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Agriculture based Thefts: Strategies and Preventive Solutions

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Agricultural theft has become a serious issue, affecting the livelihoods of farmers and agricultural businesses. This crime extends beyond the theft of machinery and crops to include the stealing of fertilizers, livestock and even valuable trade secrets. As technology advances in farming, new targets, such as sensors, drones and data have become susceptible to theft, making it harder for farmers to secure their assets. The use of sophisticated methods, such as drone surveillance and cyber-theft, has further complicated this challenge. This chapter explores the various types of agricultural theft, including machinery, produce, and data theft, and highlights some advanced techniques adopted on theft. Additionally, it discuss the practical solutions that farmers can adopt, from GPS tracking, geofencing, AI-driven surveillance systems etc., to better protect their resources. Also, the discussion signifies the importance of theft focus and establishing awareness among the farmers and agriculturalists in this regard.

Introduction

Agricultural thefts have become a significant issue, causing substantial financial losses to farmers and businesses involved in agricultural operations. These incidents range from the theft of crops and machinery to more crimes such as stealing fertilizers, trade secrets, and resource information of the country. As depicted by the worst cases, lives of farmers were swept by some dangerous offenders in the view of theft. Various tactics and strategies are followed by the farmers since ancient times. But the strategies of theft also catalyzed towards combating such prevention strategies. Such events are leading to the loss of hope in advanced farming trends such as precision agriculture, integrated farming, aquaculture etc. This affects directly the adoption of latest technologies.

Thefts can be machinery and equipments, produce, fertilizer and other inputs, trade and other data. Each category needs specific preventive measures and tactics. In preventing such thefts, farmers are subjected to sleepless nights, constant presence in and around the farm, lonely settlements, care and stress etc. Following discussion provides a general outline on such theft types, strategies and tactics adopted for theft and its preventive measures.

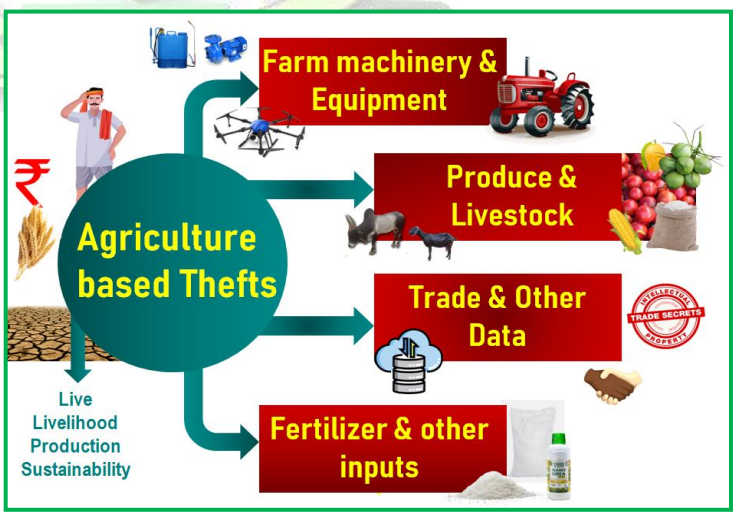

Fig.1 Agriculture based theft

Machinery and Equipment Theft

One of the most common targets of agricultural theft is machinery. Farmers invest large sums of money in purchasing essential equipment, but these investments often become the target of theft. Irrigation pumps and motors, are frequently stolen, leaving farmers without the means to water their crops on immediate days after theft which signifies crop loss as well. Additionally, incidents such as the theft of levellers, knapsack sprayers, chaff cutters, iron pipes, electricity cables, and transformers have been reported. Thefts of electricity cables connected to switch starters and transformers as well directly impact the irrigation process, as discussed earlier.

With the advent of smart farming, sensors, motors, batteries, solar panels, pipe materials, circuits, development boards are common to be available in the farm premises. Such components are susceptible to theft/replacement/misuse by an tech-knowledgeable persons.

Produce and livestock theft

The theft of agricultural produce is another common occurrence. News such as '*2000 kg of tomatoes were robbed*', '*tender coconut thefts*', *'missing of paddy seed bags'* leading to significant financial losses for the grower. In addition to vegetables and fruits, livestock such as poultry, goats, cows, sheeps are targeted in rural, compounding the financial difficulties and livestock sustainability. Some state governments impose imprisonment, seizure of vehicles, heavy fine (upto Rs.50000). Cattle insurance schemes and policies may cover livestock against theft/burglary.

