ZiMUNDA FARMING

NEWSLETTER

ISSUE 15 | FEBRUARY 2021

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Agroecology

Something Old, but Something New for Zimbabwe

BY ANNA BRAZIE, ECOLOGY AND SUSTAINABLE DEVELOPMENT

The term "agroecology" is frequently used these days, but what does it mean? How different is it to organic farming, conservation agriculture, or climate-smart agriculture? Does it mean going back to old-fashioned, traditional methods? Why is agroecology relevant to Zimbabwe? This article aims to answer these questions.

Although *agroecology* has many definitions, it is largely defined as a holistic approach that uses the science of natural systems and processes (ecology) to enhance the resilience of food and farming systems and the societies that depend on them. Agroecology is also a movement driven by like-minded people who want to transform agriculture and societies.

NEGATIVE EFFECTS OF INDUSTRIAL AGRICULTURE

Agroecology has evolved as a response to the negative impacts of industrial agriculture. Thanks to the introduction of mechanised irrigation, ploughs and other machinery; pesticides, herbicides and fertilisers; hybrid crop and animal breeds and intensive livestock production; farmers have increased yields but at a huge environmental, social, and economic cost.

Environmental effects - There has been a 75% decline in biodiversity in farming areas over the past century; 75% of the Earth's soils are severely degraded and around 25% of greenhouse gas emissions come from agriculture and land clearance. All of this makes the food production system, on which all humans depend, extremely vulnerable.

Polyculture or mixed cropping system in agroecology. It is the planting of two or more crops in the same field at the same time.

Effects on human health - Industrial agriculture has been blamed for the global rise in food allergies, intolerances, autoimmune diseases, and cancers. Antibiotics and hormones in livestock production have been implicated in increasing antibiotic-resistant bacterial diseases and a decline in human fertility. Cheaper sources of meat, carbohydrates, sugars and fats have led people to consume fewer fruits, vegetables and pulses.

Social and economic impact - As farming has become more dependent on inputs, machinery, and loans, many farmers get sucked into a cycle of debt. In developed countries, farming is heavily subsidised by governments, however, significant numbers of farmers are still unable to balance input costs with profits and have sold or lost their farms to banks. In India, the suicide rate among smallholder farmers who cannot repay debts is a national crisis.

The Zimbabwean case - Zimbabwe has not been spared. The country is currently grappling with a massive decline in biodiversity, large-scale soil degradation, water shortages, and crippling pest problems all linked to poor land-use practices. Human health problems related to poor diet and the misuse of agrochemicals are prevalent. Dependence on agro-inputs and cash crops with unstable markets impoverishes many rural households. These problems are exacerbating because of climate change impacts.

AGROECOLOGY CHALLENGING THE INDUSTRIAL WAY OF FARMING

In reaction to the afore-mentioned effects of industrial farming, many new farming approaches have arisen, such as,

- Organic farming which focuses on replacing synthetic chemicals with natural alternatives.
- Conservation agriculture which focuses on reducing tillage, crop rotation and cover crops.
- Climate-smart agriculture aims to reduce greenhouse gas emissions and help farmers adapt to climate change hazards.
- Permaculture promotes careful planning of land-use activities to ensure: healthy

environmental, social, and economic systems; limits on consumption of resources; and minimise waste.

Agroecology brings together many different farming approaches into one holistic system. Through its numerous interpretations, in an agroecological system you are likely to see:

- soil and water management methods including compost, biofertilisers, cover crops, green manures, agroforestry, and water-harvesting (refer to ZiMunda Farming Newsletter issue 12 on the water harvesting system at Chaseyama Learning Centre by Participatory Organic Research and Extension Training Trust (PORET);
- cultural, biological, mechanical and natural pests and disease management;
- a diverse range of useful, nutritious, annual and perennial plants grown together in carefully planned cropping systems to ensure maximum biodiversity, soil cover and nutrition throughout the year.
- Integrated livestock management systems.

A fundamental tenet of agroecology is the appreciation that farmers that want to switch farming approaches need to do so gradually.

AGROECOLOGY IN ZIMBABWE

In Zimbabwe, practising agroecology may seem like going back to pre-colonial methods, but it is based on sound science and provides a crucial means for farmers to ensure productivity, community health, and well-being and climate-resilience. Farmers wanting to try agroecology can get support from Fambidzanai Permaculture Centre, The Schools and Colleges Permaculture (SCOPE) Programme, Participatory Organic Research and Extension Training (PORET) Trust, Zimbabwe Smallholder Organic Farmers Forum (ZIMSOFF), Shashe agroecology training centre and Muonde Trust.

