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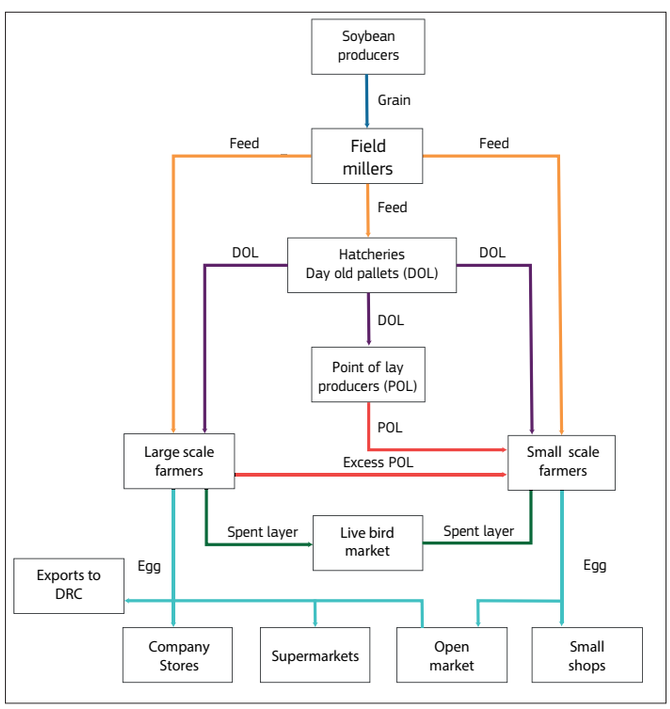
VCA4D
VALUE CHAIN ANALYSIS FOR DEVELOPMENT

Egg value chain analysis in Zambia

Value chain analyses assist in informing policy dialogue and investment operations. They help in understanding how agricultural development fits within market dynamics and permit an assessment of a value chain's impact on smallholders and agribusinesses. The methodological framework for used in this analysis has been developed by the European Commission (EC). It aims to quantify the economic contribution a value chain makes and to understand the extent to which it allows for inclusive growth and whether it is both socially and environmentally sustainable.

The value chain context

In its 7th National Development Plan, the Government of Zambia committed to the development of a diversified, export-oriented agriculture sector, which contributes to inclusive growth, as well as reduction in poverty and enhances human development.



The egg value chain (VC) is well-positioned to contribute significantly to the attainment of these objectives as it has in recent years out-performed the agriculture sector as a whole. While this sector shrunk by 0.4% between 2011 and 2015, the egg VC recorded an impressive annual growth rate of 15-20% peaking in 2015 at total in-lay bird population of over 3.5 million and producing 1.2 billion table eggs. A steep increase in maize and soya prices combined with restrictions in exports to the Democratic Republic of Congo (DRC) caused a 30% decline in the size of the industry in 2016 but the production recovered in 2017. With a domestic consumption estimated at about 800-900 million eggs per year, more than 200 million eggs are available for export to the main regional markets.

The European Union intervention

The egg VC in Zambia has benefitted from investments by the African Agriculture Fund (AAF), a private equity fund which invests in high-potential agribusinesses involved in food value chains across Africa. In 2012, AAF invested equity in the market leader producer of table eggs in Zambia, enabling the company to expand and modernise production as well as improve community-level distribution of eggs. Through the Technical Assistance Facility (TAF) linked to AAF, which is managed by the International Fund for Agricultural Development (IFAD) and implemented by TechnoServe, the EU supported two pilot actions: a) An outgrower soybean production scheme, involving smallholders who are provided with inputs and extension advice and deliver output on pre-negotiated terms to an aggregator who sells to the market leader; and b) A bottom-of-the-pyramid (BOP) egg distribution system which targets micro/small-scale retailers in relatively poor urban communities.

Figure 1 : The flows of the egg value chain

Functional analysis

Main actors and production location

The **direct actors** in the VC consist of different categories of egg producers, point of lay (POL) pullet suppliers and table egg traders. **Indirect stakeholders** include hatcheries supplying day-old-chicks (DOC), agro-dealers/vets, grain producers, feed millers, grain traders, importers of pre-mix and distributors of veterinary products, providers of agricultural and livestock research and extension services, producers' organisations, financial service providers and egg consuming households and enterprises (Figure 1).

Large-scale egg producers account for about 89% of total egg production in the country, including one company accounting for more than 20% share of the egg production.

