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Turning challenges to opportunities in human-wildlife conflict through FPOs using the start-up ecosystem and CSR schemes: A synergistic model

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Abstract:
Human-wildlife conflict management has emerged and these conflicts between humans and wildlife have been increasing with population growth. In this paper we see this as an opportunity to mitigate some risks faced by farmers in the past. Farmers Producer Organization (FPO) have been formed to increase income of farmers. These FPOs face a number of challenges some of which overlap with the trade-off between different sustainability issues. A literature survey is done on innovative technologies, insurance and financing schemes which can be used to turn these conflicts into opportunities. The authors analyse the CSR Act to find which portions of the Act are supportive for the FPOs to avail funds under the CSR schemes, including scope for further amendments and policy level changes. Through a literature survey on human-wildlife conflicts and risk mitigation strategies adopted by farmers, we bring forward a framework of using the opportunities from managing human-wildlife conflicts, start-up ecosystem, and CSR strategy as forming a model and highlighting the scope for future research in these area through the FPOs.
Keywords: conflict management, population growth Farmers Producer Organization,human-wildlife,CSR

Introduction
As the population of India increases there is an increase in conflict between humans and wildlife. In a report (figure 1) most states of India has reported above 1000 cases of such conflicts. As per a report by UNEP and WWF, titled A future for all - the need for human-wildlife coexistence, 75% of the wild cats get affected due to such conflicts. Data from Union

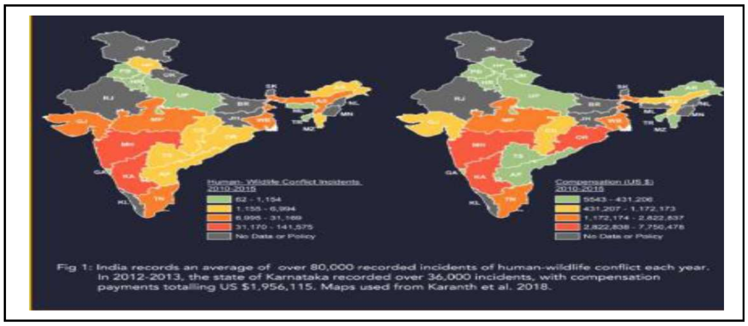

Figure 1: Source: https://vidhilegalpolicy.in/research/human-wildlife-conflict-

Ministry of Environment, Forest and Climate Change shows that 500 elephants got killed between 2014-2019 due to human-wildlife conflict. 2361 people got killed due to such conflicts.(Staff, 2021) These conflicts are both at urban and rural sectors. We will focus on the mitigation of these conflicts in the rural sector and how this can be useful for farmers. These conflicts are now a serious issue and methods to handle is need of the hour. While farmers fight forces of nature and crave for financial help, we are seeing an opportunity how negatively correlated factors may help in aiding financial burden for the farmers. We look at the issue from the lens of a start-up ecosystem and the recently promoted Farmers Produce Organizations (FPOs). In line with the main purpose of the FPOs to bring financial freedom to the farmers, CSR funds may be mobilized; innovative financial instruments and technologies can be deployed via the start-up ecosystem.

Farmers Produce Organization:

The Companies Act, 1956 in 2003 by an amendment to the Act made a provision for setting up FPCs in India. A hybrid between a private limited company and a cooperative societyis called a producer company or FPO, Farmer Produce Organization or FPC, Farmers Produce Company as per the National Bank for Agriculture and Rural Development (NABARD). It brings the benefits of a cooperative society and is a professionally managed company.

As per the national policy "Department of agriculture and cooperation, ministry of agriculture, Govt. of India has identified farmer producer organization registered under the special provisions of the Companies Act 1956 as the most appropriate institutional form around which to mobilize farmers and build their capacity to collectively leverage their production and marketing strength."

