INITIATIVE ON Nature-Positive Solutions

The true costs of food production in Kenya

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Key takeaways

- True cost accounting allows for the measurement of hidden impacts of food production on the environment, human health, and society.
- Our findings show that at the national level for all crop sectors:
  - Social costs account for 90% and environmental for 10% of external cost structure.
  - Major social cost sources are underpayment, child labor, and occupational health risks.
  - Major environmental cost sources are land-use expansion and climate change.
- Findings at farm level in NATURE+ Initiative sites in Kajiado, Kisumu, and Vihiga, for the crop sector show that:
  - Direct costs (70% of true costs) are predominantly hired labor and seed costs
  - External costs represent about 30% of the true costs
  - Social externalities costs (84%) are greater than environmental costs (16%)
  - Forced labor is the most important impact, followed by child labor, underpayment, and gender wage gaps
  - Environmental externalities include land occupation (land use) and soil degradation

Introduction

The 2021 United Nations Food Systems Summit (UNFSS) formally recognized nature-positive production as one of five critical pathways to sustainable food systems. Based on this, CGIAR launched the Nature-Positive Solutions Initiative (NATURE+) to re-imagine, co-create, and implement nature-positive solutions-based agrifood systems that equitably support local food and livelihoods, while simultaneously ensuring that agriculture is a net positive contributor to nature.

In Kenya, food systems transformation has been firmly placed on the national agenda since the 2021 UNFSS. As part of the UNFSS, Kenya developed four pathways to sustainable food systems: youth participation in agriculture, digital innovation, diversification of diets, and gender promotion through enhanced participation of women in food systems[1]. The pathways were developed after public 'dialogues' which brought together "a diversity of stakeholders, including voices that are seldom heard (…) to debate, collaborate, and take action towards a better future."[2] However, the dialogues and pathways were criticized by civil society organizations and farmer groups for not considering nature-positive solutions such as agroecology for transforming food systems. Nevertheless, the 2021 National Agricultural Policy[3] identified agroecology as one of the approaches to dealing with climate change. Spurred by these developments, the Intersectoral Forum on Agrobiodiversity and Agroecology (ISFAA), in collaboration with the Ministry of Agriculture, embarked on the development of the National Agroecology Strategy for Food Systems Transformation (NAES-FST) which underwent public consultations in December 2023 and was validated in July 2024. Initially dubbed the National Agroecology Strategy, the extended name "for Food Systems Transformation" was suggested by the Agriculture Sector Working Group which approves such strategies. Counties such as Muranga and Vihiga have shown leadership and enthusiasm to transform food systems through nature-positive solutions by developing agroecology policies and legislations even in the absence of a national strategy.

Nature-positive practices were included in the County Integrated Development Plans (CIDP) for Vihiga and Kisumu, two counties where NATURE+ is active. Vihiga County formed a core committee from Agriculture, Environment, and Health Departments to drive the development of a multisectoral agroecology policy, to be hosted by Agriculture but with strong ties to Environment and Health and with inputs from other departments such as education and trade. The Kisumu CIDP has also included key elements of nature-positive, including community seed banking as a scalable aspect of sustainable food systems.

Part of sustainable food systems is factoring in the true cost of food.[4] NATURE+ used true cost accounting (TCA) to understand true costs of food production in two of their focal countries, Kenya and Viet Nam. TCA is the systematic measurement and valuation of environmental, social, health, and economic costs to facilitate sustainable choices by governments and food system stakeholders (Baker et al. 2020; von Braun and Hendricks, 2023). It is grounded in *The Economics of Ecosystems and Biodiversity* (TEEB) agrifood evaluation framework, which accounts for costs and benefits (or externalities) generated in the use of natural, human, and social capital (TEEB 2018). The study aimed to answer three questions. First, what is the true cost of food production systems when considering externalities related to social and environmental costs in Kenya and Viet Nam? Second, what is the cost structure by externality type (i.e., social or environmental) and associated factors, and how does this differ by country? Finally, what policy and investment recommendations can inform decisions aimed at minimizing such external costs and promoting a more environmentally sustainable and socially equitable food system? By identifying and quantifying these hidden costs, governments and other decision makers can better consider tradeoffs and policies. This brief presents results and implications for Kenya.

