



Agriculture and food production

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AGRICULTURE AND FOOD PRODUCTION

Harro Maat

Introduction

Popular stories about the long-term development of societies typically start with hunter-gatherers, followed by primitive forms of farming, gradually intensifying agriculture up until future projections in which a small number of high-tech farm enterprises can feed the populations of industrious urban centers. In this summarized and simplified form it may look like a caricature but in various disguises it appears in many plans, models, and theories of development. The underlying idea is a gradual evolution of societies, ultimately reaching the status of a developed, industrialized country. Societies in which large parts of the population depend on agriculture are, in this narrative, underdeveloped by definition. The out-of-agriculture story also contains a particular understanding of human development. Growing crops, raising animals, and the preparation of food allegedly need no skills, involve mud and blood, and are low paid. Human development thus implies education and other incentives to prepare people for a proper job in the non-agricultural sectors of the economy. Although still dominant, these traditional development ideas about agriculture are increasingly challenged.

New perspectives provide new opportunities for historians by raising empirical questions about the practices of agriculture and food production in the past and reflexive questions about the meanings attached to these practices. Outcomes of such explorations provide new insights into how societies develop alongside changes in agriculture and food production. Development, however, is not merely a process each and every society deals with on its own. Interactions between communities, regions, and states lead to overarching development effects, enlarging or diminishing inequalities within and across different geographical scales and social stratifications. These interdependencies rest on differences in military power, technological capacity, and wealth accumulation, as both cause and consequence. In other words, the development dynamics of agriculture and food production are closely entwined with a range of other changes across time and space. Yet, agriculture is an ideal canvas to portray the bright future that development brings against the background of a dark past. Most twentieth-century development models hinge on a combination of eradicating hunger and increasing agricultural productivity to a level that allows fewer people to produce enough for a growing population. A future-oriented development perspective creates an agricultural past in which poor techniques resulted in poor harvests, a condition in which small fluctuations or calamities easily escalate into shortage and

starvation. Such linear projections are included in the standard repertoires of development and are increasingly challenged by the new perspectives on agriculture and food production.

The main goal of this chapter is to provide an overview of the variety of ways in which changes in agriculture and food production were a response to inequalities within and between societies. Development in its twentieth-century context of international development aid was in many ways a response to inequalities emerging from earlier periods. There is a wide variety of processes and activities included in agriculture and food production, many differences within and between countries or regions, and multiple interaction dynamics emerging from it. There are many events that triggered causal pathways affecting many societies over long periods of time but these do not add up to one or two clear and dominant historical patterns. For example, there are many linkages between the European colonization of territories on other continents and the notion of international development as it emerged in the second half of the twentieth century. However, European countries were not the only states colonizing other territories, many territories and societies resisted colonization, and resulting changes over time were different for non-colonized, colonized, and colonizers. Colonization, in particular the way colonial powers appropriated and controlled land to get access to particular agricultural products, is nevertheless crucial to understanding the history of development, agriculture, and food production. In sum, the overview presented in this chapter is not an attempt to provide a complete picture but rather to identify areas that allow for further reading and explorations that may bring other perspectives and interpretations.

Entries and entities in agriculture and development

The chapter is divided into discussions of three main entities, the plantation, the government, and the small farm, which each played a crucial role in the history of agriculture and development and continue to do so. These entities are based, first, on biophysical features, suggesting that each entity represents a landscape and ecology, resulting from human intervention, with particular practices of producing food and other products. The entities vary in scale, marking out particular places or covering entire geographical regions, and have direct observable and less observable features. A plantation's size can be measured by the amount of land it occupies, the number of workers it employs, or annual production. These and other characteristics vary with the location and kind of cash crop it produces. Arguably, intensive livestock farms fit the plantation format. Yet, biophysical features alone are not distinctive. There are many examples of government farms, but much of a government's intervention in a landscape and ecology consists of things like roads and canals or legal arrangements for land ownership, marking out spaces for plantations and smallholder farms, among other things. A second way the entities are used in this chapter is as social actors, each having rearranged the landscape and agricultural practices in the past with clear consequences for today and tomorrow. People running a plantation, a government department, or a smallholder farm hardly ever do this on their own. As a collective, there are numerous interactions within and between each of them. These interactions and the biophysical traces together result in the inequalities that form the basis of the improvements that development policies and aid agencies try to accomplish.

