

STORIES FROM THE FRONT LINE





In this chapter, we illustrate how the application of the design principles is used to adapt generic agroforestry models, like those in the previous chapter, so that these work for individual farmers and their contexts. We also show how neglect of the principles can cause problems. We do this through a series of synthetic case studies, based on real-life situations.¹²

¹² The specific situations portrayed are fictional, and any resemblance to real locations, real persons or real institutions is completely coincidental.



Hidden hunger and land degradation: An NGO responds to a village's request for assistance

Agroforestry systems exemplified:
Zero-grazing livestock production, trees integrated
with seasonal agriculture

The farmers' needs and the response



Villagers in a mixed farming area in Kenya have been worried about erosion and declining productivity. This is not their only problem. For example, many of the mothers worry that their children are not getting all the vitamins they need for healthy growth, especially towards the end of the dry season when food can be scarce.

Mary, one of the villagers, heard about agroforestry when visiting her sister in a neighbouring village, where an NGO called TreesFP was carrying

out a project. She was able to arrange a visit by the project leader, and eventually the NGO began activities in her village.

Mary comments, “We weren’t sure about accepting help from TreesFP. We liked the name – it means Trees for People – but some people have had bad experiences with agroforestry projects. But we decided to listen to what they had to say.”

Rose, an extension worker, was appointed as team leader by TreesFP.

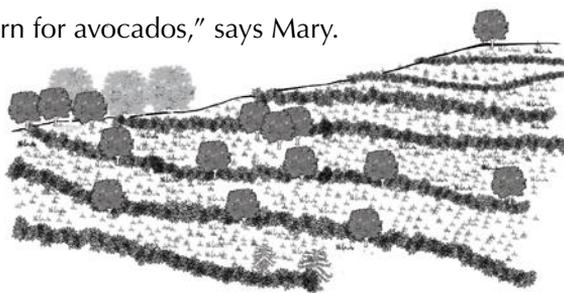
“It was difficult at the start, as some of the villagers expected us to come with ready-made solutions,” she says. “There were comments like ‘What use are you, if you don’t know what we should do?’ It took a while for me to explain that we had to share our different sorts of knowledge in order to find solutions.”

Mary says, “It is true what Rose says. TreesFP were able to help my neighbour Judith to install what they call a zero-graze system for her cattle. That didn’t suit me, but it was fine for Judith because she has grown-up children who can help her with the work. Mine are small, but TreesFP helped me plant my fruit tree portfolio.”

Her neighbour Judith comments, “We now have our cattle in feeding pens, close to the house. TreesFP taught us how to plant fodder banks of Napier grass and agroforestry trees, which we cut and carry to the cows. This means that they are no longer overgrazing our sloping land and causing erosion. We collect and carry manure to the fields and fodder banks to fertilize them. It is a bit more work, but it is worth it. And we also give Mary some fodder for her cow.”



“But only in return for avocados,” says Mary.



How the design principles were used and applied

Rose explains:

“The zero graze and the fruit tree portfolio are just two of the interventions that we helped farmers with. That really illustrates how seriously we take the **principle of farmer-centredness**. We don’t come with ready-made solutions. You have to work them out with the farmers.

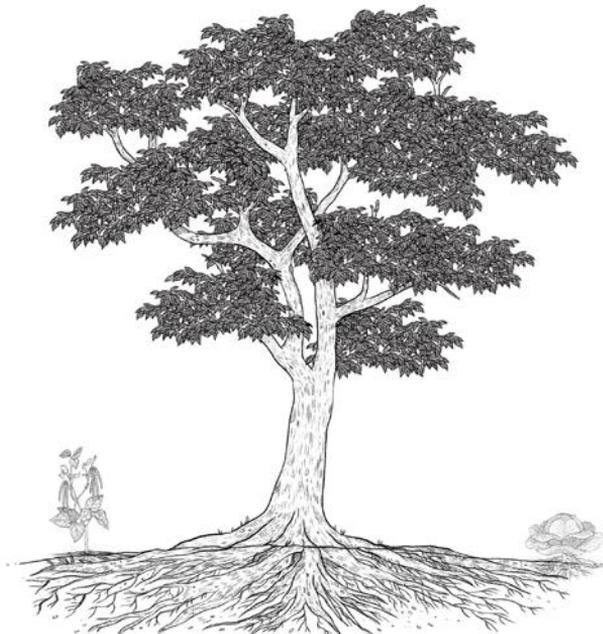
“The **principle of aptness to place, people and purpose** is nicely illustrated by the cases of Judith and Mary. We quickly realized that Mary didn’t have the time or the family labour to dedicate to a cut-and-carry system, but she was keenly interested in having a wider choice of fruits, year round. Through careful selection of the species to be planted, we were able to ensure that the trees would not interfere with the crops, particularly the maize, which would be seriously affected by any shade. In fact, we went beyond species – we were able to get some dwarf varieties of both mango and avocado that work for her. At the level of the village, too, the high participation we had in the portfolio process will ensure that we have a good match with local conditions and needs.



