antimicrobial and other chemical residues. A growing body of scientific evidence indicates that dietary exposure to mycotoxins is a likely contributing factor to child stunting in affected populations (Wild, Miller and Groopman, 2015).

Furthermore, disease in animals can impair their productivity, which in turn negatively affects the ‘consumption of ASF’ and the ‘income-generation’ pathways. Animal health interventions such as vaccinations and deworming can prevent this. However, activities to control animal disease such as preventive slaughtering of animals may also reduce the availability of ASF.
RECOMMENDATIONS FOR MAKING LIVESTOCK PROGRAMMES MORE NUTRITION-SENSITIVE

The following recommendations can help design and implement livestock programmes\(^2\) that maximize their positive impacts on human nutrition.

**General considerations for programme design**

**Assessing the local nutritional context**

A nutrition-sensitive programme should be based on a comprehensive understanding of local malnutrition problems and on the role that livestock-based livelihoods and ASF consumption can play in addressing them. This requires a sound assessment of the nutritional situation and an analysis of the local causes of malnutrition (including nutrient adequacy, dietary and ASF consumption patterns, cultural and food-safety practices). Box 3 provides an example of a programme focusing on improving poultry production in Tanzania, which includes a comprehensive assessment of maternal and child dietary patterns and of the role of chicken and egg consumption in the diets of mothers and children.

Such nutrition assessments should provide information on the frequency of ASF intake, seasonal trends and key nutrient gaps. They should also assess food-safety issues at the household level (e.g. hygiene practices, water and food storage, preservation and preparation of food, how animals are kept in the household compound in relation to food-storage and preparation areas), as disease is an immediate cause of malnutrition. It is important to look at data disaggregated by livelihood group or income level and by age and gender (boys and girls, women and men) to identify any unequal food distribution practices. Where data are not available, formative research\(^3\) should be carried out prior to planning a programme to gain an understanding of the needs of local communities, the practices and taboos that might be harmful or affect success and how they can be overcome, and to ensure that interventions

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\(^2\) Programmes may include interventions such as animal husbandry inputs, animal transfer and conditional cash transfer related to livestock activities

\(^3\) Formative research is research conducted before or during the development of a programme to help researchers decide on and describe the targeted population (understand their characteristics, behaviours and needs that influence their decisions and actions).
are culturally appropriate, feasible and acceptable. The research can be done using mixed methods such as focus-group discussions, household and key-informant interviews, knowledge, attitudes and practices (KAP) surveys and observations.

**Box 3. Promoting family poultry for household food security and nutrition in Tanzania**

In Tanzania, family poultry production plays a significant role in the food security of 70% to 99% of rural and peri-urban households. The Australian International Food Security Research Centre has been implementing a five-year project (2014 to 2019) in Manyoni District, in the semi-arid central zone of Tanzania, aimed at reducing childhood undernutrition through improved poultry and crop production.

The first component of the project consists of a community-based vaccination campaign against Newcastle disease (ND). This viral disease causes significant losses in poultry flocks, which has a negative impact on household income as well as on household nutrition. ND vaccination has significantly reduced poultry losses, strengthening food security and contributing to improved human nutrition.

The second component of the project assessed maternal and child dietary patterns and the role of chicken and egg consumption in mothers’ and children’s diet and on child growth. This established that complementary feeding practices within the communities were inadequate. Chicken and eggs were rarely eaten in the assessed households. The study further revealed that consumption of poultry products by mothers is closely associated with the intake of these foods by their children, and that there are no significant gender-based barriers to the consumption of chicken and eggs by children. The study found positive changes in dietary patterns during the project, leading to the conclusion that programmes which increase the consumption of poultry products at household level bring direct benefits to infants and young children and to maternal nutrition.

*Source: Alders et al. (2014).*

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4 KAP surveys can provide valuable information regarding what is known, believed or done regarding a specific topic. See FAO (2014a) for further information.
Setting explicit nutrition-related objectives and activities

Specific nutrition objectives should be explicitly set and reflected in activities. For instance, the objective of a programme might be to increase diet quality and contribute to nutrient adequacy for women and children under five through diversification of livestock production, or to increase the consumption of ASF by pregnant and lactating women and children through nutrition education activities and by increasing awareness of the nutritional value of ASF. Box 4 provides an example of a plant- and animal-production programme implemented in Mali that explicitly aimed to improve the diets of children under five and women of childbearing age in 2,000 households that were vulnerable to food insecurity.

