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CFGB Conservation Agriculture Technical Officers:

Putso Nyathi:
putsonyathi@MCC.org

Neil Rowe Miller:
nrmiller@foodgrainsbank.ca

Jean Twilingiyumukiza:
jeantwilingiyumukiza@mcc.org



foodgrainsbank.ca

Integrated Pest Management

Angela Boss, Food Security and Agriculture Technical Adviser, World Renew

Integrated Pest Management (IPM) is an “ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques.” IPM is among the good agronomic practices that complement conservation agriculture techniques, so CA practitioners should be familiar with its principles and applications.

Key Principles of IPM include:

- 1. Grow a healthy crop.** Healthy plants are better able to withstand pest damage than plants which are weak or stressed. CA principles help promote plant health, and thus they serve as a first step in building plant defenses against pests. Other factors affecting plant health include: selecting well-adapted varieties, planting healthy seed and seedlings, using correct plant spacing, assuring soil fertility, and optimizing water management.
- 2. Use a combination of practices to control pests.** Cultural, physical-mechanical, and biological tactics (see below) should be used before chemical sprays.
- 3. Understand and conserve beneficial insects.** These natural enemies of pests help defend our crops, and in a balanced ecosystem they are vital to keeping pests under control. Being able to identify these defenders in our fields and crops will help us make good management decisions. When possible, avoid the use of non-selective chemicals that will kill the natural enemies of pests.
- 4. Monitor crops regularly.** In IPM, farmers manage their crops based on the pest populations in their fields. They don't spray on a fixed schedule, but rather scout their fields regularly and spray only when needed. Preventing pests and diseases should be our first priority. If pests do attack, controlling them when they are small and vulnerable allows us to use less toxic methods than if we wait until pests are large and numerous.



Beneficial insects, such as this lady beetle eating aphids, help control damaging pests (photo: Matt Cole).

IPM Practices - IPM farmers use a combination of practices to manage pests and diseases. They start with the least toxic or harmful practices in order to prevent pests from becoming a problem.

1. Cultural control practices

- Crop rotation: Alternating crops from one season to another tends to decrease pest populations.
- Intercropping: Pest and disease problems are consistently lower with mixed cropping.
- Disease and pest resistant or tolerant varieties
- Mulching: Reduces some pests and diseases, but increases others
- Optimize fertility and water inputs
- Plant early or late to avoid pests
- Early or late maturing varieties can avoid some pests
- Pruning and thinning

2. Physical - Mechanical control practices

- Pulling up diseased plants to prevent their spread
- Hand-picking of pests
- Natural barriers (hedgerows, trees, etc.)
- Trapping of rodents or insects (e.g. sticky traps)
- Insect or bird screens or netting

3. Biological control practices

- Attract natural enemies. Beneficial insects are often attracted by flowering plants.
- Use biocontrol agents. *Bacillus thuringiensis*, sold as Dipel, Javelin, etc., is a widely available biological insecticide for caterpillar pests.
- Many natural pesticides (e.g. garlic-pepper sprays, wood ash, cattle urine, etc.) prevent or repel insects rather than killing them and must be sprayed repeatedly to be effective.

4. Chemical control practices

- Chemical control is used as a last resort.
- Base spray decisions on scouting results.
- Select the least toxic product available.
- Use spot applications. By avoiding spraying non-affected areas of the field you will leave a refuge for natural enemies.
- Rotate chemicals: If repeated applications are necessary, use chemicals with different modes of action.
- Use appropriate safety protocols, even for natural pesticides.

Implementing IPM – Effective IPM includes the following steps:

1. Properly identify the pest.
2. Understand the biology of the pest and host, including the life cycle of the pest.
3. Use a combination of cultural, physical/mechanical biological, and chemical practices. Remember that the least toxic methods should be used first.
4. Monitor the field to determine pest levels.
5. Use chemicals just before pest populations reach damaging levels. When plants are healthy, they can tolerate some pest damage without affecting the final harvest. Spraying too late, however, makes control more difficult and less effective.
6. Evaluate the results. After action is taken, scout again to assess the effectiveness of the controls applied.

Additional Resources on IPM

Farmer Field Schools for IPM. <http://ffs.ipm-info.org/>.

Fishel, F., et al. 2001. *Introduction to Crop Scouting*. University of Missouri Extension, IPM1006. Colombia, MO.

A Pocket Guide to the Common Natural Enemies of Crop and Garden Pests in the Pacific Northwest. Oregon State University Extension.

CFGB training modules on Insect Identification and Monitoring, Natural Pesticides, and Using Pesticides Safely.