“Judith and some others really wanted to minimize the labour needed for the cut-and-carry system, so in most cases we established fodder banks of Napier grass close to the feeding pens. Also, in many cases we were able to plant the fodder shrubs like calliandra quite close to the pens. But the majority of the fodder trees are in the contour plantings that we established on the former grazing land. To choose the species, we asked the farmers to rank their preferences, and then we discussed in a workshop which species would work best together.

“With respect to the **principle of synergy**, finding the species that work best together was part of that. Even clearer, though, is the nutrient cycle that the villages now have going with the cut-and-carry system. The manure goes straight back on to the same fields that have previously been degraded by the cattle. That means that they are indirectly transferring nutrients from the fodder trees and grass back to the pastureland. In a few years, it should be possible to use the pastureland for crops, or to reintroduce livestock again, but with sustainable stocking rates.

“The principle of synergy also helps people to think out of the box. Mary is now growing some leafy vegetables and medicinal species in the partial shade cast by some of the fruit trees.”





Land restoration for livelihoods and biodiversity conservation

Agroforestry systems exemplified: Simplified cacao multistrata system, sequential biodiverse fertilizer-species system, complex cacao system

The farmers' needs and the response

Ignacio, his son Julio, and Ignacio's cousin Rafaela are smallholder farmers in the Peruvian Amazon. Like others in their village, Santo Domingo, which is at 500 metres above sea level, they wanted both to increase their incomes and recover some of the degraded pastureland on their farms. For this reason, when they heard that people from FuturoVerde, a local NGO, were going to make a presentation in the local primary school about farm diversification and land restoration, they decided to attend.

Rafaela comments, "A few years back, we heard that FuturoVerde had received some money from Europe that they wanted to invest in sustainable agriculture, so that got us interested. I wasn't expecting much, but the agronomist from FutureVerde, Miguel, comes from near here, and he convinced me that this was something we shouldn't miss out on."

Miguel from FuturoVerde explains more about the opportunity: “The funding comes from an impact investor based in Switzerland. They invest in land restoration projects that also strengthen local livelihoods and contribute to biodiversity conservation. They contacted us to help them in building a portfolio here. As you probably know, Santo Domingo is in the buffer zone of one of our most important national parks.”

Ignacio comments: “Attending that meeting was one of the best decisions we ever made. We were able to work with FuturoVerde to come up with solutions that really suited us. Not like that other NGO, who only wanted us to stick to their technological package. So, in my case – as you can see, I’m not as young as I was – they helped me install a cacao system that I could manage, same with my cousin Rafaela and her rehabilitated pastureland. And with my son Julio ...”

“... I can explain Dad,” says Julio. “I told them that cacao is the future, but a cacao that promotes biodiversity and is good for the environment. They knew that I was willing and able to put the time in ... I think that my cacao plot is now one of the most diverse in the region. All this was possible because there is money to help in the establishment process, which is the most difficult part for us.”



How the design principles were used and applied

Miguel explains: “You can see some differences and similarities in what we ended up doing with Ignacio, Rafaela and Julio. Ignacio’s plot is fairly simple: a ground cover of *centro*¹³ that helped to control weeds, fix nitrogen and add organic matter to the soil in the first years, cacao at 4 metres spacing, inga shading, and an upper storey of mahogany.”

“I’m very proud of the mahogany,” says Ignacio. “When I was young, mahogany was abundant here. Now it’s all gone. So, with these mahogany trees, I’m helping to restore things to what they were before.” Julio, his son, adds: “I think they also add to the sale value of the property, in case one day we want to move on.”