Strengthening the ecosystem

Most of Indian population still depend on agriculture as their primary source of income. Although technology is growing at a fast pace, this dependence remains. India has been struggling to develop its farming infrastructure since independence. Steps to improve access to credit and scope of crop insurance were taken by the government but the results were always not upto the desired level as per the policy

enshrined. The Govt. also formed institutions to mobilize essential agri-services to enable latest technology for production.
Sometimes a positive step in one direction compromises another. For example, reservation for schedule caste reduces the seats for the general category. Though we are trying to provide opportunity to the schedule caste category, it brings burden to the general category. Similar is the case of policy in agriculture. A move to bring relaxation to farmer's financial burden may hamper productivity of the farm in the long run. For instance, there may be a subsidy given on purchase of chemical fertilizer to farmer groups, this may lead to excessive selling of fertilizer and hence usage thus deteriorating the soil health in the long run. As a consequence, the cash flow of a farmer deteriorates. This can be overcome by technology-driven aids like the soil testing centers. Another way may be a mobile app to guide on choice of crop, pattern for cropping, product mix, mechanization and ways of irrigation. We can take it further by having anAI(Artificial Intelligence) enabled app which will learn from data over time and give prescriptive advise.

Micro land holdings have plagued the farming in India. The small lands limits the farmer's scope to scale and adopt mixed farming. It also restricts the farmer togrow multiple crops simultaneously. To resolve this issue the Government is proactively designing severalmeasures and one such measures has been to encourage Farmer Producer Organisations (FPO).

FPOs established under the statute of Companies Act follows anunique model of collective efforts from like-minded farmers in a particular region or growing similar crops. It is derived from the crowdsourcing business model. Not only do FPOs improve marketing practices, they also positively impact the farming value chain. The farmers can tackle price uncertainty in a better way, make processing and storage efficient, deploy novel farming methods at large and also, have better access to credit. FPOs aim to empower farmers to identify inherent sectoral risks in the farming ecosystem and mitigate them by collective action.(Manglesh R. Yadav, 2022). The Ultimate aim of promoting FPOs/FPCs is to increase production, productivity, and profitability of agriculturists, particularly the small and marginal farmers in the country.These FPOs/FPCs will take care of the entire supply chain and will act as a unique model as compared to other aggregation models in the days to come.

There is a research gap in observing the role of FPOs in reducing human-wildlife conflict. Though this issue is a very critical one, the policy for FPO has not encompassed this. We see an opportunity here to have a suitable fit along with technology deployment mentioned above.

Innovative technologies in reducing human-wildlife conflict

Many innovative technologies have been proposed for catering to the human-wildlife conflict. (McCarthy, 2015). The animals include, Tigers, elephants, bears, leopards, snakes, wolves, lions, hippos, deer and crocodiles.

Figure 2: Examples of human-wildlife conflict

Few of these solutions are:

1. Strobelights : A combination of automatic light machines and motion sensor, these machines flash light beams randomly in all directions as if a farmer is doing this with a flashlight. The animals are driven away, thus reducing the conflict. However, overtime the animals may become habituated. A variation could be using different lighting patterns and timings.(Laxmikanta, 2020)KatidhanPvt. Ltd. started by Syed RehmatulAyan and Subham Banerjee have installed solar powered animal deterrent lights to wade away elephants and wild boars near Mysuru.
2. Bee Fencing and chilly peppers: This is a novel way to keep elephants at a safe distance. Elephants also dislike chili peppers, and thus smothering fences with a mixture of oil and chili peppers keeps elephants away from the farm. Bee fencing is another way.(kumar, 2021) In a pilot project near Kodagu, Karnataka,bee boxes were installed along the periphery of the forest and the villages.
3. Disguise: Exploiting their knowledge of big cat behaviour, villagers in Sunderban,India have had recent success preventing tiger attacks. Tigers attack from behind and stalk their prey before that. With an innovative frugal method forest workers wear masks on the back of their heads to prevent sneak attacks. No attacks were reported in a 3-year period, among those wearing masks. But in 18 months during same span, 29 people without these masks on the back of their head were attacked. Tigers are however getting habituated to the disguise. This can be empowered by motion sensor technology which can have a beeping sound to wade away the tigers.

1. Electricity : Solar powered electric fences are an effective way to stop elephants and other animals. (ramakrishnan, 2021) Agricultural Engineering Department in Tamil Nadu with a 40% subsidy has put up a 12 ft high solar powered fence with a cost of Rs. 3 lakhs.
2. Texting: (Howard, 2015), in this early warning system, a text message is sent to residents. Recently used in Valparai, Tamil Nadu. In the Western Ghats of India, texting as an early warning system to prevent human-elephant encounters was used. With use of tracking collars embedded with SMS chipsthese texts can be sent. 75% of elephant-attributed human deaths was due to lack of knowledge of elephant whereabouts and after the implementation of the early warning system, human deaths have dropped by 50%, and none being reported in 2010 and 2013.
3. Mapping: GPS tracking collars and GIS mapping software, can be used to identify hot spots for conflicts. Identifying conflict hot spots will help reduce the issue of human-wildlife conflict and mobilize funding appropriately.(Karanth KK, 2012)surveyed in a 5154 km2 area surrounding Kanha Tiger Reserve in India to study this impact. Another research by (Bismay Ranjan Tripathy1, 2021) provides a study in the

