The need for publishing business aquaculturist farming data

As an integrated-loop industry, aquaculture bears a primary valuable crop with additional valorization of secondary and tertiary crops coupling intra-generated nutrient waste. Scientists and business aquafarmers should meet on-field for evolution of worthy, tangible, applied blue economy publications in India. Corporate farms gunning aggressive finfish/shellfish productivity, mainstreamed challenges of climate change and other anthropic factors have been integrally affecting aquacultured farm outputs, reflecting diminished bioeconomic status. Farmers access scientific knowledge when the crop is distressed. Private farming investors do not share truths standardized through 'hands-on' approaches. Scientific contribution is normally weighed evidencing research applications into neoteric, biosecure, efficient, pro-commercial farming technologies, cutting-edge commercialization of produce and through next-generation conceptual trends impacting business and society.

Private aquafarms receive innovations by buying/owning/creating a patent, contracting veteran specialists, trialing workable peer business models on empirical basis, rigorous R&D investments, creating public–private-partnerships (PPP), collaborating knowledge production and sharing, inducting exigent climate-resilient technological change, site-specifically time-testing farm case studies and analysing performance, cultivating promising crops as a sensible bioeconomic intervention, testing amenability for laboratory-proven probiotics under field conditions, reproducibility trial of domestically evolved new protocols setting optimal performance, judicious shifting from quantity-conscious to quality-centric, eco-moderative bioeconomy, focusing on decarbonizing food chains, self-development of efficient biosensors and indicators responding to environmental pressures and changes plus synergistic technical earnings through consultancy.

The Indian seafood calendar is changing its vibrant urban tastes from seasonal catch-specific consumption of fishes (kingfish, pomfret, goatfish, sardines, breams, snappers) to sustainable plate-sized, imported niche seafood, off-the-shelf at present[1] (Norwegian salmon, Dutch cod, Danish halibut, Australian barramundi, Spanish seabass and Vietnamese pangasius), and through recirculation aquaculture system (RAS) innovations on-land for silver pompano, grouper, cobia and Asian seabass. Warranted changes and challenges in technology, prices, certified quality and taste are drivers for farmers looking towards scientists for solutions. Globally, quintessential prescriptive formula for supermarket plate-sized, farmed-fish revolution that helped foster, preserve, endorse and bolster cultured seafood farming programmes on national prerogatives rests upon techno-innovations from Universities. UK, Norway, Japan, Italy, Spain, Canada, Japan, Australia, China and South Korea are witnesses for successful contribution of universities in opening new aquaculture horizons in the last century. Industrial growth of salmon, tuna, cod, barramundi, drums and snappers, bass and bream, American catfish and striped bass received legacies from university research. Next-generation farming (e.g. RAS on-land, marine agronomy on-land, rooftop zero waste blue economic systems, portable zero-discharge blue-spacing for urban city-dwellers, one-house-one-farm conceptual inland community RAS modules, a 40 ft container converted plug-and-play RAS farm, suspended photosynthetic farming systems on-land, backyard catfish cubicles, vaccines from oceans) in India, all depend upon polytechnics, universities and IITs for uncovering sustainable sources of unconventional, next-generation, regenerative, minimal footprint aquaculture growth for economic empowerment. Development of fast-growing flagship species (cash crops like hybrid groupers, golden trevally, golden pompano) is vital. The modern seafood fish farming system is city consumer-driven and value-added marketing strategies are a crucial driving factor, transmitting consumer's desires back to farmer's opportunities. Commercial business aquaculture for finfish and bivalves, is an infant industry in India when compared to Norway, China, Japan and Southeast Asia.

In this knowledge-based society, universities have to mark newer milestones in building knowledge value-creation to connect techno-commercially with corporate clientele and working with key players in business in the form of PPP-technology platforms, patent incubator programmes, technology-analysis cooperation, techno-innovation alliances, university–industry–Government linkages, university knowledge consultancy utilization partnerships and subject matter expertise foundations. The perception of crash-publishing within laboratory-scale aquacultured miniscule conditions must change. Laboratory-based theory and open-air differentiation of culture practices under field stressors differ in ecology and management. To develop real science of sustainability in aquaculture and reflecting economic realities, interaction of producer, consultant, scientist, processor, vendor and consumer of farmed aquatic food is indispensable. Interdisciplinary endeavour between laboratory-based farming, cost-free family-farming knowledge and pro-commercial dataset logging is imperative.

