

The Renaissance Farm

Book One:

***Understanding Agriculture
and Rural Economic Growth***



By Gaye Burpee and Kim Wilson

Cover Photo: Tunsalao, Ecuador, 1999

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By Gaye Burpee and Kim Wilson
Catholic Relief Services

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Catholic Relief Services would appreciate receiving a copy of any materials in which text, graphics or photos from this book have been used. Please send to Gaye Burpee and Kim Wilson (209 West Fayette, Baltimore MD 21201-3443 USA). Suggestions for improving this book are also welcome by letter or email to gburpee@catholicrelief.org or MU@catholicrelief.org.

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ABOUT CRS

Catholic Relief Services was founded in 1943 to assist the poor and disadvantaged outside the United States. CRS works to alleviate suffering, promote human development, foster charity and justice and promote peace. CRS assists the poor solely on the basis of need, not creed, race or nationality and currently operates in over 80 countries worldwide.

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Introduction

The story

Lin rises at 5:00 a.m. before the roosters begin crowing. She walks two miles to the edge of the forest to collect wood for fuel and returns home to cook breakfast for her family. This begins her day of harvesting rice, looking after her children, thatching part of her roof with rice straw, tending poultry and doing laundry.

Lin's husband rises early as well. Harvest is always demanding, and he works in the fields all day. Lin is glad he has returned.

Three months ago, he left to take a job as



a day laborer some 100 kilometers away. While he was gone, there was much to be done on the farm and Lin had no help, save her small children. Food was scarce so they ate little and conserved their energy by sleeping whenever they could. Lin wrapped cloth firmly around the children's bellies, so they would not cry from hunger. Her neighbor brought a tea made from leaves that stop the stomach from hurting.

Lin's story is about many families in many countries. Where farm families used to endure a hunger season of one month each year right before harvest, now they endure two, three, four, five, even six months of hunger. As trees vanish and topsoils are depleted in many areas farmed by the poorest, as weather becomes more variable and groundwater disappears, it becomes harder for crops to withstand drought, floods, weeds, pests and disease, and it becomes harder for farmers to feed their families.^{1, 2} Farms in Lin's water-

¹ Worldwatch Institute, *Vital Signs 2001* (New York, NY: W.W. Norton & Company, 2001), 12, 17-19, 32.

² Worldwatch Institute, *State of the World 2001* (New York, NY: W.W. Norton & Company, 2001), 46, 52-53.



shed are able to produce less and less. Families split up as husbands try to find what little work there is far away. Like Lin, many wives are left to run the farm alone.

Some farm families, though, are able to weather the stresses brought on by the natural and social world. These families spend their days mending fish ponds and goat pens, bringing chicken manure to the compost heap, collecting eggs to sell to neighbors, picking vegetables to preserve, turning nitrogen-fixing plants back into the soil as fertilizer, pruning the low branches of hardwood trees for firewood, gathering low-hanging fruit to eat and feeding home-grown maize to a pig. They devote time to finding better ways to control insects, learning about a neighbor's weed control method, testing new varieties of seed and recharging their sub-surface aquifers through carefully designed, yet simple, irrigation systems.

These families have found a fruitful mix of life-giving activities that sustain their tiny farms throughout the hunger season. Their *renaissance farms* blend a variety of income-generating activities with low-cost organic fertilizers and farm-produced pest controls. They work the same size plots of land as their poorer neighbors, yet are able to produce one-third more year after year. Social scientists would call these farm families "positive deviants." What is their secret?

The task of the farm family

Small family farms constitute much of the world's tropical agriculture in the many countries still depending on agriculture for economic growth. In rural areas, small family farms employ the vast majority of adults and youths and generate most of the income produced. These farms are the patches of land that dot rural landscapes, quilting together the smallest fields, orchards, gardens, fish ponds and pastures into life-giving resources for the poorest families.

While such farms may be small, by no means are they simple.³ Family farms the

³ Chen, Martha Alter and Elizabeth Dunn. *Household Economic Portfolios*. (Washington, DC. U.S. Agency for International Development. USAID AIMS project, AIMS Brief Number 3. 1996). See "Desk Studies" under "AIMS publications" at www.mip.org.



world over consist of a fine web of social, economic, environmental and communal activities. However, the **healthy** family farm, is not only diverse, but also efficient and generally much better able to stave off threats, yield a livelihood for the farming family and provide for the livelihoods of future families.

Everything grown on the family farm has many uses. The secret of the healthy family farm is that it taps into and takes full advantage of the diversity. Rice



Gambia, 1999

paddies yield not only rice to eat, but can also yield fish to dry and sell, straw to compost and grain alcohol to drink.

Millet fields produce grain, but also fodder and beer. Garlic flavors meals, reduces cholesterol and enhances immune systems. When mixed with water and applied to plants, garlic can also ward off garden pests. Many legume species can be consumed as animal fodder or beans, but they can also be turned into the soil as "green manure" for a later, more profitable crop.

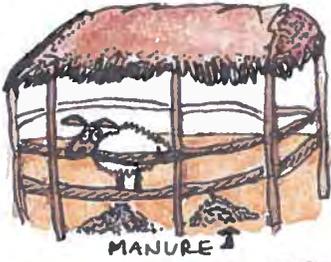
Dozens of activities can spring up around primary crops and animals. Silk is spun, cream becomes butter. Fruits are dried, ground nuts roasted, seeds pressed into oil, leaves crushed into tea. Rice straw is transformed into livestock feed, duck cages and floor mats; chili pepper becomes chutney or pesticide; thick vetiver grass mutes the wind, holds the soil and even becomes perfume.

Above all, the family farm is important because it is made up of people -- mothers, fathers, grandparents, children and grandchildren. Family labor provides the small farm with one of its greatest resources and its main comparative advantage over larger commercial farms. Small family farms are also the cornerstone of an important way of life in rural areas and the guardian of rich cultural traditions.

But to work the farm and improve their lives, members of farm families need nutritious foods, clean water, good health care, training, schooling, the opportunity to expand and improve their farming enterprise and the freedom to

A Renaissance Farm

ANIMAL PEN



MANURE

CUT AND CARRY ALFALFA



COMPOST



FRUIT TREES



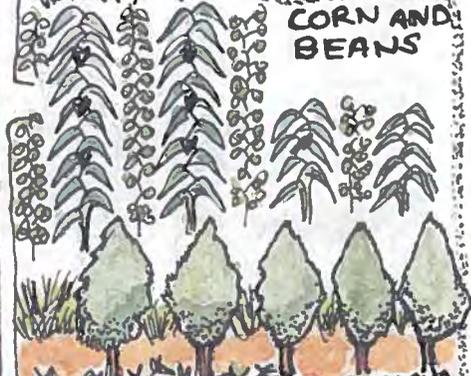
CORN AND CASSAVA



SORGHUM

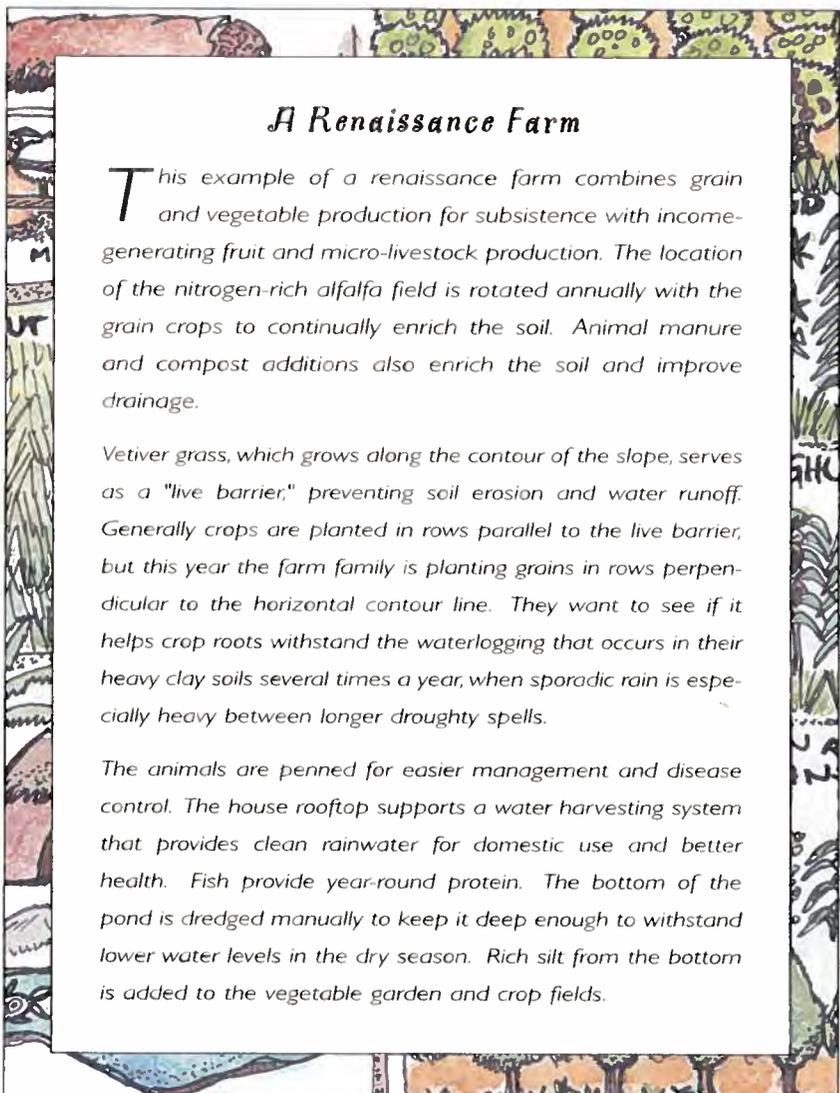


CORN AND BEANS



CASSAVA





A Renaissance Farm

This example of a renaissance farm combines grain and vegetable production for subsistence with income-generating fruit and micro-livestock production. The location of the nitrogen-rich alfalfa field is rotated annually with the grain crops to continually enrich the soil. Animal manure and compost additions also enrich the soil and improve drainage.

Vetiver grass, which grows along the contour of the slope, serves as a "live barrier," preventing soil erosion and water runoff. Generally crops are planted in rows parallel to the live barrier, but this year the farm family is planting grains in rows perpendicular to the horizontal contour line. They want to see if it helps crop roots withstand the waterlogging that occurs in their heavy clay soils several times a year, when sporadic rain is especially heavy between longer droughty spells.

The animals are penned for easier management and disease control. The house rooftop supports a water harvesting system that provides clean rainwater for domestic use and better health. Fish provide year-round protein. The bottom of the pond is dredged manually to keep it deep enough to withstand lower water levels in the dry season. Rich silt from the bottom is added to the vegetable garden and crop fields.

enjoy communal and family activities. Taken together, this is a tall order.

For the farm to survive and prosper, the family must find the right balance between those activities that use up and those that replenish the farm's natural capital – those resources that will continue to serve the farm in years to come. When these activities are appropriately balanced, the farm approaches our ideal of a **high-return conservation farm**, or what we are calling in this book the **renaissance farm**.



About the book

This book, Book 1 of the Renaissance Farm series, like its **Book 2** sequel, ***Supporting Agriculture and Rural Economic Growth***, is not a technical guide. It is a primer for anyone who plans to contribute to rural development.



It is for donors who would like to better understand the challenges of farm life. It is for practitioners in all development sectors whose work in some way touches on the smallest farm families. It is for newcomers to development who know nothing about small-scale farming. It is for seasoned practitioners and advisers who may understand their own work in agriculture, health or microfinance, but are not as familiar with the work of other sectors as it applies to the family farm. Finally, it is for anyone who knows or has come to understand that the complex holism of the smallest farms demands complete, rather than partial, responses and that complete responses require an appreciation of the rich interconnectedness of farm life.

The conclusions and recommendations in this book are based on the experiences of the authors. The Renaissance Farm series of books are not meant to be scholarly treatises, based on thorough data collection, careful replication and statistically significant analyses. Rather, these books have been written as a vehicle to share with others our field observations and lessons, to clarify for readers the challenges and realities of those we serve and to present our best thinking about the general ways to improve support to small farm families. For these reasons, the use of citations in the text is minimal. Suggestions for further reading are consolidated in the List of Resources.

Readers should also note that throughout the chapter text, there are small boxed examples of development success and failure. These examples are drawn from the experiences of the authors and their colleagues in the international relief and development community. Names of organizations have been omitted to avoid unproduc-



tive negative attention to well-meaning PVOs and NGOs, while underscoring the clear need for change.

Book 1 in the Renaissance Farm series, *Understanding Agriculture and Rural Economic Growth*, highlights both the economic and ecological realities of the small family farm. Book 2 examines the role of the development organization in supporting farm families who cope with these realities. The following is a summary of Book 1:

Chapter 1: *Farm Families and Their Social Environment*

explains who farm families are, what their multiple roles and responsibilities are, why they and their ways of life are worth serving and saving, and how their social, economic and political environment both limits and supports them.

Chapter 2: *Farm Families and Their Natural Environment*

reviews the influences of natural forces on the farm and the benefits of natural resources to the small farm family, exploring ways in which families can and do manage these forces and resources to the farm's permanent advantage.

Chapter 3: *The Family Farm as an Agricultural System* shows how careful stewardship and wise management of closely related farming activities results in many synergies that serve to limit waste, maximize production and replenish resources for future farming activities.

Chapter 4: *The Family Farm as an Economic System* explains the multiple businesses that constitute the smallest family farms. This chapter reviews the relationship between the farm's many income generating activities and the economic elements that contribute to their success.

Guide to chapter format, Renaissance Farm, Book 1:

- **Highlights:** Each chapter begins with a short list of main points covered in the chapter.
- **Shaded, Design-Border Boxes:** Each chapter contains short summaries of development successes and failures. The accounts in these boxes illustrate points made in the body of the text.
- **Take Home Messages:** Each chapter ends with a few key thoughts.



FRUIT TREE





CHAPTER I

Farm Families and Their Social Environment

Chapter Highlights

Members of smallholder farm families cope with and survive severely limiting conditions by fulfilling multiple roles, engaging in diverse activities and depending on extensive social support. Roles include that of:

- *Producer*
- *Innovator*
- *Steward*
- *Investor*
- *Strategist*
- *Entrepreneur*

Families lessen the negative impact of the problems they face by forming reciprocal social relationships and networks as a buffer. Problems discussed in this chapter include the problem of food, land, money, health, labor, gender, religion and culture, education, big business, markets and development organizations.

Who are the smallholder farm families?

You have seen these families. They are the women who rise early and go to bed late so they have enough time to wash clothes in the stream, search for wild medicinal herbs, spend hours grinding millet into flour, walk long distances to fetch cooking water and care for young children and aging parents. They are the men who prepare small, disperse plots for planting – borrowing a water buffalo from one neighbor and a plow from another, digging ditches



to keep rainwater away from chicken coops or traveling hundreds of kilometers to work as day laborers on pineapple plantations during the hunger season. You have seen these families tending fields on the farthest reaches of rural villages, removed from essential services of potable water, health care and schools. Often they reside on plots of land at desert margins or high along the slopes of steep mountains, lacking in good soil, prone to wind erosion, difficult to level for planting and subject to harsh weather. We are speaking of the poorest farm families.

