Volume 1 Issue 1, 2025 | Page: 50 - 58

Genetics, Plant Breeding and Seed Science

pISSN: 3102-0089 eISSN: 3102-0151

Journal homepage: https://plantbreeding.org.np/page/journal.html

Review article

Good Practices for Food Systems Transformation: A Case from Nepal

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ABSTRACT

ARTICLE INFO

Keywords:

Agrobiodiversity, diversification, five-trait-based food nutrition-dense site-specific food

Article history:

Received 7 Mar 2025
Revised 16 Jun 2025
Accepted 17 Jun 2025

The food system encompasses activities from the production to the utilization of agricultural genetic resources (AGRs), which include six key components: crops, livestock, agro-insects, agro-microbes, forages, and aquatic AGRs. Based on ROSE (review, observation, survey, and experience), good practices for food systems transformation have been documented. Efforts have been made to increase yield by developing and expanding mono genotypes (single uniform genotypes in large areas) of a few crops such as rice, wheat, and maize with chemical inputs. However, as agriculture has advanced, many localized AGRs-based food systems as well as farmers' rights have been neglected. Promoting and maximizing genetic diversity as well as localized-based food systems are crucial for food, nutrition, health, business, and environmental security. Understanding food systems should extend beyond human needs to include plants, livestock, agro-insects, agro-microbes, aquatic animals and plants, and the environment, including soil. Effective food systems are characterized by site-specific staple foods, the use of diverse genotypes, product diversification, incentives, circular and inclusive agriculture, waste reuse and recycling, and urban agriculture. Respecting every aspect of a farmer's contributions would be a beneficial strategy, considering the farmer's household as a shop.

Background and traditional food systems

From a broader perspective, food encompasses anything required for the functioning of cells, tissues, and organs in any living organism. However, it is often narrowly discussed as a commodity primarily for human consumption. The food system encompasses activities from production to consumption, and a sustainable food system for humans is achievable only if other living organisms are also provided with nutritious and healthy foods along with a favorable environment. In Nepal, diverse food systems exist with high variability in food preparation methods (Basnet 2023). Traditional food systems were predominantly based on circular agriculture and were more nature-positive. The nature-positive refers to actions, systems, or policies that enhance nature, not just minimize harm. It means actively restoring, regenerating, and protecting biodiversity and ecosystems, rather than simply reducing negative impacts. All six components of agrobiodiversity—crops, livestock, forages, agro-insects, agro-microbes, and aquatic agricultural genetic resources—played crucial roles in these traditional systems. However, as agriculture advanced, linear agricultural systems have come to dominate in many countries, focusing on only a few species and products. Three important but neglected food-related species are listed in Table 1. Based on total production, area coverage, population, and economic values, three major species are listed in Table 1 along with neglected species. There are thousands of species and localized genotypes that could significantly contribute to securing food, nutrition, and health systems (Knez 2024, Carrasco Azzini 2022).

Food systems beyond human consumption, such as those for soil, insects, microbes, plants, and livestock, have been largely neglected, resulting in unsustainable and unhealthy production practices. As highlighted by Altieri (1999) and the IPBES (2019) Global Assessment, neglecting the roles of soil microbes, insects, fungi, and other non-human components in agriculture leads to declining resilience and sustainability. A shift toward ecosystem-centric agriculture—where all living components are part of a balanced food web—is essential for long-term productivity and food security.

This focus on increasing the grain yields of a few crops has led to an imbalanced system. The current approach, which emphasizes a limited number of technologies and crops with mono genotypes (Joshi et al 2023, Gauchan et al 2022), is not sustainable. Therefore, it is crucial to improve localized traditional food systems rather than replace them. Smallholder farmers, who are the custodians of agricultural genetic resources and traditional knowledge, play a vital role in this transformation. Although their contributions may seem minor, their role should be further explored and recognized to transform the food system and achieve the sustainable development goal II of Zero Hunger (Jonas 2021). Food system transformation is about creating a food system that is good for people, good for the planet, and fair for everyone. Several key factors affect the food system, shaping how food is produced, distributed, and consumed. Climate change impacts crop yields and livestock health, while soil quality and water availability influence agricultural productivity. Economic factors, such as market access, prices, and trade policies, affect farmers' livelihoods and food affordability. Technology and innovation can improve efficiency but may also widen inequality. Additionally, consumer behavior, dietary trends, seed trade, and government policies play a major role in shaping demand and guiding sustainable practices. Among them, the seed business is directly related to production.