True Cost Accounting

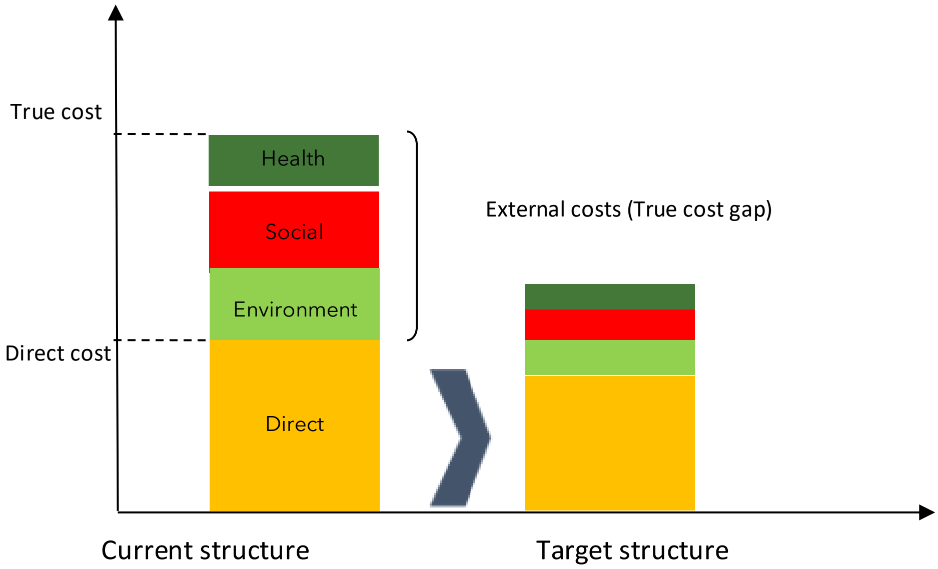
Figure 1 illustrates a hypothetical food system structure, showcasing the incorporation of external costs (externalities) atop direct production costs (e.g. inputs, labor). The externalities, consisting of environmental, social, and health costs, are defined as effects not reflected in the market prices of goods or services.

The TCA methodology links four types of capital involved in the production system: natural, human, social, and produced. The first three capitals are at the core of the TCA framework, containing food system's essential externalities. The fourth one, produced capital, corresponds to the direct production costs already incorporated by current accounting standards quantified in monetary units and reflected in the product's market price. The analysis in this study is focused only on the external costs related to the first three capitals (TCA Handbook 2022). We do not cover human health costs due to lack of comprehensive health-related data and the associated difficulty in collecting such data through household-level surveys. Each externality type has different indicators that are monetized to show the impact. *Environmental* externalities are related to climate change, air/water/soil pollution, land occupation and transformation, soil degradation, scarce water use, fossil fuel and other non-renewables depletion. *Social* externalities are related to underpayment of wages, low wages, gender wage gaps,

[1] See https://summitdialogues.org/wp-content/uploads/2021/09/Kenya-FSS-Dialogue-Series-National-Position-Paper.pdf
[2] https://www.un.org/en/food-systems-summit/dialogues
[3] Agricultural Policy – 2021. Ministry of Agriculture, Livestock, Fisheries, and Cooperatives.
[4] Hendricks et al. 2021. The True Cost and True Price of Food. United Nations Food Systems Summit 2021.

child labor, forced labor, excessive workload, and occupational health and safety. Further details on the TCA methodology applied in this study can be found in Benfica (2024) and Benfica et al. (2024).

Figure 1. The True Costs of Food



Source: Adapted from Impact Institute/True Price (2021).

Data Sources

The true cost estimates were computed separately at two levels, national and county level. Data were collected through (a) a smallholder household-level survey at county level, (b) a worker-level survey at county level, and (c) national-level data from the Global Impact Database (GID)[5]. The household survey was administered to 1,102 randomly sampled households in three NATURE+ sites in Kajiado, Kisumu, and Vihiga counties between May and July 2023.

A worker-level survey covered aspects related to indirect social costs associated with the work environment of farm laborers. The sample was drawn through a non-probabilistic procedure using snowball sampling where workers were identified and recruited by exploiting the data collected in the household survey. The worker-level survey covered 1,056 farm workers in Kenya.

Findings

National-level analysis

We first look at the national level, focusing on crop sectors using the GID data. Total externalities here represent 27% of the total value of crop output. At 90%, social externalities dominate the total externalities (Table 1). Major sources for the externalities are underpayment, child labor, and occupational health (social); and land occupation/use and air pollution (environmental). Typically, health impacts increase the external costs considerably, but as mentioned we did not collect these data.