They cope as best they can, partly by building and diversifying social capital. They hold many social and productive roles and depend on a social safety net of relatives, friends, neighbors and communities. The Lopez family regularly shares fish from their pond with the Perez family and when prolonged drought dries up the pond, the Perez family shares mangoes from their tree and meat from the goat they are forced to slaughter.



Farmer Scientists

A clever NGO in the mountains of Kerala seeks out farmers who have innovated successfully and then helps the family to spread their innovation throughout local farm communities. One family wanted to earn income by keeping bees that produced a rare and valuable medicinal honey. But each time the family tried to extract honey from the hive, it disturbed or destroyed the colony. They noticed that in the wild, bees constructed their hives in three chambers, so the husband duplicated these divisions artificially. Using three coconuts, he scraped out the white nutmeat, connected the shells in a verticle string with small holes between each shell. He placed a queen inside. When it came time to collect the honey, the family simply removed the top shell where the honey collected without disturbing the colony in the other chambers. This invention cost only coconuts and twine. Families can hang ten or more hives under the eaves of their homes for dramatic increases in household income. The NGO has spread news of ideas like this and others to local farm families by setting up demonstrations in strategic village locations.

Their multiple roles

The small rural farming system is multi-faceted and dynamic, causing the farm family to balance many roles – producer, innovator, entrepreneur, and steward – to name a few.

Farm family as producer and scientist

To succeed as producers in limiting environments, where they are cultivating crops and raising livestock in spite of adversity and



change, farm families respond by taking on the role of innovator. They use trial and error to test different ways of increasing the flow of water to crops, deterring insects and rodents from ripening grain plots or fattening goats more quickly. Out of necessity, many farmers experiment with traditional farming methods to improve on the past for today's needs – to stem the impact of drought, take advantage of heavy rains, control persistent weeds, limit the damage of fire or preserve precious topsoil.⁴

Farm family as steward and investor

A variety of important resources lie in the custody of the farm family. They must protect their financial resources, often savings, in the form of cash, seeds and livestock. The farm family is also charged with protecting and restoring the farm's natural resources – water, soil and trees – for the benefit of the family and future families. Also under care of the farming family are the members of the family. Their health and education are essential to the work of the farm.

Protecting and allocating resources are activities that form the center of the small farm economy. Distributing expenses and investments comes with the farmer's role as steward. A family finds itself carefully balancing an investment in a long-term crop like mahogany or teak with an investment in a small grain silo or payment of school fees.

Farm family as coping strategist and consumer

Farm families must manage a range of pressures arising from outside the farm, but which continually influence the farm's success or threaten its survival. Neighbors, climate and counterproductive local customs can support or destroy the family farm. Unfavorable government policies or erratic mar-

⁴ Smallholder farming systems are based on a process of evaluating, experimenting and improving. Adapting to current challenges in a dynamic world is part of agriculture and farming. Given this cycle of innovation, traditional methods are not frozen in time, but change with each generation. It is important that development organizations not idealize traditional methods just because they are traditional. We may do farmers a disservice by failing to acknowledge and encourage farmers in their role as farmer scientists. We should not overlook our own role in linking farmers to appropriate innovations, information or technology that could resolve local problems.



kets can also weigh heavily on the farm family. Negative policies on competitive goods, taxation on land or income generating activities and unfavorable pricing and subsidies can affect the survival of the small farm.

Farm families are often thought of only as producers who benefit from high prices. They are also consumers of agricultural inputs, tools, clothes and food. Unduly high prices may help the sellers, but hurt the many buyers who are often smallholder farm families themselves.



Not So Sweet

When government pricing policies favored sugar imports, small farmers growing sugar cane in western Kenya faced a crisis. These policies depressed the market for local sugar products, leaving small farmers destitute. In order to survive, successful farmers quickly diversified into other high-value crops like cotton.

Farm family as opportunity seeker and entrepreneur

To prosper, the farm family must turn its attention to opportunities in the local community, as well as to the wider world of markets and trends. The family must understand the demand for its farm produce, the price each



Millet in Mali

In a village in Mali, men were migrating more and more, seeking work to supplement family income. The hunger season was lasting three months a year. Women farmers could not increase their production, because the men were not available to help. To cope, they built small metal silos to store millet, their primary crop. This effectively increased their yield by one third. Now their hunger season lasts only one month.

crop and each animal might fetch and must balance these factors with the cost of production. It must understand the role of vegetable production in generating income and improving household nutrition. It must also understand effective crop management methods, new breeds of livestock, disease resistant crops or low cost, small-scale irrigation.

The farming family also seeks other services to increase or protect its own savings and investments. The entrepreneurial family wants credit to invest in a new opportunity or insurance to protect its crop.



The social impact of the issues they face⁵

The problem of food

"We depend on the sky," says a Cambodian farmer. "If it rains, our rice fields are watered and we have a good harvest. If it does not, we go hungry for part of the year."

Many of the world's rural farms and families depend on the sky. Their agriculture is rainfed. No rain, no crop. No rain, no livestock.



Cambodia, 2000

The poorest families also face the added challenge of farming

on the worst land – land to which they are relegated because large landowners already have the best land or because of expanding villages, new roads and larger rural communities. Food for these families is hard to come by. There is usually a hunger season, a period each year when food is so scarce that families reduce their food intake to one meal of rice or bananas a day.

To cope, they stretch their food supply by building silos, by drying or preserving food in jams, pickles and chutneys, by slaughtering livestock or by introducing income-generating activities during the off-season. They depend on remittances from relatives who have migrated abroad or they buy food on credit from the local shopkeeper who trusts them because she knows them.

The problem of land

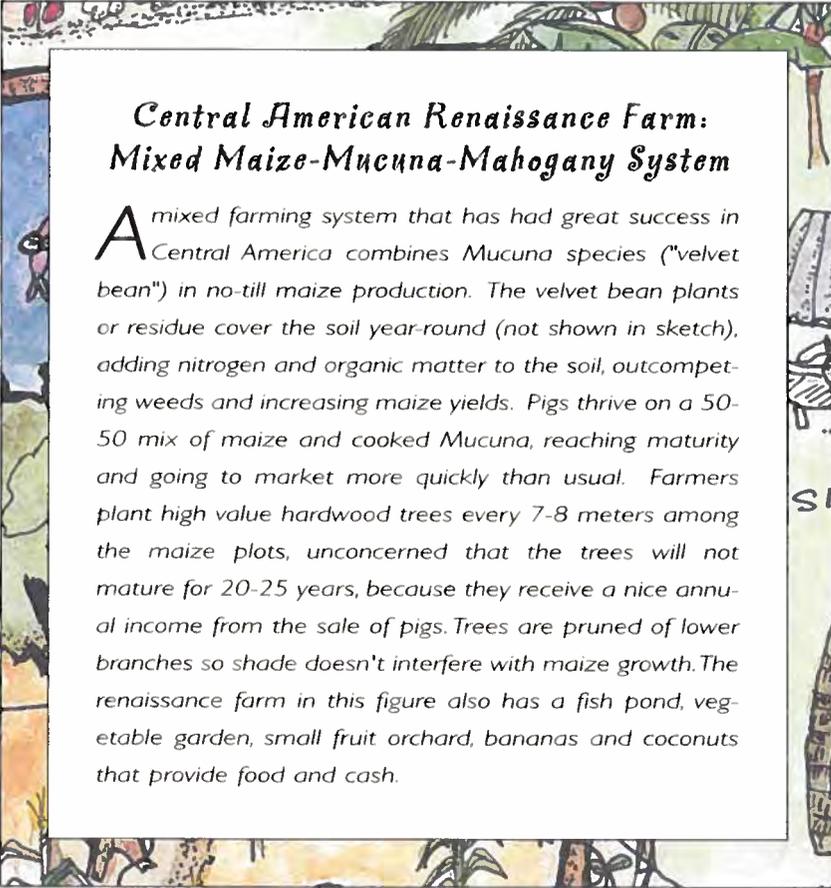
In some countries, the poorest families own no farmland and must sharecrop for wealthier landholders, offering a percentage of the harvest as payment for use of the land. Because the remainder is just enough food to meet the

⁵ The issues in this section are complex. Only a few key elements are highlighted for each problem. Although the list is not comprehensive, our intent is to introduce the idea that commonly faced problems have social impacts for farm families, impacts that may support, complicate or hinder a family's ability to cope.



family's needs, they can sell no portion of the harvest. Without the possibility of converting the harvest into cash or cash into land, the farm family is tied perpetually to the landholder in a dependent, inequitable relationship.

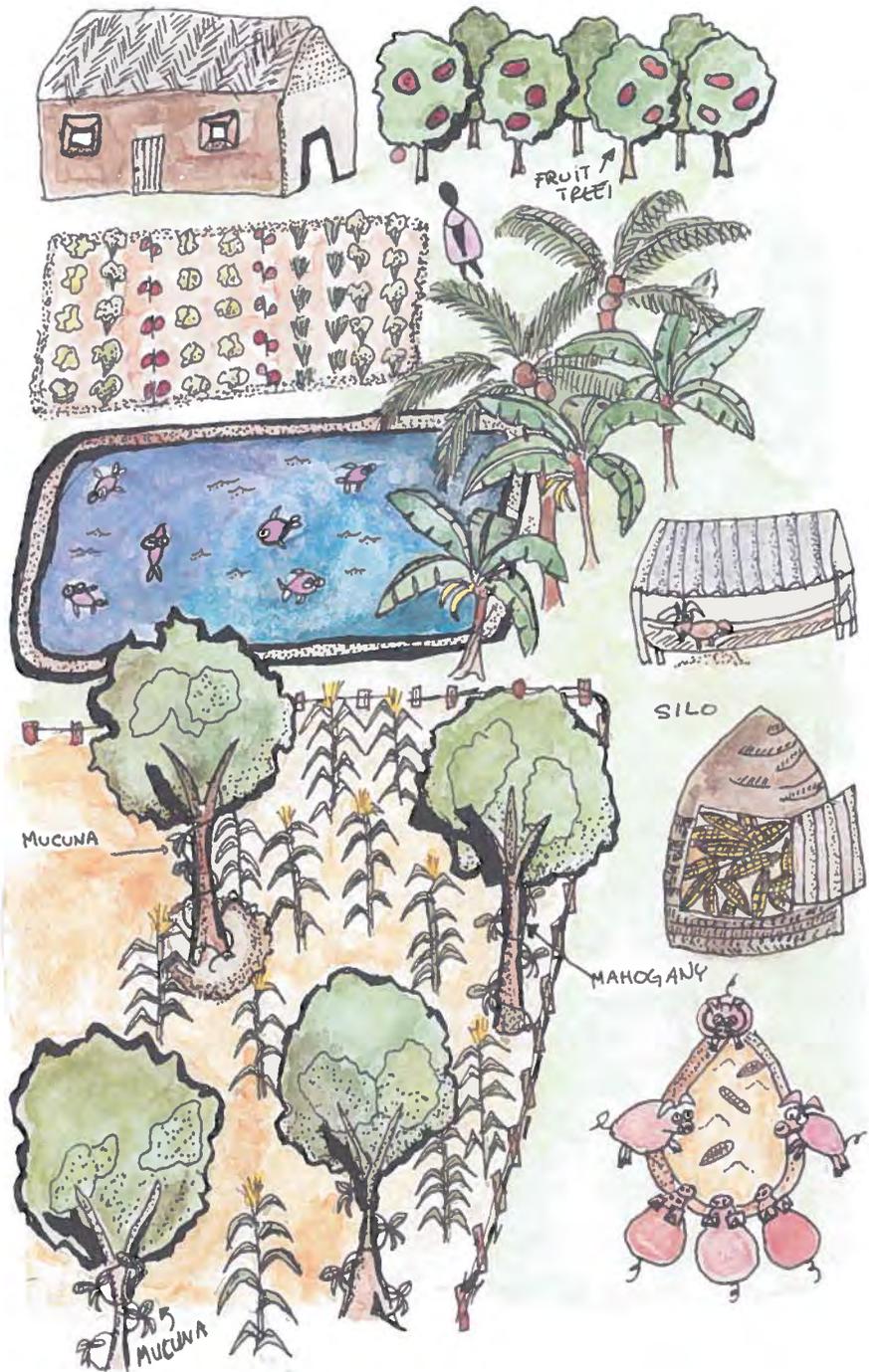
In many countries, while farm families cultivate land that has belonged to them for generations, they do not hold formal title to the land, placing their shelter, assets and hard work at risk. In communities in Africa, ancestral land can be farmed, but is useless as collateral when the family needs a guarantee for credit. In other countries, there simply is not enough good land to go around, pushing the poorest farmers to the top of the watershed or the edge of the desert.



Central American Renaissance Farm: Mixed Maize-Mucuna-Mahogany System

A mixed farming system that has had great success in Central America combines *Mucuna* species ("velvet bean") in no-till maize production. The velvet bean plants or residue cover the soil year-round (not shown in sketch), adding nitrogen and organic matter to the soil, outcompeting weeds and increasing maize yields. Pigs thrive on a 50-50 mix of maize and cooked *Mucuna*, reaching maturity and going to market more quickly than usual. Farmers plant high value hardwood trees every 7-8 meters among the maize plots, unconcerned that the trees will not mature for 20-25 years, because they receive a nice annual income from the sale of pigs. Trees are pruned of lower branches so shade doesn't interfere with maize growth. The renaissance farm in this figure also has a fish pond, vegetable garden, small fruit orchard, bananas and coconuts that provide food and cash.

Central American Renaissance Farm: Mixed Maize-Mucuna-Mahogany System





The problem of money

The poorest farm families use many forms of money. In Indonesia some remove a handful of rice each day from the family stores, setting it aside, protected, for later sale or use. This is money. In Vietnam and Zimbabwe some fatten a pig or goat, and when cash is needed for school fees or funerals, they sell the animal. This is money. In El Salvador some gather bricks over many years in anticipation of upgrading their shelter, but at any time, they can exchange their bricks for cash. This is money. In Honduras or India, some grow cedar or mahogany trees so that they may sell the precious wood one day to pay for a daughter's dowry or wedding. This is money. In the Gambia some convert harvests into gold and wear the jewelry. This is money. In Bolivia some help a neighbor dig a pond or build a house. This is also money.

Theft, floods, pests, disease, community strife and irresponsible consumption threaten this money. Thieves steal it, floods drown it, pests eat it, disease destroys it, husbands drink it. The poorest farm families are under constant pressure to protect their money, whether in the form of cash, social capital, stored grains, livestock, trees, gold or bricks.⁶

This "money" can also be viewed as family savings. Poor families struggle to raise lump sums of cash to meet timebound deadlines for school fees, agricultural inputs, health care, weddings or funerals. These "savings" are converted to cash when needed.