Developing a Biblical Perspective on Agriculture

By Brett Harrison and Sara Sytsma

Sara: Brett, how shall we begin this article about a Biblical perspective on agriculture?

Brett: Well, I begin most of my agriculture seminars by asking what the difference is between Christian and non-Christian farmers.

Sara: What kinds of answers do you get?

Brett: I've received lots of answers, some more true than others: "Christian farmers don't get drunk." "Christian farmers don't grow tobacco." "Christian farmers pray over their seeds instead of having traditional healers bless them."

Sara: How about: "Christian farmers don't take public transportation unless the vehicle has a Bible verse painted on the window?"

Brett: That's a new one to me. Most often I hear: "There's no difference between Christian farmers and non-Christian farmers. Farming is farming." This clearly reveals a failure to make Christianity applicable to everyday life.

Sara: True. I think many Christians try to serve God faithfully yet still separate the sacred – like church and evangelism – from the secular – our everyday lives and work. However, God cares about everything we do, no matter how small



Many CFGB Partners, including this church in southern Ethiopia, consider CA promotion as part of their Christian outreach.

or unimportant it might seem. So, as followers of Christ, we should be motivated to do everything, including farm work, in a way that glorifies God.

Brett: It seems it should be easy, especially in rural areas, for the church to address how faith in Christ should mold and shape agriculture practices because virtually everyone in the congregation is a farmer. What should we do about this disconnect?

Sara: Actually, we already did something about it. We assembled a curriculum called *The Earth is the Lord's: Bible Studies on Creation and Agriculture*. The name comes from Psalm 24:1, "The earth is the Lord's, and everything in it, the world, and all who live in it..." I always appreciate the reminder that everything I have belongs to God. Maybe you can tell our readers about the curriculum?

Brett: Sure thing. The Earth is the Lord's curriculum is a collection of Biblical texts related to agriculture, which focuses on obedience to God's word. It uses a Bible study method in which a facilitator guides the group to discover truths from scripture instead of simply telling them what they should learn. With practice, this Bible study method will also be useful for studying other passages of scripture. What are some of the main themes we want farmers to understand?

Sara: One of the key themes in The Earth is the Lord's is the value of God's creation. In wisdom, God created everything out of nothing and delights in all of it. And we already mentioned another important theme: farming to bring glory to God. We also want farmers to understand stewardship; that God has entrusted us with caring for his creation. Can you give an example of how the curriculum addresses these themes?

Brett: I'll share one of the passages I especially like. Genesis 2:15 reads, "The Lord God took the man and put him in the Garden of Eden to work it and take care of it." Many farmers believe agriculture is a punishment for sin, but this passage makes it clear God gave humans the work of farming before sin ever entered the world. Agriculture isn't a punishment, but a gift from God!

Sara: Just a few verses before that (v. 8) we study how God himself planted the garden. It's really powerful for farmers to understand God was the first farmer. We shouldn't look down on the work of agriculture when it is a continuation of the work of God.

Brett: Regarding stewardship, Genesis 2 teaches us to not only farm the land, but also to take care of it. This implies long-term sustainability in farming was God's plan from the beginning.

Sara: It's no surprise, then, that we promote conservation agriculture since it limits losses to erosion and maintains soil fertility, while continuing with crop production. This ensures food security for farmers in this and subsequent generations.

Brett: CA is definitely one way to work and take care of the land entrusted to us by God. It continues to amaze me how applicable Biblical principles are to agriculture. How much are we charging people for this curriculum? And where can they find it?

Sara: We've made it available for free download ([English](#)). And it's also free to print, use, and share. We want people to have a Biblical basis for their agriculture practices, and to glorify God in their farm work.

If you have questions or would like help learning to use the Bible study process in the curriculum, please email [Sara](#) or [Brett](#).

Partner Profile: Office de Développement des Eglises Evangéliques

By Jean Twilingiyumukiza, CA Technical Officer, Central & West Africa

The Office de Développement des Eglises Evangéliques (ODE) is a development agency led by 11 protestant denominations and seven mission agencies in Burkina Faso since 1972. ODE promotes sustainable agriculture and environmental conservation by training farmers on new agricultural technologies. It partners with several local and international organizations in various sectors including: agriculture, water resources (dams, wells, and irrigation facilities), non-formal education and literacy, and community health.

Burkina Faso is seldom less than 30°C at midday, though the days cool down during the rainy season (June through October). The country's food security relies on small-scale agriculture and livestock rearing. Farming occupies more than 80% of the working population. Livestock feed availability during the dry season is a major constraint. Many animals graze freely, which creates conflicts with crop farmers.