The quantum of ethically guarded, Intellectual Property (IP)-locked commercial field data captured by aquaculture researchers are sparse. Focused Scopus search with keywords (giant-scale, mass cultivation, field culture, pro commercial farming, business aquaculture, factory farming, biological economies, biofactories) gave no document results. Developing field-disciplinary expertise is high priority. The complex inter-linkage of multifaceted issues beckons a wake-up call for interdisciplinary scientists to embrace a team-based work paradigm[2]. Carrying capacity modelling, bioenergetics modelling, oceanic solutions, genetic improvement, integrated agriculture–aquaculture systems, public health and safety of farmed aquaculture products, enhancing empowered better governability of aquaculture on-land through closed systems aquaculture are major areas. Weighing leaps and bounds of aquaculture research, accelerated aquaculturally significant business commodity crop-based industrial research has been thrust into the limelight, awaiting more collaborative 'laboratory–field' innovations as fast progress for sustainability.

Today, altered protein quality with novel insect-protein feed inputs, lipidic tissue reserves in fish/shrimp adapted to algae-based oil component feedstocks,

endocrine-disrupting fish oils[3] used as biologic-binding additive need ground-truthing field-farming realities. Deficient documentation of family-farming knowledge and citizen-science on farmed-fish consumption allergies (caused by mercury, fungal toxins, anti-microbial resistance, chitosan, insect-meal chitin, synthetic canthaxanthins, histamine-rich canned stuff and yeast allergens) are visibly growing pain points.

More obscure allelopathic bioengineering, untested sustainable polyculture species combinations, unnotified seafood fraud and inordinate harvest-preservation (sodium meta bi-sulphite, formalin, essential oils, chitosan, alginates, gum arabic, xanthan) abuse, untested radiobiological sensitivity of exotic seaweeds[4] (*Ascophyllum nodosum*) added to shrimp feeds for 'Ascophyllan' active immunity-fraction, untested metallophilic attached-diatoms activated aquaculture waste sequestration are looming threats hidden today.

Bio-invasive fish effects on native pearlspot, deficient inventory of extremophilic aquaculturally-significant candidate listing, rock phosphate-originating heavy fertilization-aided pond bloom-grown shrimps and radioactive threats, rain storm-drain polluted roadside scampi, carp and tilapia ponds, modelling scarce suspended photosynthetic systems for water treatment *in situ* pond culture and a series of undeciphered, unspoken, untold, unrealized, unseen trouble-shooting issues, needs and problems do exist in modern-day field-aquaculture disciplines.

Iconic city consumption of cultured shrimp and exotic fish has soared high. Business aquaculture articles are accounted only for their content value, converging combined perspectives of field scientists with farmers as a cyber-visible, scientometric evaluation index of business aquaculture knowledge capital for peninsular India. Principal advances in aquaculture have always been the result of technological innovations from farm producers themselves[5]. Trouble-shooting segments intricately unresolved by producers prove a fertile research platform resulting in high-impact research recognition for scientists[5]. As the producers are conscientious not to adopt new findings until they witness field-manifestation under full-scale production conditions[5], time is ripe to revolutionize milking maximal business values from university research for business aquaculture with broader present and futuristic applicability upon diversified domains of freshwater, marine, brackish and high-saline food security. The internet of things concept, connecting data-gathering units to the internet enriches data available along aquaculture value chains[6]. Research on optimizing farm operation systems through computational studies of data (produce, harvest preservation, value-processing from farmgate-to-table) along the production chain bears vitality[7]. Production of utilitarian guidelines well-validated by end-users does enable further advanced learning of aquaculture applications[8]. Precision fish farming moves commercial aquaculture from traditional experience-basis to knowledge-basis farming production regimes[9].

Tapping new knowledge accumulated in a field aquaculture environment enriches aquaculture professional knowledge as a whole, the beneficence extending to business and societal domains. Field data in business aquaculture with respect to its contents and relevance, advance societal knowledge on aquatic food security. Knowledge sharing with peers in the same industry helps building mutualistic growth as a whole. There is an overall positive outlook in business aquaculture data publishing with a growingly interconnected nature of modern, minimal footprint, zero-waste aquatic food farming systems indicating future dimensions of applications of various techniques towards increased production from the aquaculture sector.

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Scytinostroma portentosum (Berk. and Curt.) Donk from West Bengal, India on a new host

During a survey conducted during 2012–2019 to record naturally occurring host plants of different wood-rotting fungi, some basidiocarps of a species of *Scytinostroma* Donk were found to grow on a dead branch of a living plant of *Artocarpus heterophyllus* Lam. (=*Artocarpus integrifolia* L.) belonging to family Moraceae causing white rot at Burdwan, West Bengal, India. These basidiocarps were studied both morphologically and anatomically for confirming the identification of this fungus.

Each basidiocarp was collected separately in polythene bags. Thin sections of