Ethics and Value Chain in Agricultural and Food Science

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Abstract:

Ethics and value chain management in agricultural and food science play a critical role in ensuring sustainability, fairness, and integrity across all stages of food production and distribution. Ethical considerations guide responsible farming practices, animal welfare, environmental conservation, and the equitable treatment of stakeholders. The agricultural value chain—from input supply, cultivation, processing, storage, and transportation to retail and consumption—requires transparency, accountability, and social responsibility to build consumer trust and promote food safety. Integrating ethical principles within the value chain enhances traceability, reduces food fraud, minimizes waste, and supports fair trade. Ultimately, applying ethics to agricultural and food systems strengthens global food security, economic stability, and the long-term well-being of producers, consumers, and the environment.

Keywords: Ethical Practices, Agricultural Value Chain, Sustainability, Food Safety and Transparency.

Introduction:

The impact of agriculture and agricultural products on human life is universal and vast. Thomas Jefferson once said, ―Cultivators of the earth are the most valuable citizens. Ethical issues in the field of agriculture have gained prominence in recent decades due to the fact that agriculture is characterized by practices that involve both social and ecological systems (Sadiku et al., 2022). Agriculture is confronted with huge problems such as hunger, climate change, ethical issues, food insecurity, which is associated with undernutrition, and overnutrition such as obesity. The term ―ethics‖ can be a source of confusion. The word refers to codes or norms for human conduct (Rao, 2021). Ethics provide guidelines that help one decide what is the right thing to do. Ethical arguments often center on ―harms, but ethical theorists differ about what is considered harm. The concept of value chain (VC) refers to the full range of activities that are required to bring a product from conception, through the different phases of production, to its delivery to final consumers, and disposal after use (Bonfim et al., 2019; Kaplinsky, 2000; Kaplinsky and Morris, 2001; DFID, 2008). The agronomic and ecological fields that receive the greatest attention from researchers comprise the techno-scientific dimension, which focuses on ecological approaches to agriculture at the plot or farm scale; the aim within this component

of agroecology is typically to minimize the environmental damage from agriculture and leverage biological interactions for food production and the long-term resilience of the food system (Kerr et al., 2022). Common agroecological practices include mulching, crop livestock integration, agroforestry, composting, and intercropping (Wezel and Silva, 2017). agroecology addresses questions of equity and social justice in food systems, supporting greater autonomy and well-being for food producers, fostering meaningful, dignified forms of food systems work, and reshaping ways of interacting with nonhuman species and natural spaces (Dumont et al., 2016; Rossett et al., 2019; Barrios et al., 2020; Wezel et al., 2020). Farmers have to pay close attention to the processes occurring within agroecosystems, work with a diverse range of crops and animals, and constantly observe and learn new skills due to the knowledge intensive nature of agroecology. The food sector—one of the largest sectors in world economies—encompasses a complex network of activities related to the supply, consumption, and catering of food services (Femi-Oladunni, 2022). People make decisions based on a complex interaction of, among other variables, values, personal identities, beliefs, social norms, traditions, emotional state, and environmental pressures. In this vein, the concept of food values, first proposed by Lusk and Briggeman (2009). Today, agricultural scientists are conducting cutting-edge research guided by goals well beyond increasing production.

Ethics in Agriculture:

Ethics may be regarded as the principles that guide our behavior toward making the best choices (Sadiku et al., 2022). The causes of agricultural ethics are multifaceted and complex, which are due to many factors, ethics in agriculture is just as important as ethics in personal life. The Food and Agriculture Organization (FAO) of the United Nations recognizes that there is no single set of ethical principles sufficient for building a more equitable and ethical food and agricultural system is shown in figure 1. However, it recommends the following actions that individuals, states, corporations, and voluntary organizations in the international community can take. Ethical agricultural practices promote conservation of natural resources, soil health, and biodiversity. The benefits are the reduction of environmental degradation, encourages sustainable land use, reduces pollution, and mitigates climate change (Thompson, 2010; Beckford, 1977). The responsibility of production of "safe food" not rests with farmer alone. Thus, to achieve a safe food production through better ethical practices involve a multi-stakeholder responsibility. At farm level, the farmers own the responsibility to produce safe food for the society where ethics is involved by not applying hazardous chemicals, safeguarding the soil health, ground water exploitation etc. If the agricultural commodities involve processing, the processor has to ensure safety measures in terms of non-adulteration, good quality raw material usage etc.