4. Keonjhar forest division to provide policy makers and managers to identify high risk zones for Human-Elephant conflict (HEC).
5. Ecotourism: Ecotourism can be an innovative solution by linking monetary value to wildlife. Ecotourism outfits owned and operated by local communities and FPOS, can change the economy of entire impoverished regions and also generate job opportunities.
6. Acoustic Deterrents:(L. Jen Shaffer1, 2019) Bio-acoustic solutions are best, but loud audio playbacks have their nuisance and also animals get habituated. Technology in this direction can be developed.
7. Drones: Drones for surveillance (PTI, 2015) Wildlife Institute in India Dehradun is using drones for monitoring. Corbett National park is planning Unmanned aerial vehicles also.

Insurance in human-wildlife conflict:

(L.Webba, 2013)Illustrates China implementing human-elephant insurance in Yunnan Province where rubber plantations were threatened. It also reports shortfall of undervaluing plantations, insufficient pay-outs in event of claims. The authors propose a shared scheme between Govt., rubber farmers and Chinese tourists.(O Wilson-Holt, 2019)reviews insurance programs and steps to make them successful. The authors report the low appeal in Italy and the success due to community involvement in India and Pakistan for snow leopard conflicts. They also illustrate the moral hazard in Pakistan to cheat the system. The author appreciate the co-financing from ecotourism structure adopted in Pakistan. The authors also discuss the micro-insurance scheme. They inform that index-based insurance which are prevalent in agriculture are inadequate though they safeguard the moral hazard. They illustrate the shortcomings of insurance in human –wildlife conflict and suggest how microfinancing can overcome these. They also cite (1. Chen, 2019)to apply CSR funds where tourism in unlikely to bring funds. (Roshan Sherchan R. K., 2021)research the insurance scheme in Nepal in Jhapa district and provide a solution of Govt. budget allocation to reduce premium and involvement of local municipality.(Karl Morrison, 2009)provides an excellent detail of compensation and insurance schemes across the world. It highlights the moral hazard, hurdles and challenges faced in these scheme. Further it provide a conceptual framework which we adopt to the Start-up, FPO and CSR scheme ecosystem in this article. The report also illustrates micro-insurance which will be an innovative tool for the start-up to deploy.(Roshan Sherchan A. B., 2017)illustrates snow leopard damage oflivestock in Ghunsa valley, where Lelep village development committee reported 28% loss but no retaliation for snowleopard killing which resulted due to insurance schemes.(Cherono, 2010)studies CSR influence in reducing human-wildlife conflict at Lake Nakuru National Park. The author presents findings revealing that CSR activities helped electric fencing, community awareness and sensitization; employee welfare and improved quality of life. It reports shortcomings like challenges of adequacy of financial resources and human resource capacity. The author suggests the allocation of more funds to support the activities and improved technological capacities.(Mariana L. Catapani1*, 2021)illustrate how the relationship between beekeepers and siliviculture companies arise from CSR Practices. The CSR practices by NGOs encourage landowners to lend their land to beekeepers to place their bee hives. The authors study why giant armadillos destroyed beehives and propose intervention strategy for peaceful coexistence which included, mitigation strategies, certification scheme to encourage implementation of these schemes and an app to enable data gathering for adaptive management. (Peloza, 2006)provides a perspective how CSR can leverage corporate financial performance. He provides two avenues, incremental gain and risk mitigation/insurance. The author provides the following structure for explanation:

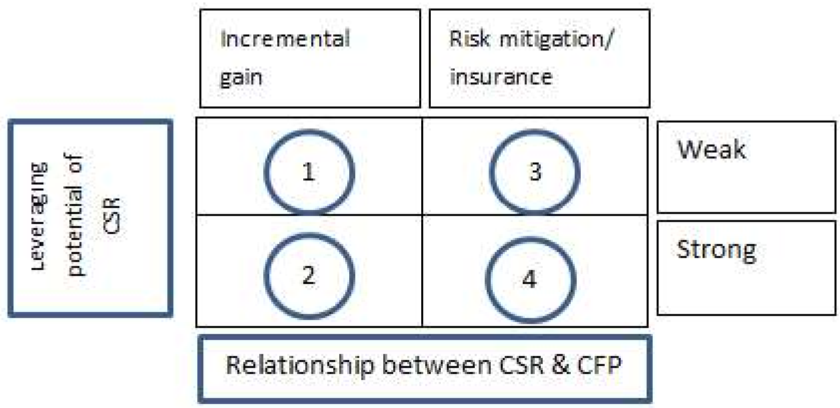

Figure 3: CSR as a insurance tool, Source:(Peloza,2006)

Quadrant 1 is for the unfocussed or undisciplined organizations practicing CSR. This quadrant is also for those who follow CSR due to legal compulsions. In such situations, personal interest of leader determines the area of spending and not linked to business strategy. These firms as per author suffer from multiple wife syndrome. The author cites Nike and BP as victims of this quadrant.

Quadrant 2 as the author describes is for firms which have a combination of philanthropic and transactional benefits and they are more than just cash donations, with in-house efforts and capacity to support.

Quadrant 3 is the area where reputation risks and moral hazard can be avoided as employees perceive the organization as responsible. An example of Danny's is given.

Quadrant 4 is where the FPO and start-up model can be implemented effectively. The author cites Bhattacharya and Sen resilience where consumers excuse negative CSR spends for long standing positive CSR spends. The example of McDonalds is given which reaped benefits due to CSR spends when attacked by animal rights activists.

The authors provides a guide how to maximize the value by observing the firm's age and industry. They prescribe effort and commitment, promotion of CSR and relationship to core business to attain this goal.

CSR Act provisions in India : Can it be made more favourable for application in FPOs?

In terms of existing provisions of the Companies Act 2013(as amended till date) CSR (ie Corporate Social Responsibility) has been made mandatory for a certain group/class of companies if they fulfil certain criterion based on turnover, Networth or Average net profit. These companies are required to spend at least 2% of its average net profit in specified areas as stated in Schedule VII of the relevant provisions of the Act. These activities are mostly aimed at sustainability, and improving the quality of life and the community it serves. It is seen that there is a lot of scope where FPOs/FPCs can synergise with the PSUs/ Corporates/NGOs by partnering/ channelizing the CSR funds towards greater connect, value transfer, and eventually building trust. A key factor towards ensuring sustainability of FPOs is extensive and continuous engagement with their members through regular touch points by adopting a mix of farm and non-firm activities.

CSR Funding can be unlocked to provide the much needed capital and human resources for strengthening the financial, and other technological requirements. The Corporates should openly come out from other stereo type CSR activities and start investing their CSR funds in these new area of FPOs/FPCs.

Though there are a lot of activities which can be supported through the CSR arms of Corporates and Public Sector undertakings (as per existing provisions of Schedule VII), we are of the opinion that if the Schedule-VIIof the Companies Act be suitably modified/amended to clearly/explicitly allow activities funding/supporting/promoting FPOs and FPCs, then it would be of great help for the FPOs and FPCs. CSR Funds can be used to nurture and handhold FPOs particularly in their initial years(say for a period of 5 to 8 years) until they become mature and can independently handle their activities. Corporates can facilitate these FPOs by supporting innovations, R&D, digitalisation, business planning, financial management, marketing, capacity building etc. CSR funds can be used by these FPOs for acquiring technology, plant& Machinery, QC(Quality Control), testing & lab facilities, etc. FMCG companies which are having a direct connection with the FPOs/FPCs may be encouraged to allocate a major part of their CSR funds to support FPOs/FPCs. This area has still not been explored to its full potential. We term this “Relationship Building”. By this strategy, Government, Corporates can collaboratewith NGOs, FPOs/FPCs in such a way that the CSR funds can be adequately and rightly utilised. These will go a long way towards a sustainable framework particularly if Schedule VII also allows specific investments/spending in this very important area. After all what is the use in limiting the activities in CSR?

What we suggestis some policy level changes in section 135 of the Companies Act so that there are specific provisions/areas where CSR funds can be used in this new sector ie FPOs/FPCs.