Box 4. Impact of crop and livestock programmes on dietary diversity of women and children in Mali

Food security is a challenge and acute malnutrition is highly prevalent in Mopti, Mali, a region prone to high seasonal variations in temperature and rainfall. Sales of agricultural products are often the only source of income for farm households. Although farmers commonly produce a surplus of grain, year-round access to food (quantity, quality and price) is an issue because farmers sell a large proportion of their produce during the first three months after harvest, often at low prices, in order to satisfy immediate basic needs.

Between 2011 and 2015, Agronomists and Veterinarians Without Borders implemented a plant- and animal-production programme that explicitly aimed to improve the diets of children under five and women of childbearing age in 2,000 households that were vulnerable to food insecurity. This programme provided the beneficiaries with improved seeds, two goats or ten hens and a rooster. It also provided training on hygiene, horticultural and husbandry practices and dry cheese production to deal with the surplus of fresh milk in periods of abundance, as well as nutrition education sessions (including awareness-raising on gender and nutrition linkages and cooking demonstrations) and mass screening for malnutrition.
As a result of the programme, the percentage of households with acceptable food consumption (measured by the household dietary diversity score) increased from 67% to 85% during the lean period. The individual dietary diversity score in the lean season rose from 3.9 to 4.4 out of 9 food groups in children from two to three years of age, and from 2.3 to 3 out of 7 food groups in children from 6 to 24 months of age (according to the World Health Organization Minimum Dietary Diversity for Young Children).

Overall, this intervention had a significant impact on the dietary diversity of mothers and young children through both the consumption pathway (increased consumption of diversity of food groups year-round) and the income-generation pathway (increased income generated through small-scale breeding, which facilitated greater access to certain nutritious foods).


Developing a nutrition-sensitive household targeting strategy

When identifying final project beneficiaries, attention should be given to households and individuals that are more vulnerable to malnutrition. This includes considering both:

- **socio-economic vulnerability** (such as the poorest households, households with limited assets [e.g. displaced people] and marginalized groups [e.g. ethnic minorities]); and
- **physiological vulnerability** (those with specific nutritional needs, e.g. pregnant and lactating women and young children [particularly during the complementary feeding phase, starting from 6 months of age], but also adolescent girls, elderly people with low intake and poor absorption of vitamin B12, and people living with HIV).

Targeting women for livestock activities

Targeting women for specific activities in livestock programmes can help increase their control over productive and economic resources and their level of empowerment. This can ultimately increase the likelihood that the income earned and the food produced will be directed to improving maternal and childcare, as well as household nutrition and health. This is especially likely if nutrition education is included in the programme activities. Box 5 gives an example of a livestock programme that targeted women using a pro-poor approach.
Box 5. Gender focus on livestock-related income-generating activities for better food security and nutrition in Bangladesh

Market demand for livestock products is high in Bangladesh. As a result, most rural farm families are involved in some way in livestock-rearing activities. Taking advantage of this, the Asian Development Bank supported a livestock project in the northwest and north-central regions of Bangladesh from 2004 to 2012. The goal of the project was to improve the living standards of the landless and marginal farm households, with a special focus on poor households headed by females.

The project provided targeted households with capacity-building on livestock enterprises, microcredit, technical services (vaccination, deworming and artificial insemination) and marketing assistance. A specific component supported the poorest women of the communities with training on building their asset base to start income-generating activities and improve their livelihoods, enabling them to increase their income and contribute towards enhancing their family’s food consumption.

The project contributed to increased production of livestock products (milk, meat and eggs). It also developed entrepreneurship among the participants through various measures including enhancing skills and knowledge for value addition and marketing of products, setting up milk collection centres and linking beneficiaries with industrial buyers to ensure fair prices for their products.

The project increased household income by 9% to 96%, encouraged land purchase and ownership, increased livestock and poultry ownership, helped households build assets and improved amenities. These impacts translated into increased household food consumption, especially children’s intake of nutritious food (particularly animal protein), and increased expenditures on children’s education and medical care. The gender mainstreaming target was successfully achieved, as about 98% of beneficiaries were women, who were able to strengthen their role in family decision-making.

Understanding the ‘livestock to nutrition’ impact pathways

Project planners should consider what the impact pathways from the project activities to improved nutrition will be. This process will help select the most suitable project activities and relevant indicators for monitoring and identify any possible negative impacts.