[5] The GID is a standardized compilation produced by the Impact Institute to provide impact data to scale up impact measurement. The data are quantitative and monetized, and include value chain impacts (economic, social, and environmental), at individual nodes, as well as a whole value chain. The data are compiled from different sources, such as global scientific databases, impact literature, trade, and Environmental, Social, and Governance (ESG) data. See https://hdl.handle.net/10568/148762 for more information.

Table 1. Key findings from the GID analysis, crop sectors

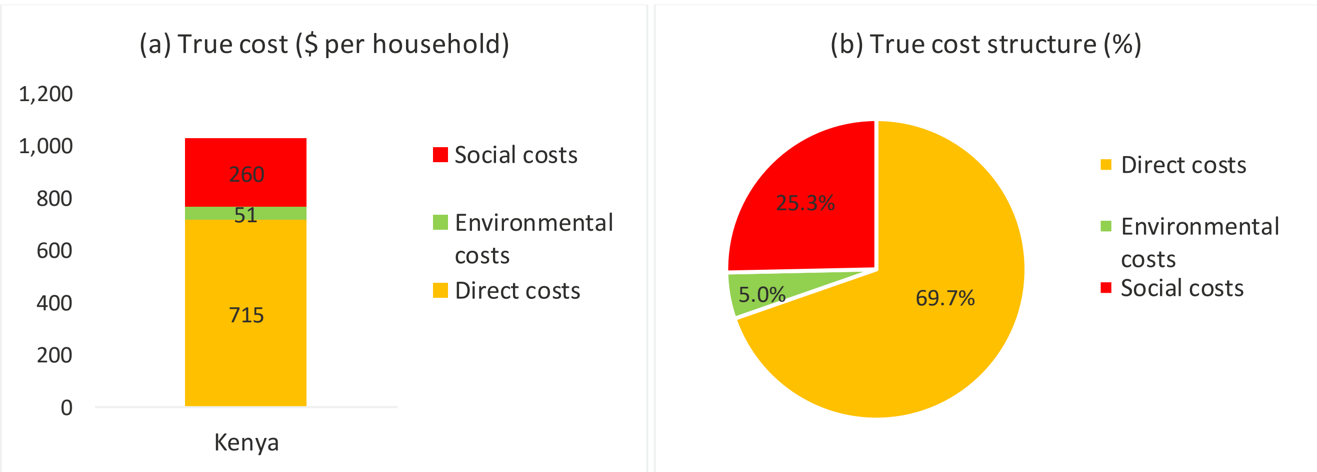
Indicator	
External cost to output ratio (%)	27
Highest external cost by crop sectors (ranked highest to lowest)	1. Non-rice/non-wheat cereals and grains (e.g., maize) 2. Vegetables, fruits, nuts 3. Other crops (e.g., beans) 4. Oilseeds 5. Sugar cane, sugar beet 6. Paddy rice 7. Wheat
External cost structure (%)	
Environmental	10
Social	90
Major externality impact source*	1. Underpayment (S) 2. Child labor (S) 3. Land occupation (E) 4. Workplace (occupational) health (S) 5. Air pollution (E)

*Source: Authors' own calculation using the Global Impact Database (GID). Notes: * E=Environmental impact, S=Social impact.*

Farm-level analysis

We now move to the farm level analysis at the NATURE+ implementation sites in Kajiado, Kisumu, and Vihiga counties. For this analysis we use the $ sign to indicate Purchasing Power Parity dollars[6] (PPP). Figure 2 shows the structure in (a) $ value and (b) percentage distribution of true costs in Kenya. The true cost of crop production is estimated at $1,026 per household per year, which is the sum of the direct production cost at $715 per household and the external costs estimated at $311 per household (of which about $260 are derived from social externalities and $51 from environmental). The external costs are also called the *true cost gap* that in this case represents 30% of the true cost. The breakdown of externalities indicates that social costs (25% of true cost, and 84% of the external costs) dominate environmental impacts (only 5% of the true costs or 16% of the external costs).