The chapter covers a time period that largely equates the twentieth century. The next section, however, presents some important insights from histories of agriculture and food production in earlier times. The order by which the plantation, the government, and the smallholder farm are presented in subsequent sections is somewhat chronological. There is an argument to make about plantations being very expansive from their liberal transformation in the nineteenth century until the late twentieth century. Government policies around the turn of the twentieth

century tried to regulate and steer plantations and small farms into more national development agendas. Both plantations and governments had a clear international agenda, with a shared interest in foreign markets. Access to such markets required international coordination. Governments, and people living in the states they represented, with and without colonial possessions, learned very costly and hard lessons about the need for international cooperation from the First and Second World Wars. This materialized first in the creation of the League of Nations in 1919. The League hosted many committees and associations, nodes of larger international networks of diplomats and scientists, out of which the Food and Agricultural Organization (FAO) was created, formally established in October 1945 but continuing from the International Institute of Agriculture that emerged from an international conference in Rome in 1905. Another element of the government policies, partly resulting from the government's limitations and failures, was the recognition that small farms are a persistent and seemingly robust phenomenon that requires more attention in development policies. Increasingly, the variation, flexibility, and persistence of smallholders are considered as positive features, turning the small farm into a valuable development option that might become more important for the future.

The selection of these three entities results from a background and interest in the history of science and technology in colonial and post-colonial periods. As a field of study it has seen its own development. Studies gradually moved away from a predominant understanding of science and technology as Western phenomena, dispersed across the globe, toward understanding science as a time and locally specific form of knowledge and technology as equally local and temporal forms of practice. The latter understanding also blurs the distinction between science and technology, coming together in the human endeavor to understand the space we live in, while interacting with, reordering, and reshaping the many items and people in that space. These rather abstract notions informed the choice of the plantation, the government, and the small farm as three dominant outcomes and foundations for the development of agriculture and food production. The chosen perspective and chapter ordering create many omissions and limitations. For example, food processing and processing industries more generally are arguably another key practice but are only mentioned sporadically throughout the sections. The same applies to culinary traditions, food preferences, and consumer choices. Linkages between consumers and producers, central in economic histories of agriculture and development, are not prominent in this chapter but nevertheless important and relevant, and economic histories are a useful source of information.

Early transformations in agriculture

A key strategy for agricultural improvement, employed for many centuries, is the exchange, over land or sea, of planting material and live animals between societies. A new crop or animal species can change agricultural practices by widening the scope to grow and consume food that may lead to adjustments of work routines and the number of people dependent on cultivated land, ultimately changing an entire economy. The transformative capacity of exchange and adoption, however, shows much variation between species, societies, and ecological conditions. Certain species or varieties may be adopted at some point, only to become significant, positively or negatively, many decades or even centuries later. A society thus can adopt new species without resolving a clear bottleneck or immediate problem in a community's farming system. Whereas larger domesticated animals and dominant crops grown in ancient societies mostly leave clear traces for archaeologists and historians, there are few if any remainders of products produced or collected in small quantities, wooden implements, or details about methods for tillage or the selection and management of particular animal breeds and crop varieties. New research tech-

niques, more capable of reconstructing crop variation and diversity of practices, have created richer pictures of agriculture and food production in ancient periods. New insights brought about by histories of adoption of new inputs and species into existing agricultural practices underline that old forms of agriculture are not the same as primitive agriculture. Adoption histories therefore have immediate relevance for current development debates.

Another assumption in the development perspective on old and nascent forms of agriculture is that population growth and an increasing division of labor require more sophisticated forms of agriculture, in particular techniques that allow for surplus production. Settlement, the emergence of cities, crafts, and small industries thus follow from advanced forms of agriculture. Although correct in very general terms, there is much variation in how the pattern manifests. For example, in many situations intensification of agriculture implied techniques implemented primarily by the skilled hands of laborers. A recurrent theme in the work of James C. Scott is that more agricultural produce was being squeezed out of farmers' toil by ruling elites. Early state formation implied forced deliveries of grain, and "improved" agriculture typically implied more hands on the field, many of those hands chained as a result of enslavement. The early state settlements, Scott shows, were fragile and a major threat was revolt and escape. Such older forms of escape and rebellion against state control frequently re-emerge in the present. Many conflicts have deep historical roots and hardly ever are these conflicts only about territory or ethnicity but are entrenched in the use of land and specific ways of making a living through the production of food and other items.

The variation in forms of agriculture and exchanges between societies, peaceful or violent, turned into a global phenomenon when bigger ships, improved navigation techniques, and weaponry enabled the transport of larger volumes over long distances. Eurocentric histories mark the discoveries of Vasco da Gama or Christopher Columbus as the start of globalization. However, non-European seafaring states had established similar connections at earlier moments, for example, Malay trade routes to Madagascar and the East-African coastal region. The Columbian exchange thus foremost implied an intensification of cross-continental trade, including a more frequent exchange of crops and animals between continents. The introduction of the potato from the Andes region of South America to Europe is considered a major driver of population growth in the continent. Potato and cassava, another American crop, likely arrived in Indonesia about the same time as in Europe, but adoption rates were low overall and differed between islands. The two crops became more popular by the end of the nineteenth century, particularly on Java where cassava and potato allowed people to settle higher up in the mountains. Many popular accounts of the global exchange of crops and other agricultural products often attribute to it a much more straightforward and immediate effect on local economies and food security, resonating with the technological optimism in development programs of the twentieth century. Maize is the model crop in this development narrative, introduced from the Americas and, so the story goes, quickly distributed and planted by farmers to fill hungry African stomachs. On closer inspection, African farming contexts, in past and present, appear far more diverse and versatile, showing historical patterns that were different from developments in other continents, but not because Africa was, or still is, waiting for crucial items from other continents.