Selecting nutrition-related indicators

Indicators should be chosen according to the likely project impact pathways. In order to select the most appropriate and realistic nutrition-related indicators, it is necessary to consider what is achievable in the programme time frame and what is feasible in terms of data collection. Anthropometric indicators (which measure individual nutritional status) may thus not be applicable as they may not change significantly during a short programme intervention or by programmes focused on a single sector. More appropriate indicators might include the following: changes in infant feeding practices (e.g. Minimum Adequate Diet, Minimum Dietary Diversity for children (MDD) (see Box 4 for an example of the use of these indicators to measure the nutrition outcomes of an animal-production programme); changes in diet quality (e.g. increase in the consumption of ASF or iron-rich foods; Minimum Dietary Diversity for Women (MDD-W); changes in the diversity of food groups consumed; changes in prevalence of diseases (e.g. episodes of diarrhoea, prevalence of zoonoses); and changes in women’s empowerment (e.g. time allocation, per cent of revenue controlled by women). FAO’s Compendium of indicators for nutrition-sensitive agriculture provides more details of these and other indicators and how to select the most appropriate indicators (FAO, 2016b).

Adhering to the ‘do no harm’ principle

It is essential to ensure that the selected livestock programme does not have a negative impact on nutritional outcomes, for example support to increased livestock productivity and market outlets should not divert ASF away from household consumption, any increase in women’s workloads should not interfere with breastfeeding or child caring capacities, or the spread of zoonotic diseases should not be increased by the enhanced livestock programmes. This will require monitoring throughout project design and implementation, using appropriate indicators.
Specific considerations related to livestock production

Choice of species

Nutritional characteristics of the different species available should be taken into account. For example:

- Short-cycle species grow fast and can thus help achieve quicker nutrition impact. However, non-ruminant species such as pigs and poultry require higher-quality feed, whereas ruminant species can produce highly nutritious products from roughages and crop by-products.

- Certain products are more suitable for own-consumption than others. For example, milk and eggs are produced regularly, in relatively small quantities and require little or no processing and are ideal for home consumption, whereas ruminants produce large quantities of product (meat and offal) at one time and require processing (slaughter and butchering) prior to consumption and may be preferred for sale.

- Keeping multiple species may have numerous benefits. It reduces the risk of losses to disease, diversifies the types of ASF produced, makes optimal use of feeds available and allows for better adaptation to market demands. For example, different species feed on different types of vegetation; cattle and sheep graze on grass and other soft vegetation, while goats browse coarser material such as shrubs. Camels, on the other hand, can survive with limited water and have a long lactation period, whereas cattle produce large volumes of milk but need more water. Small livestock such as ducks, rabbits or guinea pigs can also be considered.

Gender implications also need to be taken into account. For example, species that are reared in and around the homestead (e.g. poultry) are more readily reared by women, given their home-based responsibilities. Produce and income generated by such species are more likely to be used to improve household nutrition. The workload (physical burden and time) imposed on women is also an element to consider. Increases in women’s workload could be mitigated with additional measures, such as introducing time and labour-saving practices and technologies.
**Seasonal variations in livestock production**

In certain agroecosystems, biomass availability is strongly seasonal as a result of precipitation patterns or elevation. This is the case for example in the Sahel, in mountainous environments or in the steppes of Patagonia or Russia. As a consequence, livestock production, in particular from ruminants that depend on grazing, can also be highly seasonal. This can be mitigated through good animal husbandry practices and use of adapted genotypes and production systems in order to ensure feed and food availability all year round. Actions to be undertaken might include the following:

- Improve feed of lactating animals when forage is in short supply or of low quality by providing supplementary feed (e.g. bran, oil seed cakes), fodder (e.g. hay, straw) and/or water point rehabilitation. This has a high impact on milk yield. It is important to note that animal feed quality can affect the nutritional value of the ASF produced. Therefore, attention is needed to prevent contaminated feed from entering the food chain (e.g. grain not used for human consumption due to aflatoxin content can still be a problem if fed to animals as aflatoxins can then be found in milk).

- Match breeds to production systems and resources available. The choice of breeds needs to take into account their ability to survive and produce under prevailing conditions, including disease challenges. Crossbred livestock tend to have higher yields than pure indigenous breeds while remaining adequately adapted to the environment.