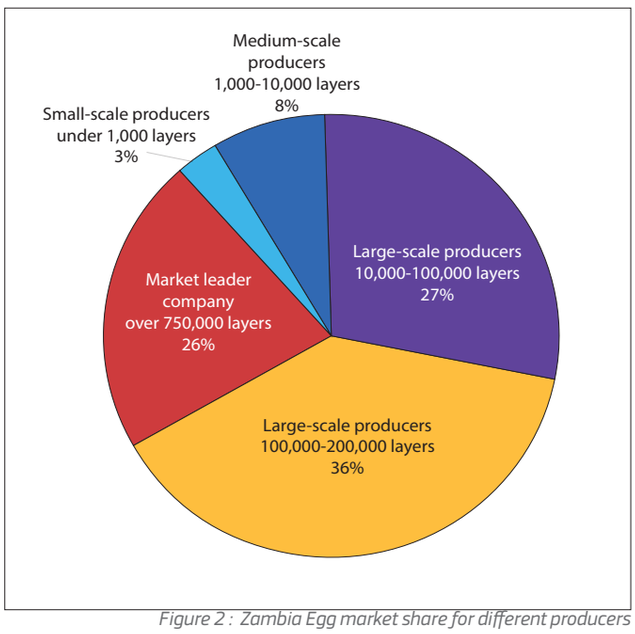


Figure 2 : Zambia Egg market share for different producers

Egg production in Zambia is concentrated in the Copperbelt, which is close to the major export market in the DRC and to markets in Northern Zambia. Production is also high in Lusaka.

Factors for competitiveness of the egg production

Wholesale/retail prices of table eggs have remained flat for over two years, making it the cheapest protein source. **This has driven up demand for eggs**, especially among poorer urban households and made cost-efficiency critical in production. Ensuring the cost of feed remains low is particularly important for ensuring viability because **it accounts for about 70% of production costs**. This is a challenge for most medium and small-scale producers as they are unable to formulate feed on-farm and also lack finance to stockpile maize and soya in order to stabilise the overall cost of feed ingredients.

Another competitive advantage for large-scale producers is their capacity to minimise labour costs and optimise efficiency through **investments in modern production technology** and employment of highly-skilled technical and administrative personnel. Investment is possible when companies are able to access relatively cheaper offshore finance and/or negotiate highly attractive trade credit from input suppliers. However, for most medium and small-scale producers, the main strategy for coping with high cost build-ups is a **temporary shift to broiler production**, a poultry enterprise which is easier to exit if the market fundamentals become unfavourable.

Supply of day old chicks and point-of-lay hen

Local hatcheries supply the bulk of the DOC required by the poultry industry in Zambia. Their ability to expand tends, however, to be constrained by **volatility in demand**, especially when sharp increases in feed costs trigger cut-back in production. Consequently, the market leader company tends to import sizeable quantities of DOCs from Europe. **POL hen producers** sell mainly to small-scale and a few medium-scale egg producers. They also provide technical advice and veterinary support to their customers.

Supply of grains through outgrower schemes

Most of the large-scale producers and some medium-scale producers source grains (maize and soya) from either their own farms or from large-scale farmers and grain traders. A window of opportunity has emerged for small-scale farmers to supply soya to the lead company in egg production through **the outgrower scheme piloted under the TAF**. The scheme can increase the productivity of smallholder soya farmer, enhance their capacity to sell into remunerative formal markets and assure access to the crop at more stable prices to egg producers. However, lack of flexibility in the terms for repaying inputs credit is putting scalability and sustainability at risk. Scaling up the outgrower scheme could help stabilise both supply and cost and, therefore, spur growth in the egg value chain.

Value chain governance and public regulation

Governance of the chain involves minimal coordination and information sharing between key players, particularly the egg producers. Large-scale producers currently set benchmark wholesale prices. Government agencies effectively regulate on animal and human health, while small-scale grain farmers are the main beneficiaries of extension and inputs support. The role of the Government in the regulation of grain prices, especially maize, is much debated among key actors.

The main producers' organisation, the **Poultry Association of Zambia (PAZ)**, operating under the umbrella of the Zambia National Farmers Union (ZNFU), provides a potentially influential platform for policy engagement, communication and service provision to poultry producers. However, many producers, particularly small/medium-scale ones, are either not aware of or not actively engaged with PAZ.