The problem of health

Good nutrition contributes directly to the health and productivity of the farm family. Many of the poorest farm families produce a diet insufficient to nurture children, resist disease or provide the energy needed to perform multiple farming tasks. Adequate food with the right combination of nutri-

⁶ Social capital is a complex mechanism that people use to cope with and adapt to change. It is defined by the World Bank as "the norms and networks that enable collective action...It is the glue that holds [a society] together." Social cohesion is essential for economic growth and sustainable development. For more on social capital, see the World Bank website at <http://www.worldbank.org/poverty/scapital>. Also refer to World Bank Report #21936, Deepa Narayan et al., *Voices of the Poor: Crying out for Change*, 2000 and Report #20246, Deepa Narayan et al., *Voices of the Poor: Can Anyone Hear Us?*, 2000.



ents may be unavailable because these families do not know efficient ways to grow a balanced diet, or they must pay off high interest seed and fertilizer loans with meager harvests or they lack sufficient land to grow the food



Harvesting a Balanced Diet

In Cambodia, many families depend solely on food from harvesting rice and fish grown in the paddies. They lack year-round protein as the rains will produce only one harvest per year, leaving the paddies dry and without fish for many months. Although families store and use fermented fish paste during the dry season, it often runs out before the rainy season begins. Thanks to a new project, families have introduced small livestock and vegetable gardens into their farms. They plant bamboo, fruit trees and acacia for food, wood and as a natural fertilizer. They have year-round fish ponds, harvesting tilapia and two kinds of carp. Now they have protein, important vitamins and minerals year-round from the fish, small animals, vegetables and fruits. They also receive cash from the sale of livestock and bamboo.

they need. Important nutrients, particularly essential proteins, vitamin A and iron, may be out of reach. Far from the advice of health workers and agricultural assistance, the poorest families have the least information and fewest resources needed to produce a balanced diet.

Clean, potable water is often far from easy reach. Village wells, if

they exist, can be a long walk for those who live on the outskirts of communities. During a drought, people often have to drink from the same contaminated source as livestock. In India, members of one caste may restrict the use of wells by other castes.

The problem of labor

The farm family relies on its own labor force and that of neighbors to power its activities. Although some families own draft animals, the poorest do not. Family labor transforms scrubland into cropland, rain into small reservoirs and animals into assets. Family labor is connected to the number, age, health and availability of family members able to work.



Pitching in

Sisiket, Thailand. To make optimal use of labor, families carefully allocate each task to an appropriate family member. Adults prepare and harvest the fields. Children collect quail eggs and low hanging fruit before school. Grandparents spin silk, weave mats and make incense.



The rhythm of family labor suffers when an adult leaves the farm to earn day wages elsewhere, while the spouse is left to manage the farm. The farm suffers when firewood is scarce and a child must walk miles each day to gather fuel, or when water is scarce and the woman must walk miles for drinking water, or when good health is scarce and the family must use most of its energy to care for sick members.

Educated children are often a goal of the farming family. The family suffers when it must take its children out of school to work the farm. Worse still is when young boys remain in school, but young girls are taken out to carry water or mind younger children, widening the gender gap.

The problem of gender

Many rural societies have highly specialized roles for males and females.

Custom may dictate which spouse tends small livestock (often women), which tends cattle and other grazing animals (often men), which cultivates the fields, which plants, weeds, harvests, threshes, grinds or sells.



Cambodia, 2000

While such division of labor can be a simple blueprint that helps family members allocate labor, often these specific roles rob women of important opportunities and decisions. For example, in rural Pakistan many women do not inherit the assets of the farm upon the death of the husband, as the plows, land and large animals are passed on to sons or other male next of kin. In Southern Africa, key decisions are usually the province of the husband, including which crops to plant, what quantities to store and which investments to make.

Borrowing money and allocating household resources is often the domain of men. Women may purchase food, pay school fees, buy medicine and clothes, yet the man may decide the amount to be spent for these purposes.



When a woman suddenly finds herself in the role of head of a household, through widowhood after war or seasonal migration by men for work, as an example, she faces a double crisis. She may find herself lacking the labor once provided by her husband, while facing decisions she has not had experience making. Her new demanding roles can place the small family farm in crisis, especially if she must focus on protecting and providing for her children.

On the other hand, once in a position to make decisions, women often seem to innovate and adapt more quickly than men, perhaps out of necessity to compensate for the lost labor or out of a stronger focus on the family and a greater desire to improve children's well-being.

The problem of education

Weighing the harvest, reading instructions on a half kilo tin of seeds or counting cash to pay school fees are part of daily farm life. But what does the farm family do when no member can read the markings on a balance scale? Or when the planting instructions on a seed tin are critical to good



Where there's a will...

Andhra Pradesh, India. Tired of waiting for government services and oppressed by a caste system that did not allow their particular caste to attend the village school, women in a rural village pooled their savings for several years. They used the funds to build a school-house and hire a teacher. The school is near the rice fields where these women spend most of their time, which makes minding their children before and after school possible.

results? Or when the family believes it has saved enough for school only to find it did not add the bills correctly? Literacy is not simply a route out of poverty, it is essential to basic survival.

Many countries have insufficient educational opportunities for both children and adults. Adding to the problem is the need of the farm family to direct part of its labor force to spend time away from the

farm. Worse still, the poorest families are so far removed from educational facilities that children simply cannot make the journey to and from school within the existing daylight hours. In some areas, school fees are expensive, as are uniforms and books, limiting the number of children that farm parents can send to school, if any.



The problem of religion and culture

While religious and cultural customs are a great benefit to many villagers, some find themselves adversely affected by surrounding belief systems and



Good neighbors

Java, Indonesia. Christian farmers discovered that raising pigs was a profitable way to complement other farming activities. Whenever pigs escaped on the Christian Sabbath (a day of no work) into the yards of Muslims (who are not permitted to touch pigs), the Christian and Muslim farmers resolved their mutual problem by agreeing to pay Hindus to capture and return the lost pigs, who were pleased with the opportunity to earn extra income.

cultural practices. The practice of one neighbor may affect the situation of another. For example, one religion may forbid handling pork, another killing cows, still another killing insects. In countries where neighbors represent a variety of religions, practices can differ widely, causing conflict. Compounding the problem are the issues of tribe, caste and ethnicity where roles

are clearly defined and may limit the variety of activities required to run a successful renaissance farm.

The problem of big business and big farms

Of increasing concern to farm families are large business operations that produce goods like soap, rope and candles to sell in villages. In the past, local farms made and sold these products to other villagers. Shifting the processing and post-harvest activities to big business removes scarce cash from the village economy, leaving fewer alternatives for generating income.

Farm families can lessen the impact of the loss of these economic activities by finding links to larger businesses and seeking their own market niches — supplying specialty raw materials or completing labor-intensive steps in the production process, for example. However, smallholder farmers may lack the information, confidence or negotiating skills to approach large businesses and farmers. This highlights a potential role for development organizations.

Large farms sharing land within the same watershed pose a threat as well. These operations often grow major commercial crops, using maximum



amounts of water, chemical fertilizers, pesticides and herbicides. Runoff loaded with inorganic matter and toxic chemicals can contaminate surface and groundwater supplies, adversely affecting fish populations, water, crops and livestock of nearby family farms.

Increasing profits

The farm family can increase its profits in three ways, through:

1. **Increasing the price of goods sold** – through strategies like better packaging or storing grains until the market price increases,
2. **Increasing crop yield through improving the inputs** – increasing fertilizer applications, preparing or buying richer fertilizers or using improved seed varieties, or
3. **Lowering the cost of production** – through strategies that increase efficiency and reduce risk. Using a cow to produce milk and also using its manure as fertilizer and cooking fuel is an example of efficiency. Building a simple water harvesting system on every rooftop to trap rainwater and offer the farm a second source of potable water is an example of risk reduction.

Most farm families believe they have more control over the third option and focus their efforts there. This opens the door for additional profits if families can begin to focus on the other options, as well.

The problem of markets

Smallholder farm families generally face unstable prices, prices over which they have little control and little information or warning. Of everything produced on a farm, the raw products are the least well paid. If farm families cannot market products they have processed themselves, they are unlikely to get decent returns.



Over the last several decades, the development community has been successful helping farm families increase production in environmentally sound ways, but they have been weak at supporting farmers in marketing, commercialization and value-added processing. With increasing globalization of markets, small farmers are expected to become increasingly marginalized without support in this arena.

The problem of development organizations

Thousands of local and international organizations dedicate their services to assisting the poorest farm families. Advisors sometimes devise interventions that prove risky and can be devastating to small farm livelihoods. When these



Bees Without Blossoms

Darkabir, Turkey. In southern Turkey, a local organization decided that honey production was a good activity for poor farmers in villages situated on rocky plains near the Tigris. The organization set families up with beehives, the cost of which was to be repaid in jars of honey that the organization would sell. Farmers discovered there were not enough flowers with the pollen that attracted the bees near the village, so they piled the hives onto horse drawn carts and hauled the bees many kilometers to a site with more of the favored flowers. Even these efforts proved fruitless. The farmers, enraged that they had altered their farming patterns to accommodate the meddling organization, refused to pay for the hives with honey that the bees could not produce. The farmers destroyed the hives.

schemes require the family to move away from the best elements of traditional practices that sustained the farm in the past into new, unproven technologies, they create new pressures on the farming system.

Neither traditional nor modern methods alone is apt to resolve all the challenges of smallholder farming systems. Some combination, locally tested and adapted, often works best.

Untested interventions

promoted and implemented with great enthusiasm ignore the reality of the smallest family farms. While they give the organization or advisor a chance to see his or her schemes put into action and while bestowing a feeling of usefulness on the organization or advisor, seemingly benign projects can have destructive consequences and place the family farm at risk. It can also set a community against accepting development assistance ever again.



One of the greatest weaknesses of the support given to small farmers by development organizations has been the lack of systematic, but reasonable, evaluation and assessment that can provide feedback during implementation, identify successes and failures and provide information about the reasons for each. Our failure to collect the necessary data, engage in critical self-analysis and share evaluation results widely means wasted resources as we reinvent the wheel and continue making similar mistakes. We often have very little proof, one way or the other, of the impact of our work.

Take Home Message

Smallholder farm families cope with the challenges of limiting environments by filling multiple social roles, by depending on complex social networks and by engaging in reciprocal social relationships.



Ecuador, 2000





CHAPTER 2

Farm Families and Their Natural Environment

Chapter Highlights

Farmers find many ways to minimize constraints and maximize the benefits of natural resources for agriculture, while protecting resources for future use. This chapter covers water, soil, wind, sun, fire, weeds and pests.

The importance of farm resources

Out of necessity, the poorest farm families must make every available resource work to its fullest measure. Natural resources on or near the family farm are the least costly resources for the farmer to deploy for farm use. They are close at hand and offered by nature at no cost except labor, which can be the most abundant resource on family farms. Moreover, these natural resources can generate better results than their synthetic substitutes.

The challenge for the farm family is to wring from every drop of water and every inch of soil its full productive potential, while ensuring that the same supply of water and same quality of soil are available for coming harvests. This double task requires that the family farm the land with an eye to the preservation and replenishment of naturally available resources. Poor water management may lead to a contaminated or inadequate water supply and can worsen the impact of drought. Poor soil fertility management can lead to harvests with successively lower yields. Both have the effect of robbing the family of its chances for survival and prosperity.



Environmental problems

The problem of water

Water, sun, air and soil are the lifeblood of the family farm. Water, in particular, affects all aspects of farm life, from the health of the family to cultivation of crops and raising of animals. In order to mature, plants and animals need clean, plentiful water devoid of contaminants and salinity.

Water is also a people issue. People use it, dam it, channel it, pollute it, waste it, deplete it and fight over it. When water is scarce, people's activities can heighten the impact of scarcity. Farm families can lower water tables through improper cultivation, wasteful use or poor irrigation techniques. Droughts magnify the problem. Lowered water tables may have a serious effect on farming activities.

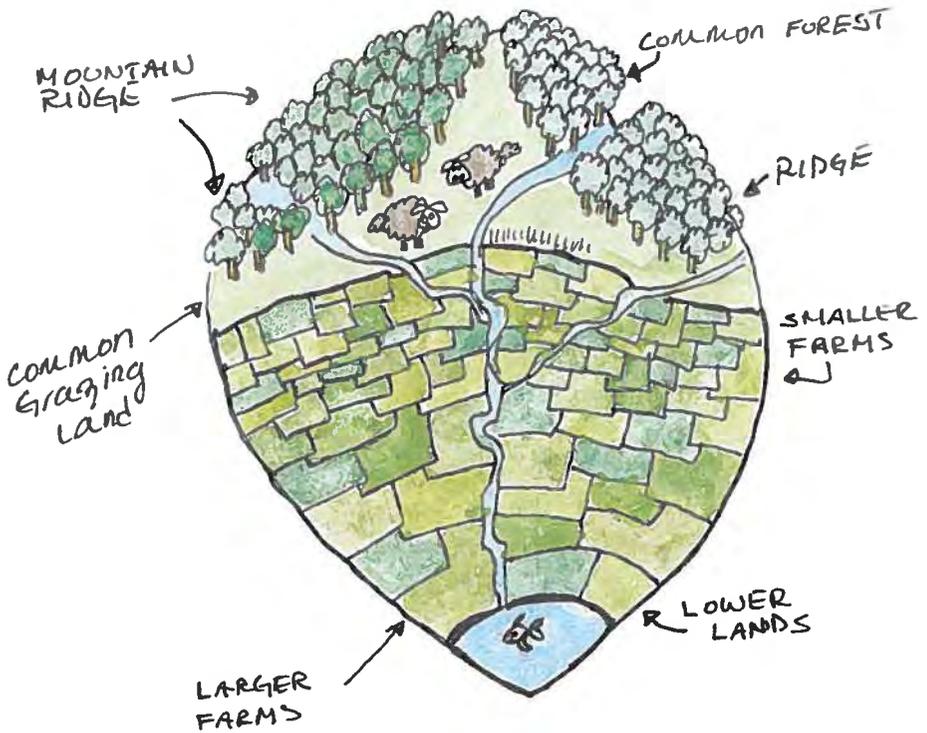
Crop root systems struggle to reach the water table, plants wither, land sinks, rivers and springs dry up. As streams and irrigation channels shrink into puddles, standing water accumulates, multiplying disease and pest problems.