The seed business in modern agriculture has become a formalized and highly profitable sector. In traditional food systems, which relied on informal seed sources, almost all farmers were self-sufficient in seeds and other inputs. With the modernization of agriculture, farmers now depend on the market and other stakeholders for seeds, which is unsustainable for smallholder farmers. Additionally, farmers often face challenges in selling their products. Therefore, the good practice for transforming food systems is to ensure a market for every product from all farming households. Formalizing product marketing is more important than formalizing the seed system, as there are numerous instances each season where farmers are forced to discard their products without any use.

This paper explains the good practices of agricultural genetic resources management for food system transformation in Nepal. These practices are essential for achieving the Sustainable Development Goals (SDGs), specifically No Poverty (SDG 1), Zero Hunger (SDG 2), Good Health and Well-being (SDG 3), Responsible Consumption and Production (SDG 12), Climate Action (SDG 13), and Life on Land (SDG 15). The information presented is based on ROSE (review, observation, survey, and experiences) during field research, along with discussions among key experts.

Table 1. Three major important and neglected food-related agricultural genetic resources (AGRs) in Nepal

S.N.	Component of agrobiodiversity	Major 3 AGRs		Neglected 3 AGRs	
		Common name	Scientific name	Common name	Scientific name
1.	Crops	Rice	*Oryza sativa* L.	Buckwheat	*Fagopyrum esculentum* Moench.
		Wheat	*Triticum aestivum* L.	Finger millet	*Eleusine coracana* Gaertn.
		Maize	*Zea mays* L.	Grain amaranth	*Amaranthus cruentus* L.
2.	Livestock	Cow	*Bos indicus* L.	Yak/Nak	*Bos grunniens* L.
		Buffalo	*Bubalus bubalis* L.	Turkey	*Meleagris gallopavo* L.
		Goat	*Capra hircus* L.	Duck	*Anas platyrhynchos* L.
3.	Forages	Napier	*Pennisetum purpureum* Schumach.	Broom grass	*Thysanolaena latifolia* (Roxb. ex Hornem.) Honda
		Teosinte	*Zea diploperennis* Doeb. & Guz.	Cutch tree	*Acacia catechu* (L.f.) Wild.
		Ipil ipil	*Leucaena leucocephala* Lam.	Setaria	*Setaria viridis* (L.) Beauv.
4.	Aquatic agri-animal genetic resources	Rainbow trout	*Oncorhynchus mykiss*	Putitor	*Tor putitora*
		Rohu	*Labeo rohita*	Walking snakehead	*Channa orientalis*
		Common carp	*Cyprinus carpio*	Freshwater snail	*Bellamya bengalensis*
5.	Agri-insects	European honey bee	*Apis mellifera* L.	Lac insect	*Kerria lacca* Kerr.
		Silkworm	*Bombyx mori* L.	Bumble bee	*Bombus* spp.
		Asiatic hive bee	*Apis cerana* Fab.	Stingless bee	*Mellipona* spp.
6.	Agri-microbes	Oyster mushroom	*Lentinus sajor-caju* (Fr.) Fr.	Giant puffball	*Calvatia gigantean* (Batsch ex Pers.) Lloyd
		Yarsha-gumba	*Cordyceps liangshanensis* M. Zang, D.Liu & R.Hu	Yeast	*Saccharomyces cerevisiae* Meyen ex E.C. Hansen
		Trichoderma	*Trichoderma harzianum* Rifa	Morel mushrooms	*Morchella esculenta* (L.) Pers. : Fr.

Source: MoALD 2023, Joshi et al. 2019

Efforts on food systems transformation

Genetic improvement through breeding methods and the use of biotechnological tools are major initiatives in many countries. The Green Revolution is a notable outcome of these breeding efforts, significantly increasing agricultural productivity. Additionally, numerous awareness and mission-based programs have been organized. Many countries have established favorable policy environments (e.g. subsidies and support to farmers, training and exposure visits, providing chemical fertilizers, tools, pesticides, etc) and implemented extensive incentive mechanisms (subsidies on inputs, grants, insurance, loans, training, in-kind support) (Ghose 2014, Gauchan et al. 2022). Other efforts include the implementation of the Seed Without Borders project, organizing training workshops and educational programs, promoting urban agriculture, conducting food system dialogues, and celebrating specific days, weeks, and years as special events (e.g., International Year of Millets 2023). Many additional initiatives have been undertaken across Asian countries (Jonas 2021, Pingali and Abraham 2022).