Figure 2. True costs of food production in NATURE+ sites

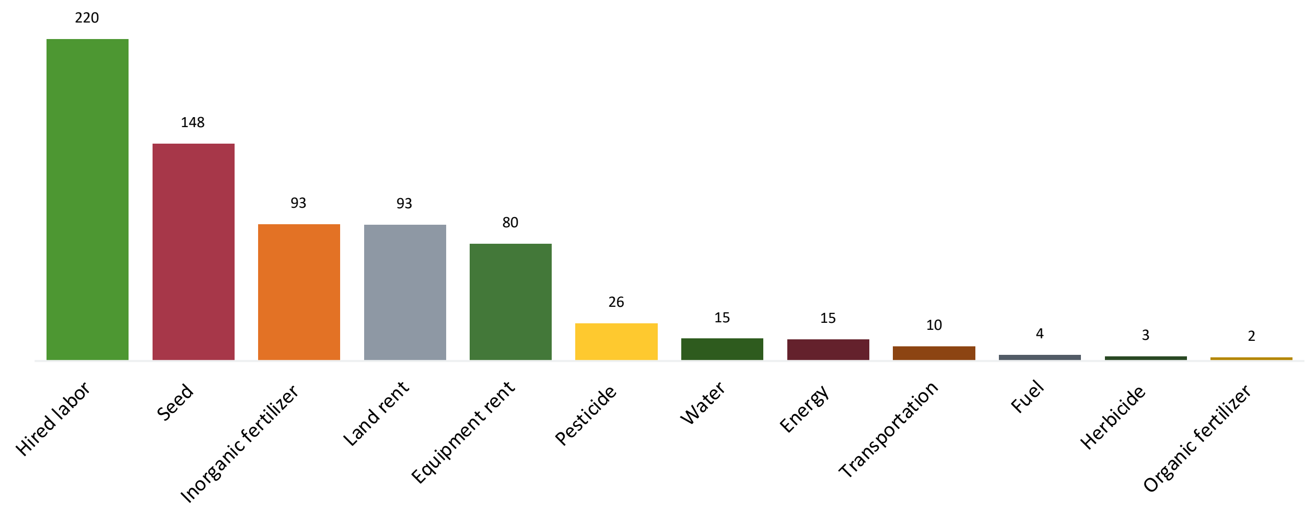


Source: Authors' own calculation using NATURE+ household and workers surveys, and monetization factors.

[6] Purchasing power parity (PPP) is a metric used to compare economic productivity and standards of living between countries. PPP compares different countries' currencies through a "basket of goods" approach. PPP is the exchange rate at which one country's currency would be converted into another to purchase the same amounts of a large group of products.

Figure 3 shows the direct costs of crop production, estimated at $715. This direct production cost equals 62% of gross crop income. The highest direct cost is attributed to hired labor.[7] Seed costs also contribute substantially, becoming the second highest direct production cost in farming practices. Inorganic fertilizer, land rental, and equipment rental costs follow closely, underscoring the reliance on external inputs for soil enrichment and mechanized farming operations. The cost of energy, pesticide, and water are comparatively lower.

Figure 3. Direct costs of crop production ($ per household)



Source: Authors' own calculation using NATURE+ Kenya household surveys. N=1,102. All the indicators are measured at the household level.

We now turn attention to the relative magnitude of the external impacts for the environmental and social externalities. Figure 4 shows the structure and ranking of the external costs and Box 1 defines the impacts.

Box 1. Definition of impact categories

Land occupation relates to occupation of lands resulting in loss and forgone biodiversity and value of ecosystem services.

Soil degradation relates to consequences of erosion and widespread use of chemical inputs.

Contributions to climate change relate to emissions driven by intensive crop and livestock production, including the use of chemical inputs, etc.

Forced labor, working against one's will, is driven by factors ranging from less severe financial coercion, including debts to employers and back wages to more severe forms of physical coercion that lead to individuals working against their free will outside normal hours or without being paid.

Underpayment/Insufficient income is associated with low worker wages and farmer profits. It is closely associated with **gender wage gap** and the **occurrence of harassment** (e.g., verbal abuse).