In many countries, the poorest farm families, dependent on rainfed agriculture, are driven to the upper reaches of watersheds at and beyond the extreme margins of land that is suitable for agriculture. These farmers inhabit those areas of slopes and depressions down which rain and spring-fed rivers and streams travel. Diverting water to irrigate upland farms may deprive larger farms and wealthier landowners below of their expected supply. Farmers in the valleys often expect the poorest farmers on steep slopes and ridges to protect the supply of water that originates at the top of the watershed by



Escobar, 1999

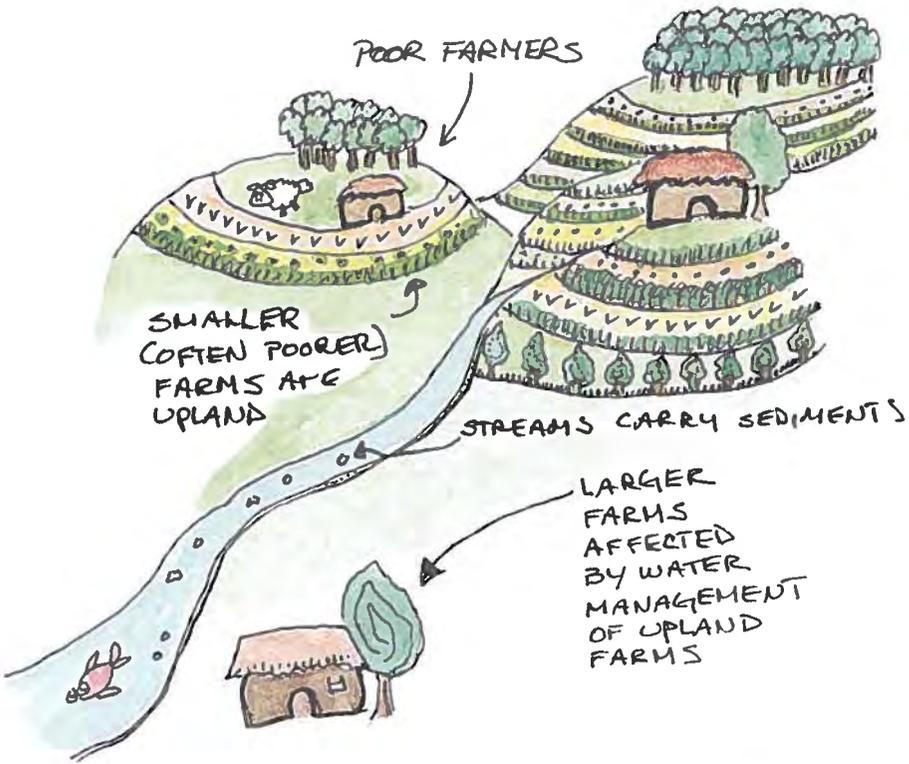
Aerial View of a Micro-Watershed



Aerial View of a Micro-Watershed

This figure shows an aerial view of a micro-watershed. While a watershed is the entire catchment area of a river system, a micro-watershed is one of many smaller sub-catchment areas that drain into feeder streams for the main waterway. Watershed or micro-watershed borders form an invisible line linking the highest elevation points that ring the watershed. These high points cause all water to flow towards the stream or river. The figure shows that land use at the top of the watershed is primary forest and pastureland, with farm plots located at middle and lower elevations.

A Micro-Watershed



A Micro-Watershed

This sketch shows a side view of smaller farms located at higher elevations and larger farms near the base of the watershed, where the richer soil and easier-to-farm, more level land is usually found. Projects using a watershed focus require attention to cross-community collaboration and communication to protect rights and share responsibilities equitably.

STREAMS CAR



careful use and by maintaining protective vegetative cover. However, they rarely think of sharing the cost of planting trees. Social conflict may arise when the poorest are unable or unwilling to protect the water supply for the richest.

Farm families, including the very poorest families, manage the quality and quantity of water through various means. Their primary goal is to remove variability from their water supply, which is subject to the vagaries of climate and weather, while still maintaining good relations with neighbors.

To maintain a more consistent supply of water, farm families work hard to capture and store water during the rainy season for use during the dry season. Vessels near gutters catch rainwater close to the home, as do roofs that are shaped like a basin. Ponds and small dams along streams hold and store water. Good soil management and cropping patterns help ensure that water is continuously available to different plants throughout the growing season. Simple irrigation systems help the farm family weather the dry season.

The problem of soil

Soil is alive. It is a complex, virtually invisible system of inorganic sand, silt, and clay, the organic remains of plants and animals and millions of tiny, living



The Kitchen Sink

In Guatemala, farm families build their compost heaps with eggshells that provide calcium, kitchen scraps and maize leaves that provide essential carbon and trace elements, chicken manure that is high in nitrogen and ash from cooking fires that provides potassium and phosphorous. When decomposed, this compost provides a natural time-release fertilizer that is richer and more complete than purchased, inorganic fertilizer.

organisms. With the help of larger creatures like earthworms and beetles, these micro-organisms break down dead plant and animal matter, mixing it with particles of soil so that important nutrients are stored where they are available to plants as roots need them.

Soil scientists say that one inch (2.5 centimeters) of topsoil, the fertile, loamy soil on which crops thrive, takes about one hundred years to develop through natural processes. By its very nature, the work of cultivating land for agriculture exposes and degrades precious topsoil. Many cultivation practices leave



land bare until plants grow and begin to develop a canopy, exposing the soil to the effects of wind, rain and too much sun. In addition, crops require large quantities of nutrients. These nutrients, pulled up through the roots during the growing season, leave the field with the harvest, permanently spent, unless somehow replaced.

The poorest families, whether farming the top of a steep watershed, or working the fringes of a relatively flat farming community, usually farm the most degraded soils – rocky soils, clay soils, salty, sandy or infertile soils. Excessive clay means plant roots will be trapped or suffocate. Soils with lots of clay become waterlogged when it rains, and the heavy clay blocks roots from growing easily, from reaching nutrients and finding essential oxygen. On the other hand, in excessive sand, plants will either starve or die of thirst. Sandy soils are generally infertile, and they drain water so quickly and easily that it's gone before plants can use it. When a soil has too many rocks or gravel, seeds have trouble germinating and roots have trouble finding room to grow. When farmers irrigate a lot, but do not flush and drain the soil from time to time, fertilizer salts collect at the surface and soil can become too salty for plant growth.



Can of Worms

In Cuba, farm families cultivate containers of soil, kitchen garbage and earthworms, which they spread in fields to break down organic matter and improve soil structure. As worms digest leaves and other organic matter, they accelerate the process of creating nutrient-rich soil and humus.



Green Manure

In Peru, farm families cultivate "leguminous" plants that are able to take nitrogen from the air and convert it into a form in the soil that other crops can use. Families turn young crops of tropical kudzu into the soil to increase its nitrogen content and improve its capacity to hold and drain water and even control weeds when cut and left to die on the surface. These nitrogen-fixing plants are called "green manure."

Farmers improve soil by increasing its fertility (amount of available nutrients), by providing a healthy environment for biological activity (microflora and microfauna), by improving its physical properties for root growth and by helping the soil to maintain a good balance between water retention and drainage. Farmers improve soil

fertility by replacing lost, harvested organic matter through composting, ver-



miculture (producing worms in a bed of manure) and by incorporating animal manure or green manure from high-nitrogen plants. Farm families create compost heaps made of organic matter readily available on the farm – ash, eggshells, leaves and straw, kitchen scraps and manure. Carefully constructed and maintained over several months, these compost heaps yield dark, crumbly, fresh-smelling matter that is called humus – the farmer's gold.

Humus is rich in nitrogen, phosphorous and potassium, the main nutrients needed for good plant growth, as well as many other important nutrients and trace elements. Humus adds fertility to sandy soils and helps retain water, it helps aerate and loosen clay soils and it provides habitat for the flora and fauna that keep the soil healthy and functioning. Humus is not simply farmer's gold, but soil's lifeblood.

The problem of wind, sun and fire

Wind racing unchecked across a freshly planted field can destroy young seedlings. It blows sand that destroys young leaves, it dries and withers them and removes topsoil. Wind can also harm crops in the middle of the growing season, making it difficult for plants to retain water, flattening and bending taller plants like maize or millet and exposing shorter crops like beans and sweet potatoes to the hot sun.

When wind removes rich topsoil, it can leave the land unproductive for future crops. It also increases the amount of labor the farm family must exert to remove dead plants and clean out low lying areas covered by soil. When livestock are allowed to overgraze pastureland or when forests are cut back excessively,

the land is deprived of a proper defense against the wind. With time, severe wind erosion, combined with overgrazing, overcultivation or deforestation, can and does lead to the formation of deserts.



Fire Escape

Cashews produce tasty nuts to sell, but trees also serve as a natural firebreak. The tree's roots produce a mild herbicide that prevents grasses from growing beneath. If a fire approaches several rows of cashew trees, a stretch of bare ground breaks its spread.



Sunlight gives crops the energy they need to convert carbon dioxide and water into plant material. But too much sun, wind and heat can dry the soil and burn crops. Tropical farmers use a variety of tricks to cope with the harmful impact of sun and wind. Their goal is to create a favorable microclimate, one that lowers or modulates the temperature of the air and soil while preventing loss of precious water. Families can limit the power of wind by building windbreaks made of trees planted in a row perpendicular to the

wind's prevailing direction. Trees like Acacia and Calliandra serve well as this kind of protection. Families can also plant vegetative covers of bushy legumes and thick grasses in open fields to deal with the effects of both wind and sun. These canopies of growing plants hold the soil in place, protecting it from removal by wind and rain.

As with wind, farm families can protect crops in arid zones from too much sun. They shade young plants by planting them between rows of trees in an alley cropping system, or they cover the surrounding soil with dead leaves, straw or cut grass as mulch to hold water in the soil and suppress weeds. Millet and sorghum provide excellent canopies that shade low-growing crops such as sweet potatoes, cassava and beans. Farm families also plant trees like Leucaena for rich animal fodder when pruned, trees for lumber and fruit trees that form living fences on plot borders, resisting damage caused by termites with fences of lumber and shading crops for part of the day.

Lightning, sun and people start fires. Fire, quite obviously, will destroy crops, animals and shelter. Fire is often used to clear land for farming, as it is an easy way to rid an area of weeds and unwanted shrubs or trees. While kitchen ashes can nourish the soil when mixed with dead plant matter, so that nutrients are trapped in the rich, dark humus produced in compost piles, ashes that remain on the surface of the soil after a fire have short-lived



benefits. They provide an immediate flush of nutrients to the soil, but they are easily washed or blown away, usually before new seedlings are large enough to make use of them.

The practice of clearing land through fire can do much harm. Fire burns the millions of tiny organisms that live near the soil surface. Their job is to break down undecomposed organic matter, so that important nutrients become available to crops. Fire also kills wildlife, birds, bees and beneficial soil creatures. It clouds the atmosphere with harmful smoke, and acrid air pollution can blanket entire regions for weeks as smoke particles block sunlight. Yet for many farm families, fire is the most effective tool they have to control weeds and pests. The trick is to burn judiciously and properly.

The farm family copes with fire through natural or manmade firebreaks or by keeping soil as moist as possible. Some trees resistant to fire can block its spread, others retard it by limiting the growth of grasses underneath.

The problem of the unwanted

Weeds compete with crops for soil, sun, water and nutrients. Rodents and birds seek the same yield from crops, growing or stored, as the farm family.



Cutworms, locusts, beetles and weevils feed off the leaves, fruit and roots of crops, raid grain bins and food stores.

Free-roaming goats trample vegetables in the gardens of neighbors, chew the crops of the farm family and destroy soil dikes and wood fences. Diseases kill

livestock, ruin crops and weaken members of the farm family.



Small is Beautiful

The humble radish is more than a food; the lowly garlic is more than a flavor enhancer. In Thailand, families intercrop radishes with cucumbers. The radishes repel cucumber beetles, protecting both crops. In many countries farmers use a spray of diluted garlic juice to kill bacteria that damage fruits, nuts and vegetables.

Weeds, snakes, rats and insect pests are unwanted on the family farm. But as much as farmers might like, they will never disappear completely. Each has important functions in natural ecosystems. Botanists like to



say that a weed is a plant whose purpose has not yet been discovered. Good farming system management can prevent the unwanted from taking more than their fair share of the family farm.

What to do about the unwanted? Prevention is the chief strategy. To prevent weed growth, farmers will mulch between crop rows. Deprived of needed sunlight, many weeds never get the chance to sprout. Farmers also plant companion crops near primary ones. The roots, color or smell of the companion plants may deter weed growth or control disease or insect problems for the primary crop. Farmers also use commonly available items like vinegar or neem tree byproducts to kill weeds.

Dealing with harmful insects is another ceaseless task.

Resourceful families use natural methods to keep insect levels under control. They cultivate companion crops that attract predators to consume unwanted insects in the main crop.

They mix a variety of organic pesticides to ward off persistent predators. Garlic and chili mixed with water deter insects from their rice feasts. Water from seeds of the neem tree is diluted into a spray that prevents pests from damaging the roots and stems of maize, tobacco and coffee.

Farmers handpick large caterpillar pests and larvae from stems and leaves and use barriers to protect plants from pests. They string up nets to keep out birds and insects. To bar goats, they plant thorny shrubs. To keep snails and slugs at bay, women spread cooking fire ash on the soil in a ring around their vegetables, its grit preventing slugs from slithering toward plump tomatoes.

Disease can also damage crops. One strategy farmers use is to plant improved, disease-resistant varieties if they have the money. But often farm families do their own plant breeding by annual selection. They plant a field and choose the most resistant plants from each year's crop to provide seeds for the next crop. After repeatedly choosing the strongest plants, farmers



Bug Stew

In Liberia farmers fill a barrel with water and the remains of grasshoppers and crickets. After sitting for several days, they spray the bug stew on their cabbage fields. Crickets and grasshoppers, repelled by the scent of their ancestors, flee.



are able to select resistant strains in sufficient quantities for entire fields of future crops.



Slug Tavern

Farm families in Mexico were annoyed at the damage caused by slugs, who were fond of feasting in local vegetable gardens. Several families decided to test different deterrents. On Saturday mornings after a fiesta, people discovered how much slugs love leftover beer. Now they place beer in shallow bowls sunk to ground level near the crops. Slugs happily get drunk on the beer and drown.

Families also diversify the crops they plant near each other to stop the spread of disease. For example, they will plant two rows of maize interspersed with several rows of beans, or they will plant climbing beans or climbing squash in the same mounds with maize seed.

Diseases preferring one kind of host can have difficulty spreading past rows planted to other crops. Farmers also

rotate crops to stave off diseases that lie dormant in the soil between growing seasons. If families plant onions in one plot this year and peas in the same plot next year, onion pathogens will die off for lack of a meal.

Take Home Message

The most resilient farm families combine short-term and long-term objectives, seeking a balance between production for today and conservation for tomorrow.



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CHAPTER 3

The Family Farm as an Agricultural System

Chapter Highlights

Much of what happens on a farm is beyond the farmer's control, while much is within her control. This chapter introduces the ways in which farmers:

- *Manage threats*
- *Reduce risks*
- *Cope with constraints*
- *Manage a farm*

The chapter concludes by showing how agriculture is linked to the fields of natural resource management, health, education, microfinance and microenterprise development.

The agricultural system

Small farm agricultural systems are production systems that are generally thought of as no more than 5 hectares (12 acres) in size, yet the poorest farm families have significantly less land, often only half a hectare (about one acre) located in highly disperse, separate parcels. Families manage these small farms to earn part or all of their livelihoods. They raise livestock and fish; grow crops, vegetables and trees; produce farm inputs like seeds, fish fin-



What farm families value

Three of the most important things for the farm family are:

1. *Food security**
2. *Reducing risk*
3. *Daily income*

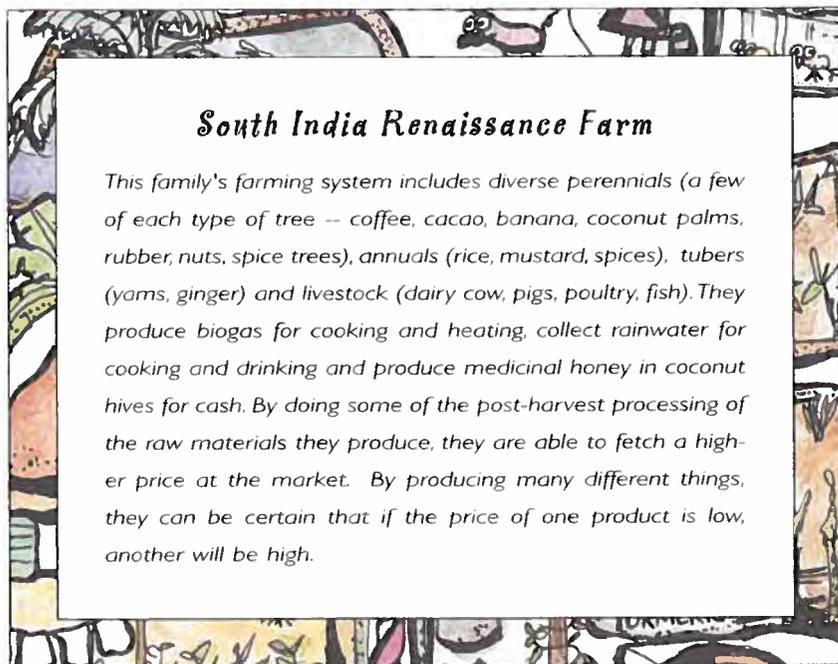
**Food can be 70% of a poor family's expenditures.*



gerlings and fodder; manage farm assets and natural resources; add value to farm products through post-harvest processing and sell surplus goods at Saturday market. In higher, cooler plots, families grow potatoes and coffee; in lower, dryer plots they grow millet and melons.

