Responses to the Student’s Questions

Q1. Your paper argues that the greatest climate solution is not more trees, but changing how we farm. What is the biggest misconception behind the world’s focus on tree planting?

The biggest misconception is that **carbon capture is treated as something mainly performed by forests**, while agricultural crops are seen only as food producers. In reality, every green plant captures atmospheric carbon through photosynthesis. A wheat plant, maize plant, vegetable crop and forest tree all use the same basic biological process.

The real difference appears after the carbon has been captured. Forest soil normally remains covered, rooted and undisturbed, so much of the carbon can remain within roots, microorganisms, fungal networks and stable soil organic matter. Agricultural soil is often ploughed, left bare, flooded or repeatedly disturbed, which exposes organic matter to oxygen and accelerates its return to the atmosphere as carbon dioxide.

Therefore, the misconception is not that tree planting is wrong. It is that **planting trees alone can compensate for the continuing degradation of much larger areas of agricultural land**.

Q2. If trees and crops use the same biological process, why has agricultural land received less attention as a carbon sink?

Climate policy has traditionally separated land into two categories:

- forests store carbon;
- farms produce food.

That separation is incomplete. Agricultural policy has generally measured yield, production and profitability, while forestry policy has measured tree cover, biomass and carbon. As a result, the carbon captured by crops has received less attention because most annual crop biomass is harvested, grazed, burned or decomposed, and the soil beneath it is frequently disturbed.

Forests appear to be more permanent because their roots, litter and soil remain in place for long periods. Agricultural crops are seasonal, but that does not mean their carbon contribution must also be temporary. When roots are retained, soil is kept covered and biological activity is protected, farmland can produce food while also rebuilding soil carbon.

The neglected opportunity is therefore not the crop plant itself. It is the possibility of managing cropland as a permanent biological ecosystem.

Q3. Why is agricultural soil management so important in determining whether carbon remains stored or returns to the atmosphere?

Plants first capture carbon through their leaves and then transfer part of it below ground through roots, root exudates, mycorrhizal fungi and plant residues. Soil organisms process this carbon and gradually incorporate it into soil organic matter.

That carbon remains more secure when it is protected inside soil aggregates and connected biological structures. Repeated ploughing, discing, rotavation and cultivation break those aggregates, expose previously protected organic material to oxygen and accelerate microbial decomposition. Carbon that had been captured from the atmosphere may then return to it as carbon dioxide.

Management also determines whether new carbon continues entering the soil. A bare field has little living root activity. A permanently covered and biologically diverse field continuously feeds the underground ecosystem. Therefore, carbon storage depends on both sides of the equation:

how much carbon enters the soil and how effectively it is protected after entering.

Q4. Why must the four PQNK principles be implemented together rather than focusing only on no-till?

Because no single principle can recreate the functioning of a natural ecosystem.

No soil disturbance protects aggregates, fungal networks, root channels and soil organisms. But no-till alone may leave the soil bare, compacted, chemically dependent or biologically inactive.

No inundation protects the water–air balance. Soil organisms and roots require moisture, but they also require oxygen. Flooding fills pore spaces with water and suppresses aerobic biological activity.

Permanent biological cover protects the surface from heat, erosion, evaporation and raindrop impact while continuously supplying organic matter.

Maximum biodiversity creates different root depths, root exudates, habitats and food sources, making the system more stable and biologically productive.

These principles support one another. No disturbance preserves the habitat; cover protects and feeds it; balanced moisture keeps it aerated; biodiversity expands its biological functions. Removing one principle weakens the entire system. This is why the paper stresses that stopping tillage alone is not enough.

Q5. What are the first three practical changes an ordinary Pakistani farmer should make?

The first practical change is to **stop routine soil disturbance as quickly as conditions allow**. The farmer should avoid repeated ploughing, rotavation and unnecessary cultivation and begin moving toward permanent beds and permanent traffic routes.

The second is to **keep the soil covered**. Existing crop residues should not be burned or removed unnecessarily. Mulch, retained roots and suitable cover crops should protect the surface throughout the year.

The third is to **change water management from flooding to controlled moisture management**. Water should be applied through furrows or another controlled method so the root zone remains moist but aerated rather than inundated.

In fields with severe compaction, poor layout or hardpan, a one-time corrective conversion may be necessary before permanent no-disturbance management begins. The important point is that correction should be transitional, not repeated before every crop.