Economic analysis

Financial analysis

All categories of egg producers are profitable and the return on turnover ranges from 5% for small-scale producers to 16-24% for large-scale producers. At the small-scale end, the average annual earnings of €414 tends to be supplementary household income as it is well below the annual minimum wage of €714 or the annual living wage in Zambia, which is estimated at €3,403. For medium-scale producers the average net annual income is €2,578. It is the only category that the family is engaged in. However, that requires investing in battery cage production systems while access to finance is still very expensive (annual interest rates exceed 30%). It is only when producers reach **the scale of about 1,750 in-lay birds** that the net income from the operation is able to support the average family.

Egg trading is profitable for all traders as the margins exceed 11% for supermarkets, community-based wholesalers and retailers. Margins are very tight for wholesalers based in urban markets, estimated at less than 7%. However households who are dependent on this trade can sustain their livelihood as average net earnings (over €7,000 per annum) exceed the annual living wage in Zambia. The net earnings generated for community-based retailers is estimated at €242 per annum, which is an important supplementary income for poor urban households also selling other essential food items.

Contribution to growth

In 2015, the direct value added in the egg VC was €137 million and the indirect contribution from suppliers was €14,7 million. **The total value added represents 13.6% of the agricultural GDP** in Zambia in 2015, around 1.2 times the total contribution of fisheries and aquaculture. About 60% of the growth is generated by large-scale producers, while medium and small-scale producers contribute about 6.1%. The contribution by traders is estimated at 22% and that of maize and soya producers in the form of feed for the birds, amounts to 5%. Buoyant growth in the egg VC also means increased capacity to drive growth in the grains subsectors as **it absorbs about 38% of the soya produced in Zambia**.

Net profit is by far the largest proportion of the value added (69%). 2/3 of the VC income benefit the large scale egg producers (Figure 3). Only 7% of the value added is allocated to hired labour; an indication of the rather low labour-intensity of the chain and a growing trend due to fully automated production systems.

Public finances and balance of trade

The egg VC contributes an estimated **€9.1 million to public finances.** This figure breaks down as follows: 50% from corporate tax at a rate of 10%; 35% from VAT on egg sales through formal channels (mainly supermarkets) but also unclaimed VAT refund which can be claimed by small and medium-scale producers as VAT on inputs such as feed and veterinary products is refundable although most producers are unaware and do not claim it. The remaining 15% is the contribution in the form of Council Levies paid to the local government authorities.

Macroeconomic performance

The foreign exchange generated from the export of table eggs was about €18.2 million in 2015. With the total value of imported intermediate goods used in the chain estimated at €15.2 million, the chain generated **net foreign exchange of €3 million** during that year. The gross foreign exchange generated is higher than earnings from more "visible" industries such as cut flowers and fresh fruits/vegetables. It is also likely to increase in the near term as many of the large-scale producers are located close to the main regional export markets.

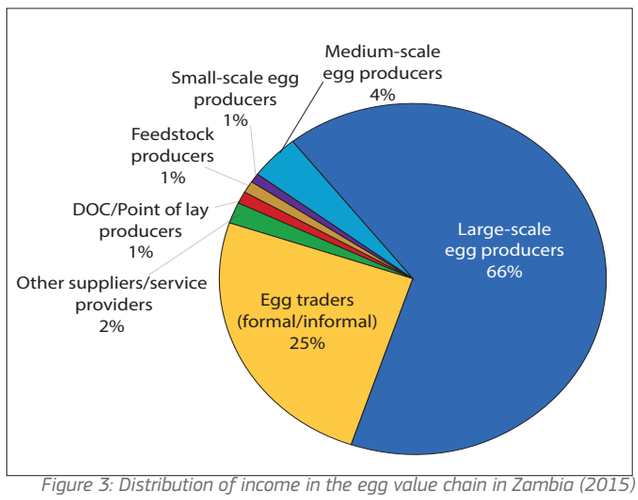


Figure 3: Distribution of income in the egg value chain in Zambia (2015)

A ratio of 0.67 for total value added/value of production indicates that the chain depends on imports and is not well integrated into the local economy. The Domestic Ratio Cost (DRC) is 0.17, which is well below unity (i.e. <1), indicating that it is viable within the global economy.

WHAT IS THE CONTRIBUTION OF THE VALUE CHAIN TO ECONOMIC GROWTH?

The egg VC makes a significant contribution to Zambia's economy. The total value added in the chain in 2015 was almost €152 million, representing close to 14% of the agricultural GDP in Zambia. Foreign exchange generated through export of table eggs is estimated at nearly €20 million per annum, much higher than contributions from horticultural exports. The VC also contributes to public finances in terms of taxes paid to the revenue authorities as well as levies paid to local councils. With table eggs production and distribution being demonstrably profitable at all levels, the VC offers good investment opportunities.