Monoculture practices in Nepal have increased both dependency on external inputs and the overall cost of agricultural production. To build a more resilient and sustainable food system, the strategy should focus on enhancing localized agricultural genetic resources (AGRs). Although local landraces are often criticized for having lower yields, they offer significant potential when improved for ecological performance and adapted productivity. Rather than replacing them, these native resources should be diversified, genetically enhanced, and strengthened to align with nature and local ecosystems. Additionally, agricultural products from remote and high-value regions must be better integrated into mainstream markets. A dual strategy meeting local demand while promoting global exports should be developed, and supported by dedicated research and innovation in native AGRs.

Factors for food system transformation

Transforming food systems requires addressing a range of interconnected factors that influence how food is produced, distributed, and consumed. At the core are agricultural genetic resources (AGRs), which include crops, livestock, agro-insects, agro-microbes, forage, and aquatic AGRs. These diverse genetic materials are critical for building resilient and adaptive agricultural systems, especially in the face of climate change, pests, and shifting environmental conditions. In addition to genetic diversity, policy support plays a crucial role. Effective policies—such as subsidies for sustainable practices, regulations that promote biodiversity, and investment in research—create an enabling environment for transformation. Education and knowledge dissemination are equally important, empowering farmers and stakeholders with the skills and tools needed to adopt sustainable methods and technologies.

Other critical factors include product diversification, policy dimensions, education, production environment, knowledge, infrastructure, and advancements in agricultural science (Timmer 2017). Product diversification helps reduce risk and market dependence, and infrastructure development, such as irrigation, storage, and transportation systems. This will minimizes food loss and improves market access. Technological innovation, from precision agriculture to digital advisory services, is also transforming how food is grown and managed, making systems more efficient and climate-resilient.

Lesson and existing food systems

Breeding and non-breeding approaches have significantly increased yields in many countries in the past. However, the expansion of a few high-yielding, uniform mono genotypes has replaced many site-specific, broadly adapted landraces (Joshi et al. 2020b). Many of these landraces were climate-resilient and nutritionally superior to improved varieties (Farooq and Siddique 2022). Additionally, the high inputs of chemical-based fertilizers and pesticides have damaged soil properties, associated biodiversity, and the environment (Altieri 1999). The major food recipes in Asian countries have come to rely on very few crops, replacing the traditions of many local and Indigenous communities (Padulosi et al. 2013, FAO 2019). Transporting major food grains from one location to another, where these crops could not be grown, has become common practice. However, other crops could significantly contribute to ensuring food and nutrition security.

Native agricultural genetic resources (AGRs) should be enhanced through genetic improvement, utilizing modern technologies to boost their performance while maintaining their adaptability to local conditions. At the same time, integrated farming and system-based approaches must be strengthened in ways that are practical and locally applicable. Instead of replacing traditional methods, local and indigenous technologies should be improved, adapted, and modernized to suit current needs, ensuring sustainability and cultural relevance.

Good practices for food systems

Nepal exhibits great diversity in terms of caste, land types, religion, culture, food preparation, food production, and the conservation and utilization of agricultural genetic resources. Below are some best practices of food systems (Figure 1), many of which are highly localized and have played a significant role in securing food and nutrition at the household level. These practices contribute to six Sustainable Development Goals (SDGs): No Poverty, Zero Hunger, Good Health and Well-being, Responsible Consumption and Production, Climate Action, and Life on Land.

Site-specific staple food: Site-specific staple food refers to the main crops-based food traditionally prepared and consumed in a particular geographic region, determined by the area's climate, soil, altitude, culture, and agricultural practices. In Nepal, a country with diverse topography and ethnic groups, staple foods vary significantly from one region to another. These staples are deeply connected to local ecosystems, livelihoods, and cultural identities.