Q6. What incentives and support systems would encourage farmers to adopt these practices?

Farmers should not be asked to adopt a new system only because it is environmentally desirable. They need to see clear reductions in risk and production cost.

The most effective support would include:

- nearby demonstration farms showing actual crops, costs, yields and water use;
- access to suitable machinery, especially no-till precision planters and permanent-bed equipment;
- operator training rather than classroom instruction alone;
- transitional credit or machinery rental services;
- reduced financial risk during the first conversion season;
- rewards for measurable water saving, soil-cover improvement and lower chemical dependence;
- reliable markets for high-quality produce.

The strongest incentive will ultimately be economic. When farmers see lower diesel use, reduced irrigation, less dependence on fertilizers and pesticides, and stable or improved yields, adoption becomes a business decision rather than an environmental sacrifice.

Q7. Could improved agricultural land management have a greater overall climate impact than forest expansion alone?

Potentially, yes—because of scale.

The paper notes that agricultural land occupies a much larger proportion of Pakistan than forest land. This means that even a modest improvement in soil carbon, infiltration and biological productivity across millions of cultivated hectares could have a very large cumulative effect.

This does not mean that one hectare of farmland necessarily stores more carbon than one hectare of mature forest. Forests remain exceptionally important carbon reservoirs and biodiversity systems. The argument is that Pakistan has far more agricultural land available for immediate management improvement.

Therefore, the national impact may be larger because the intervention can be applied across a much greater area while continuing to produce food.

Q8. How should Pakistan balance forest protection, forest restoration and agricultural transformation?

The three priorities should not be treated as competitors.

The first priority should be **protecting existing natural forests**, because a mature forest cannot be quickly replaced once destroyed. Existing forests contain established biodiversity, soil structure, watersheds and stored carbon.

The second should be **restoring degraded land where forests naturally belong**, particularly mountain watersheds, riverbanks, eroded slopes, biodiversity corridors and appropriate urban areas.

The third should be **transforming agricultural land management at national scale**, because this is where Pakistan can achieve widespread improvements in soil carbon, water infiltration, heat moderation and food-system resilience.

With limited resources, forest planting should be geographically targeted, while agricultural reform should be integrated into routine farm policy, irrigation policy, machinery support, research and extension. In other words, forests require protection and strategic restoration; farmland requires systemic transformation.

Q9. Can climate-friendly agricultural practices conflict with short-term food production?

Some poorly designed environmental programmes can reduce food production—for example, removing productive farmland from cultivation without considering food demand, imposing unsuitable restrictions, or introducing practices that reduce yield during an unmanaged transition.

However, the purpose of PQNK is not to sacrifice production for carbon. It is to restore the biological processes that support production.

There may be a temporary transition period in degraded soils because farmers and soil biology must adjust to a new management system. That transition should be carefully planned, demonstrated and supported. Climate restoration should not be imposed through sudden yield-reducing measures.

The correct balance is to evaluate both short-term and long-term food security. A system that produces a slightly higher yield today while degrading soil, exhausting groundwater and increasing dependence on imported inputs may reduce national food security later. A climate-friendly system should therefore be judged by whether it can maintain or increase production while reducing long-term ecological and financial risk.

Q10. What is the biggest obstacle to implementing this approach across Pakistan?

The greatest obstacle is not a single factor. It is the **institutional commitment to the existing agricultural model**.

Farmers are often blamed for resisting change, but they operate within a system shaped by:

- government recommendations;
- university teaching;
- machinery availability;
- irrigation practices;
- fertilizer and pesticide markets;
- credit systems;
- procurement policies;
- extension advice.

When all these institutions support ploughing, flooding, bare soil and input-intensive agriculture, an individual farmer faces considerable risk in changing alone.

Lack of awareness matters, but awareness without working machinery, field demonstrations, technical support and supportive policy will not produce national transformation. The central challenge is therefore changing the agricultural system around the farmer, not merely changing the farmer's opinion.

Q11. Should tree planting and sustainable agriculture be viewed as competing solutions?

No. The strongest strategy is exactly the one suggested in the question.

Forests should be protected and restored where forests naturally belong. Agricultural land should remain productive but be managed so that it also functions as a carbon sink, water reservoir and living ecosystem.

The paper does not argue against trees. It argues against treating trees as the only meaningful land-based climate solution. Forest restoration and agricultural transformation are complementary because they address different parts of the landscape.