Social Analysis

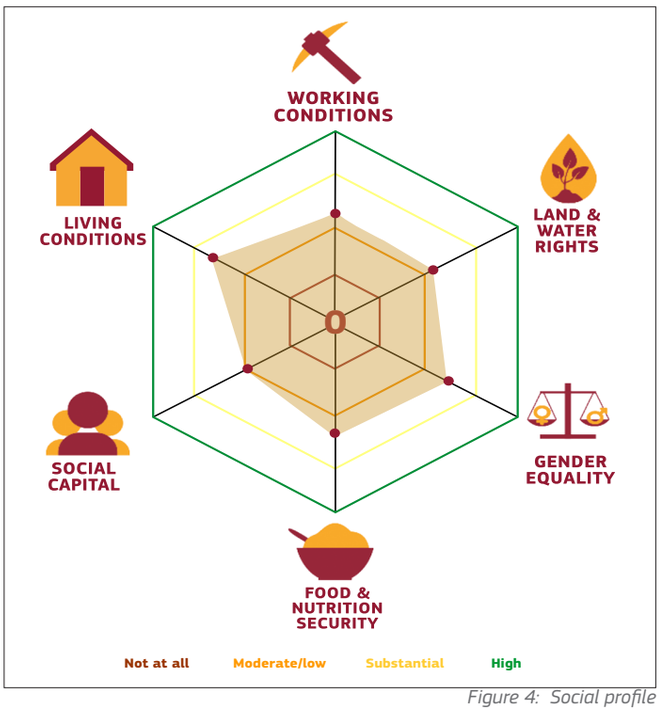


Figure 4: Social profile

Working conditions	• Labour laws reflect international conventions but enforcement is not strong. • There are safety concerns regarding use of agro-chemicals by smallholder soya/ maize growers. • A trend towards more automation limits future job creation. • Small-scale soya production has high labour demands and unpredictable farmgate prices.
Land and water rights	• Land and water rights are currently not a significant risk area but conversion of land from customary to state to be followed up.
Gender equality	• Increased opportunities for inclusion of women through more widespread uptake of the "aggregator" model. • Youth involved in different segments of the VC, but in the less rewarding niches. • Soya production provides earning opportunities for younger men (as farmers or service providers). • Gender dynamics in household decisions on credit and crop sale in married households negatively impact on livelihood and food security.
Food and nutrition security	• Increased availability of eggs and soya products at affordable prices for consumers, particularly relatively poor communities in urban areas. • Potential risks of seasonal rural food insecurity associated with out-grower cash cropping arrangements for soya.
Social capital	• Weak in egg production, potentially limiting long-term sustainability. • Solid relationships and trust between smaller egg producers and service. providers, but less so with the egg traders. • Smaller egg farmers face challenges on access to technical information. • Low levels of trust between players in small-scale soya production hinders. effective organisation and weakens the bargaining power of small-scale farmers.
Living Conditions	• Housing for employees provided by some egg producers (large and small). • Access to education, health and transport depends on distance from main roads and villages. • Small-scale farmers may live close to these services but lack means to pay for them.

IS THIS ECONOMIC GROWTH INCLUSIVE?

Large-scale egg production has limited peri-urban employment opportunities, especially for women and youth with low levels of education as it has become increasingly "high-tech". Layer feed price instability disfavours medium/ small-scale producers but if access to business advisory services and lower-cost finance are ensured then growth in the VC can be more inclusive.

Table egg distribution is more inclusive than production, creating employment particularly for male youth. Income is well spread among over 600 "wholesalers" and an estimated 18,500 micro-retailers in urban and peri-urban areas.

Soya production has attracted increasing numbers of smallholder farmers of both genders and provided opportunities for seasonal employment in rural areas. Scaling up outgrower schemes and empowering producers to better manage price risks can further enhance inclusive growth.

IS THE VALUE CHAIN SOCIALLY SUSTAINABLE?

Dominance of egg production by large-scale producers may suggest that the chain is not socially sustainable. However, the high level of egg consumption in relatively poor urban communities has opened up trading opportunities, with relatively low entry barriers, for younger men and women without formal employment. The chain also employs educated/skilled youth and women to manage complex production tasks. There are also opportunities for improving levels of trust between key actors in the egg VC and so contribute to enhancement of its social sustainability and increased contribution to livelihoods and economic growth. Egg consumption is rising rapidly in poor areas, with significant nutrition-security benefits. However, rural Zambia is not having a similar experience.

