GLOSSARY OF KEY TERMS

The following terms are used throughout this book with specific meanings that may differ from their use in conventional agricultural literature.

Aggregate structure The arrangement of soil particles into stable clumps (aggregates) held together by fungal threads, bacterial glues, and root exudates. Healthy aggregate structure creates the pore network that allows water infiltration, air movement, and root penetration. Tillage shatters aggregate structure; PQNK management builds it.

Biological community The full assemblage of living organisms in the soil, bacteria, fungi, protozoa, nematodes, earthworms, arthropods, and hundreds of other groups, that perform every essential agricultural function: nutrient cycling, water management, pest regulation, and structural maintenance. PQNK's goal is the restoration and protection of this community.

Capillary action The movement of water through narrow spaces in soil against gravity, driven by surface tension and adhesion. In a biologically active PQNK profile, capillary action distributes furrow water laterally through the entire root zone without surface flooding or evaporation.

Carbon sequestration The capture of atmospheric carbon dioxide and its storage in stable soil organic matter. In PQNK farming this happens through the Liquid Carbon Pathway, the biological conversion of root exudate carbon into stable humus by the microbial community. Chapter 46 sets out the global potential.

Closed-loop system A production system in which all outputs (crop residues, root mass, organic matter) are returned to the farm as inputs for the next cycle, with no external nutrient inputs required at maturity.

Cover-up technology In PQNK analysis, a purchased input that masks a symptom caused by a prior purchased input rather than addressing its root cause. Example: synthetic nitrogen fertilizer covers up the loss of biological nitrogen fixation caused by tillage, creating the next requirement in a chain of substitutions.

Designed diversity The planned planting of several complementary crops in the same permanent beds at the same time, each in its own position, for income through the whole season. The One Acre Prosperity model grows six crops at once.

Geological abundance The vast mineral reserves locked in the parent rock material of the soil, phosphorus, potassium, calcium, magnesium, and every micronutrient a crop requires, present in the top six inches alone at 50 to 1,167 times what a crop removes in a season (Chapter 3). Geological abundance is the mineral bank; the biological community is the withdrawal mechanism.

Hardpan A dense, compacted layer beneath the cultivated zone of a tilled field, formed by repeated tillage at the same depth. Hardpan prevents root penetration below 8 to 12 inches (20–30 cm), blocks upward capillary rise of subsoil moisture, and stops water from soaking down into the subsoil. PQNK subsoiling shatters the hardpan once; biology prevents its reformation permanently.

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Liquid Carbon Pathway The biological mechanism by which plants transfer photosynthetically fixed carbon from leaves to roots as liquid sugar exudates, which are consumed by mycorrhizal fungi and bacteria in the root zone. The microbial community converts this carbon into stable soil organic matter (humus) as a by-product of the carbon-for-mineral exchange. The Liquid Carbon Pathway is the primary mechanism of soil carbon sequestration in PQNK systems.

Microbiome The community of microorganisms, bacteria, fungi, archaea, viruses, and protozoa, that inhabit a specific environment. The soil microbiome is the most complex on Earth: a teaspoon of healthy PQNK soil contains more microorganisms than there are people on Earth.

Mulch A layer of organic material, about three inches (7.5 cm) of crop residue and dried vegetation, kept permanently on the soil surface in PQNK farming. Mulch performs five functions simultaneously: moderates soil temperature, feeds the biological community as it decomposes, suppresses weed germination by blocking light, conserves moisture by reducing evaporation, and builds soil organic carbon continuously.

Mycorrhizal network The web of fungal threads (hyphae) extending from plant roots into the surrounding soil matrix, extending the root's effective reach up to a hundredfold. Mycorrhizal fungi deliver phosphorus, potassium, water, and micronutrients to the plant in exchange for carbon-rich root exudates. Synthetic phosphorus fertilizer and tillage both suppress mycorrhizal activity.

Permanent raised bed A fixed, elevated planting surface, with a standard 42-inch (107 cm) bed top, an 18-inch (46 cm) furrow top, an 8-inch (20 cm) furrow bottom and an 8-inch (20 cm) depth, that is never tilled, never flooded, and never left bare. The permanent raised bed is the physical infrastructure of PQNK farming: it enables no-till precision planting, furrow irrigation, mulch application, and full biological continuity season after season.

Predator community The many species of insects, spiders, birds, reptiles, and other organisms that prey upon crop pest species in a biologically intact PQNK field. When the predator community is intact, pests very rarely reach 2 percent of the crop, and any outbreak settles within days. Pesticide application destroys predators faster than pests, because predators breed more slowly and are more susceptible to chemical contact, triggering the spray cycle that characterizes ACI pest management.

Root exudate The sugary, carbon-rich compounds released by plant roots into the rhizosphere (the zone of soil immediately surrounding roots). Root exudates are the primary food source for the mycorrhizal fungi and bacteria that perform nutrient delivery for the plant. A plant allocates 20 to 40 percent of its photosynthate below ground, depending on plant type and growth stage; root exudates are one part of that allocation, funding the plant's own biological support system.

Rhizosphere The narrow zone of soil immediately surrounding and influenced by plant roots, typically a few millimetres thick. The rhizosphere holds far larger bacterial populations than the surrounding soil, drives the carbon-for-minerals exchange between plant and microbiome, and is the primary site of nutrient mobilization in a PQNK system.

Subsoiling Breaking the compacted hardpan below the normal tillage depth, once, with a subsoiler. After the hardpan is broken, biological activity, earthworms, fungal threads, and

root channels, maintains the open profile permanently, making future mechanical intervention unnecessary.

Transition protocol The eight-step PQNK process for converting an ACI-managed field to a biologically functioning PQNK field (Chapter 23): design the farm; probe and break the hardpan once with a subsoiler, to about 22 inches; wash the soil where the pH is above 8; form permanent raised beds; grow a Jantar cover crop, leaving its roots in the soil and using its biomass as the first mulch; plant through the mulch with SIPP or careful hand placement; water only when the ball test shows the soil is dry; and harvest without disturbing the soil.

Weed as diagnosis The PQNK principle that the species composition of a weed community is a precise indicator of soil condition. Sedges and rushes indicate waterlogging. Dock and sorrel indicate soil acidity. Thistle indicates compaction. Chickweed indicates high nitrogen. Rather than eliminating weeds chemically, PQNK interprets them as diagnostic data and corrects the underlying soil condition, after which the weed community changes without intervention.