Figure 1: Sustainable Development Goals

Facts about the impacts and historical aspects of agriculture and food science:

Agriculture is the mainstay of Indian economy because of its share in employment and livelihood creation, not withstanding, its reduced contribution to the nation's Gross Domestic Product. The agricultural sector acts as a bulwark in maintain food security and in the process, national security as well. Recognizing the crucial role played by the agricultural sector in enabling the widest dispersal of economic benefits, the tenth plan emphasized that agricultural development is central to rapid economic development of the country (Adekunte et al., 2025). Preservation of food products has a prolonged history in human civilization. Because of the plentiful availability of food from natural resources in ancient times and also due to hunting and wandering habits of man, no major problems were faced by mankind in terms of food security till recent times. Ultimately agri and horticultures became major commercial ventures of critical socio-economic importance to each country.

Quantitative harvest Losses:

The post-harvest losses are quite huge. According to a report on "Assessment of Quantitative Harvest and Post-harvest Losses of Major Crops and Commodities in India" by CIPHET the wastage is almost INR 920 billion (USD 13 billion) per annum. Such losses have implications for other associated losses (Sundarraj, 2025).

Importance of values in agricultural sectors:

Values are essential in all walks of life irrespective of the profession and position in the hierarchy. "These values communicate 'what we stand for 'and 'what is important to us'…values are the soul of the organization" (Hitt, 1988). Although some of the old Agricultural Extension textbooks (Reddy, 1971) mention some of these values as commandments for extension professionals, these are either ignored or not given the prominence they deserve.

Value Chain in Agricultural Sector:

Value Chains Analysis has been applied for the most part in developing countries (Trienekens, 2011) and is the driver of the new strategy of public and international agencies to conduct their projects and development programs addressing the private sector (Pietrobelli and Staritz, 2013; Simatupang *et al*.,2017). However, it is necessary for environmental analysis that, beyond evaluating the impact of VC activities and methods, also includes valuing farmers´ available environmental assets. VC study, its theory, analysis, and methodologies, are rooted in two concepts, the francophone concept of filiere, and the anglophone concept of commodity chain (Raikes *et al*., 2000). The filiere arose during the 1960s, developed by the French National Institute for Agricultural Research and the French Agricultural Research Centre for International Development. It was first applied in studies about contract farming and vertical integration in French agriculture, and second to the linkage between the French state and France's former colonies through traditional commodities such as cocoa, coffee, rubber, and also to the agricultural development policies for these ex-colonies (Raikes *et al*.,2000; Fabe *et al*.,2009; Drost *et al*.,2010; Bellu, 2013). The focus will remain on the agricultural sector mainly for two reasons. First, it is the most efficient sector for poverty mitigation (Webber and Labaste, 2010; Deutsch Bank, 2014), and second, is often the dominant sector in DC (Trienekens, 2011). It is therefore expectable that VCA will continue to rise in coming years, as in the cases of "Model for Sustainability Smallholder Inclusion in High- Value-Agro-food Chains" and "Value Chains Analysis for Development" (Gibbon *et al*., 2008).

Management of Non-agricultural environments:

Foragers maintain resources by intentional sowing of wild seeds, irrigation of stands of grasses (Bharucha and Pretty, 2010), burning to stimulate plant growth, selective culling of game animals and fish, replanting of portions of roots, enrichment planting of trees and extraction of only parts of honeycombs so that sites are not deserted by bees (Steward 1938; Lawton et al., 1976; Woodburn, 1980; Kelly, 1995). Farmers also widely transplant species from the wild. In northern Nigeria, they plant Hibiscus on field boundaries; in South Africa, wild fruit trees and edible herbs are grown on farms; and in northeastern Thailand, a quarter of all the 159 wild food species gathered from field boundaries, irrigation canals, swamps and roadsides are transplanted and propagated by rice farmers (Price 1997; High & Shackleton 2000; Harris & Mohammed 2003). Burning is a widespread management practice. Australian Aborigines call it 'firestick farming', and used fire to make the 'country happy', to keep it 'clean' (Bird Rose 1996).

Ethics in Food Science:

Food science and technology can help in addressing these issues by improving food production techniques, the addition of novel ingredients derived from sustainable sources, and development of new and acceptable food products (Qadri et al., 2024; Westlake et al., 2022). Food ethics deals with the production, processing, distribution and consumption of food, and addresses the practices in the food system with humanity's accumulated standards and procedures for right conduct, social justice and sustainability (Thompson, 2016). The World

Health Organization defines food additives as "the substances that are added to food to maintain or improve the safety, freshness, taste, texture, or appearance of food". The application of nanotechnology in the food industry has made it imperative to analyze this development from an ethical perspective in order to ensure public acceptance. Imran and colleagues (2010) listed several ethical concerns related to the rise of active and smart food packaging.