Environmental analysis

Human health: very low potential impact

The main risks are related to **pesticides application on crops** used on feed. Impacts tend to be localised and reversible and can be minimised with adoption of best practices in application of pesticides. Application rates will require effective monitoring and control. In particular, chemicals present in feed formulations should be monitored if excreta is used for fertilising soils either in direct land application or composting. Awareness campaigns on such issues need to be promoted along with relevant advisory services provided through public extension services and by agri-businesses.

Ecosystems quality: medium potential impact

There is an impact on ecosystems quality with regards to **organic manure disposal**, potential groundwater contamination and air emissions of nitrous oxides when manure is stocked or when an overload of manure disposal on land occurs. These problems mainly occur at the level of large-scale egg producers and though the impact may be significant they tend to be localised and are reversible. Appropriate mitigation measures are also available in the environmental protection technology market and have been mainstreamed in many countries. However, the technologies require significant investments and skilled operators.

Resources depletion: low potential impact

The egg VC uses **non-renewable resources** for fertilizers/ pesticides production and energy carriers in feed production, egg production facilities and transport (at regional and trans-boundary levels). Impacts are usually not significant. However, if organic loads due to manure disposal in land are higher than crop requirements, or if the water table is high, then ecosystem services (soil and groundwater) may be jeopardized. Nitrogen emissions from manure denitrification processes may be significant too, but can be minimised if properly managed.

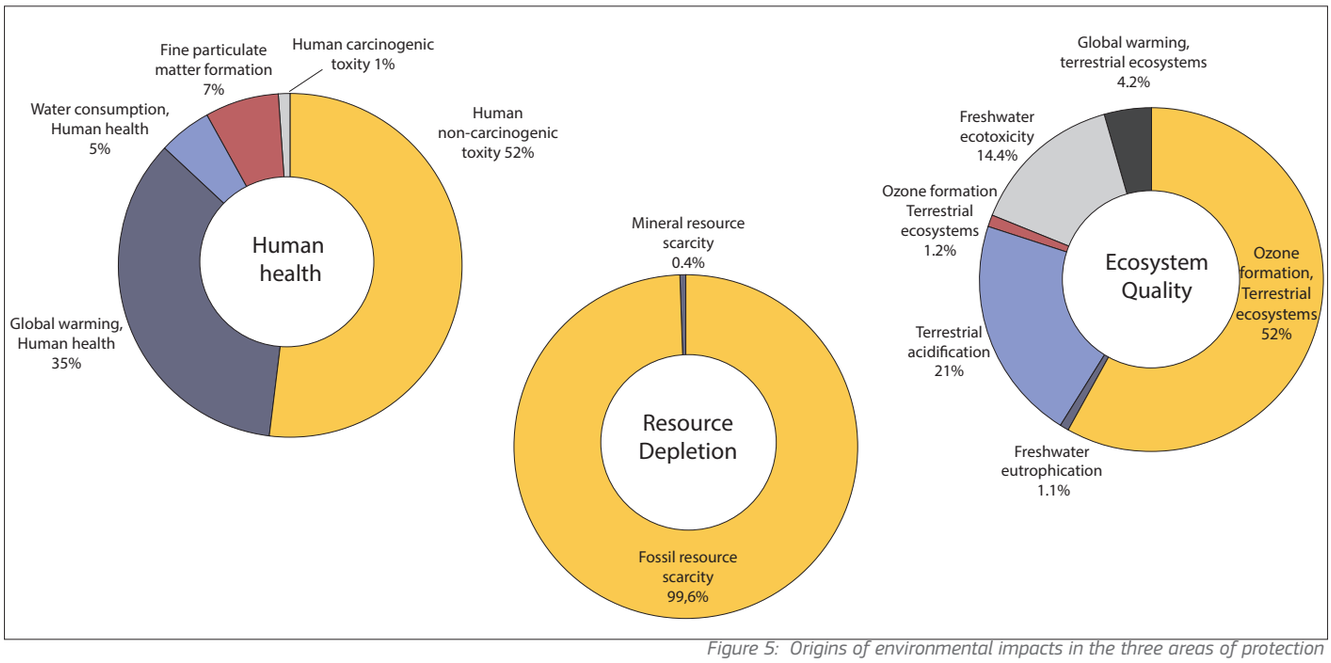


Figure 5: Origins of environmental impacts in the three areas of protection

IS THE VALUE CHAIN ENVIRONMENTALLY SUSTAINABLE?

