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Spring Maize - Punjab's New Rice

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The countryside of central and northern Punjab presents a striking contrast during summer – golden combine-harvested wheat fields, sitting alongside tall and green spring maize. It is, on first glance, an impressive sight. But, the feeling is hard to hold onto when one reckons with the huge groundwater footprint of rice – the crop that came before wheat – and of currently standing spring maize. With spring maize requiring around 17 irrigations, a typical rice-potato-spring maize cropping system needs 25-40% more irrigation water than the conventional rice-wheat system. Spring maize cultivation took root initially in potato growing regions of Jalandhar, Kapurthala and Hoshiarpur, where farmers would experiment with diverse crops that could slot between two high earning crops - potato and rice. Amongst gradually establishing alternatives, muskmelon and sunflower stayed confined to niches. Summer moong also remained a minor player. Spring maize surged ahead as a dominant third crop. Short duration rice variety PR 126 released by the Punjab Agricultural University during 2017 has also become entrenched in the system. It has found wider acceptance not as a water saving tool; instead, it has been repurposed as a third crop enabler. High profitability associated with spring maize based system made it expand into other neighboring regions of the state as well. Ethanol blending targets, silage, poultry, cattle feed and starch related industries – all against the backdrop of free electricity in farm sector – have collectively driven this expansion. Aggressive promotion by the companies selling private sector varieties has also helped. These varieties offer little in resource conservation and attract wider adoption due to their high yields. These varieties respond to high solar radiation levels, demand sustained leaf water content for biomass accumulation and stay in field for roughly 120 days. They draw heavily on ground water during its critical nadir phase prior to the start of monsoon. The practice of planting spring maize on beds or ridges is increasingly adopted not as a water saving technique, but as an improved agronomic practice for attaining high yields.

Accurate assessment of the spread of spring maize itself has been a problem. It is learnt that this crop misses *girdawri* or harvest time crop assessment exercises. In the absence of official area estimates, several rough figures have been in circulation, mostly guessing around 1.50 to 2 lakh hectares. To fill this gap, open-source spectral data (accessed via Google Earth Engine) collected by two European Space Agency satellites Sentinel-2 and Sentinel-1 over four years (2023-2026) in all the districts of Punjab

was used. This satellite analysis though carries some caveats related to the granularity of methodology and crop misclassification, and cannot replace on-ground assessment. That said, the satellite-assisted estimate for the spring maize acreage during the current season 2026 stands at 1.43 lakh hectare (ha), up from 1.12 lakh ha in 2023. Five districts – Hoshiarpur, Jalandhar, Kapurthala, Ludhiana and Rupnagar – account for 64% of the area. Satellite analysis further revealed that most of the crop was sown in early to mid-March, well past the window of 20 January – 15 February recommended by the Punjab Agricultural University. Late sowing pushes crop into hotter season, sharply raising irrigation water requirements. Western disturbances, however frequent, do not bring rainfall enough to make any meaningful dent in irrigation demand, keeping the groundwater draft unaffected. At current acreage, spring maize accounts for roughly 5% of the irrigation groundwater draft of the state. PR 126 rice, despite additional demand on account of puddling and deep percolation, edges out spring maize on net water consumption – a paradox explained by monsoon rains that slash its irrigation needs significantly. Yet even for rice, deep aquifers (from which generally irrigation water is pumped out) do not receive appreciable monsoon recharge. Recharge pathways may not extend upto deep aquifers. Later in the season, shallow aquifers get saturated and shed further monsoon inputs as run-off.

Beyond water, spring maize carries other concerns. Main fertilizer requirements of the rice-potato – spring maize rotation are almost double that of the conventional rice-wheat system. It provides an uninterrupted green biomass corridor to the spread of fall armyworm - an emerging multigenerational migratory pest of maize crop. This can further undermine already disadvantaged kharif maize, which is being popularized in the state as an alternative to rice. Of late, as per anecdotal evidence, post-harvest burning of spring maize has also teamed up with the wheat straw burning.

Over the past three decades, free electricity for farm sector has become politically entrenched. It first pushed rice into areas otherwise unsuitable for it and is now driving spring maize cultivation. Certain water saving agronomic approaches like drip irrigation and mulching are going to remain in consequential under free electricity environment. Any workable solution should first accept this reality. In the light of this situation, expanding scope of the Punjab Preservation of Sub-soil Water Act, 2009to cover spring maize is a practical option. However, it comes with a self-undermining caveat: the Act continues to be bent from time to time largely at political discretion. Even so, its statutory backing can be consequential when political choice aligns with the popular choice. Expectations from this Act should be realistic - incremental, not radical. Planting time proposed by the PAU can serve as a regulatory baseline: it should be stipulated that when micro-irrigation has not been adopted, spring maize crop must terminate by the end of May, keeping at least the first half of June free from any pumping burden. Terminating early offers a viable option of silage production in order to offset the income foregone by abandoning grain production. Developing short duration, water efficient maize varieties, alongside high yielding varieties and practices in case of alternative crops, should receive special attention. Some spring maize growing blocks have already gone far beyond the natural recharge limits in groundwater extraction - Jalandhar East at 400%, Shahkot at

344%, and Nakodar at 313% level of groundwater extraction. These areas require special water governance focus by incentivizing less water intensive crops.

Given its profitability under the scenario of free electricity for irrigation, spring maize cannot be wished away. Its upward acreage trajectory is the 'second canary' (first one was rice) in Punjab's coalmine- and the time to act is now.