- Conserve animal products or process them in ways that ensure their conservation. Processing milk into cheese or butter or drying meat can ensure their availability all year long. More information is provided in the next section and in Box 7.
Animal health programmes

Programmes such as vaccination and adequate supply of veterinary extension services are essential to protect a household’s productive assets, improve productivity and avoid harmful side effects on human health and nutrition (e.g. spread of new animal diseases, transmission of zoonoses). Large-scale vaccination campaigns are strategic interventions that can have a huge impact on productivity, as illustrated in Boxes 3 and 6. Good practices include:

- building upon existing systems of community animal health workers and veterinary outreach projects in order to ensure sustainability;
- ensuring that biosecurity measures are adhered to throughout to avoid the spread of diseases; and
- ensuring that appropriate veterinary support is provided to the animals remaining with women and children or the elderly when men of pastoralist households migrate with the main herds.

Box 6. Improving livestock productivity and milk consumption in a community development programme in Nepal

As part of its Agricultural Perspective Plan (1996–2015), the Government of Nepal, supported by the Asian Development Bank, implemented a Community Livestock Development Project for a five-year period starting in December 2005. The project aimed at improving the levels of food security, nutrition, income and employment in rural communities by increasing productivity of the livestock subsector. The project focused on two elements: (i) intensive livestock production (ILP); and (ii) processing, marketing and commercialization of livestock subsector services.

The ILP component targeted poor families (62% headed by women), comprising disadvantaged castes and resource-poor ethnic groups. Activities included cultivation of improved perennial forage and winter forage; breed improvement through provision of artificial insemination services and higher-quality cattle bulls and buffalo bulls; and provision of veterinary services (such as vaccination and drenching against internal parasites, laboratory services and disease diagnosis). The ILP component increased cow milk production by 140%, buffalo milk production by 57% and goat off-take by 28%.

The project increased food consumption and dietary adequacy of the target households. Milk consumption increased by 11% and meat consumption by 50%. On average, it was estimated that nutritional intake of girls and boys under six years of age increased by 19.1% during project implementation.

Specific considerations related to the livestock value chains

Livestock value chains\(^5\) (VC) hold a great potential for improved nutrition. A nutrition lens needs to be applied throughout the VC development process to unlock all the positive benefits, especially for the nutritional needs of the vulnerable groups. CFS (2016) outlines a nutrition-sensitive value chain (NSVC) framework developed by FAO, the International Fund for Agricultural Development, the World Food Programme, along with Biodiversity International and International Food Policy Research Institute. This is a tool intended to enhance supply of and/or demand for nutritious food, as well as to help leverage opportunities to add nutritional value (and/or minimize food and nutrient loss) at each step of the chain, thereby improving the availability, affordability, quality and acceptability of nutritious food.\(^6\)

Developing a nutrition-sensitive livestock VC would greatly benefit from giving specific attention to the aspects described below.

Preservation and processing techniques

Promoting these technologies can reduce the seasonality of ASF availability, increase shelf life, improve food safety and ultimately reduce waste. Modern food technology activities often require a lot of resources (e.g. water, electricity, machinery) and may require a critical mass to justify investment, which can be limiting in many settings. However, there is also a range of traditional techniques that can be broadly implemented, including at household level (see Box 7). Preservation activities should work hand in hand with increased production for cost-effectiveness and should be tailored to local food preferences and circumstances.

\(\checkmark\) Box 7. Traditional preservation and processing techniques for animal-source foods

Degradation of ASF is influenced by several factors including microbiological contamination (pathogens or non-pathogenic spoilage bacteria); humidity; pH; temperature; and exposure to oxygen. Supply and efficient use of ASF are often

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\(^5\) A food value chain consists of all the stakeholders who participate in the coordinated production and value-adding activities that are needed to make food products (FAO, 2014b).

\(^6\) The NSVC framework can help guide livestock VC programme development in, for instance, analysing the roles and incentives of different actors along the chain, better integrating the impact of cross-cutting issues such as gender and climate change or contributing to create a conducive policy and regulatory environment. See CFS (2016) and FAO (2017b) for more information.
challenging in settings where there is no electricity or cold chain. In this context, traditional low-cost and low-resource preservation methods can help ensure food safety and maintain the nutritional value of ASF. Examples of such processing methods include the following:

- **Drying:** partial or total elimination of the water contained in fresh meat. Drying is widely used in Sahelian countries to help preserve meat throughout the year. The meat can be consumed raw or rehydrated and cooked in stews (e.g. *kilichi* in Niger).