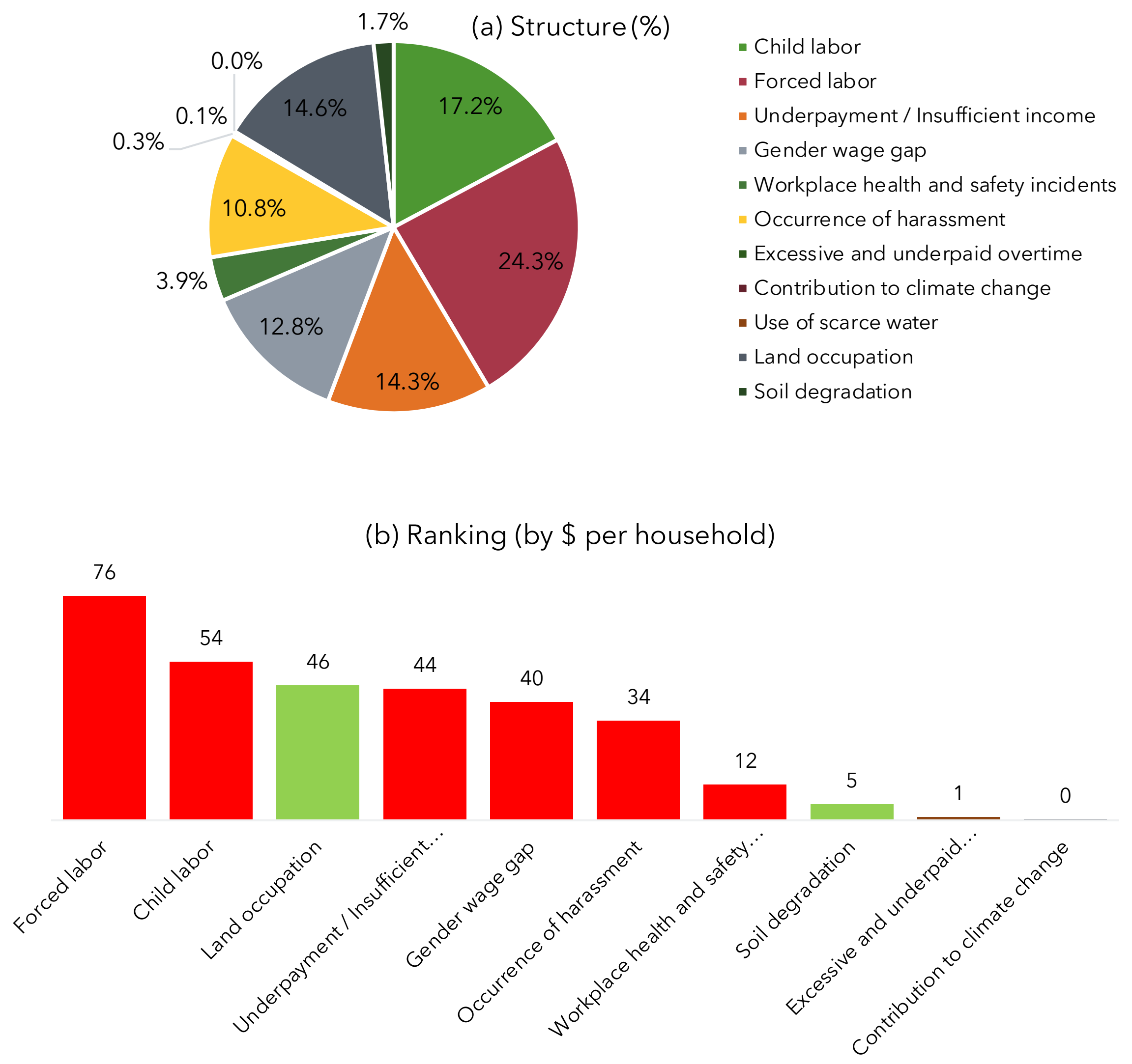
Child labor relates to the engagement of children in light, non-light and hazardous work. In Kenya, a child is defined as anyone below 18 years old as per the Children Act of 2001. Monetization occurs through, for instance, compensation costs for loss of future earnings from not being in school, and/or harm to physical and mental development from engaging in non-light and hazardous work.

[7] Note that the analysis does not account for (or monetize) family labor or free labor costs, which could substantially increase labor costs.

As noted earlier, in Kenya, external costs are dominated by social impacts. Forced labor is the main external impact in agriculture in Kenya, about $76 per household per year, or 24% of total external costs and 30% of social costs. Child labor[8] represents 17% of total external costs and 21% of the social externalities in Kenya. The impact of child labor on costs is driven by the significant number of children performing hazardous (working with machinery, heavy tools, and chemical inputs such as application of pesticides) activities (about 34%) and others involved in other light and non-light activities such as weeding or using light tools (e.g., hoe).