Differences resulting from the ecologies and social dynamics in specific locations add up to the global level. The temperate climate zones allow for a limited number of crops grown only during the warm period, having to feed farm animals and people for an entire year. Additional food items from tropical zones were a welcome addition. A limiting factor was transport. The relatively small and slow vessels of the early globalization period were selected for goods with high value and low decay, such as processed sugar, dried tobacco, coffee, and spices. More perishable goods could only be transported over shorter distances until new ship-

building techniques in the nineteenth century were applied. Likewise, long-distance transport of animal products was limited to skins, salted and dried meat, and fish, until the emergence of canning and cooling techniques. Despite these limitations, the effects of changes in diets were significant. The classic study by Sidney Mintz on the intricate connection between the craving for sugar, European colonization, plantation agriculture, and the slave trade shows how differences in global power and wealth increased with the growing amounts of sugar and other goods traded between the temperate and tropical zones. Such interactions and effects were not unique to European colonization nor necessarily cross-continental. For example, climatic and ecological differences between north and south China triggered an internal and coastal shipping network out of which rice, primarily grown in the southern provinces, became a national food.

A final insight from early periods is the continuous movement of people. Within and between countries, migration to and from more populated, urbanized areas always went hand in hand with lethal threats, most prominently war and disease outbreaks, as well as limiting factors such as the breakdown of transport routes and state regulation. A relatively recent and devastating population intervention that affected almost every continent was the Atlantic slave trade. An estimated 12.5 million persons from mostly West Africa were enslaved and shipped across the ocean to work on plantation fields in the Caribbean and mainland American colonies, producing sugar, cotton, coffee, cocoa, and other products for primarily European markets. However, the influx of enslaved laborers also implied new local forms of agriculture, primarily growing food for the emerging plantation society. A substantial share of the food was produced on smaller patches of land, farmed in large part autonomously by the slave communities. The autonomy extended and increased in the fields of escaped slaves. Such Maroon communities existed in various Caribbean islands and areas in Brazil and North America. In Haiti the agricultural practices of Maroon communities formed the basis for the revolution that drove out French plantation owners and continued to clash with Haitian leaders trying to reinstall plantation agriculture and forced labor. Many of the agricultural development challenges of the twentieth century in the Americas and elsewhere are primed by the multi-layered and entangled demographic effects of enslaved, escaped, and migrating populations in previous centuries.

The plantation

Although there were clear humanitarian motives underlying the halt to the slave trade and later bans on enslaved labor in various countries and colonial territories, the wider humanitarian consequences of the exploitative economic structure of plantation agriculture were not addressed. Larger countries, like the USA or Brazil, had significant internal markets but most produce was sold abroad. The plantation in its emblematic form consisted of confiscated land, from which local people were cast out, new people moved in from elsewhere as workers on the fields planted with export crops, and finances controlled by distant metropolitan owners. The plantation started a second life after the end of slavery, as new ways of recruiting labor coincided with geopolitical changes and improved transport and processing technologies made the plantation an interesting option for investors. Labor recruitment for plantations in the Americas shifted from Africa to the more populated parts of Asia, the majority of the global indentured workforce coming from India and China. Sugar plantations run with indentured labor from India were set up in African colonial territories, most prominently Mauritius and Natal. Also in India and other places in Asia large stretches of land were turned into plantations. Tea plantations in Assam mushroomed after the 1840s, attracting laborers from all over India. A few decades later tobacco plantations around Medan, Sumatra, brought in workers from Malaysia, China, and

Java. The rapidly expanding Vietnamese rubber plantations in the early decades of the twentieth century increasingly relied on labor migrants from outside Vietnam.

These are only a few examples of the macro changes characterizing the plantation, a format that was far from uniform and a phenomenon not only applied by European colonizers. The rapidly expanding plantation sector and its huge demand for laborers went hand in hand with harsh working conditions, overall maltreatment and severe punishments for any perceived offense. In many countries and colonial territories improvements to labor conditions were implemented slowly and reluctantly. One might wonder why the search for cheap labor was at all necessary, given the many technological options available in the twentieth century.