- **Smoking:** direct or indirect exposure to smoke from burning certain plants or woods. This technique delays ASF degradation and also alters the flavour. The meat must be thinly sliced to ensure uniform smoking. The presence of phenolic compounds in the smoked meat hinders insect attacks.

- **Salting:** with or without addition of spices. This technique is frequently combined with drying, cooking or smoking. There are two types of salting: dry salting (meat, either in a block or in fine slices, is rubbed with a dry salt mixture) or wet salting (meat is marinated in water with the salt mixture, i.e. brining, for a variable length of time).

- **Fermenting:** such as the preparation of sour milk, where growth of lactic acid-producing bacteria is promoted. These bacteria convert sugars into lactic acid, which reduces pH. Some also produce antibiotic compounds, thus preventing the development of other undesirable bacteria. In addition, fermentation alters the organoleptic characteristics of the product and increases the digestibility of the milk. Milk is commonly heat-treated to kill off other bacteria and fungi before fermentation culture is added.

- **Other techniques:** these include butter- and cheese-making; pasteurization, condensing or desiccating milk; and home preparation of canned meat.

In addition to preserving the food, preservation techniques can have positive or negative impacts on the nutritional value. For instance, thermic treatments (cooking, drying, smoking) can cause the degradation of certain components such as vitamins and cause structural change in proteins that alter their biological quality. Moreover, toxic compounds such as heterocyclic aromatic amines (potential carcinogens) can be formed when the treatment temperature is too high. Adding salt significantly increases the overall sodium content of the food, which increases the salt load of the diet with potential deleterious effect on health. Conversely, fermentation can enhance the nutritional profile of meat by making certain components more digestible, synthesizing vitamins (mainly B vitamins) and other bioactive compounds or providing probiotics, which are important to maintain gut health. Thus, preservation of ASF also has implications for their nutritional content and even their taste (hence acceptability) which need to be factored in when planning processing activities.

*Source: Authors*
Value-chain analysis

Value-chain analysis identifies issues of governance, equity and health risks and opportunities and constraints for producers, consumers and other actors (FAO, 2017c). For example, in some societies women may not participate in slaughter of animals, but they can participate in subsequent ASF processing (e.g. meat drying). Value-chain analysis also helps identify local markets and incentives and opportunities for traders that influence livestock and ASF prices. Understanding value-chain drivers is also important for producers – for example, to encourage early sale of animals during crises. Value-chain analysis should not only focus on ASF but also on the upstream supply of feed and forage, drugs and other necessary inputs.

Business approach

Profitable programmes that are based on a good and inclusive business model and sound analysis of opportunities presented throughout the value chain are more likely to be sustainable and have a long-term effect on nutrition.

Box 8. Impact of dairy value chain improvement on food security and nutrition in Rwanda

Working closely with the Government of Rwanda, Land O’Lakes implemented a project funded by the United States Agency for International Development to unlock the potential of the dairy sector in the Eastern Province of Rwanda. The project, organized in two phases, started in 2007 and aimed at developing the capacities of smallholder milk producers to: (i) improve the productivity of dairy cows (e.g. through improved cattle management and health and provision of artificial insemination services); and (ii) strengthen the dairy value chain and facilitate market access by smallholders. Activities included training on hygiene practices for safe collection and transport of milk; home and business finances; cooperative development; and gender sensitization. The smallholder producers were also provided with metal milk cans for collection and transport of milk. The project also included a behaviour-change communication component to encourage households to retain milk for their own consumption. Using radio, TV and billboard channels, the project disseminated messages (in Kinyarwanda) on the nutritional benefits of milk, specifically for children and pregnant and lactating women.
At the end of the second phase (2012–2017), smallholder milk production showed a significant increase, from an average of 5.8 litres/day in 2013 to 19.4 litres/day in 2015. The project also resulted in an increase in daily household milk consumption, from 2.2 litres in 2013 to 5.8 litres in 2016. According to both farmers and cooperatives, the introduction of best practices for the collection, handling and transportation of milk and the support for quality testing and access to improved equipment contributed to drastically reducing the amount of milk spoiled and rejected at milk collection centres. With the increase in production, many households were able to increase their income and to retain milk for home consumption.

*Source: McMahon (2016); Land O’Lakes/USAID (2017).*

**Use of livestock by-products**

Planners should investigate the potential of other activities related to livestock, such as production of skins, handicrafts, wool or cosmetics, to generate income, especially for women, who are more likely to use additional income for household care and nutrition.