Families manage and coordinate activities and resources, flora and fauna, biochemical and physical processes. They manage soil processes, water and nutrient flows, solar and heat energy and modify micro-climates to the benefit of crops. They coordinate family labor, adjusting activities to seasonal weather cycles; participate in irrigation water user associations to manage benefits and responsibilities; they contribute to community work crews to level and bund moderate slopes so they can farm the land. They belong to community marketing cooperatives, village banks and PTAs (community support organizations for local schools).

Farm families maintain roads to get tools from town and crops to market, they borrow money to pay for seeds, they practice soil and water conservation, they innovate and test new ideas. They work hard at getting access to suitable land. They seek information and moral support from neighbors and agricultural extensionists.



South India Renaissance Farm

This family's farming system includes diverse perennials (a few of each type of tree -- coffee, cacao, banana, coconut palms, rubber, nuts, spice trees), annuals (rice, mustard, spices), tubers (yams, ginger) and livestock (dairy cow, pigs, poultry, fish). They produce biogas for cooking and heating, collect rainwater for cooking and drinking and produce medicinal honey in coconut hives for cash. By doing some of the post-harvest processing of the raw materials they produce, they are able to fetch a higher price at the market. By producing many different things, they can be certain that if the price of one product is low, another will be high.

South India Renaissance Farm





Farm families are multi-taskers and renaissance entrepreneurs. They are also laborers, tillers, herders, researchers, ecologists, foresters, meteorologists, machinists, entomologists, nutritionists, veterinarians, construction engineers, carpenters, botanists and soil scientists.

Threats and risks

What happens on the farm is often out of the control of the farm family. For example, when a politically unstable government floods the market with cheap imported rice just before harvest, the farm family feels betrayed by its own government and cannot sell its surplus rice at a profit. However, the politicians and national government remain in power, because the masses of urban poor are fed.

In this example, if the farm family has been fortunate and wise, they or their community will have a grain silo to store surplus rice until prices rise. Or they may have mature fuelwood trees to harvest and sell or plump broilers ready for local markets. Or they'll borrow money from the cousin who was given a gift of the goat's kid last year. If they're unwise or unlucky, they'll borrow money from a loan shark at terms they cannot afford to pay back, sell the family goat or send the man of the house to a coastal sugar plantation to sell his labor cutting cane. If they're really desperate and have no other reserves, the family will begin to sell assets that compromise future earnings -- a piece of land, the family plow or a small fruit orchard.

Achieving farming systems goals is more than a finely tuned juggling act by experienced farm families. It involves multiple strategies to cope with multiple risks, and it is extremely difficult without supportive or at least



One step at a time

Orissa, India. Farmers eager to increase their income are reluctant to invest in a standard-size chicken coop that houses many chickens. New chicken breeds allow farmers to get into the chicken business gradually. Specially-bred free range chickens are able to forage for food unprotected in the farm yard and still fatten well. While their maturity takes a few months longer than caged chickens, cost of food and care is low. Plus their tasty meat brings a good price. Farm families can invest in 10-20 chickens at a time without too much risk.



benign national policy and weather. It is impossible or nearly impossible during wars, natural disasters, economic crashes, locust plagues or in areas where there are high rates of HIV/AIDS.

Reducing risk

Although farm families cannot control off-farm factors, there is much that they can control. By maintaining diverse farming systems, they can secure their well-being and maintain survival even in moderately unstable environments. They can minimize risk with different productive activities, spread multiple, heavy labor requirements throughout the year and diversify and improve the family diet and family income. If the family has the labor, resources and knowledge to manage the farm properly, they can protect,



recycle and make efficient use of the natural resource base.

What Goes Around Comes Around

*In Southeast Asia farmers have perfected an intensive pig-fish production system. A pigpen with a cement floor drains directly into an adjacent fish pond, providing natural pig fertilizer to the pond. This fertilizer feeds the plankton that feeds the fish. It fertilizes the miracle duckweed that feeds the pig and keeps the pond clean for the fish. Vegetables and ipil ipil (*Leucaena* spp.) trees thrive on the pond banks in the moist, rich soil. Ipil ipil leaves fall into the pond, feed the fish, fertilize the pond and provide cut-and-carry fodder for the pig. On their royal diets of rice bran, vegetables, beans, ipil ipil and duckweed, pigs become bacon very quickly, feeding the farmer who feeds the pig who feeds the fish.*

Improving productivity (increasing the production per unit of land) is increasingly important for today's rural poor, as family plot size shrinks from generation to generation. Generally, on a worldwide scale, production can no longer be increased through felling forest margins to create new pastures and cropland or through breeding higher-yielding varieties. There are no new lands available for agriculture,

and breeders have reached plant physiological limits for yield increases of key grains.

Food security solutions for the future tend to lie not with increasing food production through allocating increased land to agriculture (extensification), but through higher productivity (intensification) on each plot of agricultural



land, using higher levels of inputs or seeking greater efficiencies in the use of resources and inputs. This includes recycling and rehabilitating resources, curbing resource use, reducing resource waste or increasing the use of inputs like fertilizer and high-yielding varieties.

Taking water as an example, farmers in semi-arid regions can make the most of scarce water by planting fast-maturing crops or varieties that use less water. They can replace cash crops that are heavy water users like sugar cane with low water users like cotton. They can plant drought-tolerant trees that yield fruit or nuts with little water. They can manage the soil so it holds water longer, using mulches and tilling soil in ways that seal the surface and prevent evaporation. They can copy or develop clever ways of collecting and storing rooftop water or rain that falls on sloped land.

COPING WITH CONSTRAINTS – THE BIG THREE

CONSTRAINT #1 – Water

In many areas of the world, the major constraint for the poorest farm families is water. Far too often, farmers in Africa, Asia and Latin America now say that rainfall amounts are significantly less than they were 20 years ago, when their land supported upland rice or bananas. Now they must plant cassava, cotton, sorghum and millet, because these crops require less rain. Too often, farmers also say rainfall is much less dependable. The rainy season begins in fits and starts, onset can be delayed a month or more and the initial soaking rains that signal planting time are followed by 3 weeks of sun, withering and killing seedlings.

Farmers cope with variable weather patterns in ingenious ways. Honduran farm families use microfinance loans to buy cement for one cubic meter micro-reservoirs, buried to ground level and spaced along the contour. Once filled, these small "tanks" supply enough liquid to handwater seedlings, taking the guesswork out of early planting. Families not only plant, but harvest, a month earlier than their neighbors, getting better market prices and planting their second crop sooner.



CONSTRAINT #2 – Land

Often, the critical constraint facing small farm families is land. Families can be very creative in maximizing land use, availing themselves of all three dimensions, not just the top layer of soil that forms the surface area of their plots.

Vertical space becomes important. In Cambodia, tall, narrow palms that produce useful sap are staggered on paddy bunds without reducing needed light for rice. Vietnamese families develop multi-story systems where tall and medium-height trees are spread among crop fields of tall grain crops interplanted with bushy tomatoes or climbing beans.

Farmers and agronomists test and refine these multi-story systems to find plant combinations and spacings that work well. Otherwise, competition for water, light and nutrients can easily reduce productivity or increase disease.

Depth also becomes important. In Pakistan, farmers bury mushroom sheds in the ground of soils that are not suitable for planting. Storage structures are placed on top of mushroom sheds for greater land-use efficiency.

CONSTRAINT #3 – Labor

In other areas, labor is the major constraint for small farms. An area may be less densely populated because it is remote or has a harsh climate, because of high emigration rates or because of decimation from war or disease. In Zimbabwe, where many adults have died of HIV/AIDS, farm families plant community gardens, sharing labor, using increased fossil fuel inputs like bagged fertilizer when possible, supplementing their labor and increasing productivity under difficult circumstances. While still active, HIV-positive adults are building fish ponds, planting fruit orchards and constructing beehives to ensure their young children have low-labor ways to survive once orphaned.



Elements of agricultural systems

While there is much that farm families cannot control, they do have control over how they manage their farming systems. By keeping their systems diverse, the farm family decreases risk. If a vegetable crop fails, chances are the fruit trees will bear fruit, the fish pond will yield fish or the bee hives honey. Diverse systems also allow the family to share or spread labor. Different farm activities require different amounts of effort over the year or season. During harvest, the family may have little time for collecting and selling honey. But in the off-season, honey can become a significant time investment and income-producing activity for the family.

Families can decide how to use the land; which crop, tree and livestock combinations to plant in which cropping patterns; whether to use mechanical, botanical or chemical methods of pest control; whether to stagger plantings for ongoing harvests and market sales; whether to focus on high-value, perishable vegetable crops because the farm is close to markets; or whether to plant non-perishable dried beans, because the farm is remote and products must be transported long distances.

They manage elements and processes, contribute labor, adjust to change and innovate. They manage seasons, time and micro-climates to their benefit, modifying soil surfaces to deal with too much or too little water and too high or too low temperatures. They reshape landscapes to make agriculture easier or more productive. But above all, they make trade-offs and seek alternatives.

Obvious elements in a farming system are the farm family, their pastures,



The Old Boy Network

In the Gambia, Green Revolution extension workers in the 70s wanted to increase rice yields in the lowlands. Traditionally, lowlands were the only farmland women owned. The rice the women produced from these paddies was the sole source of income that they could offer their families. The agronomists and extension workers, all male, trained the husbands on new Green Revolution techniques, ignoring traditional divisions of labor that complemented traditional farming systems. They also provided the men with tools and fertilizer. The men took over the lowland rice paddies, leaving women with no income to offer the family and no assets over which they had control. To this day, women must seek permission to farm the land.



fishponds, irrigation canals, sorghum and cassava plots, eucalyptus and banana trees, manure heaps, ducks and rabbits. Other farming system elements are not as obvious – the manual oilseed press, the wooden threshing tools, the dimestore calculator. Some elements are even less noticeable – processes that take place in the soil and in plants to support or inhibit plant growth, loss of precious nitrogen to the air when plants are burned or when manure is left on the soil surface. Whether obvious or not, they all must be used and managed wisely and productively in the successful renaissance farm.

Synergy between agriculture & natural resources

Stewardship of resources, the farm's natural capital, ensures a base for future productivity. It also creates natural synergies that foster efficiencies in the farming system. Although many families are in a desperate fight to provide one or two meals a day, blocking out attention to anything else, there are others who are not as desperate and who see themselves as conservers and protectors of the natural resources on which their livelihoods depend.



For example, families who plant live barriers of trees along the contour lines of sloped plots prevent losses of topsoil gold. Live barriers also increase

the amount of water that infiltrates the soil in dry regions or sloped plots, increasing crop yield and recharging underground sources. With more water, plants grow faster, becoming stronger and more resistant to stress earlier in the growing season, reducing crop loss due to harsh weather, pests and disease.



FOUR ELEMENTS OF THE RENAISSANCE FARM

1. **Diversity**, or when different elements perform the same function. Eggs from chickens and fish from the fishpond both offer protein. If one source fails, the family has a backup. Diversity reduces risk and increases resilience.
2. **Complexity**, or when a single element performs many functions. A palm tree provides fruit, wood for fences, fronds for thatch and coconut shells for cow fodder. Complexity offers efficiency.
3. **Synergy**, or when elements "cooperate" and build on each other to increase the farm's total output. Locating the fishpond under a leguminous tree provides nutritious food to fish in the form of leaves. The trees use water from the pond to maintain growth and produce more. Synergy increases efficiency and output.
4. **Regeneration**, or when the end product of one system becomes the input and resource of another. After rice is harvested, the family cow eats the straw, producing manure which fertilizes the vegetable patch, that produces vegetables which the family eats, and the family produces leftover scraps, which provides organic matter that goes into the compost heap for fertilizing the vegetable garden. Regeneration increases efficiency through recycling resources.

Tree branches in live barriers can be pruned, decreasing pressure on local forests for fuelwood. Leaves can be used for green manure, mulch and fod-



der, enriching nearby soils, conserving soil moisture and providing high-protein animal fodder.

Improving the quality and quantity of livestock feed allows the farm to raise more, healthier livestock. It creates additional manure for composting and



provides animal power to cultivate more deeply or till more land. In addition, mixed crop systems use water, sun and nutrients more efficiently. All these practices increase crop production, yield surpluses, strengthen farm resilience, and improve food security and family income.

Though not the topic of this book, healthy, robust natural resource systems are essential to mitigating the negative impact of natural disasters and reducing emergency recovery costs. Hurricane Mitch in Central America was only average in rainfall intensity, quantity and duration. Yet damage in Honduras was severe, in large part because of widespread deforestation and already saturated soils throughout this mountainous country of 85% sloped lands.

Synergy between agriculture, education, health and microfinance

Other sectors, such as health, education and financial services, complement agriculture to help farm families achieve their goals. While the goal of the renaissance farm family is to achieve an optimum balance between productive outputs, profits, resource protection and food security, the family cannot achieve its goals without information or the skills associated with good health, proper education or reliable financial resources.

Agriculture and education

In order to weigh alternatives and make good management decisions, farmers need some of the skills that scientists use in order to innovate and test alternatives. Simple methods and tools are available to help farmers experiment and evaluate results. But these methods require basic reading and math skills, and adults in poor farm families are often illiterate.

Though adult literacy is essential to renaissance farms, general adult literacy programs have not attained widespread success. However, when lessons are targeted to specific, immediate goals like recognizing, recording and adding numbers on a tin-can rain gauge or totaling harvest weights from a balance scale and calculating market prices, literacy training can be highly



effective. Once learned, these skills have a domino effect in self-esteem and pride, strengthening the community's water user associations and village banks, for example.

Agriculture and health and nutrition

Training for farm family members in health and nutrition helps them grow a balanced diet, making wise decisions about the most nutritious crops to plant, the importance of variety in diet and the right combinations of foods to reduce child malnutrition and lengthen the productive life of adults with HIV/AIDS. Health/nutrition training strengthens the farm family for productive work and increases farming system diversity for greater food security.