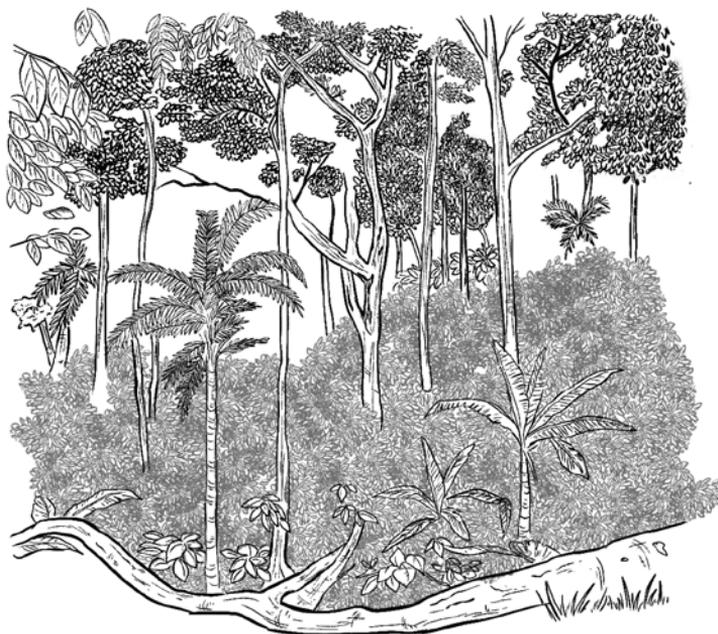
“As I was explaining,” continues Miguel, “what we did with each farmer depended on the situation. For example, in Rafaela’s case, she had a lot of degraded pastureland that she wanted to recover. She decided to opt for a sequential system, which means that the components change in a planned way as time goes on. First, we planted fertilizer species in five-metre-wide strips along the contour lines. Some of these just work by producing a lot of biomass, which then goes back to the soil after being cut back: for example, highly productive grasses like panic grass. We also planted Mexican sunflower, which is a great accumulator of phosphorus and potassium. Plus the leguminous species, of course – trees like *gliricidia* and *inga*, both of which tolerate these acid soils, and shorter-lived legumes like *stylo* and *pigeon pea*. Between the fertilizer strips, we planted one-metre-wide beds with annual crops and the fruit trees and plantain that you can now see. Eventually these are going to shade out the fertilizer species, and the organic matter will come from the trees themselves. If you come back in five years, it will look a bit like a forest – but one that will be full of productive species, what we call an agroforest.”

¹³ *Centrosema molle*, a ground cover plant widely planted in Latin America.

"I suppose we didn't treat the land very well over the years," says Rafaela. "Also, it is quite steep. Before I installed my restoration system you could see the earth, all dry and hard, through the blades of grass. Like that field you can see over there." She points to a neighbour's land: the criss-crossing tracks of the cattle on the gentle slope can be clearly seen. "I'm really happy that my land will be healthy again."

"And then there's Julio," says Miguel. "His cacao plot is a lot more complex than his dad's ..."

"Yes," says Julio, "with the cacao, the ginger, the turmeric, the black pepper, the annato, not to mention the timber species in the overstorey, it is complex. Managing this plot is a bit like managing a herd of cattle. You get to know each animal – each tree, in this case. You need to know when the flowering is coming, when the tree most needs light; you need to know how to read the signs that they give you. I pollard the gliricidias when the cacao is coming up to flowering time, because that's when it needs more light. Later on, when the cacao trees get bigger and start to self shade, I'll probably thin out some of the gliricidias and prune the other trees in the second storey. Sure, it's labour intensive, but I'm a cacao farmer. It's what I do. The more I put in, the greater the rewards."



“So,” says Miguel, “you can see that the farmers’ interests were paramount, even though FuturoVerde and our funding partner have other goals. We explained all that to the community. Transparency first. Don’t forget too that what you see with these three cases is only a sample of what we did. We’ve been able to negotiate a cacao export deal with one of the big cacao trading houses, and we’ve also given training in agribusiness management. We don’t just come here to ‘do agroforestry’. In some cases, we thought that other types of production were more suitable. That’s what the **principle of farmer-centredness** means in practice.

