Roha-Precision introduces Gow-Kit, an intelligent and scalable diagnostic instrument for detect GI parasites in cows and buffaloes.

The dairy market in India reached a value of INR 2.35 Lakh Crores in 2024. Mordor Intelligence Organization expects the market to grow at a CAGR of 6.5% and reach INR 3.22 Lakh Crores by 2029. Despite its size and importance assigned by the Indian government, the Indian dairy farm industry is vastly inefficient. A key contributor is its inability to provide quick and accurate health care to the 125 million milk producing cows and buffaloes (Department of Animal Husbandry & Dairying, 2020 census, press article in Indiatimes). Several studies show a 5%-40% milk loss, lower quality of milk, measured in fat content and milk protein are attributed to untreated gastro-intestinal (GI) parasite infections [1, 2]. These infections are found in about 20%-80% of cattle in all states of India [3, 4]. GI parasite infection also cause difficulties in conceiving and miscarriages and fatalities in extreme cases [5, 6].

The root cause: In India, the number of bovines per veterinary doctor is 5000. This ratio is un-manageable, especially when doctors are also treating pets and other livestock like pigs, goats, sheep and chicken. Hence, doctors typically prescribe quick symptom-based broad-spectrum medicines rather than diagnosis-based medicines to save time and money. The infrastructure is worse in rural areas, where doctors are lesser in number and government veterinary laboratories (Gov Vet Labs) are ill-equipped. Thus, most dairy farmers don't bring their cattle to the Gov Vet Labs for diagnosis. This approach leads to insufficient, inaccurate or untimely treatment, all of which leads to loss of productivity. Universal scheduled administration of broad spectrum de-worming medicines, a brute-force method adopted by some governments, has both short-term and long-term medical risks. Global and indigenous research clearly show rapid increase in resistance among parasites towards the medicines when universal deworming is used. In fact, European Union has passed legislation, to allow only evidence-based deworming [7]. FDA of USA has also issue advisory on the same [8]. This growth in resistance will inevitably outpace the discovery of stronger de-worming medicines in the future. Furthermore, over-dosing with strong de-worming medicines has toxicity risks to the cattle as well as to its milk [9]. Unfortunately, opening several laboratories in the rural area will not solve the problem either, because current laboratory techniques (McMaster Floatation Technique) for faecal analysis has low sensitivity, preventing early detection and cure.

The solution and its benefits: To solve this problem, Roha Precision Systems Development LLP is developing a "farmer operable", battery operated, portable, diagnostic instrument, Gow-Kit, that perform parasite egg detection tests in less than 10

minutes, locally at the farm site. It uses precision microscopy, automation and machine

learning based image analysis algorithms to convert the test protocol to literally with one button push. Additionally, it can transmit test results using a wi-fi dongle and get a prescription from a remote veterinarian doctor, anywhere in India, within a few more minutes directly to the user's phone via message or app. By having a unique sample preparation technique using ultrasonic sound waves, the instrument achieves significantly high sensitivity than current techniques, which enables early detection and treatment of the GI parasite infections. Therefore, dairy farmers no longer need to travel to veterinary diagnostic labs with large animals, which saves time and money. Overall, with one regular monthly check-up and proper medication, dairy farmers in high parasite prevalence areas can easily expect to double their daily milk output. On average, a 20% milk productivity improvement can be expected from previously infected bovines [10-13].

This instrument also enables the veterinary doctors to be more efficient. They can examine significantly more patients in a day, not limited to their own locality, which will lead to more income. Furthermore, they can prescribe specific dewormers at precise dosage levels for each infection, instead of high dosage of broad-spectrum medicines, to combat the ever-growing resistance of parasites to deworming medicines. As Gow-Kit number grows in the field, the prescription cost is expected to come down due to competition, which will be an added benefit to the farmers.

The Gow-Kit will be a perfect addition to mobile veterinary units deployed by several state governments, where doctors visit one village every day via car/van to treat livestock. GI parasite are a common problem and Gow-Kit will enable the travelling veterinarians to be more precise in their treatment.

The diagnostic data from multiple instruments will be stored and analyzed in a central server to understand and predict the geographical GI parasite infection trends. This data can then be used by medicine producers to regulate their production quantities. Additionally, researchers can use the data from a network of Gow-Kits to do clinical studies. Governments can also use the data to develop long term strategies to improve the overall health of cattle.

The final beneficiaries of this diagnostic instrument are the animals themselves. They can produce more milk with lower stress levels and without suffering from the toxicity of overdosage. Also, infant mortality rate of calves can be significantly reduced. Even during the non-lactation period, the cows can lead a healthy life at a low cost.