Site-specific staple foods are integral to the food system in Nepal, where a wide variety of foods are available. This system has developed over decades through various exercises and practices. Promoting site-specific foods as staples is crucial for each locality. For instance, the consumption of millet-based foods is a longstanding practice in districts like Humla and Jumla. Site-specific staple foods in Nepal reflect the country's rich cultural and ecological diversity, with each region developing unique food traditions based on locally available resources. These foods are adapted to local climates and terrains — for example, buckwheat-based roti and potato stew are common in high-altitude Himalayan regions where cold-tolerant crops are abundant. In the mid-hills, dhido made from millet or maize is a staple, often paired with locally grown greens and fermented pickles. In contrast, the Tarai region favors rice-based meals like "bhaat-daal-tarkari" (rice-lentil soup-vegetable curry), taking advantage of the fertile plains and warm climate. These regional foods are not only culturally significant but also nutritionally balanced, often combining cereals, legumes, and fermented items that support digestive health. Importantly, site-specific foods are generally more sustainable, as they rely on local ingredients that are well-adapted to the environment, require fewer external inputs, and preserve traditional ecological knowledge.

Promotion and development of site-specific genotypes: This refers to the process of identifying, improving, conserving, and encouraging the use of crop and livestock varieties that are genetically adapted to specific ecological regions or farming conditions within Nepal. Nepal's diverse topography — ranging from lowland Tarai to mid-hill and high Himalayas — creates a wide range of agroecological zones, each with distinct climatic conditions, soil types, altitude, and water availability. To ensure sustainable agricultural productivity and resilience in these varied environments, it is crucial to promote genotypes (varieties or breeds) that are evolved under local conditions.

The promotion and development of site-specific genotypes are crucial aspects of agricultural practices. Farmers have diligently created and preserved various localized landraces of crops, livestock, agro-insects, agro-microbes, aquatic AGRs, and forages. Enhancing the genetic makeup of these localized genotypes can render them more competitive in the agricultural landscape. Site-specific genotypes with a broad genetic base play a pivotal role in sustaining self-sufficient agriculture (Joshi et al. 2023).

Site-specific genotypes are naturally or selectively bred to thrive in local climates, such as drought-tolerant millet varieties in the dry mid-hills, or cold-tolerant barley in high mountain zones. These genotypes are often closely tied to traditional food systems and local diets, preserving culinary heritage and supporting food sovereignty. Promoting local landraces and indigenous breeds helps preserve agrobiodiversity, which is essential for climate resilience, pest resistance, and long-term sustainability. Development of site-specific genotypes often involves community seed banks, on-farm trials, and farmer-led selection, ensuring that varieties meet local preferences and conditions. Because these genotypes are well-suited to local conditions, they often require less water, fertilizer, and pesticide, making farming more sustainable and cost-effective.

Promotion of genetic diversity in the field, market, and kitchen: Many smallholders have upheld a significant level of genetic diversity in their fields. They cultivate and harvest multiple commodities, which they then sell in the market. This preservation of genetic diversity contributes to the sustainability of their food system and enhances resilience to climate change (Joshi et al. 2023).

Circular agriculture (ecological agriculture) based farming system: Circular agriculture, also known as ecological agriculture, represents a farming system where farmers minimize dependency on external service providers, a trend that's steadily rising under linear agriculture. In circular agriculture, many farmers can autonomously manage all inputs and produce diverse crops in small quantities. Integrated farming, utilizing inputs sourced from the same farming areas, and marketing the produce are core features of circular agriculture. This approach enables farmers to reduce farming costs significantly. Furthermore, circular agriculture operates as a nature-positive production system, effectively and efficiently utilizing all available resources. Many farmers, particularly those in remote areas of Nepal, still practice circular agriculture, which fosters self-reliance in agricultural production.

Multi-commodities and multi-household-based business: It refers to a commercial system where multiple farming households within a community each produce a variety of different agricultural products in small quantities, rather than specializing in a single crop or product. Together, these households create a diverse and complementary local agricultural economy.