Backlink - For more insights on permaculture agriculture, please refer to *ZiMunda Farming Newsletter Issue 6* on Chaseyama Permaculture Club (CPC) by Participatory Organic Research Extension and Training Trust (PORET) and A Case of Women Farmers in Matobo by Fambidzanai Permaculture Centre (FPC).

Images provided by Anna Brazzie

Factors Affecting the Effectiveness of Post-Emergent Herbicides

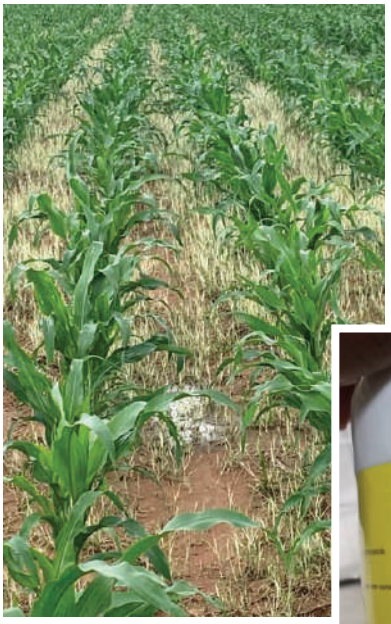
BY O.T. MLAMBO, SENIOR TECHNICAL SALES AGRONOMIST, AGRICURA

Weeds deprive desirable plants of the much-needed water, light, and soil nutrients. Herbicides are chemicals used to control weeds and half the time farmers complain that *"at times the herbicides do not give desirable results"*. I would like to urge that product efficacy is determined by many factors, besides the active ingredients or formulation. To get the best results from post-emergent herbicides, the following factors are critical;

1. Stressed weeds

Stressed weeds are harder to kill than healthy actively growing weeds. Stress is caused by lack of moisture, lack of oxygen due to waterlogging, extreme temperature, nutrient deficiencies, insect pests, disease, sub-lethal doses of herbicides from prior applications or chemical residues, and mechanical damage from tillage, slashing, or grazing. Once a weed has been subjected to stress it will not be adequatelycontrolled by the herbicide standard rates that would otherwise be sufficient to control an unstressed weed even after the stressed weed has recovered from the stress.

-Never apply post-emergent herbicides on stressed weeds-



(Above) Evidence of wilting weeds due to effective use of post-emergent herbicide

2. Timing of application

Proper timing is critical for obtaining maximum performance from post-emergent herbicides. The label on the herbicide defines restrictions regarding application timing and that is the most important consideration. The impact of application timing on the effectiveness and prevention of competitive yield losses also needs to be considered. The improved control provided by early applications of herbicides must be balanced against the risk of late-emerging weeds becoming established following application. While concerns over late flushes of weeds are valid, weeds that emerge soon after planting are the most competitive with the crop. The control of weeds that emerge soon after crop planting should not be compromised in order to allow later flushes of weeds to become established. Post-emergent herbicides generally decrease in effectiveness as weeds increase in size. Do not apply post-emergent herbicides to overgrown or matured weeds.

-Always apply post-emergent herbicides on young and tender weeds preferably between the 2 to 5 leaf stage-

3. Rain-fast period

Herbicide labels include recommendations on how much time must elapse between herbicide application and subsequent rainfall to ensure good herbicide performance. This is known as the rain-fast period. Generally, herbicide rain-fast ratings are based on good growing conditions. Poor conditions may require a longer interval between application and any rainfall to ensure adequate herbicide translocation within the week before the herbicide is washed off. For most herbicides, any amount of rainfall soon after spraying has the potential to reduce absorption, translocation, and subsequently weed control. If you apply a herbicide and it rains before its rain-fast period is over, the herbicide's effectiveness will be reduced. The rain-fast period generally ranges from 30 minutes to 6 hours depending on the herbicide under consideration among other key factors. Product labels will indicate the specific rain-fast periods.

-Do not force spraying operations on the weather, respect the herbicides rain-fastness as per label specifications -

(Right) An example of a post- emergent herbicide

4. Effects of temperature on Rain-fast period

The likelihood of decreased weed control of the herbicide due to cool temperatures will vary according to the target weed, herbicide, and rate applied. For instance, glyphosate usually performs well under a wide range of temperatures. When the temperature is lower than 12°C, weed growth slows, resulting in slower herbicide uptake and translocation. This increases the required rain-fast period and slows the onset of symptoms and herbicide efficacy.