**Emergency nutritional programmes**

Food may have to be distributed in certain areas and at certain times of the year to address hunger and malnutrition. However, planners must take care to ensure a balanced diet and that foods distributed do not displace other local foods when these are available. Small-scale initiatives supporting local producers and local markets can help improve the nutritional value of the food baskets with ASF such as dried meat or milk.
Nutrition education and behaviour-change communication

Nutrition education plays an important role in developing and delivering nutrition-sensitive agricultural development initiatives by ensuring that increased food production or income translates into improvements in diets and nutrition status. As mentioned previously, where data are not available, formative research should be carried out prior to planning a programme. This is necessary to provide an understanding of the needs of local communities and to help identify the most important behaviours and related barriers/attitudes that might be harmful or affect success and how they can be overcome.

In particular, when designing nutrition education interventions for livestock programmes, the following aspects will deserve specific attention.

Promoting the nutritional value of animal-source foods

Nutrition education can help promote consumption of ASF in nutritionally vulnerable groups by raising awareness of the importance of ASF as nutrient-dense foods, including for complementary foods and during pregnancy and lactation. Such education may include topics such as how to prepare ASF (e.g. participatory cooking and tasting sessions), how to store ASF safely, good hygienic practices and home processing. Attention also needs to be given to excessive consumption of ASF. Nutrition education should always emphasize the importance of balanced diets, because attitudes formed through these interventions can become lifelong attitudes and lead to under- or overconsumption of ASF when the context changes.

Addressing taboos and diversifying consumption of animal-source foods

When designing nutrition education interventions, it is important to understand the impact of culture, social organization and gender dynamics on household diet and nutrition. This includes understanding who eats which part or product of which animal and when and whether consumption of ASF is subject to gender restrictions and taboos and assessing how best to address these issues. Dietary practices and cultural beliefs are not easy to change, and programmes will have to work with religious/community leaders or elders and obtain their buy-in for any proposed changes. It is also vital to test new
behaviours and recommendations before rolling out the interventions widely. Box 9 provides an example of a behaviour-change communication strategy using the channel of a weekly radio soap opera and tapping into the strong Ethiopian tradition of oral storytelling to entertain and educate.

Box 9. Radio soap opera tackles nutrition in pastoral communities in Ethiopia

Following the 2011 food crisis in the Horn of Africa, Mercy Corps implemented the Pastoralists Areas Resilience Improvement through Market Expansion programme, funded by the United States Agency for International Development, to help vulnerable pastoralist families in the Somali, Oromia and Afar regions of Ethiopia to increase their food security and resilience. The programme helped pastoralists diversify their incomes and develop reliable farming methods.

To strengthen positive impacts on nutrition, a partnership with Warner Bros. was established in 2015 to implement a three-year project to promote behaviour change using the channel of a weekly radio soap opera. The goal was to transform some of the inherent behaviours and beliefs that prevent families from thriving by tapping into the strong Ethiopian tradition of oral storytelling and harnessing the power of stories to entertain and educate.

Weekly broadcasts engaged listeners with stories in local dialect with characters tailored to the three regions. These stories stressed the importance of livestock health, of diversified diets (particularly for mothers and young children), of the first 1,000 days, and of equitable decision-making for improved household nutrition. Details unique to each region, such as names and common greetings, contributed to helping local audiences relate to the stories. As part of the communication strategy, the programme established listener groups to coordinate and facilitate listening to the soap opera, refine messages to take away and assist with monitoring and evaluation. The show has received positive feedback from the community and the listening group leaders.

Source: Cogan (2015); ReliefWeb (2015).

Promoting food hygiene and safety at household level

Adequate hygiene practices during home-preservation of food, storage and meal preparation (e.g. boiling, stewing, roasting, frying) are crucial to reducing microbial contamination and preventing disease. Education and sensitization activities can help promote adoption and uptake of hygienic practices.
Broadly targeting nutrition education

Nutrition education at household level should engage all relevant individuals whose actions might affect household nutrition; it should not be restricted to women of reproductive age. Men should be included because they are commonly in charge of the household’s productive assets and have an important role in livestock-related activities. Traditional healers, mothers-in-law and grandmothers often play an important role in the household and in decision-making regarding health, feeding, childcare and household expenses. Other groups to be targeted include local leaders and religious leaders. Care must be taken to include such individuals in the nutrition education activities and get their buy-in right from the start.