In many farming communities, the majority of farmers have limited yet diverse farming areas eg upland, low land, dry land, shady area, water log area, etc. Consequently, they cultivate multiple agricultural genetic resources (AGRs), albeit in small quantities. By aggregating these small amounts of various AGRs from numerous households, a substantial volume is generated, facilitating easier marketing. Rather than pursuing monoculture over vast expanses of land, a traditional approach involving multi-commodities and multi-household-based food systems proves sustainable and nature-positive. In Nepal, numerous villages exemplify this practice, where each household cultivates different landraces of the same crops within small areas. For instance, various varieties of broadleaf mustard are grown, and the collective harvest from these households forms a marketable product in large volumes. This multi-commodities approach helps reduce risks, support nutrition, strengthen local economies, and enhance resilience.

Collection center and agriculture fair: Emphasizing marketing for all produce holds greater significance than solely focusing on enhancing and expanding the formal seed system and other inputs. To ensure the value of each agricultural item, the establishment of collection centers and agriculture fairs plays a pivotal role. These platforms serve to directly connect primary producers with primary consumers, fostering mutual benefits for both parties. In Nepal, numerous collection centers are strategically positioned across various locations to promote multi-household-based businesses, while open farmers' markets, known as "hatbazar", facilitate the sale of products from each household. There are now many hatbazar and collection centers across the country. Additionally, community seed banks serve the dual purpose of conserving and marketing native seeds. Furthermore, relevant stakeholders regularly organize agricultural fairs, including diversity fairs, and food fairs, which contribute to promoting, understanding, and exchanging seeds and products to enhance diversity in agricultural practices.

Product diversification and value addition: Product diversification and value addition are essential strategies for changing food habits and promoting local foods, especially among younger generations and people from different regions. Many traditional foods may not appeal to these demographics, necessitating the introduction of new products based on local produce. For instance, in Humla, farmers initially showed little interest in growing proso millet due to difficulties in threshing and the perceived lack of taste in the food (Parajuli et al 2016). To address this issue, the Nepal Genebank implemented various action research initiatives and provided training on diversifying proso millet production (Gauchan et al. 2020). As a result, farmers can now prepare 12 different food items from proso millet, leading to an increase in the cultivation areas of this crop. Similar success stories exist across the country, highlighting the effectiveness of product diversification and value addition in promoting local foods (Gauchan et al. 2020, Shrestha and Joshi 2023).

Incentives and market guarantee: The current incentive mechanisms (subsidies, training, exposure visits, tools, and other input support) in the food system predominantly favor a select few commodities and farmers, overlooking the value and contribution of native and informal systems (Gauchan et al. 2020). Rather than providing incentives to only formal seed/ food systems, recognizing and incentivizing informal seed/food systems can significantly enhance the production volume of nutrient-dense foods. The introduction of policies supporting native landraces has helped provide incentives for preserving broad genetic base landraces. Based on field observations and news, it is observed that many farmers have encountered losses in agricultural produce, prompting the implementation of market guarantee provisions for all types and quantities of agricultural products in certain areas. Some municipalities have taken steps to ensure irrigation and market access for native products, while certain local governments offer incentives for local food and seed systems. These initiatives reflect efforts to elevate the status and support the resilience of indigenous and informal food systems.

Region and season-based production and consumption system: Implementing a region and season-based production and consumption system has proven highly beneficial for producing quality, healthy, and nutritious products (FAO 2020, Johnston 2014). This self-sustainable production system prioritizes production over expanding the formal seed system, which has historically focused solely on the seed sector, leading to the widespread expansion of only a few crop varieties. This formal seed system-based monoculture increases dependency and the risk of crop production failure. Region and season-based production systems ensure timely crop harvest, minimize environmental shocks, and enhance ecological services (Altieri and Nicholls 2017**,** Pretty et al. 2018). Examples such as Rato Kodo (a finger millet landrace) in Jumla, Dudhe Chino (a proso millet landrace) in Humla, and Bariyo Kaguno (a foxtail millet landrace) in Lamjung perform exceptionally well in their respective localities and normal growing seasons (Gauchan et al. 2020).

Region- and season-based production systems in Nepal align agricultural practices with local climates, altitudes, and seasonal patterns, allowing farmers to plant and harvest crops at optimal times. This approach helps reduce crop failure due to unexpected weather events, conserves natural resources, and enhances ecological services such as soil fertility, water use efficiency, and biodiversity. By tailoring production to specific regional and seasonal conditions, these systems promote sustainable, resilient, and efficient agriculture across Nepal's diverse agroecological zones (Gauchan et al. 2020, Parajuli et al. 2016, Shrestha and Joshi 2023).