Agriculture, microfinance and microenterprise

Access to flexible savings and credit services (microfinance) allows farm families to increase productive assets and respond to market opportunities (microenterprise and business development). Training in simple market analysis and access to marketing information can mean increased income, especially when these microenterprise activities complement microfinance services. When further complemented by adult literacy and health activities, microfinance and microenterprise activities strengthen all aspects of the family farm, securing well-being even in unfavorable environments.

A word of caution – microfinance institutions have not had great success adding microenterprise services to their savings and credit services. It may



Meat on Their Bones

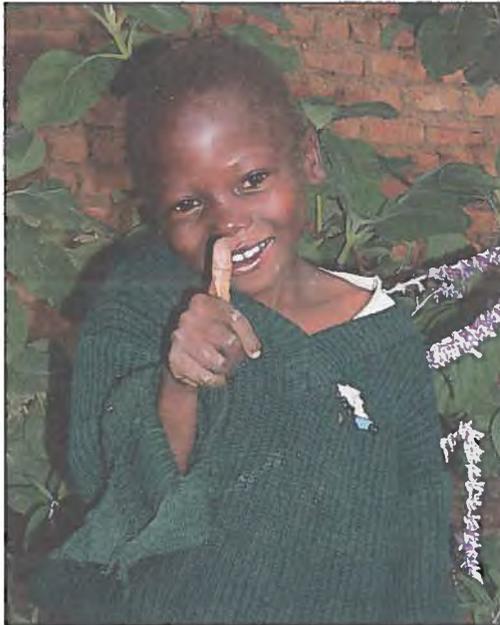
In a mountain village in the Philippines, nutritionists and agronomists teamed up to eradicate severe malnutrition forever. The agronomists helped families double their rice yields and plant fast-growing fuelwood trees. Nutritionists taught villagers not to polish the rice, which gets rid of the outer bran layer, where the protein and nutrition are located. Polishing turns "brown" rice, or whole grain rice, into white rice, but white rice has only carbohydrates. When combined with beans, nuts, seeds or green leafy vegetables, whole grain rice provides complete protein to the diet, regardless of whether meat is available. After the project, villagers watched children's bellies shrink and body weights soar, while children in surrounding villages who were still eating white rice, struggled with high rates of malnutrition.



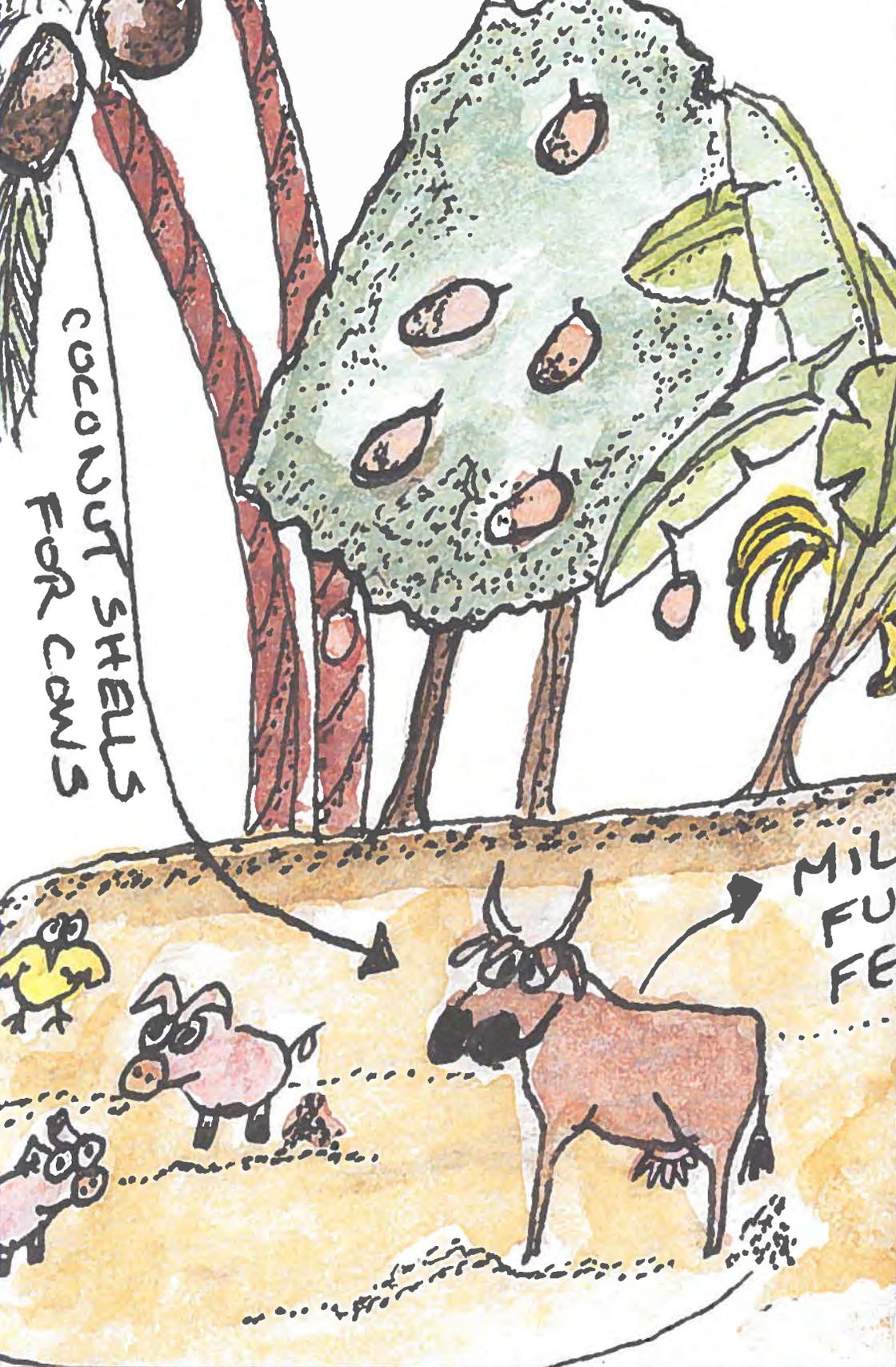
be wiser to let separate institutions support the same communities, providing different, but complementary, services.

Take Home Message

Family farms are beset by complex challenges and constraints. Renaissance farms resist threats and stress through diverse solutions, skilled management and clever stewardship of scarce resources.



AIDS Orphan, Zimbabwe, 2000



COCONUT SHELLS
FOR COWS

MILK
FOR FE...



CHAPTER 4

The Family Farm as an Economic System

Chapter Highlights

Successful renaissance farms are an effective mix of agricultural and economic systems. They strengthen and build on each other for resilient production and stable income. The key elements of a renaissance farm are:

- *Production*
- *Marketing*
- *Finance*

When these three elements exist in a supportive national environment and are combined with healthy competition, community support, synergy and stewardship, they result in farm wealth.

The economic system

Women sell cassava flatbread processed and slow-baked to get rid of naturally occurring cyanide, they sell candles made of beeswax from family hives located near the village eucalyptus grove, or they sell tea from hibiscus bushes that border their homes. Men sell lumber made from the fast-growing trees lining their sorghum and maize plots or climb sugar palms to tap their precious sap. Children carry milk, yogurt or cheese from a goat or cow to sell in the village. Grandmothers sell rugs woven from the jute harvested on a neighbor's farm. Grandfathers help with the groundnut harvest that their daughters take to market.



Dozens of activities make up the economy of the family farm, each producing a stream of income that contributes to what the family consumes and saves. These income streams ebb and flow with planting seasons, annual weather patterns, and the health, gender and number of family members available to work.

The most successful family farms, the renaissance farms, are those able to develop and benefit from synergies among the elements of both the agricultural and economic systems. A family might sell most of its fresh groundnut crop to a wholesaler but save a portion to roast and salt, measure into tiny packets and sell as snacks in the local schoolyard. Or, after pruning low-hanging branches from hardwood trees to curb shade on its millet field, a family might sell the branches as fuel to neighbors. To deter insects from its rice crop, the family might refine a potent mixture of homegrown garlic, soap and water and later sell the spray to members of another community. These synergies can be powerful, allowing elements of the agricultural and economic systems to strengthen one another and with time to increase the wealth and resilience of the family and its farm.



A worm turns profits

In rural Ecuador farm families began growing boxes of worms in kitchen scraps and manure. When placed in the soil, these worms improved soil quality and health, ultimately improving crop yields. Once families perfected the practice of 'vermiculture' for their own use, they began growing enough to sell the extra worms to neighboring farmers and communities.

The elements of the economic system

The economy of the family farm embraces infinite activity, part of which produces income and food for the family, and most of which remains unseen. Visible economic activities include the production and sale of farm produce, farm products and the value added to goods through "value-added processing" and labor. Invisible activities include the quiet workings of worms in the soil, plants converting water and carbon dioxide into grain each night, heat in a compost heap, a cover of pigeon pea plowed into a field and stimulating vital biological work in the soil. These activities are silent producers.

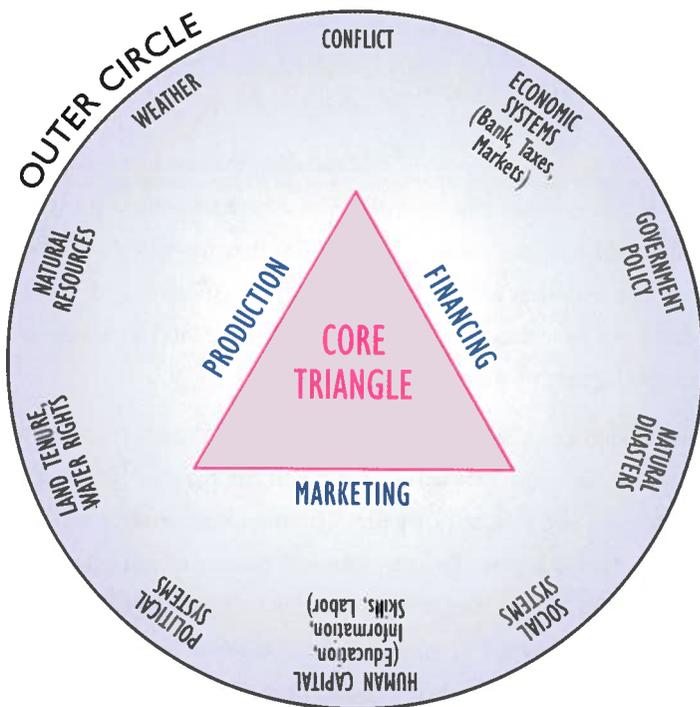


Powered by sun, wind, water and the chemistries of nature, they cost nothing except wisdom and work. Yet they drive the invisible farm – the essential agriculture that makes all that is seen, happen.

Two constructs make up the visible economic system. The first construct is the Core Triangle. It includes the core elements of an income generation activity. The second construct, the Outer Circle, includes those factors which influence the effectiveness of the Core Triangle.

The basic triangle of income generation

The Core Triangle includes the fundamental elements of making and selling a product or providing a service. Each side of the triangle is as important as the other two.





Production: The income generation activity

Crop yields, livestock production, dairy products, fish culture – all contribute to the suite of products, or the product line, of the family farm. Families sell rabbits, weave colorful cloth, or do activities unique to their region. They may collect leaves that fall on the forest floor, stitching and pressing them together to sell as dinner plates. They may collect insects from tuna cactus, convert them into red dye and sell the dye to the local cosmetics company for lipstick.

Families also engage in other forms of income generation besides production, through providing services. They buy charcoal from the farmer near the forest and divide it into smaller amounts to sell to villagers. They purchase clothing from shops that require a bus ride to the border and sell it back to neighbors. These services are also considered part of production.



Nature's own farm

In South Africa some of the poorest farmers do not own land. They 'produce' from the veld. Women gather truffles to sell and herbs for herbal teas. They collect wild vegetables, thatch, fruit and firewood. All activities produce an income.

Producing the product – planting and harvesting the crop, collecting medicinal forest herbs, purchasing sugar to make marmalade and jam – involves costs. So does marketing the product, which includes the costs of storage, transportation, or packaging and processing. Renaissance farm families continually seek to diminish these costs to turn sales into the highest possible profit.

There are hidden costs too, costs that do not involve cash, but cost the family nonetheless. Soil nutrients leave a field with the harvest. This is a cost. Future crops will need those nutrients. The rains that water crops can carry topsoil away. This is a cost. Future crops will need that soil. Livestock grazing the same pasture too long can compact and degrade the soil, destroying good pastureland. This is a cost. Future burros, goats and cows will need that pasture. Water pumped into irrigation canals lowers the water table. This is a cost. Future crops will need that water. Pulling children out of school to help with harvesting is a cost that compromises children's futures. These hidden costs are no less important than the out-of-pocket costs that



the family must cover to keep the farm healthy and profitable.

Marketing: Markets and selling to the markets

Harvested rice or maize provides value to the family in the form of food, but without a firm appeal to customers, neither has any cash value. The task of the farm is to balance the quality of the crop it has labored to bring to harvest with the costs of producing and bringing it to the customer, a task which requires that the family understand the demand for the crop in relation to similar crops offered by competitors. Without a market – meaning a group of customers – the crop will not convert to cash. Without a good market – a group of customers who will pay the right price – the crop will not convert to profit.

Each major cash crop may have several types of markets. The farm may sell produce directly to customers who consume it. Or they can sell to retail customers, the local stall owners who in turn sell to their own consumers. Or to wholesalers who export to international importers or sell to their own retailers. Each market requires a different approach to pricing, processing, packaging and distribution.

Various farm-based microenterprises may have different types of customers as well, each demanding its own marketing approach. These links between farmers, their suppliers (from whom they buy agricultural inputs) and their different customers are called "market chains." Market chains are incredibly important and usually poorly understood by development practitioners. Intuitively, farmers understand that there is a market chain, but rarely do they have access to complete information about it, where they as farmers fit into it



Market Miracles

In northern Vietnam a family, together with other families in their commune, have two markets for their primary crop - rice. The family sells rice grain to local stall owners and rice straw to a wholesaling intermediary, distributing it as fodder to retailers in several cities. The family also has two markets for its corn crop, with corn ears sold as animal fodder through a broker and cornstalks sold as fuel to neighbors. From its orchard, the family dries peaches and plums for sale to retailers in the village market. Each of the rice, corn and dried fruit customers has special needs for pricing, packaging and processing. This farm family tracks the costs and pricing associated with each product and each market to their ultimate benefit.



and how they play a role. This makes it difficult to develop strategies or build strong relationships with others in the market chain. When they are able to coordinate buying and selling, the different people in a market chain can help each other to reduce everyone's costs, while maximizing profits.

Financing: Savings and credit

Some activities require only the labor of the farm family to transform a thing of little value (wild grass) into a thing of greater value (a mat or rope). But labor has a cost. The farm family must be healthy to provide the amount of work needed to make such income generating activities possible. Health requires investment in producing a balanced diet, developing and protecting a clean water supply, constructing a simple home waste management system or purchasing medicine and vaccines.

Most activities also require money beyond any investment in nutrition or health. The family needs money to purchase tillage tools, seeds, a rice mill, tree seedlings and plastic nursery bags, an oil press, bricks for an oven or wood for a potato storage shed. These investments come from savings or from borrowing.