The industrial revolution in Europe of the late eighteenth century is almost synonymous with the invention of steam-powered machines by which cotton could be cleaned, spun, and woven. It took about another 150 years before mechanized cotton picking was developed. The disparity in mechanization between field and factory applies to almost all major plantation crops. Cigarette machines scaled up industrial tobacco processing by the end of the nineteenth century, whereas tobacco harvesting machines appeared in tobacco fields from about the 1970s. For crops like sugar cane and oil palm, the harvested product requires pressing and purifying, a process that from halfway through the nineteenth century was scaled up through steam-powered mills and refineries. Also for these crops, transport was the only component of the field work for which machines proved effective. Moreover, increased processing capacity amplified the demand for field workers. For example, each time a sugar mill replaced or expanded its processing equipment, it could handle more cane and thus needed expansion of acreage and yield. In colonial Suriname, one of the few surviving sugar estates (Mariënborg) was, by the early 1900s, larger than all sugar estates put together a century earlier and would increase its acreage five times between the 1900s and 1930s. Production and the number of laborers multiplied six times over the same period.

The disbalance of innovation between factory and field is not to suggest that cultivation techniques largely remained the same. A major increase in field productivity was realized with fertilizer application, starting halfway through the nineteenth century with guano and mined minerals, followed by other chemical fertilizers in the early twentieth century. Earlier soil fertility techniques mainly consisted of fallowing. However, fields were hardly ever entirely uncultivated as plantation managers often allowed workers to grow food crops in these fields or applied particular crop rotation themselves. The intensification of crop production enabled by mineral fertilizers implied more work. On sugar plantations on Java, it was often young children who carried baskets of fertilizer into the field, followed by an older worker spading the fertilizer in the soil. The example reveals some of the variations in tasks and skill levels of plantation workers coinciding with differences in age, gender, and ethnicity.

Contrary to the common image of a labor force with overall low skills, needed for muscle power only, skilled labor is essential for every plantation, including the research stations that emerged alongside plantation agriculture. The increased scale of plantation areas and intensified production methods turned plantation fields into a luxury resort for insects, fungi, bacteria, and viruses. Plantation owners started to call in science-based expertise for pest control and other problems the planters faced with their crops. Much of the agricultural research activities up until the mid-twentieth century heavily relied on field-based explorations and experiments, equally depending on large numbers of field technicians. The hierarchy of research stations means that heads of the labs and leaders of the experiments are clearly visible in the written records, hiding the crucial role of field workers' knowledge and skills. An agronomist who grew up in colonial Indonesia recalled that research assistants for specific investigations were often recruited from the plantation workers, as sampling or catching insects required the knowledge and skills to

find and reach affected parts of plants and trees or catch predatory insects. The contributions of local technicians to scientific research are hardly ever acknowledged and if they are, they remain anonymous and in the Dutch example mostly collectively referred to as “*de Javaan*.” Rather than knowledge transferred from Western research institutes, the science of plantations was embedded in the fields and a shared effort of the various persons involved in field research.

Just as the plantation laborer is not a homogeneous category and scientific knowledge of growing cash crops is not transferred from laboratories to the field, other features of plantation agriculture that may give it a typically developed, twentieth-century image appear less modern on closer inspection. Date groves in California, USA, at first sight seem a modern version of the groves in the desert environment of the Arabian Peninsula. However, the California date plantations are neither copies nor modernized versions of the Arabic system. Plantation agriculture, in other words, provides a diverse and varied image of development, to which simplified projections of expansion and progress rooted in Western science and leadership are a caricature at best. Date palm plantations may seem an atypical case, but historians increasingly apply similar impartial and symmetrical investigative methods to study “old” and “new” cultivation methods and how these are mixed up when transferred to other areas. The common image of rubber production, for example, is science-based testing of various latex-producing trees out of which the Amazon type (*Hevea brasiliensis*) emerged and was improved to fit the large-scale plantations in Malaysia and Indonesia. More detailed histories of the crop reveal many of the contingencies, challenges, and choices made to change rubber production. Another major plantation crop with a complex history is oil palm.

The production of oil palm is, like rubber, dominated by plantations in Asia. The commercial oil palm species (*Elaeis guineensis*) is, however, native to West Africa. The first trees were introduced to the botanical garden on Java in 1848, and commercial exploitation took off in the 1910s. Indonesia and Malaysia’s production overtook production in the continent of the crop’s origin in West Africa from the 1930s onward. Palm oil is often perceived as a rather stable and uniform raw product from which a wide variety of food and cosmetic products are made. Like rubber, the selection, breeding, and cultivation of the now dominant palm variety and extraction of oil from the fruit bunches was not that straightforward. There is variation, for example, in the characteristics of trees and in the use of trees and fruits. Red palm oil is the preferred cooking oil in most of West Africa and some areas in Brazil, but early attempts by the British to introduce palm oil as cooking oil in Malaysia failed, as coconut oil was preferred. Another variation is in land arrangements for oil palm production. In the colonial period large-scale land concessions to plantation companies dominated alongside some local small producers. Smallholder production was overall considered inefficient and destructive for the forest and thought to produce inferior quality. However, colonial records also contain accounts of researchers and officials showing opposing arguments and evidence for favorable effects of smallholder production on forest conservation and quality of the product. These debates resonate in current development debates about ways in which oil palm production can have a less negative environmental impact and increase the share of smallholder production.