-Ambient temperatures for weed growth have a direct bearing on rain fastness-

5. Water quality

The quality of water used in spray mixes or tanks can affect herbicide efficacy. Water is the primary carrier for herbicide applications. It usually makes up over 99%

of the spray solution, as such, the chemistry of water added to the spray tank greatly impacts herbicide effectiveness.

6. Turbidity

Turbid water or water containing suspended solids, soil, or organic matter can reduce the effectiveness of post-emergent herbicides. Water should be clean and clear for all herbicide applications; however, some herbicides are not as sensitive to turbidity as others.

7. Water pH

Water pH is a measure of the Hydrogen ion concentration in water. As water pH decreases, it becomes more acidic, and the number of Hydrogen ions increases. Acidic conditions (pH 3 to 6) are generally suitable for mixing post-emergent herbicides classified as weak acids. When water pH exceeds 7, consider adding adjuvants to lower the pH. Weak acids dissociate less under acid conditions where Hydrogen ion concentration is high. Dissociated herbicides are absorbed more slowly across plant cell membranes. Ideally, spray water pH should be low such that herbicides do not dissociate or dissociate at low levels. Avoiding herbicide dissociation is the primary reason water used in the mixing solution should be acidic.

Results of using a wrong herbicide on a maize field

A well sprayed, weed free maize field

8. Spray adjuvants

Spray adjuvants are used in combination with post-emergent herbicides so as to overcome the barriers that impede the movement of the herbicide from the leaf surface to the interior of the cell. An adjuvant is an additive or any substance that modifies herbicidal activity or its application characteristics. Some herbicides are formulated with sufficient additives such that the user usually does not need to add them to the tank mixture at spraying, whereas other products require the addition of adjuvants for all uses.

The role of adjuvants – Surfactants (surface active agents) are a type of adjuvant designed to improve the dispersing/emulsifying, absorbing, spreading, and sticking of the spray mixture. The epi-cuticular wax on the surface of leaves repels water, resulting in the beading of spray droplets as they land on leaves. In some situations, a high percentage of spray droplets may simply bounce off leaves resulting in the herbicide falling harmlessly to the ground. Surfactants reduce the surface tension of spray droplets, increasing spray retention and allowing the spray droplets to spread over a larger area. An increase in spray coverage is especially important with contact herbicides that do not move within plants.

9. The crop vs the weed spectrum

Post-emergent herbicides are selective. A selective herbicide targets only a specified weed spectrum in a certain type of crop spectrum. It is critical for farmers to know the crop and the weed spectrum, as this determines which type of herbicide(s) is applied to articular crops. Weeds generally fall into three main categories, namely,

- Sedges such as yellow and purple nutsedge.
- Grasses such as crowfoot grass, couch grass, shamva grass & Indian goosegrass.
- Broadleaf weeds such as pigweed, thorn apple, and gallant soldier.

If a farmer is not aware of the types of weeds that are present in the field or at least the predominant type(s) of weeds then there is a risk of grabbing the wrong herbicide altogether. Examples of broad-leafed herbicides include;

- Atrazine targets broadleaf weeds in maize, sugarcane, and sorghum. It cannot be used in sugar beans which are broad-leafed crops.
- Agil targets annual and perennial grasses in broadleaf crops such as sugar beans, soya-beans, potato, tomato, etc. It cannot be used in grass crops such as maize, sorghum, or sugar-cane.
- Halosulfron targets sedges in maize. It cannot be used in sugar beans, tomato or leafy vegetables, etc.

10. Dose rates

It is important to always read and follow label instructions. Label instructions are inserted by the manufacturer for any given product to assist the user in the correct use of the herbicide. If the dosage rates are strictly adhered to as per manufacturer's instructions, product effectiveness and safety of the crop can be achieved. An increase in the dose rate in violation of label instructions can result in permanent crop injury whereas a decrease in the dose rate can result in compromised results/reduced effectiveness.

Images provided by O. T. Mlambo

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The Use of Antimicrobial Growth Promoters In Animal Feeds

BY LOVEMORE R. MUTETWA, ANIMAL NUTRITIONIST

Antimicrobial growth promoters (AGPs) are antibiotics added to the feed of food animals to enhance their growth rate and production performance. Antimicrobials have been used in animal feed for many years, not only to treat diseases but also to boost growth, improve feed utilisation, and reduce mortality.