The resources used and substances emitted by the VC moderately affect the three areas of protection - human health, ecosystems quality and resources depletion. Manure disposal is the most significant environmental issue but should be perceived as an opportunity rather than a problem. Large-scale egg producers can produce bioenergy (biogas) from anaerobic treatment of manure in order to reduce fuel dependence and avoid air emissions. Small/medium-scale egg producers can also use composting processes to handle manure and satisfy crop requirements for micronutrients, thereby restoring organic soil structure and properties and saving mineral resources used in fertilizer production.

Groundwater contamination in the vicinity of mining industries is an emerging problem, especially in the Copperbelt. Water treatment technologies are available but the first strategy should be preventive and based on implementation of source protection zones.

Main findings and recommendations

The egg VC is making a very significant contribution to Zambia's economy. Its share of agricultural GDP is significant and it generates foreign exchange, contributes to public finance and creation of jobs as well as income-earning opportunities, especially at the level of the predominantly informal egg trade. The chain also offers an important market for major feed grains (maize and soya) and is ensuring improved household nutrition security by making available the cheapest but also very rich animal protein source to relatively poor households in urban areas. To further catalyse its already dynamic growth whilst ensuring inclusiveness, the following findings and recommendations are made for decision makers:

Finance, organisation and support services

- The competitive advantage of large-scale egg producers is mainly due to their **capacity to invest in more efficient production technology**. The experience of the lead company has demonstrated that large-scale producers **can use cost-effective offshore finance to scale up operations**. However, access to finance for smaller-scale chain actors is severely limited and requires that policymakers and the banking industry promote innovative, cost-effective financing packages which are appropriately de-risked.
- Medium-scale egg producers need to be particularly targeted as they have substantial scope for growth but need to invest in improved production technology and processes (e.g. installing battery cages, formulating feed on-farm and using gas instead of charcoal for brooding).
- The egg producers' organisations need strengthening with a specific focus on supporting the medium-scale egg producers and new entrants.
- The potential of the **outgrower soya production scheme** linked to egg producers has been demonstrated. However, greater flexibility in repayment terms for inputs credit is needed in scaling up such schemes. The emergence of **structured trading and finance systems** promoted by the Zambia Agricultural Commodity Exchange (ZAMACE) offers a viable opportunity beneficial to soya producers as well as grain traders and egg producers.
- The bottom-of-the-pyramid scheme successfully piloted with TAF support is a proven strategy for penetrating informal markets in urban communities.
- The quality of support to small-scale soya producers needs to be improved through **relevant service-providing agencies** in order to foster mutual trust and sustainable business relations. Services such as technical advice, supply of inoculum and seed, credit packages as part of contract arrangements, marketing support need to be more carefully tailored, taking into account variations within the small-scale sector.

Public infrastructure, training and monitoring

- Invest in **road infrastructure**, linking egg producers to under-exploited rural and regional export markets can boost output and demand by lowering distribution cost, while reducing emissions and vehicle maintenance.
- Develop initiatives targeting the youth including vocational training in rural areas for increased employment.
- Provide knowledge and training on **biogas technology**.
- Provide training and education for farmers on **best practices and environmental management,** in particular on sustainable labelling, farm management and control (including machinery maintenance), manure management regarding nitrogen and odour control techniques near peri-urban areas, fertilization and pesticide application, general waste management and recycling.
- Reinforce **water monitoring programmes** with extensive chemical analysis, including priority substances. Monitoring should be mandatory where medium-to-large scale facilities spread manure on land and where groundwater abstractions for drinking water supply may exist.

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Agrinatura (http://agrinatura-eu.eu) is the European Alliance of Universities and Research Centers involved in agricultural research and capacity building for development.

The information and knowledge produced through the value chain studies are intended to support **the Delegations of the European Union** and their partners in improving policy dialogue, investing in value chains and better understanding the changes linked to their actions

VCA4D uses a systematic methodological framework for analysing value chains in agriculture, livestock, fishery, aquaculture and agroforestry. More information including reports and communication material can be found at: https://europa.eu/capacity4dev/value-chain-analysis-for-development-vca4d-

VCA4D VALUE CHAIN ANALYSIS FOR DEVELOPMENT

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This document is based on the report "Egg Value Chain Analysis in Zambia", by Gideon E Onumah (NRI), Alistair Sutherland (NRI), Antonio Guerreiro de Brito (ISA), Antony Chapoto (IAPRI, national expert) and Helena Farrall (ISA). Only the original report binds the authors.