Palm oil is likely the most prominent case of dependency between consumers in the Global North and producers in the Global South with clear and direct historical patterns. One example is the multinational firm Société Financière des Caoutchoucs (Socfin), currently one of the biggest oil palm producers. One of the company’s founders was the Belgian planter Adrian Hallet, who pioneered oil palm plantations in Congo soon after the region was colonized by Belgium in the late nineteenth century, from where Hallet expanded his business to Indonesia and Malaysia. Another international player in palm oil production in Africa was the British soap company Lever Brothers, merging in 1929 with a Dutch margarine and meat processing

company (*Margarine Unie*) into Unilever. Today, palm oil is an ingredient in many industrial food items, and Unilever is one of the largest multinational companies producing such products.

The accumulation of wealth and financial control by multinational companies is a major continuity in the development of plantation agriculture. Whereas the growing power of multinational companies results in a rather sobering, if not depressing development perspective, the diversity of plantation practices offers many opportunities to rethink plantation agriculture.

The government

Over the first half of the twentieth century the foreign investment companies and plantation managers noticed that the time of unconditional support of national governments and colonial administrations was coming to an end. An important element of the new agriculture and development agendas was an overall acknowledgment of the economic importance of “local” or “indigenous” farmers, craftsmen, traders, and other businesses. Stimulating national producers, in particular within the agricultural sector, was part of a wider goal to increase revenues through taxation and tariffs to make national economies more viable and colonies more financially independent. Agricultural improvement programs thus became increasingly integrated with national development policies, besides global economic and geopolitical strategies. Much of this integration hinged on the issue of food security.

Regional food shortages and occasional famines challenged the legitimacy of colonialism and national governments alike, with food riots often being the culmination of wider and deeply felt grievances. Political stability within the national territory and humanitarian concerns over the wellbeing of the population may be strong motives for food security, but access to food increasingly became part of international market competition and the geopolitical positioning this required. By the beginning of the twentieth century more food traveled over larger distances than ever before, and farmers and farm laborers had to produce food for increasing numbers of consumers in cities, nearby and far away.

The increased dependence on and fragility of the global food trade was brutally exposed by the First World War. One of the causes of the First World War was an increasing dependence of Britain and Western Europe on the Americas and Dominions for food and other agricultural products, a dependence protected by the Royal Navy to the exclusion of Europe’s central powers. The national and colonial policies after the war increasingly focused on safeguarding agricultural production and international trade. For example, colonial investments in the French West-African territories were focused on the production of peanut oil, mostly in Senegal, and rice and cotton in Mali (French Soudan). Despite the cheaper imports of Asian rice, the French colonial planners envisioned that the Soudan scheme would produce enough rice for the entire West-African region. It never did.

The close connection between international markets for agricultural products and national food security is a recurrent development theme. Policies set in motion during the interbellum had a major impact on interventions during the second half of the twentieth century. In Indonesia, for example, the Dutch colonial administration heavily invested in irrigation infrastructure on Java, increasing water availability year-round, benefiting the sugar estates and rice farmers. On Sumatra, where huge stretches of land were leased out to plantation companies growing tobacco, rubber, oil palm, and other cash crops, securing the food demand of the expanding plantation workforce created a different challenge. Whereas on Java inundated rice fields dominated and many farmers produced more than they needed to feed their family, rice on Sumatra was primarily in rain-fed uplands, integrated with other crops and trees. The colonial policy aimed to increase inundated rice production on Sumatra by bringing over farmers

from Java, expanding agriculture to the lower areas. Similar transformations of the agricultural landscape happened all across South and South-East Asia, opening up new land, in particular lower areas where irrigation infrastructure improved the water management. From about the 1920s, other agricultural improvements, most prominently the selection and breeding of new varieties, the control of pests and diseases, and experiments with fertilizers, further stimulated food production, although results of these improvements were mostly marginal.