Himalayan superfoods: The Nepal Himalayas harbor numerous nutritionally dense crop landraces. This region boasts an environmentally clean (i.e. a natural, unpolluted environment with minimal contamination from industrial activities, synthetic chemicals, or environmental degradation) where farmers practice organic farming, resulting in the production of healthy and nutritious products. Despite their nutritional density, many of these landraces have been neglected and underutilized. However, there is a growing popularity of such neglected species, including proso millet, foxtail millet, amaranth, etc., in many areas. This surge in popularity can be attributed to the recognition of these crops as superfoods, with native landraces outperforming exotic ones in terms of both nutrition and taste (Joshi et al. 2020a).

Foxtail millet, commonly known as small millet, is a traditional staple food crop consumed in high-altitude, drier mountain regions. It is non-glutinous and non-acid-generating, and regular consumption is believed to lead to a significant decrease in blood glucose levels. It is considered a useful food for managing and preventing diabetes.

Proso millet, locally known as Chino, has the lowest water requirement among cereals, making it an incredibly climate-resilient crop. Its grains are packed with essential nutrients, providing about 350 calories per 100 grams. It is gluten-free and contains a variety of essential minerals, particularly potassium, which contributes to nervous system health. It serves as a substitute for rice in mountain regions.

Amaranth is a nutritious grain commonly consumed in high mountain communities. It is also known for its iron-rich leafy greens. Amaranth is gluten-free and is a great source of protein and manganese, essential for healthy bones. It is also a significant source of essential amino acids like lysine, which are rare in plant sources. Culturally, it holds importance in western Nepal.

Foods as medicine: The concept of "food as medicine" means using foods to prevent, manage, or treat health conditions. A balanced diet rich in whole grains, fruits, vegetables, legumes, healthy fats, and lean proteins can help reduce the risk of chronic diseases such as diabetes, heart disease, and obesity. Traditional foods, herbs, and fermented products also support gut health and immunity. In traditional practices, various agricultural products have been valued not just as food, but also for their medicinal properties (Manandhar 2002, Kunwar et al. 2006). For example, turmeric has been used for its anti-inflammatory effects, ginger for digestion and nausea, and garlic for boosting immunity and heart health. Grains like millet and buckwheat are often used to support digestion and manage blood sugar, while fermented foods like gundruk (fermented leafy greens in Nepal) are known to enhance gut health. These practices reflect a deep understanding of how food and health are interconnected, forming the basis of the traditional belief in "food as medicine."

Rather than relying solely on pharmaceuticals, this approach emphasizes food choices as a foundation for long-term health and well-being. Nepal boasts a rich tradition of Ayurveda, a holistic system that emphasizes improving health through the use of agricultural products. In this context, the food system should prioritize producing healthy, nutrient-dense, and nature-positive foods. Many consumers are now adopting various food systems to address or improve health problems, viewing food as medicine. This approach not only promotes health but also helps reduce food waste. For instance, millets are considered positive and neutral grains with nutraceutical values (Bellad and Belavadi 2023, Gahalawat et al. 2024). Examples include foxtail millet, little millet, browntop millet, and barnyard millet. These grains are gluten-free, lectin-free, and rich in numerous micronutrients, antioxidants, and phytochemicals (Sujith et al. 2023, Vali 2019). Regular consumption of millet has been associated with the alleviation of various diseases, including diabetes and high blood pressure (Vali 2019). Therefore, incorporating these nutrient-rich grains into the diet can contribute to overall health and well-being (WHO 2003).

Strengthening capacity and understanding food system: Strengthening capacity and enhancing understanding of the food system is essential, particularly in recognizing, exploring, and valuing the importance of localized genetic diversity-based food systems. These localized genetic resources play a significant role not only in enhancing the food system but also in restoring ecosystems. Increasing awareness of the value of these resources is crucial for boosting the overall food system. Improving understanding of sustainable food systems is essential for all consumers. Food system dialogues play a vital role in raising awareness about these issues (FAO et al. 2021, NPC 2021). Moreover, enhancing the capacity of local farming communities has greatly contributed to the conservation and utilization of native agricultural genetic resources (AGRs) and traditional knowledge. This capacity-building effort also promotes food traditions across the country, contributing to the preservation and enhancement of cultural heritage.