History in Food Science:

As humans became more energy-demanding, thermal processing became increasingly important (Truninger, 2013). There is evidence of opportunistic fire from 1.8 million years ago in Africa and Eastern Asia, albeit interpretations of the excavations are controversial (Huebbe and Rimbach, 2020). Traditions to ferment food, bread, and cheese evolved along with grain cultivation and early milk production. There is archaeological evidence that beer brewing and bread making began approximately 14,000 years ago, while cheese making began approximately 8000 years ago in Europe. In 1810, Nicholas Appert invented canning, becoming a major advance in food science (Misra et al., 2016). Napoleon Bonaparte found a need for thermally preserved food for his soldiers during lengthy sea voyages. He offered a reward to any scientist who could come up with a food preservation method. Leistner introduced the hurdle concept in the literature, and the same author published the hurdle technology in 1985.

Value Chain in Food Science Sector:

According to this view, consumers base their product choices on a set of inferred food values, which often encompasses numerous physical attributes simultaneously, such as naturalness, taste, price, safety, convenience, nutrition, origin, fairness, tradition, appearance, and environmental impact. Their framework sorted values into four types: product values (values such as safety, nutrition, price, convenience, taste, texture, and other sensory properties of the product), process values (consumers' interest in the practices and processes of the food production, such as environmental impact and naturalness), location values (the location where the food is being purchased) and emotional values (feel-good factors such as experience, novelty, etc.). Among the review papers, Martinez-Ruiz and Gomez-Canto (2016) analyzed the most important external influences that consumers may encounter in food shopping environments. In general, it was observed that fast food consumers assigned more importance to the hedonic than to the utilitarian benefits of food (Perez-Villarreal et al., 2019; Perez-Villarreal et al., 2020). There is a study that explains how food values and other variables related to dietary acculturation influence purchasing decisions of foreign students in Spanish universities (Tirelli et al., 2013). In another study focused on the Czech Republic, consumers were revealed to devote more attention to the nutritional value and the composition, as well as the food's origin (Jezovicova et al., 2017). In Thailand, the most influential food values were nutrition, assurance, storytelling, and taste, in that order (Tohtubtiang, 2017). Finally, in a comparative study of imported fruit preferences between Japan, Taiwan, and Indonesia, food safety certification and freshness appeared to be the first and second most important food values for the majority of those consumers (Yang et al., 2021). To conclude, in a case study

focused on the contingent of Australia (Oceania), the authors showed that university students treated taste, cost, and convenience as the greatest determinants of food choice (Tam et al., 2017) is shown in figure 2.