The financing required for an income generating activity falls into two categories: asset financing and working capital financing. The first, asset financing, occurs when a family buys or builds something that will produce income or reduce costs over many seasons. A chicken coop, a plow, a silo, even a cow are examples. The second category, working capital financing, is when the family uses funds to invest in something that will be transformed into an item for prompt sale. Examples include buying jute to weave into mats, fabric to stitch into clothes or even hiring labor to harvest a tea crop. The renaissance farm family knows when and how to balance long-term investment with shorter term working capital.



Politics, Schmolitics

Government financing programs for farm families often center on political motives. Subsidized interest rates and forgiveness of debt at first seemed attractive to farmers in Minia, Egypt, a city on the Nile. Later, when these 'services' could no longer be sustained by the government and collapsed, the farm family had to return to the money lender. This time around the moneylenders, miffed by a gap in business, charged even higher interest rates.



Most traditional farming communities have various means of developing and managing communal savings, through which farm families save and then borrow. Moneylenders also supplement savings, however their high interest rates deter cost-conscious families. Increasingly, financing is becoming available to farm families through government programs and microfinance institutions.

The outer circle

Shaping the success of the Core Triangle is the economic, social, environmental and political context of the farm. Factors and forces like labor availability, foreign exchange rates, climate patterns and religion and community all have a bearing on the success of the suite of economic activities of a family farm. The following discussion highlights only a few of the most powerful forces.

The competition

Families often farm land with soil, water and climate conditions similar to that of neighboring farms. These conditions limit what the farms can produce, placing them in competition with one another. When many competitors offer similar products to the same group of customers, these customers acquire bargaining power. They can negotiate a low price. Low prices mean slim profits for the farm family.

Renaissance farms – with farmers who understand market forces – are able to maintain good prices through a variety of competitive strategies.



Ecuador, 2000

A family may choose to add value to raw silk by dyeing it. The colorful thread may suit customers that other farmers do not serve, providing a greater profit for the family.



Another family may segment its apple crop. Instead of selling all the harvest in bulk to a wholesaler who receives a lot of similar produce at the same time of year, the family may select the best apples for packaging to the specifications of a high-end wholesaler, and press lower grade apples into juice for sale through other channels. Such competitive strategies require that the family research the variety of available markets, determine the competition for each and decide which market offers the greatest potential for profit.

Community

Farm families rarely work in isolation. When one family needs to terrace a slope, other families will share the work, knowing that next season, they themselves may need to call on neighbors for support.

Farm families not only share labor, they form credit unions, create seed banks and develop agricultural cooperatives. By pooling savings and lending it to farmers, rural credit unions, owned exclusively by farmers in the community, direct cash surpluses to places of cash need. By storing seeds for future planting in small community silos, farmers can separate varieties into different silos and access a greater variety of seed than those produced on their own plots. By developing agricultural cooperatives, families pool their purchasing power for better prices on seeds and fertilizer or equipment. Cooperatives can also attract large wholesale customers who would prefer to deal with one entity over dozens of small farms. By working together, farm families transform competitors into partners.



Delayed gratification

Farm families in Nicaragua pooled their resources to purchase a silo. Before purchasing this asset, families were forced to sell their corn at harvest time when prices were lowest. The silo allowed families to store maize until market prices improved, increasing their profits substantially.

Synergy and stewardship

The best way to hold costs down and maintain profits is to make the farm efficient. Families that build on the synergies of both agricultural and economic systems are efficient. For example, a family that is already growing



neem trees for fuelwood and soap production, is efficient when it layers neem leaves in its grain silo to prevent insect damage.

Families that limit waste and use the byproducts of one activity to support another are efficient. For example, a family that converts dirty laundry water into irrigation water for the kitchen vegetable garden is efficient. A family that pens its animals at night on a bed of straw or leaves in order to trap nutritious animal waste, later incorporating the mix into gardens and fields, is efficient.

Families that replenish resources such as soil and water by clever use and management of their labor and natural resources are efficient. For example, a family that terraces sloped fields so that rainwater percolates down into the soil, making it more available for crops and trees on the family's plots, while recharging the local aquifers on which wells depend, is efficient.

Threats to the system

A farm's economic system faces many threats. Natural disasters in the form of fire, hurricanes, droughts, floods and earthquakes may destroy the natural systems on which farms are based, paralyzing the economic systems.

Unfair government practices, like unpredictable credit policies, biased land tenure systems or unfair import strategies, can cripple the farm enterprise. So can large farms that decide to compete with the small farm or corporations able to patent uses of natural resources on which the family economy depends. Outbreaks of cholera or malaria may weaken farm labor, producing a total disruption in the farm's economic system. Plagues of pests may do the same.



Owning nature

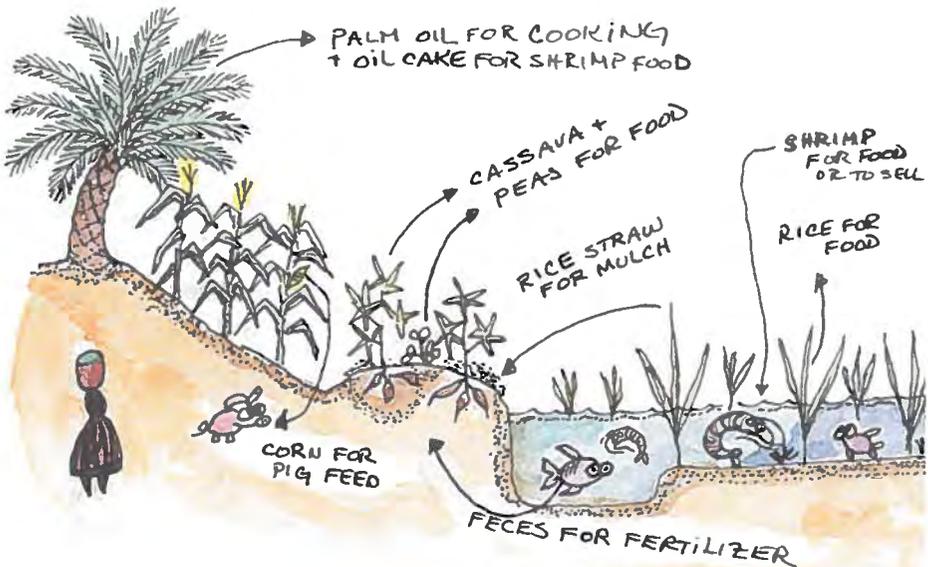
The amazing neem tree native to India provides many benefits to the small family farm. It offers valuable shade and firewood, deters pests from grain stores and homes, and contains medicinal oils which can be mixed into soap and toothpaste. Major Indian firms lobbied to obtain patents to any commercial goods produced from neem. Thousands of farming enterprises, that once converted the neem into useful village products, can no longer sell those products legally.

Increasing Wealth on a Renaissance Farm

This farm is extremely efficient. With time family wealth is increased by improving soil and water resources for higher productivity and by depending on diverse income sources that withstand market and weather fluctuations. The illustration shows animal wastes being recycled into pond and crop fertilizer; converting crop grain and fodder into livestock and fish feed; using trees to stabilize and protect soil, while also producing fruit for consumption, processing and sale; producing fish feed from tree leaves and thatch for roofs and animal bedding. Bedding thatch traps important nutrients from the manure, nutrients that would otherwise be converted to a gas and return to the atmosphere, lost to the farm.

FISH RICE - FOOD

Increasing Wealth on a Renaissance Farm

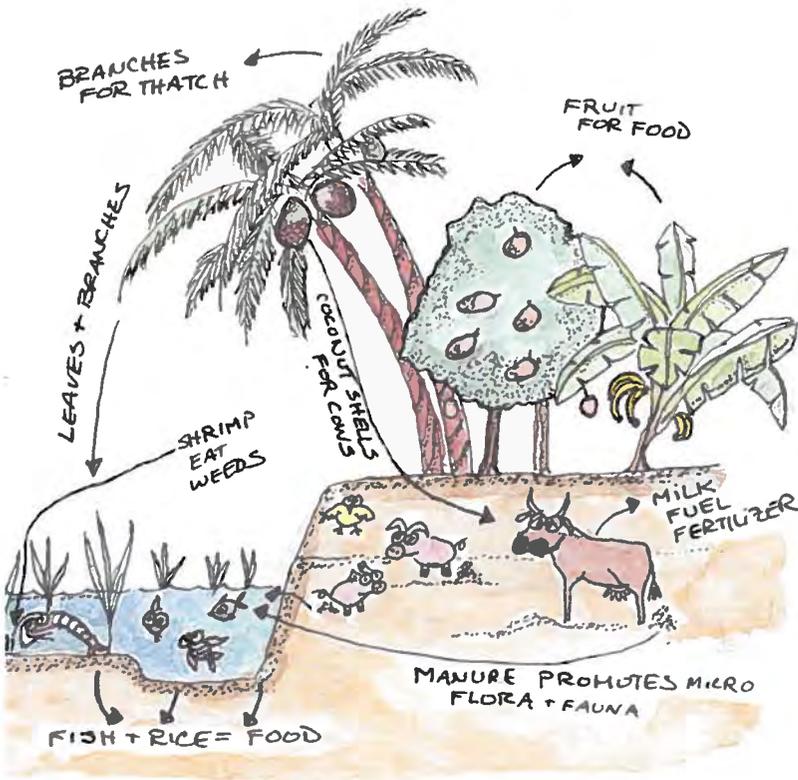




The flow of farm wealth

With good management, with the fortunes of good weather, access to some natural resources and a favorable socio-economic and political environment, poor farm families accumulate wealth slowly over many years. Their wealth includes natural and man-made assets. It includes the goat pen and the soil, the grain silo and the aquifer. It includes cash, gold and a surplus of favors in the favor bank - the social insurance that ensures good deeds provided to a neighbor can be redeemed in the future. The offering of an ox and plow to the family next door during planting season can be converted into the use of their rice mill after harvest.

A family practicing poor stewardship loses wealth over time. Losses in the form of expenses and hidden costs continue at the same pace while gains remain constant. In contrast, the following illustration shows how a renaissance farm family increases its wealth over time. Losses are kept to a mini-





mum and a portion of the gains are reinvested into the farm's ecology and economy. Gains are kept to a maximum by clever management of activities, so that each builds on the other.

Trees on the farm serve as a windbreak for nearby crops, reducing evaporation of precious moisture from crop leaves. Fish eat mosquito larvae and keep malaria under control. Shrimp control pond weeds for greater rice yields. From time to time, the family digs out the bottom of the pond to maintain pond depth and to use as crop and garden soil amendments. Pond silt is composed of eroded topsoil from farm plots, nitrogen-rich fish and shrimp waste and valuable organic matter.

Moisture from the pond seeps horizontally into neighboring soils for crops and trees, improving their resilience to droughty spells. Moist soil beneath the pond helps recharge aquifers. Rice straw is used to mulch vegetable gardens conserving moisture and preventing weed growth. It also serves as livestock fodder. This farm family can feed itself a diverse, nutritious diet of dark green cassava leaves, cassava root, grains, fruit, fish, vegetables, animal products, legumes and meat. They earn income from diverse farm products that make it possible to sell throughout the year – surplus crops, crop products, tree products, livestock, fish and shrimp.

We can reduce farm wealth flow to a simple equation: Farm wealth at the end of a season is beginning farm wealth plus the net gain or loss during the season. Included in this accounting are all forms of gain or loss, relative to fluctuations in the value of man-made assets and to the increase or depletion in quantity and quality of natural resources.

Farm Wealth Flow in One Growing Season

Final Farm Wealth	=	Beginning Farm Wealth	+	Net Gain/Loss <i>(value of manmade + natural resources)</i>
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Take Home Message

Healthy, prosperous farms diversify their crops, animals and small enterprises to buffer against risk. Wise families use their savings and loans to make investments in income generating activities.



Vietnam, 2000

CONCLUSION

The simple life. Or is it? We wrote Book One in the Renaissance Farm series partly to show that behind the seemingly uncomplicated life of the smallholder farm family lies a world teeming with challenges and activity, requiring clever solutions for complex, dynamic constraints.

But there is a larger purpose to this book – sharing a portrait of the few families who are able to escape the fate of their neighbors – lives of poverty. These exceptional families manage something we are calling a renaissance farm. They rear healthier children, raise sturdier animals, harvest more from their crops, manage to avert disease, withstand drought better and have more food and cash on hand than their neighbors over the hill with weaker children, fewer animals, sparser harvests and less income. Both families farm the same rocky soils, are subject to the same vagaries of weather, operate within the same economic constraints and uphold the same local customs, yet one family fares far better. What is their secret?

As we've demonstrated in this book, chances are good that the renaissance farm family produces not only a diversity of goods, but recycles and renews resources and waste, rehabilitates the land, protects their water supply and maintains moderate tree cover. Their farm is continually reborn. Indeed, renaissance means rebirth.⁷

We hope readers will walk away with a few lasting impressions. Renaissance farmers sow their futures in very difficult environments -- degraded natural resources, unstable governments, unfavorable policy and inequitable socio-economic systems. Yet somehow they succeed where others fail.

⁷ The authors were asked to reconsider the use of the word "renaissance" in the series title because it is a western term, and these farmers would not consider themselves renaissance farmers. In fact, they would be unlikely to consider themselves particularly outstanding farmers, any more than they would think of themselves as entrepreneurs, agronomists, community activists, coping strategists, farmer-scientists or innovators. Yet we believe they are all of these things. Clearly this book is not for farm families. It is about them. It is for western donors and development agencies who can appreciate that renaissance means a multi-faceted rebirth of tradition, melded with the most appropriate, fresh technologies and new ideas.

Although they are more capable than their neighbors, in the long run the odds are against them. They need support from donors and development agencies to protect the gains they've made, and they need the voices of concerned, educated citizens in other countries to advocate on their behalf against inequitable global trends and systems.

Their life of toil, testing, persistence and talent holds many natural processes and human technologies in balance. Their judicious management can steady the extremes of seasons and economies. Their nurturing and development of a renaissance farm reaps stability, as the farm is able to sustain the family in times of moderate social, political and natural crises. Finally and above all, donor or development agencies wishing to strengthen the efforts of these families must do so wisely and with humility, with fruitful intention and vast stores of respect, and they must take the time to do their homework.



GLOSSARY OF TERMS

Acre - a unit of land equal to 0.405 hectares; 4,050 square meters or 43,560 square feet.

Agriculture – the art and science of farming. Activities include cultivating the soil, managing water, producing crops and raising livestock.

Agro-ecology – the combined sciences of agriculture and ecology. Agro-ecosystems are those ecosystems that are modified by humans for the purpose of agricultural production of food, fuel, clothing, medicine, bedding, animal species, etc. Agro-ecosystems involve complementary components, using different soil depths for different plants, different types and timing of labor for different purposes, different amounts of light for light- or shade-loving plants. Agro-ecosystems also involve synergy, as one element improves conditions for other elements – crops that repel weeds, insects or disease for a companion crop; plants that produce nutrients that another plant needs; crops that cover and protect the soil for a companion crop or a later crop, etc.

Agro-forestry – growing trees on the same land as crops and livestock.

Agronomist – a professional trained in the agricultural sciences.

Annual – in agriculture, an annual crop refers to a crop that grows, reaches maturity and is harvested within one year or growing season.

Aquaculture – growing fish (or plants) in water as a productive endeavor.