THE ROLE OF ANTIMICROBIALS IN LIVESTOCK NUTRITION

At low concentrations, AGPs are effective against the main flora/fauna in the gut. This results in a lower activity of microbial fermentation in the gut, which in turn leads to reduced loss of energy. By limiting microbial fermentation, growth promoters enhance the efficient

digestion of feed which translates to a positive effect on live weight gains and feed conversion. Other effects of antimicrobials include the reduction in sub-clinical infections, diarrhoea (scours), and production of toxins which helps to spare amino acids and minerals which otherwise would have been rendered unavailable to the animal.

THE BAN OF ANTIMICROBIAL GROWTH PROMOTERS

AGPs that have been in use for many years in animal feeds are now under immense scrutiny or completely banned in an increasing number of countries. The bans are/were attributed to the changes in consumer perceptions regarding the safety and health of the final products. The ban of non-essential antibiotic uses in livestock intends to reduce the pool of resistance genes in micro-organisms affecting human patterns.

In Zimbabwe and elsewhere in Africa, there is still use of several antimicrobial/antibiotic growth promoters in some of the stock feeds. Some of the in-feed antimicrobials used include, Flavomycin, Salinomycin, Tylosine phosphate, and Zinc Bacitracin. Given the global trends, it is a matter of time before the stock feeds industry must join the rest of the world in antibiotic-free livestock production. The European Union/United States of America have already banned the use of Virginiamycin, Avoparcin, Bacitracin, Tylosin, and Spiramycin the feed. However, the withdrawal of these antibiotic feed additives associated with a deterioration in animal health, evidenced by an increased incidence of diarrhoea, weight loss, mortality in post-weaning pigs, and necrotic enteritis in broiler chickens. The presentation of economic losses in livestock production due to withdrawal of antimicrobials calls for an introduction of alternatives.

ALTERNATIVES TO ANTIMICROBIALS

The ban imposed on most of the antimicrobial products lead to increased costs of producing animal foods (meat, eggs, milk), hence the need for non-pharmaceutical products for use as alternative growth promoters in animal feed. Some of the possible products destined to replace antibiotics include in-feed enzymes, organic acids, yeast extracts, probiotics and herbals, and essential oils. This new generation of growth-enhancing products is collectively called *nutraceuticals*. Nutraceuticals is a broad umbrella term that is used to describe any product derived from food sources with extra health benefits in addition to the basic nutritional value found in food. Although the action mechanism of the nutraceuticals is not fully understood, scientific research shows that like antibiotics nutraceuticals influence the balance of microflora of the gut. This proves that it is possible to achieve good livestock performance without recourse to AGPs.

A SUMMARY OF THE POSSIBLE ALTERNATIVES TO ANTIBIOTICS

Feed additive	Possible effects/mode of action
Essential oils	Bacteriostatic, fungistatic, and bactericidal.
Enzymes	Elimination of anti-nutritional effects of water-soluble polysaccharides.
Yeast and yeast extracts	Improve immune function.
Organic acids	Inhibition of bacterial growth.
Probiotics	Introduction of desirable bacterial in the gut and disease prophylaxis.
Prebiotics	Promotion of the growth of the desirable bacteria in the gut.
Herbs and mixtures	Variable effects e.g., antiseptic, antioxidant, and immune-stimulating.

The alternatives are set to play a key role in smart animal nutrition as the emphasis should be on optimum animal nutrition and improving animal husbandry systems and biosafety as opposed to regulatory intervention.

For more information on antimicrobials in stock feed contact Edurate (Pvt) Ltd:
Email: lovemore.mutetwa@vamara.com or
Call +263 774 586 536.

Image provided by Melissa Katunga

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Spotting Common Diseases in Chickens

BY GENERAL BEVEN MUNDIDA, LIVESTOCK CONSULTANT

In poultry production, the occurrence of diseases can often lead to reduced performance in breeding, growth rate, feed conversion, and egg production. In common terms, a disease is an abnormal condition that is caused by an infection (bacterial, viral, or fungi), parasites (protozoa, worms, and external parasites such as mites and lice), nutrition deficiencies, poisoning, or environmental stress. Determining the cause of a disease is an important factor in disease management. Some of the infectious diseases can be classified into;

Viral diseases - These are caused by viruses and include New Castle Disease (NCD), Bird flu, Marek's disease, Gumboro, and Fowlpox. The diseases are not treated with antibiotics and as such vaccination is the only effective option of preventing such infections. It is, therefore, critical to ensure that you vaccinate your flock against viral diseases that are endemic in your area.