Market and commercial opportunity: From our in-person survey of dairy farmers, goshalas, veterinarians, para-veterinarians, laboratories, animal husbandry government entities and professors in nine states, we found that the milk production losses were reported to be as high as 62.5% during GI Infection. One dairy farm owner in Rajasthan said that “a healthy cow gives an average of 16L of milk per day, an unhealthy cow suffering from GI Infection gives an average of 6L of milk per day”. A research scientist from Kerala commented on anthelmintic resistance, “We do undergo a rigid deworming schedule, but we realize that the medicine doses no longer work with the same efficacy after a certain number of times and there is development of anthelmintic resistance over time, but we currently have no better alternative”. A dairy farm manager in West Bengal said about medicines, “We observed the milk production of two GI parasite infected cows, one fed with deworming medicine and other without medicine and found no difference in improving milk production”. Several farm owners in West Bengal and Rajasthan said (paraphrased), “There are no labs nearby, we have to travel 3 hrs to reach the nearest veterinary lab, thus we opt to do that only in case of extreme havoc or emergency”. A veterinarian doctor from Sikkim commented of the logistics issue, “It takes about a day to just go to the farmers place and bring in the sample from the farmers place to the lab, making it extremely hectic and time consuming for the on-field veterinarians”. Several veterinary doctors, professors and scientists from diverse parts of India said (paraphrased), “Some of the farm owners know about the deworming medicines and some don’t. Those who do, treat the cattle by themselves experimenting with the known medicines and those who don’t refer to the veterinarians. The veterinarians prescribe deworming medicines based on hit and trial method primarily due to the lack of nearby testing facilities”. A diagnostic lab in Orissa noted that “the infection rate in goats and sheep is 70-90% and we get more cases than we have handle on a daily basis”.

There are a few international competitive instruments with AI based image analysis. The most noteworthy is ParaSight (USA) that sells a lab instrument for semi-automated fecal flotation tests. There is also Zoetis (USA), IDEXX (USA), Ovacyte (Netherland), Kubic-Flotac (Italy), FECPAK (New Zealand) and mini-FLOTAC (Italy). However, all the competitive instruments are meant to be set up in a lab environment and run by a skilled lab technician after preparing the sample. Hence, these instruments cannot be practically taken from home to home with 3-4 bovines for tests, which is about 80% of the dairy farms in India. Secondly, the competitive instruments are “feature-intensive” rather than “specialized for one test”, which makes them much more expensive and much beyond the affordable range of rural India. Gow-Kit beats its competitors by being specialized to do faecal parasite egg detection test extremely reliably, robustly and full automation.

Doing a bottoms-up calculation, with customers as para-veterinarian, veterinary hospitals, goshalas, veterinary doctors, veterinary colleges and state governments, the **total addressable market (TAM) in India turns out to be INR 11K Crores per year** for bovines alone. This is based on selling consumables for tests (highest earnings), renting and selling instruments, selling data and servicing instruments. It should be noted that the TAM is calculated per year because GI parasites cannot be eliminated but only controlled leading to steady need of testing every year. **Global TAM for GI parasite testing for bovines, goats and sheep is about INR 1 Lakh Crores**. Other lucrative markets are south-east Asia and Brazil.

The business model based on a rental-to-buy scheme. Using milk-cooperatives and milk collection centres as the major touchpoints, para-vets and vets can rent the machine one a daily, weekly or monthly basis. The consumables will be sold from the same touchpoints or online. The data will be sold via subscription from the company website and will be a major marketing tool, rather than a major revenue tool. In the "Agri" sector winning the trust of rural people is a challenge. Hence, developing local champions is a must and providing them with 'big picture' insights on veterinary health management in their locality is a promising method to gain their trust. After renting the instrument for some time, the user can choose to buy new or used instrument to save rent.

Innovation and Technology Protection: Gow-Kit has several innovations that separates it from its competitors. Firstly, Roha has the proprietary training set for the YOLO based ML algorithm, that not only has India specific images of faecal matter from various states but also can detect unknown egg-like structures to handle situations when a new parasite egg in a region is discovered. This is common as there are hundreds of parasites which can migrate from one region to another. Secondly, Gow-Kit uses a novel sample preparation method, by using an ultrasound to vibrate and break down hard faecal matter without overheating or damaging the delicate parasite eggs. A patent application for this method has been submitted. Thirdly, Gow-Kit has a novel bearing that provides nanometric repeatability over centimeters of motion during auto-focusing the camera onto the parasite eggs. Such accuracy is required for getting high quality images for AI based image analysis of faecal eggs. The innovative bearing has no friction and hence it does not require any lubrication and can undergo orders of magnitude higher cycles than normal bearings. A patent application for this bearing design has been submitted. Finally, predictive algorithms based on Gow-Kit data (parasite ID, parasite load, prescribed drugs, efficacy of drugs), weather data, landscape data (water bodies, grazing options) and economic data are being developed to predict the future regional prevalence of GI parasites, future demand to de-wormers to control them and trends of milk productivity. These data aggregation and classification

algorithms will be patented in the future. Technology protection will be done by serialization and detection of the same for sample holders ensuring that it is used only once after it is sold.

Brief introduction of founders:

Dr. Shiladitya Sen is the CEO and founder of Roha Precision Systems Development LLP. After graduating from Indian Institute of Technology (IIT) Kharagpur in 2006, Shiladitya completed his Ph.D. in mechanical engineering from University of Michigan in the field of design of flexure mechanisms in 2012. Recently in 2022, he completed his MBA degree. He has worked in scientific instruments ever since has released 5 scientific instruments to production in multiple companies.

Mohit Pathak is the CTO of Roha Precision Systems Development LLP. After graduating from IIT Kharagpur 2004, Mohit completed his Masters from Georgia Institute of Technology Atlanta in 2014. After that he worked for Microsoft for almost a decade. He has had over 15 years of experience in software development and is an expert in YOLO.

Soumajit Chail is the Director of Sales & Marketing of Roha Precision Systems Development LLP. Having completed his B.E. from Jadavpur University and MBA from IIT Kharagpur, he has worked in the field of Operations, Supply Chain, Analytics & Marketing with several renowned companies, most notable being Titan Company.

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