Other external costs include land occupation/use (14.6%), underpayment/insufficient income (14.3%), gender wage gap (12.8%), occurrence of harassment (10.8%) and workplace health and safety incidents (3.9%). Besides land occupation, the only other environmental impact in the top 10 is soil degradation (1.7%).

Figure 4. Structure and ranking of external costs



Source: Authors' own calculation using NATURE+ Kenya and Vietnam household and workers surveys, and monetization factors (Impact Institute, 2021). Notes: N=1,502 in Kenya and 1,153 in Vietnam. All the indicators are measured at the household level.

[8] While family farming in Kenya is a cultural norm because homegrown food is critical to household diets, child farmers often miss school, which only serves to entrench poverty. School abandonment is also exacerbated by high hired labor costs and the climate crisis.

Policy recommendations

We found in Kenya that social externalities are relatively higher than the environmental ones, though both are critical factors that should be addressed. In addition, we did not analyze/include human health externalities due to budget constraints and difficulties in collecting such data.

High social costs tend to be rooted in low prices of agricultural commodities, high costs of production, low efficiency in production and marketing, and high levels of informality in the sector. Low market prices press producers to cut costs, leading to downward pressure on farm workers' wages (underpayment) and the reduction of profits, resulting in insufficient income for producers.

High unemployment rates also lead to the deterioration of working conditions. The high prevalence of informal relationships, with a lack of formal contracts, increases vulnerability of farm workers and exposure to social impacts such as forced labor and different forms of harassment. Furthermore, the high costs of hired labor may lead farmers to increase the use of family labor, which in turn increases the prevalence of child labor. The widespread informality and lack of formal worker unions makes it costly for governments to monitor and enforce regulations.

Based on the true cost accounting of Kenya's food system, the national and county governments and relevant stakeholders need to weigh trade-offs and discuss policy instruments to reduce negative externalities (and increase positive externalities) for the environment and society. This will require multisector coordination, such as those mentioned in the introduction in Vihiga for the agroecology policy. Actions and policies are needed around the following areas:

Strengthen nature-positive farmers' economic situation

- Strengthen nature-positive productivity and production capacity (and thus incomes) of small-scale farmers. One possible policy instrument would be subsidies for nature-positive farming, allowing for better incomes to trickle down to workers (through decent wages and implementation of occupational health and safety measures on their farms). Farmer participation would be conditional on the adherence to labor laws and respect of worker rights.
- Support branding and price premiums for more environmentally friendly and safe nature-positive products. NGOs, projects, and the private sector are better suited to support this type of activity.
- Strengthen value chains and market linkages for nature-positive farmers and groups.
- Invest in startups to invest in food processing for crops and diversified farming and create access to finance and enabling environment for MSMEs to operate.
- Allow for better input and output prices for farmer through collective action, e.g., cooperatives.

Capacitate farmers, farm workers, cooperatives and farmers' groups on human rights and labor laws

- Provide information and/or training to farmers and agricultural workers, preferably organized in groups, about fundamental national labor rights, including health and safety standards. County governments should make this information available and let it disseminate through farmer organizations and projects. This will allow farm workers to know, advocate, and claim their rights more effectively.
- Equip farmer groups (or cooperatives) to deal with these issues collectively. Departments of Labor can brief farmer group leadership and provide printed or electronic materials.
- Empower farm workers. A key limitation of farm workers lies in their capacity to advocate and safeguard/protect their rights, particularly with respect to the violations related to forced labor, harassment, unfair remuneration, and occupational health and safety. Post relevant information in markets, radio, and provide guidance to farmer groups, churches, and other points of information dissemination.
- Promote the development and strengthening of worker associations. The opportunities arising from workers organizations are related to benefits of collective bargaining that strengthens participants positions to negotiate fair wages, better working conditions, and other benefits.

Regulate and sanction

- Provide (and enforce) regulations around farm gate prices, assuring transparency for farmers.
- Enhance abilities of relevant bodies to enforce public and private environmental, occupational health and safety standards, and labor laws.

- Enhance reliability of existing public and private certification schemes.
- Strengthen capacities of nature-positive groups to have an effective internal inspection and sanctioning system in place.
- Participatory guarantee systems, where players come up with the rules and have internal mechanisms to ensure compliance.

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