Educating producers and consumers

Livestock extension officers, farmer associations and ASF retailers can play an important role in relaying key messages on nutrition to both producers and consumers and to motivate both producing and non-producing households to diversify their diet and to consume more ASF. This requires developing the knowledge of these actors on basic principles of livestock-nutrition linkages and developing strategies to promote behavioural change. Planners should review the terms of reference of agricultural extension services to assess the best strategies to incorporate support for nutrition in their current roles. It is important to note that behaviours are difficult to change and a one-off message is unlikely to result in the desired change; therefore, combining different approaches and identifying the most appropriate channels is essential.
Box 10. Behavioural change for improved nutrition through pastoralist field schools in Ethiopia.

Box 10. Behavioural change for improved nutrition through pastoralist field schools in Ethiopia

In 2013, Vétérinaires Sans Frontières (VSF) Suisse implemented a livestock-based intervention to help the pastoralist communities in Kebriderhar and Shilabo districts of Somali region, Ethiopia, to improve their food security, nutrition and resilience. The main intervention was providing milking goats to households that had children recurrently affected by malnutrition.

The intervention had positive impacts on child nutrition in the target households. The percentage of children with mid-upper arm circumference of less than 11 cm at four months decreased from 33% before the intervention to 0% after. The percentage of children showing signs of acute malnutrition decreased from 56.8% before the intervention to 12.3% after.

However, it was also reported that some mothers stopped breastfeeding after receiving a milking goat, which could negatively impact child nutrition. To prevent this potential negative effect, the intervention also provided nutrition education through pastoral field schools and village community banks (i.e. groups made up mainly of women who meet regularly and organize collective saving and loans) as channels for behavioural change for nutrition. Nutrition messages focused on maternal, infant and young child nutrition (MIYCN) and hygiene practices (e.g. the first food a newborn should receive, how frequently to feed with breast milk and critical times for hand-washing).

Along with these activities, from April 2015 to August 2016 VSF Suisse conducted a study of behavioural change for improved nutrition to assess the ability of pastoral field schools and village community banks to promote positive behavioural change in the community. The study found that mothers in the intervention communities were more aware of what the appropriate practices for MIYCN are. Moreover, participating mothers also passed the messages to other mothers in their communities.

Source: Lensse et al. (2017); Transform Nutrition (2017).
CREATING AN ENABLING ENVIRONMENT FOR ENHANCED LINKAGES BETWEEN LIVESTOCK AND HUMAN NUTRITION

The role of ASF in improving the nutrition of vulnerable populations has been largely overlooked in public policies and international development programs. However, as discussed, the livestock sector has the potential to contribute to addressing malnutrition, particularly in regions where livestock production is a major economic activity. Not using livestock as a pathway out of malnutrition in such regions would be a missed opportunity. At the same time, the operational recommendations presented in the previous section require a conducive environment to be created. This calls for the following steps to be taken:

• **Strengthening intersectoral collaboration and strategies:** Coherent and well-coordinated programming between the nutrition and livestock sectors can optimize the use of resources, maximize impact and build resilience. Achieving this would require mobilizing mixed teams of experts with knowledge of livestock–nutrition linkages to identify synergies between programmes of each sector and ensure successful interdisciplinary approaches. Strategies need to be inclusive and consider smallholders and consumers who do not possess livestock. Institutional/structural challenges and funding barriers that keep work in ‘silos’ need to be overcome through advocacy at national and institutional levels. Opportunities need to be forged to start and maintain dialogue at local, national and regional levels (e.g. creation of mixed working groups).

• **Developing capacity in integrated nutrition and livestock programming:** Developing such capacity requires establishment of a ‘nutrition-sensitive’ culture among livestock experts and nutrition experts should include livestock programmes in the portfolio of dietary diversification strategies. The necessary capacity can be built by various means, such as formal face-to-face and online training; facilitation of intersectoral workshops with a focus on experience-sharing and challenges and opportunities for integration; and creation of a community of practice on ‘livestock for nutrition’ to share lessons learned that are specific to livestock programmes.
• **Building a body of evidence in nutrition-sensitive livestock programmes:**
  The evidence base on the impact pathways from livestock to nutrition and successful intervention models is a work in progress and needs to be expanded to ensure that informed decisions can be taken. This includes conducting robust nutrition impact assessments and process evaluations to better understand the factors that influence the pathways from livestock to nutrition and the internal and external validity of existing and innovative nutrition-livestock programmes, and to document potential for scaling up nutrition. Partnerships involving multiple types of stakeholders (i.e. from researchers to policymakers and field implementers) can contribute to successful integrated action, while at the same time shaping policy and research.

