Value Addition to Poultry Manure

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Summary

Chicken manure is useful as an organic fertilizer to food and feed crops. It has the highest concentration of nitrogen, phosphorus, and potassium of all the manures. Chicken manure is seldom used directly because it can contain pathogens such as salmonella; it can ‘burn’ plants by damaging roots, and its odor is off-putting. Fortunately, it composts quickly into forms safe for people and plants. Small amounts of chicken manure produced in mixed smallholder farming systems is an asset, particularly when used as an ingredient of mixed compost and then applied to fertilize higher value crops. Massive amounts of manure produced by large commercial farms, on the other hand, pose an environmental and social liability from its unpleasant odor, leaching into groundwater, and methane emissions. Industrial scale processing options exist such as the production of organic fertilizer pellets and anaerobic digestion into biogas. Otherwise, the responsible disposal of waste from large poultry farms poses a major production cost.

Technical Description

Each chicken produces about three to five kg of manure monthly. Nutrients in chicken manure are valuable, but the material must be handled properly because fresh manure can damage plants. Composting detoxifies manure, and while doing so it is important to minimize the loss of ammonia. Optimal composting and storage conditions for chicken manure include keeping it in a covered area and retaining its liquid, because a significant amount of its nitrogen exists as urine. A simple way to add value to poultry manure is to operate a free-run chicken production system. Another option is to collect manure from the poultry house floor, heap it a safe distance from the flock, cover the pile and allow it to compost for two to six months. Compost is ready when a stick buried 50 cm into the pile no longer feels hot to touch. The processed manure is then applied to the farmlands, reducing the need for chemical fertilizers.

Uses

Fresh chicken manure is rich in plant nutrients, containing 0.5% to 0.9% nitrogen, 0.4% to 0.5% phosphorus, and 1.2% to 1.7% potassium, as well as essential mineral nutrients in balanced ratio. Larger-scale industrial processing involves drying, granulation and pelleting.

Composition

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Means of application

Low-tech equipment is needed such as forks, spades, and wheelbarrows. Pelletized manure is prepared by drying and grinding poultry manure, mixing it with ground husk or straw and a starch binder, and then passing it through an extruder or granulator. This process facilitates storage, transportation, and field application. The resulting product releases nutrients slowly and reduces leaching and run-off. These fertilizers also contain organic matter that acts as a soil conditioner, improving retention of nutrients and water. Poultry manure can also be used as a feedstock for anaerobic digestion to break down organic material for biogas and digestate production in a sealed vessel known as reactor. The biogas can be used to provide electricity and gas for cooking, while the digestate can be used as plant fertilizer and soil amendment.

Agroecologies	All Agroecologies.
Regions	Africa South of Sahara.
Developed in Countries	Zimbabwe, Zambia, Uganda, Tanzania, South Sudan, Somalia, Sierra Leone, Senegal, Rwanda, Nigeria, Niger, Mozambique, Malawi, Madagascar, Kenya, Ivory Coast, Guinea, Ghana, Gabon, Ethiopia, Democratic Republic of the Congo, Central African Republic, Burundi, Botswana, Benin.
Available in	Zimbabwe, Zambia, Uganda, Tanzania, South Sudan, Somalia, Sierra Leone, Senegal, Rwanda, Nigeria, Niger, Mozambique, Malawi, Madagascar, Kenya, Ivory Coast, Guinea, Ghana, Gabon, Ethiopia, Democratic Republic of the Congo, Central African Republic, Burundi, Botswana, Benin.
Solution Forms	Input Supply, Management.
Solution Applications	Soil fertility management, Value addition, Livestock Production.
Agricultural Commodities	Poultry.

Target Beneficiaries	Agro-dealers, Commercial farmers, Small-scale farmers.

Commercialization

Commercialization Category

Commercially available

Startup Requirements

Designing a fertilizer production line for poultry manure involves the following steps: 1) establish a technology outfit that is efficient and matches size of operation, 2) optimize the formulation of fertilizer based on the local soil properties and cropping systems, and 3) implement quality control and pollution mitigation measures

Production Costs

Simple drying and pelleting equipment able to process several tons per day cost about US $5,000 to $10,000. An organic fertilizer production line from fermented manure that includes crushing, mixing, granulation, drying, screening and packaging able to process 15 tons per hour is available in China for about US $30,000. A 15 m3 anaerobic digester able to process 300 kg of poultry manure per day costs about US $3,000 in China.

Customer Segmentation

There is economic opportunity associated with value-addition poultry manure for small-scale and commercial farmers, as well as agro-input dealers.

Potential Profitability

Bagged chicken manure is sold as fertilizer for about US $50 per ton. Removing feces from poultry houses reduces the ammonia emissions from poultry sheds by about 90% which decreases respiratory illness of birds and mitigates the climate footprint of production.

Licensing Requirements

Regulations against uncontrolled waste discharge and environmental protection laws drive investment in poultry manure processing. The nutrient contents of fertilizers must be labeled and authenticated through testing.

Innovation as Public Good

The solution is a public regional good disseminated by the International Livestock Research Institute.

Solution Images



Manure accumulated on the poultry house floor (left) and finished compost ready for use as an organic fertilizer (right)



Fertilizer pelleting machine (left) and final product (right)



A batch digester for producing biogas from poultry manure

Institutions

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