ODE is MCC Burkina Faso's longest standing partner, and for over 30 years, MCC worked under the auspices of ODE. Since 2013, ODE has partnered with CFGB through MCC to promote conservation agriculture (CA), seed production, vegetable production, nutrition education, and training of community leaders in sustainable rural land management.



Free grazing livestock is a critical challenge for farming in most parts of Burkina Faso.

Burkinabé farmers use traditional planting stations known as *zai* and *demi-lunes*. The project builds on this by promoting soil cover legume production.

The PROSAN-Yé project began in 2013 and continued for a second phase from 2015 to 2017. It promoted CA, planting of moringa, and developed six irrigated market gardening sites. PROSAN-Yé, market gardeners produced 104 tonnes of vegetables with an average of one tonne per gardener. Vegetable production along with moringa has improved nutrition in Yé township. CA crops in Yé are largely cereals, legumes and sesame. CA has increased cereal and legume production of 200 producers in 20 villages. 5,750 farmers, including 2,231 women, were involved in project activities.

The PROSAN-Koti project started in 2014, and a second three-year project was approved in 2018. Both phases aimed to improve food security, nutritional status, and family incomes for the poorest people of Koti. CA project activities included promoting crop rotations with legumes and cash crops (sesame, groundnuts, cowpea, etc.) 100 gardeners, including 50 women, were trained in financial and administrative governance; while government, traditional, and religious leaders were trained in managing public land, conflict management, and nutrition.

CA in Burkina Faso remains an important and effective approach to improve soil fertility and boost crop productivity. Introduction of legumes and green manure cover crops/species are an effective complement to traditional *zai*, providing soil cover and animal feed.

Discussions from the Network

Miem Leru: I would like to ask members why they think CA basins and furrows ripped and planted in a rather clayey field, look so much worse than neighbouring fields that were oxen ploughed? This specific experiment happened in a floodplain field, soil is probably quite nutrient rich...

Mikael Norton: Millets are generally not tolerant of waterlogging. With very clayey soils, light tillage may help with infiltration on the short term... It is likely the millet was waterlogged in the plant stations... I would try experimenting with sorghum as it has greater waterlogging capabilities. Some other experiments could be digging field drains (trenches) every few meters.

Kjell Bjørgen Esser: I agree with Mikael that you might have had a waterlogging problem... and unless your soil was covered by mulch, you may have experienced more surface runoff on your CA fields compared to the plowed fields. If so, your fields would have dried up more quickly after the rain.

Neil Miller: In my experience, the single biggest management factor affecting water infiltration is soil cover... Good soil cover prevents surface sealing, even without tillage. Without soil cover, unplowed soils will definitely seal hard, leading to the problems you're describing... Zero tillage without soil cover will not bring the same benefits as true CA.

Miem Leru: Thank you... We are not novices but only have sandy soil experience. Soil cover has been a huge problem... due to cattle grazing residues and 9 months yearly without rain. We have decided to rather introduce cover crops, after giving crops a head start. What is your opinion?

Neil Miller: Glad to hear you're considering cover crops. In our environment, lablab will last 6-7 months with no rain if well established, and pigeon pea even longer than that...

Miem Leru: Could someone post me a picture of what a field drain among checkered pattern basins would look like?

Mikael Norton: In this case was just suggesting a narrow trench (approx 20cm deep) every few rows (experiment with different spacings)... Over time (as indicated by Neil) provided some mulching is used, water infiltration rates should improve.

The CA Technical Officers manage a Facebook Discussion Group from which the above conversations were copied. If you'd like to join the discussion, sign up at www.facebook.com/groups/CAinAfrica.

CA Technical Officer Travel Schedules

JEAN TWILINGIYUMUKIZA

1 June

Goma, DR Congo
Planning Visit: CBCA

10-13 June

Geita, Tanzania
Study Tour with Help Channel Burundi

2-7 July

Bugesera, Rwanda
CA Training with ECHO

14-29 July

Akron, Pennsylvania, USA
MCC General Orientation

6-10 August

Eastern DR Congo
CA Visit & Training workshop

20-24 August

Kirehe, Rwanda
Partner Visit workshop: AEBR

27-31 August

Kicukiro, Rwanda
CA Training workshop: PDN

PUTSO NYATHI

11- 17 June

Malawi
Farmer training sessions: SOLDEV and NCM

2-6 July

Lesotho
GNT Core Farmer training and Competition

15-19 July

Mozambique
Partner Visit: CCM Tete

NEIL ROWE MILLER

11- 15 June

Igunga, Tanzania
CA Project visit

20- 29 June

Interlaken, Switzerland
Breathe Retreat

TBD August

Ethiopia
CA training meetings