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**Properly managed livestock can play a role in addressing malnutrition.**
Greater integration between the livestock and nutrition sectors is necessary to ensure livestock livelihoods and animal-source foods contribute to fighting malnutrition.
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ANNEX 1: CHECKLIST FOR NUTRITION-SENSITIVE LIVESTOCK INTERVENTIONS

Assessment

☑ Review existing assessments of the nutritional context. Conduct new formative research if necessary. Answer the following questions:
  - What are the main malnutrition problems and key nutrient deficiencies in the target region? What is the best/most efficient way to address them? Are livestock interventions and ASF production a feasible/effective option? How?
  - What are the local ASF consumption patterns? What are the enablers/barriers to ASF consumption (including attitudes and taboos)?

☑ Assess the role of livestock in the food system/food environment, including the characteristics of livestock production. Answer the following questions:
  - What are the local ASF production patterns?
  - What are the preferred species and what are the associated challenges and opportunities?
  - What are the household gender dynamics in terms of involvement with different animal species?
  - Are there any seasonal problems? What are the strategies and practices used by households to cope with these problems?
  - What will be the implementation structure?
  - Are there specific risky production, food safety, hygiene or storage practices related to ASF and livestock activities?
  - What are the seasonal dynamics?
**Design**

☑ Define clear nutrition-related objectives in relation to the main nutrition problems identified.

☑ Define a nutrition-sensitive targeting strategy for households. Answer the following questions:
  - Who are the most nutritionally vulnerable populations and age/sex groups in the area of intervention?
  - How will the proposed intervention benefit those populations?

☑ Design activities that can promote nutrition-related outcomes. Answer the following questions:
  - Which pathways may/may not be used?
  - What factors might affect these pathways?
  - How can the positive pathways be enhanced in the local context?
  - Who will be involved in the activities? How will women be included?

☑ Identify possible risks to nutrition (i.e. unintended side effects) based on the identified impact pathways and consider how these negative impacts can be prevented or mitigated.

**Implementation**

Consider the following:

☑ Approach the intervention implementation from a business point of view to ensure sustainability.

☑ Promote intersectoral collaboration within the geographical area:
  - Are the existing delivery platforms for nutrition-sensitive livestock well-structured and is resource allocation for implementation being optimized?
  - Are other related organizations/agencies aware of the importance of livestock to nutrition and on board?

☑ Consider gender aspects during the organization of the activities, such as trainings and distribution of assets (what are women’s/men’s workloads and time distribution throughout the day?).

☑ Dedicate efforts to ensure good husbandry and animal health practices (health, genetics, feeding, reproduction, etc.).
Include a nutrition education component to address key behaviours, including food hygiene.
   - Is the nutrition education component based on adequate information? Should formative research be carried out?
   - Are taboos and cultural practices taken into account?
   - Are all the relevant members involved (i.e. beyond women/mothers – e.g. grandmothers, men)?

Valorize ASF and sub-products to optimize the livestock inputs invested.

Provide opportunities for household consumption, ideally including across seasons (e.g. ASF preservation, recipe preparation).

Put in place measures to ensure sustainability of the intervention in the long term.
   - Are the delivery platforms/structures used likely to exist after the intervention has ended?
   - Are all programme staff sensitized about the importance of nutrition-sensitive livestock interventions and their potential benefits?

**Monitoring and evaluation**

Select appropriate indicators for the project/programme:
   - Are the consumption/nutrition indicators realistic and adapted to the scope and duration of the intervention?
   - Are there any intermediate indicators that can be used to better understand the use of the different pathways?

Measure process indicators and conduct process evaluation.

Evaluate the impact against the original nutrition objectives.

Document and disseminate lessons learned.
ANNEX 2: RESOURCES FOR FURTHER INFORMATION

Specific to livestock

Technical documents


Reviews


About nutrition-sensitive programming in food and agriculture

For designing nutrition-sensitive policy and programmes


E-learning modules: https://elearning.fao.org/course (see section “Nutrition and Food Systems”)

For assessment, monitoring and evaluation of nutrition-sensitive approaches


For multisectoral planning for nutrition and resilience


Nutrition education