The mechanization of food crop production, in particular for grain crops, was considered an attractive option to further increase production. Before the Dutch colonial government relied on Javanese farmers for increasing rice production in Sumatra, they had tried a large mechanized rice scheme shortly after WWI. The experimental rice farm was modeled after the rice industry that had emerged in the early twentieth century in the South-West of the USA. Before the experiment started, the agronomists involved warned that mechanization only works when soil conditions, rainfall, and temperatures were such that machines could enter the fields at the required moment, and effective tillage and weed management could be applied, conditions that existed in the rice areas in the USA but not on Sumatra. The experiment was stopped after three failed harvests. Overall, there are very few places where the mechanization of food crop production in tropical conditions was successful. Most large flat areas in tropical regions are either too wet or too dry, the latter found out by British agronomists in the late 1940s when they tried to set up a groundnut scheme in Tanyanika. The wartime experiences likely invoked images of machines going through fields in squadron formation, an image frequently presented from the large agricultural areas of the North American prairies, Russian steppes, and the plains of Brazil and Argentina. Only in the 1960s, when light fuel engines became affordable, was some of the heavy work in the muddy paddy fields done by two-wheel tractors, the same engines often added to propellers for boats and water pumps.

The focus on food security also resulted in an increased focus on calculating supply and demand. At a national level this was the field of agricultural statistics. At the micro level this was the science of human nutrition, in particular the quantification of energy needs for which the calorie became the international standard. Nutrient use and energy conversion in humans, plants, and animals became specialized scientific fields. Besides nutrition, diseases such as malaria and other health effects also became more prevalent as an effect of landscape change, water infrastructure, and demography. Although such cross-linkages were known, development policies were often implemented along the administrative lines of particular ministries and the disciplinary divides of science, working on targeted solutions.

For the development of crops, mineral fertilizers became the preferred solution for the twentieth century. Fertilizers produced from chemical procedures on an industrial scale were scarce and up until the 1960s mostly produced in high-income countries. Moreover, not all crops responded equally well to fertilizers. In particular, grain crops typically converted the nutrients in the stalks and leaves rather than bigger grains, which made the plants topple over and die before ripening. As research continued to unravel the complex connections between the physiology, genetics, and ecology of crop production, the chemical industry expanded the production of mineral fertilizers and pesticides.

Over the first half of the twentieth century most governments of the more wealthy countries had set up agricultural research and extension facilities, mostly related to agricultural colleges. The colleges trained the experts for the research institutes and advisory work of the government extension services. Besides distributing verbal and written information to farmers, a key extension method was setting up experiments that combined the testing and demonstration of new inputs and methods in the farmers' fields. Education level, financial capital, and the vicinity of roads and railways were key conditions for access to agricultural technologies. In

colonial territories there were tight linkages between public research, government services, and the plantation sector. Moreover, farmers in remote places were mostly illiterate and often suspicious toward government officials. The skewed access to extension services also implied that knowledge about the farming systems and potential solutions for smallholders developed little, if at all. Or in the words of a British soil scientist in colonial Nigeria: “This experience has made me skeptical of situations in which a failure to persuade farmers is blamed on a lack of extension facilities – lack of a proven product is more likely the cause.”¹ Mid-way through the twentieth century such critical voices were far from the mainstream but not unique to a single soil researcher.

The international development organizations created after the Second World War, most prominently the World Bank and the Food and Agriculture Organization (FAO), became important players in supporting national policies and plans for the improvement of agriculture. Although formally linked to the United Nations, dominant international powers influenced the organizations’ support programs to align them with their own national interests. For many decades the Cold War was the major geopolitical incentive for international development programs. The program most affecting agriculture was the Green Revolution, named as such to mark out the contrast from the red revolutions proclaimed by the Soviet bloc and China. The agronomical core was the breeding of short-straw and short-duration varieties of wheat and rice that allowed for multiple harvests a year under optimized water and soil fertility conditions. The wheat program had started in Mexico in the 1940s and from there expanded to other countries, mainly in Asia where rice became the other target crop of the Green Revolution. The availability of improved seeds was conditioned by political agreements between the US and recipient countries and commercial expansion of the fertilizer industry, and wrapped up in a narrative of global food security and the eradication of rural poverty and hunger.

The Green Revolution thus implied a strong involvement of the US and allied Western donors in the agricultural policies of developing countries. There was a firm belief in science-based improvements. The key assumption was that agricultural technologies produced by the international research institutes, from 1971 coordinated by the Consultative Group for International Agricultural Research, would work in agricultural systems within and across countries. The term for this was “wide adaptability” which referred to the capacity of improved varieties to provide high yields across broad ecological and climatic zones. Improved rice varieties, for example, were distributed all across India, a country with huge differences between north and south, coastal and inland areas. As early critics warned and later studies confirmed, the potential wide adaptability is premised on the availability and affordability of fertilizers, pesticides, and irrigation water, amplifying existing differences between wealthier and poorer farmers. These findings triggered additional research on implementation and adjustment to poorer farm areas, in recent decades mostly focused on Sub-Saharan Africa. However, most of the locally specific adjustments for crop improvement continue to be premised on the availability and affordability of mineral fertilizer and pesticides.