Bacterial diseases - These can be treated with antibiotics and some can be prevented with vaccinations. Examples are Fowl cholera, Infectious coryza, Mycoplasmosis, and Fowl typhoid.

Some diseases have a greater negative effect and higher consequences for the bird population than other diseases. By becoming educated about these diseases, flock owners can protect their birds and promote better animal health. Below are descriptions of some of the diseases, including their symptoms, how they are spread, and effective prevention methods.

INFECTIOUS CORYZA

One of the most common diseases in poultry farming is called Infectious Coryza. It is an acute respiratory disease also referred to as a cold and is caused by the bacterium ***Haemophilus paragallinarum***. The disease's main *symptom* is swollen face or eyes coupled with a sticky discharge from the eyes and nostrils. Other clinical signs that may be observed are diarrhoea and respiratory signs (rales/snoring and nasal discharge). The *spread* of the disease is perpetuated by multiple-age flocks. Birds of different ages should not be mixed. Transmission is normally by direct bird-to-bird contact as well as contamination of feed and water.

Prevention and control - Caution should be observed when introducing a new flock or chicken into the farm. Birds that recover usually act as carriers and easily spread the disease to uninfected chickens. The "All-in/all-out" system is the ideal technique of preventing the disease. Under the all-in all-out system, the farm will have only one batch of broilers, belonging to the same hatch at any time. This system is more hygienic, presents lesser sub-clinical infections, and horizontal spreading of diseases; thereby lesser mortality rate, better growth rate, and improved feed efficiency. *Treatment* with water-soluble antibacterial can be used mainly erythromycin, tetracycline, and sulfa drugs.

MAREK'S DISEASE

Amongst viral infections, Marek's disease is one of the most ubiquitous poultry disease. It is a type of cancer that affects the nervous system of the chicken. Pheasants, quail, and turkeys may occasionally be infected. The disease mostly affects birds older than three weeks with the highest cases reported in birds between 12 to 25 weeks of age.

Symptoms include lameness and paralysis, un-thriftiness, weight loss, and greenish diarrhoea may be observed in the terminal stages. Mortality usually exceeds 60 per cent if the flock is unvaccinated. Strict sanitation and disinfection of the poultry house before the introduction of a new flock is required to avoid the *spread of the disease*. The virus is shed through the feather dander and may survive for months in the poultry house litter or dust. Birds with clinical signs should be culled. Marek's has *no treatment*. Chicks need to be vaccinated at the hatchery level. To be on the safe side, it is paramount to source chicks from reputable hatcheries that vaccinate day-old-chicks against Marek's disease.

COCCIDIOSIS

The ***Coccidian protozoa*** is the cause of a parasitic intestinal tract disease of animals. It is universally present in poultry-raising establishments. *The disease*

occurs and spreads after ingestion of large numbers of the infective organism by susceptible birds. Contaminated feed, water, and soil act as the routes of transmission to other chickens. Mechanical carriers such as equipment, human clothing and footwear help in the spread of the protozoa. *Symptoms of coccidiosis* include bloody droppings and severe diarrhoea. High mortality rates are reported in grave cases of the disease. Depression, decreased weight gain, and dehydration may be witnessed in long-standing cases.

As part of *prevention measures*, feed companies normally include anticoccidials when formulating poultry feeds. These are chemicals that are generally included in feeds and help prevent the acute disease as well as reduce losses associated with the infection.

Once clinical signs are observed, water *treatment* with sulfa-based drugs such as ESB3 can be used. Vitamin A and K should also be included to improve the rate of recovery as well as prevent secondary infections.

IMPORTANCE OF CORRECT DISEASE DIAGNOSIS

Cases of misdiagnosis usually occur when farmers or animal caregivers miss out on vital clinical signs when reporting a disease to a veterinary officer. With that reality, farmers must be as detailed as possible when reporting a disease occurrence on their farm. It is always advisable for the farmer to sacrifice one sick bird for post-mortem purpose and in return save the rest of the birds with the correct diagnosis and consequent correct medication.

It is important to implement proper hygiene and biosecurity measures in poultry farms. The health status of birds can often be directly correlated with the comprehensiveness of the biosecurity programme implemented in an operation.

For more information on chicken health, please call: +263 776 420 161 or email: gbmundida@gmail.com

Backlink - For more information on Biosecurity in Poultry Farms, refer to *ZiMunda Farming Newsletter Issue 9*.

Images provided by Beven Mundida & Melissa Katunga

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COVER

Pre-emergent weed control on a sugarbean field at Art farm