Fertilizer and Material Theft

Fertilizers which are essential for crop growth, valuable pesticide chemicals are also subjected to theft. Stored fertilizers or left out fertilizer after fertilizer application are mostly susceptible. Tonnes of fertilizer stolen from a large farm godown or a supply centre will directly affect the nutritional security of the crop raised around the centre. Scaled down/concentrated products like nano-urea (replaces a bulk bag with small bottle) is susceptible for easy shifting on theft.

Data and Trade associated thefts

In recent times, agricultural theft has taken on a more advanced form, with data and trade secrets being stolen. This kind of theft can have long-term impacts on businesses, particularly those involved in agricultural research and innovation. Nationwide data, trade secrets, production tactics were crucial sources and target by the adversary nation. Abundance/deficiency on resources, climate impacts, water availability, crop production and productivity, pest and disease infestations, cultivation practices etc were the data susceptible.

Some strategies and factors favour theft

Here are some usual and advanced strategies adopted for theft and factors influencing easy theft are listed.

- Spy on farm premises using drones, gathering information before executing thefts
- Thefts tend to increase during foggy winter nights, as the reduced visibility provides cover for offenders.
- Offender(s) induced or technical fault induced false alarms
- Lack of awareness among farmers on advanced and smart farming components present in the booming machinery. For example, if a drone GPS is stolen, the farmer may not recognize the theft until the next operation/feature failure of the particular drone.
- Stealing/Misuse of large scale data on a nation's natural resource without their knowledge through international trade – like drone imports/exports. For example, a foreign

agricultural drone manufacturer can monitor and collect the data from sold out drone which is working on the targeted country.

- Smaller components like development boards with identical appearance can replaced with fake or duplicate components
- Uses of electric gadgets are booming, inducing the use of batteries. Such components are vulnerable for direct theft or replaced with used scrap batteries.
- Non-maintenance of scrap machinery and equipment values massive recyclable metals and components.

Some safety measures

- Artificial Intelligence (AI) driven cameras can monitor farm areas and use facial recognition to detect known individuals or intruders. AI can also identify suspicious behaviour, such as unusual movements near equipment or livestock.
- Use invisible UV pens or chemical markers to tag livestock, machinery, or tools. These markings are invisible to the naked eye but can be revealed using a UV light, allowing easy identification if the stolen items are recovered.
- Place several visible dummy cameras, especially in highly visible but less critical areas. Simultaneously an other hidden camera can cover the same location to cover the person trying to dysfunction first (dummy) camera.
- Constant rotation of machinery with neighbouring farmers and storage locality
- Solar-powered security equipments instead of electric supply or battery power.
- Identification of critical areas like equipment shed, storage yard or godowns etc.
- GPS tagged tractors, machinery and equipments with real-time update on smart phone applications.
- For high value crops, make a surrounding cover of less valuable crop makes the inner high value crop invisible.
- Smart patrol robots and drones for highly sophisticated farms
- Radio-Frequency Identification (RFID) tags and Geofencing technology allows farmers to set virtual perimeters around their property. If someone crosses these predefined boundaries, the system triggers alarms or sends notifications to the farmer's mobile device.
- Encrypted communications, multi-factor authentication, and network firewalls to protect sensitive data
- Policy decisions on import of smart devices such as drones and robots.
- Immediate intellectual property filings after the innovation.
- Silent and invisible security (e.g., inside birdhouses, trees) enhancing the capture of thieves without their knowledge.
- Place non-functional or inexpensive decoy machinery in visible areas while securing valuable equipment out of sight. This allows valuable things untouched or provide farmer a response time.
- Create false paths, dead ends, misleading routes, misleading/unpleasant signage which makes thieves mislead, trapped or in wastage of their time.
- Playing random human voices, dog barks, or machinery noises at irregular intervals.

A comprehensive approach to addressing theft requires immediate attention to government policy decisions on the manufacture, use, reuse, and import/export of equipment, along with awareness and training programs on the latest machinery. Collaborative actions by local farmer groups and the deployment of advanced, targeted surveillance technologies are also critical to effectively mitigate theft.

Conclusion

In conclusion, agricultural theft is a multifaceted challenge that not only threatens the lives, livelihoods of farmers, sustainability but also indirectly impacts the adoption of advanced agricultural technologies. The theft of machinery, produce, fertilizers, and data demands targeted and diversified preventive strategies. Farmers need to implement both traditional and innovative measures, such as GPS tracking, AI-driven surveillance, and geofencing to protect their assets. Additionally, raising awareness and fostering collaboration among farmer groups, along with government-led policies on equipment use and security, are crucial in addressing this issue.