The Cold War situation implied that developing countries in search of foreign support were under diplomatic pressure to align with either of the global powers. However, most countries held enough operational space to give a distinct national twist to their agricultural policies. Moreover, the variation in agricultural landscapes, effectiveness of government administrations, and colonial legacies created many differences in the development of agriculture. China is only one example of a country that orchestrated a distinct agricultural development trajectory, including a different approach in creating linkages between science, agricultural advisors, and farmers with a heavy involvement of local party administrators. Another distinct agricultural development trajectory was employed under the Apartheid regimes in South Africa, Zimbabwe,

and Zambia. Favoring the colonial plantation model that had been established in the early twentieth century, agricultural policies mainly implied access to land for the larger farmers, economically strong enough to buy the technologies required for crop and livestock improvement.

The small farm

The previous section emphasized that government action for agricultural improvement in the Global South was to secure access to agricultural commodities from tropical environments. However, national agricultural policies and international arrangements equally secured commodities moving in the other direction. Famine relief and aid programs implied the shipping of wheat, maize, and rice to the countries facing shortages. Most of the grain sent as food aid from about the 1950s up until today has been grown in the USA. Shipments typically exceed the quantities and time spans that would suffice for famine relief. The continued shipping of food to low-income countries, with “development aid” as a decoy for price subsidies, has received much criticism for the dependencies it sustains, undermining the marketing options of local food producers. More than bilateral arrangements, these dependencies are often inherent in how the global food system evolved. For example, intensive livestock industries in high-income countries rely on imports of cheap feed, mostly soya, cassava, and feed grains. Meat is considered a luxury product but advantages of scale, by-products, and consumer preferences create many cheap meat products that can be sold in low-income countries. Egg farms replace hens as soon as their productivity reduces, typically around 18 months. The breed and age make these chickens fit for sale in low-income countries where consumers are not yet spoiled with the watery meat of the fast-growing broilers slaughtered at a very young age. It is unlikely that chicken will ever disappear from small farms in low-income countries, but investment in surplus production to serve nearby city markets is not an attractive option when competing with large industrial operators.

The intricate global nature of agricultural production suggests a grim situation for smallholder farmers. Small farms or family farms nevertheless continue to exist, and according to recent FAO statistics count up on a global scale to about half a billion, cultivating about 75% of the global farm land and producing 80% of the food. Smallholdings are most prominent in regions such as South Asia and Sub-Saharan Africa but not exclusively there, and in recent years countries like the USA and Brazil have shown a rise in the number of smallholders. The websites of the FAO and the United Nations, which declared the period 2019–2028 as the Decade of Family Farming, provide laudable plans in support of family farms. The high percentage of farm land cultivated by smallholders contrasts with the low land ownership (less than 25%) and the kind of land cultivated by smallholders (not the best pieces). In other words, small farmers dominate farming as an activity without having equal control over key assets, most prominently land. Such inequalities have deep historical roots that played out differently across different time periods and geographies but also display some common features.

There is a straight line from colonial encroachment in early periods and what today is called “land grabbing,” the large-scale land acquisitions by foreign investors. The implication for smallholders is eviction, having the choice to move, or being jailed or shot. Movement typically implies movement to places with lesser access to favorable soils and other natural resources, resulting in economic deterioration, shortages, and the risk of starvation. Such downward trajectories are frequent although with much variation and hardly ever that linear. For example, slave emancipation and increased international competition implied bankruptcy for many Caribbean plantation owners in the second half of the nineteenth century. If not bought up by another investor, these plantations fell to the colonial administration and were then parceled out to

smallholders. Plantation owners in the Caribbean successfully lobbied for preferential access and reduced land rents for Asian indentured laborers after they had served their contract term, in the hope they would continue to hire out their labor. In British Guiana, Suriname and many other areas where plantation agriculture dominated, this resulted in complicated legal arrangements imbued with economic interests and ethnic categorizations. National governments and colonial administrations played a key role in setting up such legal systems that often continue to exist today, having long-term consequences for agricultural production. Such inequalities in access to land often extend to urban differences as those with the fewest options to cultivate most likely migrate to urban areas to find work there. Although legal systems tend to favor capital investors, large numbers of smallholders imply many votes to which political rulers are often sensitive. A prominent example is Japan's legal protection of small rice farmers, even when, over the second half of the twentieth century, the country's many agro-industrial giants could easily absorb their land.