A complete strategy would include:

- natural forests in forest ecosystems;
- trees along appropriate riverbanks, watersheds, roads and urban areas;
- agroforestry where ecologically and agriculturally suitable;
- biologically managed crop production across cultivated land.

The objective is not to turn every field into a forest. It is to make every part of the landscape perform its proper ecological function.

Q12. Which three indicators would show whether an environmental restoration project was genuinely successful?

I would choose three broad indicators.

1. Increase in living soil and stored carbon

This should include measurable changes in soil organic carbon, aggregate stability, root activity and biological function—not simply above-ground vegetation counts.

2. Improvement in the water cycle

The project should measure rainfall infiltration, runoff reduction, erosion, soil-moisture retention and, where possible, groundwater recharge. A restored ecosystem should absorb and retain more water.

3. Long-term biological and productive resilience

This should include plant survival, biodiversity, reduced dependence on external inputs, improved drought tolerance and, on farms, stable or improved food production and farmer profitability.

Counting planted trees is an activity indicator. Measuring whether the soil, water and biological system are improving is an outcome indicator.

Q13. How can a school deforestation project broaden its understanding without losing focus on forests?

The project can retain forests as its central subject while expanding the question from **“How many trees can we plant?”**to **“Why are forests disappearing, and how can the surrounding landscape reduce pressure on them?”**

Students could investigate:

- why local people cut trees;
- whether fuelwood demand, grazing, land conversion or poverty is involved;
- whether farm degradation pushes people into forest areas;
- whether better agricultural productivity could reduce expansion into forests;
- whether planted species are native and suitable;
- whether saplings survive after the planting event;
- whether soil and water conditions support forest recovery.

The team can also compare natural forest restoration with plantation-style tree planting. A forest is not merely a collection of trunks. It includes soil organisms, understory plants, litter, wildlife, moisture and natural regeneration.

Therefore, the broader project could become: **protect forests, understand the causes of deforestation, restore ecological function and reduce pressure from surrounding land use.**

Q14. What meaningful environmental action can secondary school students take beyond planting trees and raising awareness?

Students can move from symbolic action to measured local investigation.

They could adopt a small school or community site and record:

- soil temperature under bare soil and mulch;
- rainfall infiltration;
- runoff after rain;
- tree survival rather than trees planted;
- organic waste generated by the school;
- biodiversity of insects, birds and plants;
- water consumption;
- the amount of soil kept covered.

They could establish a small comparison plot with bare soil on one side and permanently covered, undisturbed soil on the other. Over time, they could document temperature, moisture, earthworms, plant growth and infiltration.

They could also reduce food and organic-waste disposal, produce compost or surface mulch, protect existing mature trees, identify native species and present evidence-based recommendations to school administrators or local government.

The most important lesson is to measure results over time. One afternoon of planting is useful, but environmental restoration requires continuing responsibility.

Q15. What is the one major change Pakistan needs in the way it thinks about climate restoration?

Pakistan must stop thinking of climate restoration as a separate environmental activity carried out on limited land by planting trees.

It must begin treating **every managed acre as part of the climate system**.

Agriculture, water, soil, food, heat, biodiversity and carbon are not separate subjects. They are different expressions of the same functioning or malfunctioning landscape. A cultivated field can either release carbon, waste water and intensify heat, or it can store carbon, absorb rainfall, support biodiversity and produce food.

The major change is therefore from **project thinking to system thinking**.

Instead of asking only:

How many trees did we plant?

Pakistan should also ask:

How much land became biologically functional?
How much soil remained covered?
How much rainfall entered the ground?
How much carbon stayed in the soil?
How much water and farm expenditure were saved?
How much nutritious food was produced without degrading the resource base?

Forests remain indispensable. But the climate cannot be restored while the agricultural landscape continues to lose the soil, water and biological functions on which both people and forests depend.

Applying PQNK without understanding nature's operating system will not deliver abundance, stability, or nutrient density.

PQNK (pronounced "picnic")—the regenerative & sustainable ***Pristine Organic Farming System*** *—is grounded in* ***Natural Ecosystem Science****. This science employs perennial biodiversity, protects soil with organic mulch, and avoids practices such as water inundation, tillage disturbance, and leaving soil bare.*

*It is the **process** that matters most. PQNK is a pristine production system designed not merely for yield, but for optimal, balanced output—where quality, sustainability, and ecological harmony emerge from a self-regulated, zero-external-input methodology.*

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