“I think you can see how seriously we’ve taken the matching of these systems to what the farmers wanted ... to what their land is suitable for, too. But if we’re talking about the **principle of fitness to people, place, and purpose**, then you have to take into account the wider objectives. I mentioned before that our funding partner is interested not just in livelihoods, but also in enhancing biodiversity. If all we’d done had been to establish systems like Ignacio’s simple cacao, then I don’t think we’d have met those goals. What we’ve done is to diversify the structure of the landscape here, as well as to increase connectivity with remnant patches of forest. Simple cacao on its own wouldn’t be enough, but when it’s combined with agroforests, complex cacao, and other actions (like the boundary and riparian trees we’ve been helping people put in), what you have is a much more uneven landscape, with lots of different niches for wildlife. It’s a far cry from the old mix of degraded pastureland and forest remnants.



“It’s pretty clear that the **principle of synergy** is what underlies these systems. For example, in Ignacio’s system, the cacao and inga give strong lateral shade to the young mahogany trees. That reduces the incidence and severity of mahogany shoot borer. That’s why almost all Ignacio’s mahoganies have just one, straight stem.

“Then look at Julio’s system. We gave it a kick-start using organic fertilizers – manure, rock phosphate – but now you have a closed system where the only things coming out are

the cacao seeds. He composts the pulp and the pods, and it goes back to the plot. The soil is moist, even in the dry season, because of the trees and the organic matter. Julio is like a manager of synergy, helping to channel light and nutrients where they are needed. Or we can talk about how Rafaela's fertilizer species prepared the ground – literally – for what she has now.

“But it's more than that, because our intervention was designed to have an effect greater than the sum of its parts. The different interventions complement each other, as far as biodiversity is concerned. Then the biodiversity value helps make demand for the cacao beans more stable, with the different kinds of certification we have. And one of Julio's sisters is talking about opening a tourist lodge, so people going to the national park can also learn about how agroforestry and trees-on-farms can help with conservation. So, we have synergy of different sorts and at different levels – agroecological at the plot level, ecological at the landscape level ... even economic synergy.”





Forest restoration through 'rainforestation'

Agroforestry systems exemplified: Complex sequential multistrata system

The farmers' needs and the response

Historically, management of the once magnificent dipterocarp forests near the community of La Pacífica in Leyte Province, Philippines had not served community members well. A village elder explains what happened: "When I was young, the land was covered with forest. Then the logging companies came in, and they left a wasteland. There were a few low-value trees left, but all the upland areas were covered by this kugon¹⁴ grass. A wasteland is what they left, in spite of all the promises. We wanted to bring the forest back, but no one really knew how."

¹⁴ *Imperata cylindrica*, a highly invasive grass native to tropical and subtropical areas worldwide (except the Americas).

The villagers were at first sceptical when Angel, an agronomist who works with the local municipality, visited them to tell them about what he called 'rainforestation'. Angel comments, "People are right to be sceptical, but they heard me out. I told them that we had technical back up from an international research centre and a local NGO called ReForesta, and I invited a group to go and see the work that they've done in one of the other partner municipalities."

Gabriela, a community leader adds, "When we made that visit, we talked to other villagers, and we could see there was something in this rainforestation. That was ten years ago. Now you can see the results. Over that time, we've used agroforestry to bring back the forest. We have 50 hectares in total, and the time and energy we've put in are paying off. On top of that, the community nursery is making money from selling seedlings."

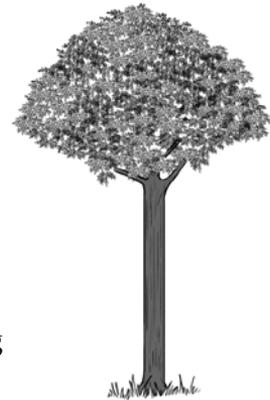


How the design principles were used and applied

Villagers in the area have a lot of experience in cultivation of abaca¹⁵ so they were pleased when the agronomists from ReForesta told them that it would work well in the reforestation system. Angel explains: “Some of the dipterocarps grow best under light shade. Traditionally, that’s also how people have cultivated abaca. When we explained about reforestation in the agroforestry design workshop, the people at one suggested that abaca can provide some of the shade that the dipterocarps need. We also use some fast-growing native trees that fix nitrogen, especially agoho and narra.¹⁶ We start off with some staple crops. Cereals can be used in the first year but we also plant some root crops that are a little more shade tolerant. The villages chose sweet potato and taro. Also some pineapple – not a root crop of course, but they do well in the kind of shade that the system has over the first two years. We also plant the abaca at the very start.”