Aquifer – a geological formation beneath the soil that holds and carries large amounts of sub-surface water through permeable rocks, gravel or sand.

Arid – climates with an average annual rainfall of less than 200 mm (about 8 inches).

Bi-modal rainfall – when the annual rainy season is characterized by two distinct periods of rainfall separated by a dry spell.

Bund – a dike or ridge of soil located on the contour of a slope to reduce erosion. Bunds are also used as a border around fields of water-flooded crops like paddy rice.

Compost – a farm-made fertilizer consisting of decomposed organic matter, weeds, leaves, straw and other crop residue, kitchen scraps, ashes, manure and sometimes lime, urea fertilizer, chalk or rock phosphate. The final product of composting is rich, dark, crumbly "humus."

(Because it is a labor-intensive fertilizer, compost is more appropriate for small spaces like kitchen gardens or high-value crops like market vegetable gardens. For large crop fields of maize, millet, rice or wheat, less labor-intensive soil amendments like "green manure" or bagged fertilizer are more appropriate.)

See also "green manure.")

Contour – an imaginary line on a slope that connects all points at the same elevation. A contour line is always perpendicular to the slope. Planting crops and placing bunds and infiltration ditches on the contour reduces soil and water erosion and usually increases yields.

Cover crop – An annual crop that is planted to protect the soil from evaporation, erosion and weed growth. Cover crops are also used to improve soil fertility and increase soil organic matter.

Crop – Annual or perennial plants cultivated to yield products for humans and livestock. Crop products include grains, vegetables, fuel, fodder, clothing, fruit and flowers.

Desertification – the process of decline in production due to land degradation and changing weather patterns in arid or semi-arid regions. Land can become so degraded, infertile or saline, that the process of desertification becomes irreversible.

Diversity (in agro-ecosystems) – the quantity of different species, organisms and crops per unit area.

Ecology – the science of the relationship between organisms and their natural environments. Ecologically-sound, or environmentally-sound, agriculture refers to production activities that incorporate conservation or rehabilitation of natural resources, maintaining or improving the quality and quantity of soil, water and vegetation. Resources are recycled, losses are minimized and pollution is avoided or mitigated. Wherever possible, renewable resources are used in production.

Extension – disseminating and sharing improved production methods and appropriate innovations through providing advice and training for farmers. Extensionists work with farmers to help solve local production problems, improve decision-making and enhance farm management.

Fallow – when land is not cultivated for one or more growing seasons and is left to rest. Natural vegetation returns and is sometimes grazed.

Fertilizer – chemical or bio-chemical compounds that contain nutrients needed by plants. Compost and bedding manure are examples of "natural" fertilizers that provide soil nutrients and improve a wide range of soil properties like soil structure, nutrient- and water-holding capacity, aeration, drainage and soil organic matter. Industrially-manufactured fertilizers are fast-acting, short-term suppliers of nutrients and need to be applied several times during the growing season. They do not provide many of the benefits of compost or green manure, and if overused, will harm beneficial soil life and contribute to degradation of soil texture. But commercial fertilizer requires less labor on the part of the farm family. Smallholder farmers tend to use a combination of the two kinds of fertilizer, when they can afford to buy commercial fertilizer.

Green manure – Any crop plant, but generally a nitrogen-fixing plant, that is grown and worked back into the soil as a natural fertilizer. Green manure can be used as a low-labor alternative to composting for fertilizing large cropping areas. See also "compost."

Groundwater – sub-surface water that supplies wells and springs.

Hectare -- a unit of land that is equal to 2.47 acres or 10,000 square meters.

Horticulture – the science of gardening (vegetables, flowers, fruit).

Humus – the sweet smelling, rich, dark fertilizer produced through natural decomposition of forest litter, for example, or by composting. When added to soil, humus improves soil fertility, nutrient and water retention, drainage and aeration.

Hybrid seed – seed that is produced by crossing different varieties or species. When hybrid seed is planted with recommended fertilizer amounts, yields can be much greater than non-hybrids. However, yields cannot be maintained from saved seed in successive years, so hybrid seed must be purchased each year. Hybrids often lose the disease- or drought-resistant traits of their parent lines, as the breeding process selects for traits that increase yield capacity. A judicious combination of "traditional" varieties for some crops and, when cash is available, "improved" hybrids for others is a common survival strategy of smallholder families.

Inputs – used here to refer to farm inputs like water, nutrients, solar energy, information, fertilizer, pesticides, herbicides, tools and processing equipment.

Legume, leguminous – any plant, shrub or tree in the Leguminosae family. With the help of soil bacteria called Rhizobia, leguminous plants have the ability to convert atmospheric nitrogen into a form of nitrogen in the soil that can be used by plants. Examples of legumes are beans, peas, alfalfas and trees in the Acacia and Leucaena families.

Maize – another word for corn. Maize generally refers to the hardier field corn varieties, not sweet corn.

Manure – animal waste and stable litter of farm animals. This natural fertilizer is one of the oldest and, when managed and handled properly, one of the most effective fertilizers available to farmers.

Marketing - any activities related to bringing products to customers for the purpose of selling. Marketing activities include market research, product positioning, sales, product grading, pricing, processing, packaging, transporting and distributing.

Microenterprise - Small business activities.

Microfinance - savings, credit and other financial services for low income and very poor people.

Micro-livestock – in this book, micro-livestock refers to smaller farmyard

species like rabbits or poultry, rather than pigs or cows.

Mulch – a layer of dead leaves, stalks or other plant matter, bark, stones or plastic that is spread on the surface of the soil between plants or rows to prevent evaporation from the soil, control weeds or regulate soil temperature.

NGO - Non-governmental organization. In this document NGO will refer to local organizations, as opposed to PVOs which will refer to international relief and development organizations like Oxfam, CARE and World Vision.

Nitrogen-fixing plants – also referred to as leguminous, these plants take nitrogen from the air and with the help of bacteria in the soil, transform it into a plant-available form that the leguminous plant itself and any surrounding plants can use.

Outputs – used here to refer to farm products or functions that result from farm activities. Outputs are consumed on the farm (grains, vegetables, fuel-wood, livestock), reinvested on the farm (cover crops, manure), exchanged or sold.

Partners – Catholic Relief Services works through local non-governmental organizations called "partners" to implement development projects. Working through partners improves local capacity building, long-term continuity of activities and ensures benefits that continue after project funding ends. Many CRS partners are part of a broad network of Catholic agencies and parishes around the world, and many are local secular development organizations.

Perennial – A crop or plant that has a lifespan of more than two years. Trees are "perennials." (Bean or wheat crops are "annuals.")

PVO – Private voluntary organization. An international relief and development organization like Oxfam, CARE and World Vision. PVO is used here to distinguish international non-governmental organizations from national NGOs.

Renaissance farm - A farm that balances production, conservation and income generation; balances the use and replenishment of natural resources; has diverse animal, tree and crop production systems; recycles and uses resources efficiently. Renaissance farms can provide modestly for a smallholder family's food and economic security, while withstanding moderately severe fluctuations and crises.

Residue – this refers to the non-harvested or residual portion of a crop – leaves, straw, stalks, branches, stems, husks, etc.

Rotation – a cropping cycle in which different crops are planted in succession each year to revitalize and protect the soil. Sometimes the rotation includes a fallow year.

Self-help groups - groups of women who save small amounts of money each month, lend savings to one another in the form of small loans and when ready, borrow additional money from the bank.

Semi-arid – climates where annual precipitation ranges from about 200-900 mm (8-35 inches) and where timing of rainfall may vary widely, making cropped, rainfed agriculture a challenge.

Smallholder – this term generally refers to farm families that survive by agricultural production on small landholdings, 5 hectares or less, generally much less.

Solidarity groups – groups of women, organized by an NGO, in which members agree to approve and guarantee one another's loans extended to each by the NGO. (CRS microfinance programs generally work with women clients.)

Subsistence agriculture – farming in which most of the production is geared toward feeding the farm family. Very little smallholder production today is completely subsistence-oriented, as every family needs some cash for school fees, shoes, medicine, tools, fertilizer, etc.

Sustainable agriculture – environmentally-sound farm production that conserves and protects natural resources for further production.

Tenure – right to property, through legal rights or custom. Tenure may include rights to land, water or trees.

Value-added processing – When the raw goods produced on a farm gain increased value because they have been roasted, peeled, graded, husked, ground, milled, dried, salted, pickled, baked or modified in some way to meet the needs or standards of customers.

Vetiver grass (*Vetiveria zizanioides*) – a coarse grass often planted in a row along the contour of slopes, growing quickly to form a very dense hedge that blocks passage of soil, slows rainfall runoff and helps spread rain evenly across the slope, so it soaks in near to where it falls. Established vetiver plantings are so effective that they can prevent mudslides in high intensity storms. (Board on Science and Technology for International Development. 1993. *Vetiver grass: A thin green line against erosion*. National Academy Press: Washington, D.C.)

Village banks – similar to large solidarity groups, often with 20 to 50 women who meet regularly, review loan requests and guarantee that as a group, they will pay back the loans of all its members to the NGO who provided the initial loan. Most village banks require that members save regularly.

Water harvesting – collecting or storing rainfall or surface water from a river or stream in barrels, "tanks" or micro-reservoirs in the soil to provide water for domestic use, crops or livestock.

Waterlogging – when a soil becomes saturated with water. Water replaces most of the aeration pores and drainage paths in the soil and can kill crops when the saturation persists.

Watershed – an area of land bordered by high elevation points in which all the water falling within those borders drains to the same river or body of water.

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Liberra, 2000

ABOUT CRS AGRICULTURE

CRS agriculture programs seek to improve family well-being through agro-economic development and environmental stewardship. Program activities are based on assessments of local needs, opportunities and constraints. They include rural credit, agricultural recovery from disaster, crop and horticultural production, soil and water conservation, agro-forestry, livestock and aquaculture production, soil improvement, integrated pest management, integrated water management, watershed management, marketing, small-scale irrigation, land tenure and titling.

CRS partner agencies and agriculture projects work with the poorest farm families and communities, with farm laborers, the landless, rural farming communities with high rates of HIV/AIDS and victims of manmade and natural disasters. As landholding size and production decrease in many countries, increasing seasonal migration by men means that CRS is working with greater numbers of women farmers and young adults.

CRS agriculture programs take place at high and low elevations, in areas with short growing seasons, too much and too little rain, on sloped plots, on rocky, infertile soils and deforested lands. We tend to work in isolated, remote areas with harsh climates and fragile, degraded ecosystems. In the past these areas were not farmed because of undependable, hostile climates and poor natural resources. They are farmed now because in many cases the poor have no other option.

CRS works with farmers as partners and treats farming as a family-run business, acknowledging that rural communities are linked to markets and that farm families need income for off-farm products and services. CRS agriculture programs focus on farming systems, supporting diverse production for risk reduction and food security – crops, livestock, trees, fish, vegetables. We promote sustainable agriculture, linking production to conservation. Finally, CRS uses watershed approaches, fostering cross-community collaboration for resource protection and upstream/downstream cooperation to meet competing water needs, especially in areas where water is scarce or available only seasonally.

ABOUT CRS MICROFINANCE

CRS invests in rural economies around the world by sponsoring a network of local organizations called partners. Partners offer credit and savings services (microfinance) to very poor farm families to help them make timely investments in their farm activities and small businesses, as well as in their homes and children. CRS continuously seeks to improve program quality by supporting those innovations that best serve the financial needs of the farm family.

Increasingly, we are finding more effective ways to match savings and loan products to the seasons and cycles of rural life. Partner organizations encourage groups of women clients to save so they may invest in themselves and their families when the need arises. Microfinance programs link loans to savings and always begin with small amounts. In this way, clients learn to manage debt as they accumulate new wealth. Groups of women, often up to fifty in number, gather regularly for the purposes of making their savings deposits, lending savings to one another and taking loans from local organizations and banking institutions. These groups serve as way to guarantee loans, so that even the very poorest families may join without having to pledge land or other forms of loan collateral.

CRS Microfinance programs benefit farm families in many ways. Good credit and savings services allow families to reduce their dependence on exploitative moneylenders and keep savings out of the hands of needy friends and relatives. Through regular savings, families build cash reserves to cushion them in times of emergencies. Together with loans, families use savings to make important investments in education, as well as in farm and home. Because CRS microfinance programs encourage women clients to meet regularly as a group, these women's groups provide the venue for important social activities. Many groups manage economic and agricultural issues within their watersheds or commit themselves to reducing spousal abuse or alcoholism in their communities or advocating with local officials governments for improved health services from the government. Other groups invest their savings in joint activities to optimize community labor, choosing to raise goats collectively, erect a grain silo or build a spill dam.

The most challenging aspect of microfinance involves matching credit and savings services to the realities of farm life. CRS programs strive to link loans payments to household income in both size of payment and timing. Savings services are most useful when programs allow flexible savings amounts and convenient deposit taking. Providing good services requires CRS microfinance programs to take the time to understand the rhythms of daily life, the ebbs and flows of cash from farm and family activities as well as the seasonal patterns of sowing and harvest, animal husbandry, schooling, holidays and the availability of labor and water.



Cameroon, 2000

ABOUT THE AUTHORS

Gaye Burpee, Director of the Technical Services Unit, Program Quality and Support Department at Catholic Relief Services (CRS), served previously as Senior Technical Advisor for Agriculture/Environment. Prior to joining CRS, she was the soil scientist for the Central American Hillside Project (CIAT, International Center for Tropical Agriculture), developing simple, farmer-friendly tools for monitoring change in soil quality in collaboration with Honduran farmers. Dr. Burpee specialized in soil physics and sustainable agriculture in graduate studies at Michigan State University, teaching soil physics and graduate courses in plant science teaching methods for diverse students. She conducted research on sustainable alternatives for potato production in temperate zones, as well as crop production and vegetative cover for harsh tropical environments (Dominican Republic), served as director of a USAID-funded economic household survey of Grenada, West Indies, and as a Research Associate at University of Michigan's Institute for Social Research, focusing on socio-economic and political survey research. She completed Peace Corps service in Grenada and St. Vincent, West Indies.

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THE RENAISSANCE FARM books are interdisciplinary primers written for those who are involved in or who support rural development. **Book I: *Understanding Agriculture and Rural Economic Growth*** highlights the economic and ecological realities of the small family farm. **Book II: *Supporting Agriculture and Rural Economic Growth***, examines the role of the development organization in supporting farm families who cope with these economic and environmental realities.

In simple, straightforward language with photos and illustrations, **The Renaissance Farm** books include examples of development successes and failures, share observations and lessons from the field, clarify the challenges and realities of rural development work and provide guidance for donors and practitioners who understand that the rich interconnectedness and complexities of smallholder farm life demand complete, rather than partial, responses and support.

These books were written for development practitioners in all development sectors whose work touches in some way on the lives of smallholder farm families. The books are appropriate for those who know nothing about small-scale farming or rural economies, and they are appropriate for seasoned practitioners who may understand their own work in agriculture, health or microfinance, but are not as familiar with the work of other sectors in supporting the small farm family.

ABOUT CRS

Catholic Relief Services is an international relief and development organization founded in 1943, serving the poor in 87 countries. CRS provides direct aid to the poor, involves people in their own development and works to remove the causes of poverty and promote social justice.

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