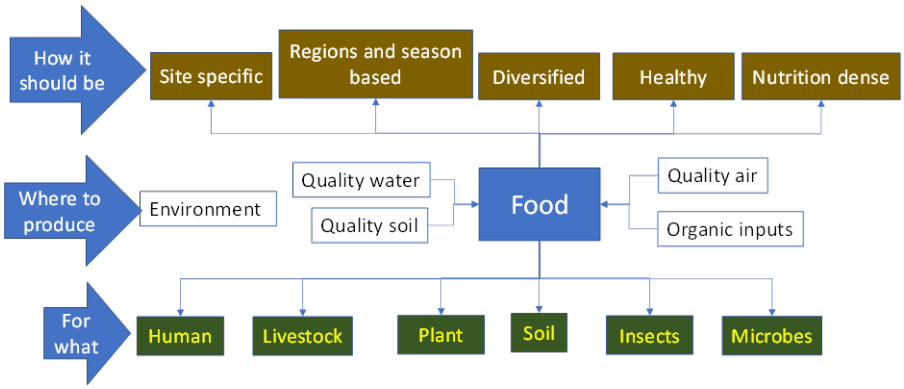

Figure 1. Sustainable and healthy food and agro-ecosystem

Ways forward

Agriculture is a broad and interconnected sector that includes the food system as a core component. Beyond producing food, it also involves the cultivation of raw materials for industry, housing, clothing, and environmental improvement. Agriculture encompasses traditional knowledge, cultural practices, and the management of plants, animals, agro-insects, agro-microbes, and biodiversity — all of which contribute to livelihoods, sustainability, and ecosystem health. The concept of a food system extends beyond merely nourishing humans; it encompasses a holistic approach that considers the well-being of plants, insects, animals, microbes, and the environment as a whole, including air, water, and soil. To enhance food systems, it is imperative to promote and preserve native agricultural genetic resources and traditional practices while embracing circular agriculture.

Diversifying native products and food recipes is crucial to attracting consumers, especially the younger generation, who may be more inclined towards modernized food choices. For example, the revitalization of traditional dishes like buckwheat pancakes or amaranth porridge, millet-based cookies, and biscuits can reintroduce these nutrient-rich foods into contemporary diets. Adopting an integrated farming approach, which incorporates diverse populations of agricultural genetic resources, ensures balanced ecological services and resilience to regional and seasonal variations. These integrated systems enhance soil fertility, reduce pest pressure, and improve overall farm productivity and sustainability.

Furthermore, promoting urban agriculture can yield multiple benefits, including environmental improvement, waste management, and contributing to food, nutrition, and health security. It reduces the distance food travels from farm to plate, cutting greenhouse gas emissions and ensuring fresher, more nutritious produce. Urban farming also helps improve food security, especially in low-income communities, by increasing access to healthy food. Additionally, it supports circular practices like composting and water recycling, creates green spaces, and strengthens community engagement. As a result, urban agriculture contributes to building more resilient, inclusive, and sustainable food systems. By preserving genetic diversity, embracing traditional practices, and adopting innovative approaches like circular agriculture and urban farming, we can build more resilient and equitable food systems for the future.

Conclusion

Transforming the current food system in Nepal to align with the Sustainable Development Goals (SDGs) is imperative. While various initiatives for food system transformations have been launched, achieving food and nutrition security remains a formidable challenge. The primary obstacle to this goal lies in the unprofitable nature of current farming practices, underscoring the need for profitable and sustainable agricultural systems. Promoting, enhancing, and diversifying location-specific practices within and among countries is essential. Agroecology-based integrated farming emerges as the optimal approach for transforming the food system, as it involves the development of specific genotypes and site-specific food recipes based on all six components of agrobiodiversity (ie, crops, forages, livestock, agro-insects, agro-microbes, and aquatic agricultural genetic resources). Additionally, product diversification should be tailored to specific locations to facilitate changes in current food habits. The most effective practice for transforming the food system is one that prioritizes food, nutrition, health, business, and environmental security through the preservation and utilization of native agrobiodiversity.

Conflict of interest declaration

Declare none.

Declaration on the use of generative AI tools

Nothing to declare.

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