“At the end of the first year, the villagers start harvesting the root crops and replacing them with shade crops. They chose ginger as a cash crop, with some robusta coffee, just for their own use. By the end of the second year, all the root crops and the pineapple have been harvested, and we put in the dipterocarp seedlings. We also thin the agoho and the narra to reduce competition with all the other components. We do a second thinning much later, when we thin out some of the dipterocarps. That also allows enough light for continued abaca production, or even to put some cacao into the system. In the long term, the villagers will be able to selectively harvest the dipterocarps, as they have full tenure rights over the forest and its products. But I think that right now they are just glad to have the forest coming back.”

Community leader Gabriela also had the idea of installing a community tree nursery. She comments, “Of course,



¹⁵ *Musa textilis*, a species of banana native to the Philippines and grown for its fibre.

¹⁶ *Casuarina equisetifolia* and *Pterocarpus* spp.

the nursery is not an agroforestry system – we understand that – but it is an important part of **our** system. We collect local seeds of all the species, as well as what we call wildlings: orphan seedlings that we take in and look after until they are in good condition for planting. Sometimes it's the best way to get plants of the most valuable species, as many of them only produce seed once every few years. We can't wait that long!

“We received training in nursery operation from ReForesta, so we know all about things like root quality, sturdiness index and mycorrhizae. Here, we are experts. We don't sell the plants, but the municipality pays us and some other community and private nurseries to produce them, and then they give them to the projects. It's a win-win, a bit like trees and mycorrhizae.”



Manolo, lead agroforester with ReForesta, takes up the story: “The reforestation idea came from a partnership between Visayas State University and the German Technical Cooperation Agency, and has proved to be highly successful.¹⁷ However, it won't work on the ground unless what we do is **farmer-centred**. So, we explain that part of our interest is to restore the dipterocarp forest, but that it has to be done in a way that benefits them from the start. It has to be farmer-centred, whatever global challenges you have in mind. In fact, that's one of the benefits of a sequential system – if it's done right. There are no gaps, no time when the income dries up. Here, you get the cereals and root crops, then the abaca and the ginger kick in. I think Angel didn't mention that most of the villagers also plant various other fruit species, either at the same time as the narra, or when the dipterocarps go in. Here, there will always be something to harvest. I was happy when the villagers suggested abaca, as it's a very thrifty species, perfect for agroforestry. The fibre that's extracted from it only makes up about two percent of the biomass – the rest stays in the system as mulch. It's **synergy** in action – abaca loves the shade that the narra and agoho give, and I guess the nitrogen that they fix ... but it all goes back to them and the other components.”

¹⁷ For more information, see: Rainforest Information Portal. 2010. Manila: Rain Forest Restoration Initiative. Accessed 2 June 2022. <http://www.rainforestation.ph/index.html>.



When things haven't gone right

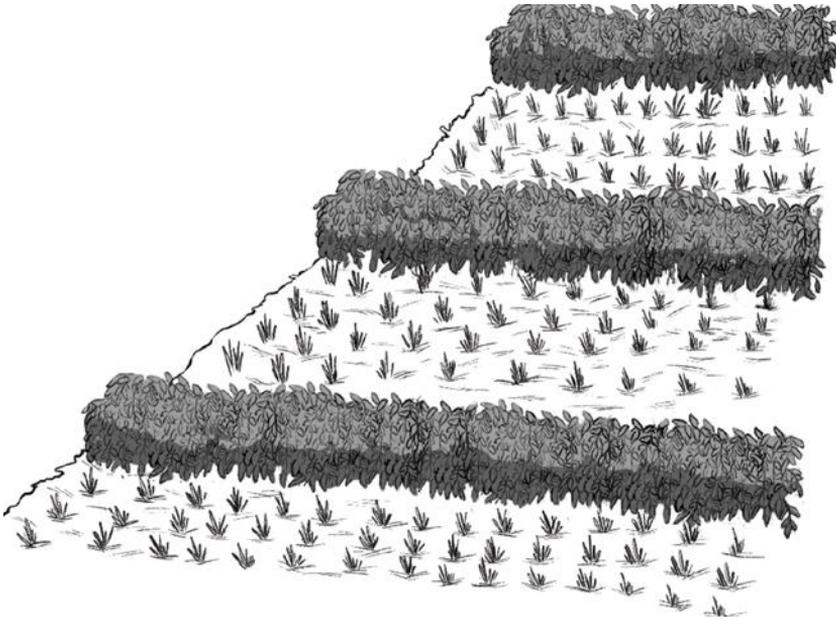
The farmers' needs and the response

The villagers in the Kenyan community we described in the first story have become agroforestry enthusiasts, but it hasn't always been that way. Mary explains: "As I said before, some people have had bad experiences with agroforestry. That was a long time ago, when I was quite little. But you know what they say, 'once bitten, twice shy'. And even those who were not bitten can be shy of the dog."