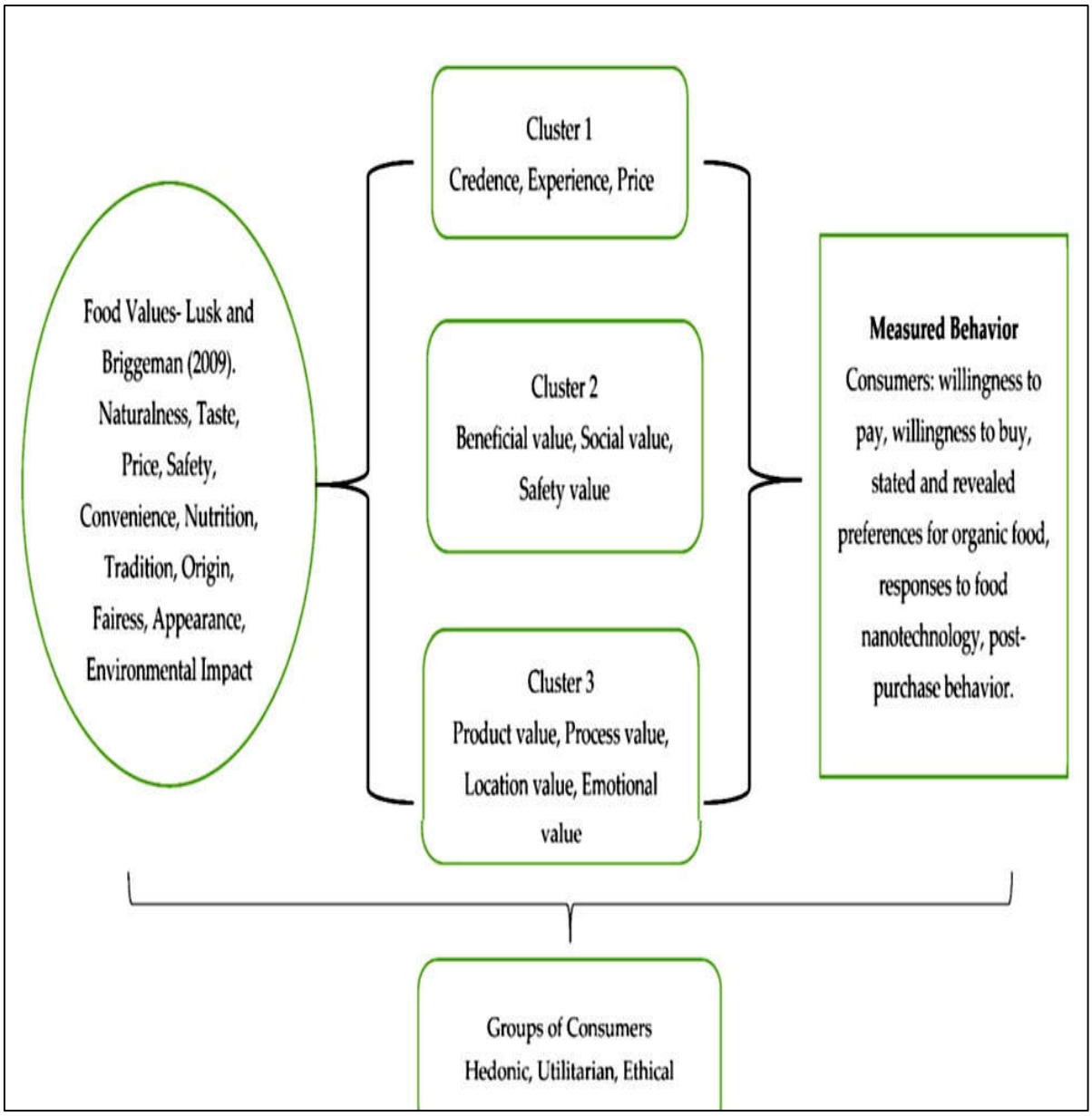

Figure 2: Food Value Clusters and Measured Behavior (Kerr et al. 2022).
(Notes: Cluster 1- Credence, Experience, Price (Bazzani et al., 2018); Cluster 2—Beneficial value, Social value, Safety value (Suzuki et al., 2019); Cluster 3—Product Value, Process Value, Location Value, Emotional Value (Dagevos, 2013). Consumer Groups: Hedonic Values, Utilitarian Values, Ethical Values (Izquierdo-Yusa et al., 2019).

Conclusion:

Value chain analysis is also more updated, because first, it encompasses the life-cycle assessment in its own structure to conduct a quantitative analysis of environmental impacts of VC activities, and second, its framework due to its strong sustainability component providing a social and socioeconomic analysis around the VC. Livelihood impacts in urban agroecology initiatives, the role of youth, and the connections with urban consumers is another gap. As

emergent topics related to the more recent development of feminist agroecology, the impacts of agroecological approaches on the care economy and gender power dynamics will be critical to assess in order to realize a more just and equitable food system. Seeking to synthesize the evolution of this concept, the present article reviewed existing evidence about the influence of food values on consumers' food buying behavior. Researchers have also examined consumer behavior across different markets and different food types while controlling for the effects of disasters or pandemics. However, the focus on the contribution of agriculture to total food security has resulted in the routine undervaluation of wild food species. The continued contribution of wild species to food and nutritional security is threatened by some of the processes that seek to increase agricultural production and enhance economic development. We may perhaps say that we must strive for a substantial change in our value orientations and lifestyles if we want people in the future to have the chance to live their lives with dignity, quality and creativity. We are still 'hungry' for a higher material standard of living. The FAO recognizes that 'nutrition and biodiversity converge to a common path leading to food security and sustainable development' and that 'wild species and intraspecies biodiversity have key roles in global nutrition security. As the history of agriculture and food science illustrates, this field is unique as it often applies modern scientific methods to help meet the needs and goals of the larger community of farmers, citizens, and consumers.

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