The difficulty of defining a small farm is not only an effect of the various landscapes, ecologies, and social conditions in which small farms exist. Defying definition and categorization is inherent in the way small farms operate. An example is pastoralism, a farm method in which livestock is moved around to where plants grow that are palatable for animals, combining herds of multiple families, often moving across fields where other small farmers grow crops. This may lead to conflicts that at times escalate or come to resolutions, for example agreed post-harvest entry in which livestock eat crop residues in return for droppings and urine. Pastoralism resonates with the nomadic bands of early epochs mentioned at the beginning of the chapter, where such bands were associated with escape from state repression. In the eyes of a state official, moving around and hiding something are likely synonymous. Over the twentieth century nomadic pastoralism faced, and often still is facing, restrictions in movement through a combination of armed force, land entitlement systems, livestock registration, and sanitary and other rules for dairy and meat production. Taxation and regulation require a clear definition of products. However, small farms produce many "things" and one of their major benefits is flexibility in the purpose of things. A small field of legumes can be consumed by the people living off the farm, fed to a pig, or sold on the market. Legumes fix nitrogen, serving other crops in the same field. Governments and commercial companies have a shared interest in separating all these functions. Smallholders are encouraged to buy feed for their animals, mineral fertilizer for their crops, sell their crops to the market, and buy their groceries from the same market. However, small farmers benefit more from retaining flexibility in how and what they grow and how much they commodify and when. Such decisions are often co-informed by collective interests and regulated by cultural codes that are attached to particular qualities of a crop or animal. Cultural codes can also be attached to farm activities, as in the example of the Balinese water temples in which religious congregation is combined with decision making over the division of irrigation water and shared arrangements for labor peaks in the season.

Governments, companies, and aid donor and nongovernmental organizations have a shared history of misinterpreting the benefits of flexibility that a small farm brings, in particular when farmers base decisions on "irrational" cultural explanations. Likewise, agronomists and other experts tend to miss out on the benefits of variation and collective arrangements when analyzing smallholders with preconceived farm models. Exceptions mostly emerged from observations of farming practices and interactions with smallholders over multiple years. The Dutch colonial policy toward smallholders on Sumatra in the 1920s and 1930s was to make them benefit from the plantation infrastructure by urging them to specialize in cash crops. Their mixed farms, colonial officials argued, added up to a much lower economic value than when they specialized in growing cash crops. A multi-year study of the smallholders showed they responded very well

to market incentives, growing less cash crops when prices were low but maintaining food crops, in particular upland rice, at very stable production levels over the years. A very rational strategy, the colonial researchers concluded. Likewise, French agronomists working in the cotton, rice, and groundnut schemes in West Africa noticed that contracted farmers grew a variety of crops, including rice, in fields outside the scheme (*hors casier*) with better yields than obtained in the scheme.

Conclusion

The recent history of agriculture and development is a global phenomenon and yet contains deep historical roots in specific regional landscapes and communities in these areas. The plantation, the government, and the small farm provide appropriate starting points to show how agriculture as an activity cuts across different scale levels. Although these are not unique or exclusive entries, the three together arguably put a firm mark on every country. Besides formational entities in the history of agriculture and development, the plantation, the government, and the small farm also provide starting points for further historical queries and study.

The plantation as a practice and as an acting entity contains a wide variety of arrangements of its constituting elements: Specialized production of cash crops, inequitable division of land, labor, and revenues. Histories of interactions between these and other elements have an inherent development relevance by revealing various and often erratic patterns of change over time and across places. Likewise, there is ample work for historians in developing countries to tease out national agricultural policies, their impact on how agriculture was done, and what new agricultural landscapes emerged. Such histories seem to gain relevance given the criticism of the strong reduction of public spending and, consequently, the limited effect of national policies on agriculture from the late 1980s until now.

As mentioned in the introduction, theories of development increasingly question the out-of-agriculture narrative that has dominated the thinking of scholars and policy makers. This raises a wide variety of new questions about the way agriculture has been embedded in and can continue to be essential for development strategies. What has become clear in recent decades is that industries and intensive specialized agricultural systems that characterize most high-income countries have destructive effects on biodiversity and the natural environment more generally. Arguments for limits to growth, circular economies, and more diverse and less intensive forms of agriculture are increasingly heard. This suggests a bright future for the kind of agricultural practices that characterize the small farm.

Reports, research papers, and books emerging from fieldwork in smallholder areas over prolonged periods and different seasons appeared throughout the twentieth and cover many countries on all continents. These studies invariably reveal many fallacies, contradictions, and reverse effects for small farms when implementing agricultural improvement policies and development projects. This implies that official records and publications, in the colonial period or from later dates, contain valuable information about the activities of smallholder farmers but require reading "against the grain." Combining written sources with techniques like oral history, screening herbaria, or using molecular techniques to trace backgrounds and movement patterns of crops and animals, enables richer historical reconstructions of small farms. Moreover, the huge number of small farms and the large variation of practices provide many opportunities for enriching the historiography of small farms. Documenting these histories is a valuable goal in itself and of direct relevance, given that biodiversity, reduced dependence on external farm inputs, and environmentally sustainable forms of agriculture and food production appear more prominently in development agendas.

Note

- 1 Cited in: Hodge, Joseph Morgan. *Triumph of the Expert: Agrarian Doctrines of Development and the Legacies of British Colonialism*. Ohio University Press Series in Ecology and History. Athens: Ohio University Press, 2007: 252.

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