Extension worker Rose takes up the story. "After Mary told me what she could remember, I tried to find out what happened. I have a friend who works for the organization that led that agroforestry project, and she found some old reports and talked to some of the people who were involved. And, in the reports, I also found the names of some of the participants, who are still here in the village. In the final report there is even a nice picture of Mary when she was little, standing by one of the eucalyptus trees that they planted. She looks very happy in that photo."

"I think that they'd just given me a very big mango," says Mary, laughing.

"Let me tell you what happened," says Rose. "They planted trees in two different places, the same as we did with TreesFP: in the lowland near the houses, like where Mary has her fruit trees, and in the pastureland, like where Judith used to have her cows. But that is where the similarities end ..."



“They knew that people were short of cattle fodder and timber, so on all the boundaries of the farms they planted hedgerows with species that cattle can eat, like calliandra, gliricidia, leucaena, with timber trees like teak and pine every six metres. If you look, you can still see a few of the teak trees. But people didn’t like the hedgerows, because they had to be pruned all the time and – since they’re all spread out – it took too long to collect the leaves for fodder. And then there were the mice ...”

“I can still remember them squeaking as I walked along our hedgerow,” interrupts Mary.

“... If you read the report,” continues Rose, “it explains how in the end they had to recommend not sowing maize seed too close to the hedgerows, because the mice would eat it all. After the project, everyone grubbed out the hedges. The timber trees have been cut down one-by-one over the years. They’ve been quite useful, but no one has planted any new ones.

“They tried alley cropping too. They knew that here the soils are quite poor and that most people can’t afford fertilizer, so that was the solution, they said. They brought in some workers to plant gliricidia in rows in some of the fields. They were supposed to pump up the nutrients from below. There were four metres between the rows, and people planted their maize in the alleys. Every three months they were supposed to prune back the trees and leave the foliage to decompose, like green manure. But the maize didn’t grow any faster, and the trees took up space that we used for crops before. The report doesn’t say what happened in the end, but everyone says they mostly had to poison the trees to get rid of them.

“Then, on the hilly pastures, they said it was important that the cattle had some shade, and that trees could also help to prevent the grass from drying out so much in the dry season. So, people planted some trees – I think they got them from South America – and they had to protect them with little stockades around the groups of trees until they were too tall for the cattle to reach the leaves. To be fair, the trees were very fast growing, and after just one growing season they were almost two metres tall. So, they said that the people could remove the stockades to put the cattle in. I think that everybody knew what would happen. The cows couldn’t reach the leaves, but they liked to scratch themselves on the trunks of the trees, and they soon pushed most of them over and broke the stems.”



How the principles were misapplied or ignored: What went wrong?

“I think I can answer that question quite quickly,” says Rose. “You know, the report talks a lot about participatory methods. But I think they thought that participation was just about asking people questions. Also, if you look at some of their tables of results, you can see that most of the people they talked to were men. I think that the women would have given them another story. So, this wasn’t really a **farmer-centred process**, because either they didn’t talk to the real farmers, or they didn’t listen. As for the **principle of aptness** – as you can see, it is quite dry here and, as I have said, the soils are poor. That means that we can’t have trees here that are going to take the nutrients and water that the crops need. Solutions that work elsewhere won’t work here. You know that photo I mentioned, of Mary with the eucalypt tree? Well, you know, that tree is still there. It is because someone planted it in a very dry and rocky place that is not good for anything else. Almost all the others are gone.

“As for **synergy**, these systems were synergistic in theory, but in practice the different components were not connected, except negatively. The hedgerows competed with the maize and provided habitat for mice, the gliricidia just took up space, and the trees in the pastures were a bit of a waste of time.”

Rose smiles. “So, nought out of three. You know, we are lucky. We’ve had the chance to learn from these kinds of mistakes.”