Start-ups and FPOs:

(Kavita Sharma, 2021)Farmers have a wide range of options but they are handicapped as most have less than one hectare of land. FPOs will help them attain bargaining power, and start-ups can help them scale up, bring technology and give real time solutions. To scale up the FPOs need mechanisation, procure in bulk to get discount and bargaining power. Start-ups can have innovative schemes to become a guaranteed buyer and mitigate the price fluctuations. They can also be a link to high value crop in the international market. Further they can also have innovation and technology in the food chain. Land Accelerator South Asia program is working on this to bring the two together. But the gap is still wide.

AadhimalaiPazhangudiyinar Producer Co. works in the Nilgiris Biosphere reserve in Tamil Nadu for tribal villagers. Its founder Jestin Paul helps them to enable forest protection and sustainable extraction practices. This is where the human-wildlife conflicts are very important. FPOs are helping these tribal communities already who lack professional skills, political influence and also lack finance to restore farms and forests. Working small with local community and people can reap ecological and economic benefits. But if designed poorly, it may fail.

Vasumitra Life Energies start-up founder BhushanJambhekar informs that villagers are hesitant to adopt technology and high upfront cost. Field demonstration, awareness and financing schemes are critical for success. Azim Premji University proposes a “two-tiered model” as a social impact enterprise, where an FPO is the majority shareholderi.e 51% or more, and balance by a start-up which can be set up at the district or block level as market-facing. FPO would focus exclusively on producing high-quality products and the two-tier structure would also enable the start-up mobilize increased investment of external capital.

Portfolio Diversification & Risk migration strategies:

Climate change is directly affecting HWC (Jamwal, 2018). The author cites an entrepreneur Pradhan who left her job in Kolkata and returned to Sikkim. Pradhan informs the damage due to wildlife attacks. A report by non-profit Lakshya Organization shows that these attacks are due to shortage of food in forests i.e long dry spells and erratic rainfall. We therefore see that the same factors are responsible for a bad harvest! There could be direct correlation between increase in HWC and crop damage. Other reasons cited are forest fires, increase in wildlife population. However, no research has yet established a cause-effect correlation between climate change and rise in HWC. The report cites other studies due to such change in Himalayan region. The paper cites a fencing sponsored by Axis Bank Foundation CSR fund under Mahatma Gandhi National rural Employment Guarantee Act to protect from wildlife attack damage. It also suggests growth of coffee and turmeric which are not attacked by the animals. This is diversification strategy. It also cites other strategies like growing dairy, cottage cheese and village tourism, portfolio diversification strategies. Another risk mitigation strategy cited by the article is bee hive boxes in Bhutan.

(Kobzar, 2006) In this thesis the author provide portfolio diversification strategies in order to stabilize whole farm income. It advises diversification and insurance as two powerful risk reduction strategies. The author cites agricultural risk into business risk and financial risks. Business risk

1. From production factors (weather pattern, performance of crops and livestock)
2. from market risk (price changes ,currency rate variation , and demand fluctuation) .
3. institutional risk (policy of govt.) , and partners relationships and human life risk

Financial risk include farm financing, like credit availability, loans, leasing, and interest rate changes

The thesis also discuss crop insurance, like yield insurance, price insurance. The author cites the problem of high subsidization, cost, complexity, moral hazard and administrative costs. This is where the FPOs can play and important role. The author proposes, the concept of asset broadening like crop and livestock company, machinery buying, buying or constructing building, land, labour, financing alternatives, activities related to consumption and tax. The author suggests the mix of assets to be balanced for the farmer's protection as well as provide opportunities.

(James D. Libbin, 2004)in this article the authors use CAPM model for agricultural risk management. The suggest holding farm and non-farm assets to diversify risks. They cite a work by Mishra and Morehart that concludes holding off-farm assets to mitigate risks. It also shows that increase in debt and farm diversification reduces the likelihood to have off-farm assets.

(Franco Rosa, 2019)Conclude crop diversification as a viable strategy to hedge risk.

We see from the above that human-wildlife conflict is one of the risks which is related to production risks and an area where FPOs can devise innovative risk mitigation strategies with help of start-up ecosystem and CSR funds.

Conceptual Model

We develop the conceptual model by (Karl Morrison, 2009) for the FPO start-up ecosystem and CSR We propose that the start-up rolls out technologies and financing opportunities while FPOs concentrate on producing high quality products and improve productivity. CSR funds to be mobilized by start-ups to fill the need in the human-wildlife conflict and opportunity for FPOs.

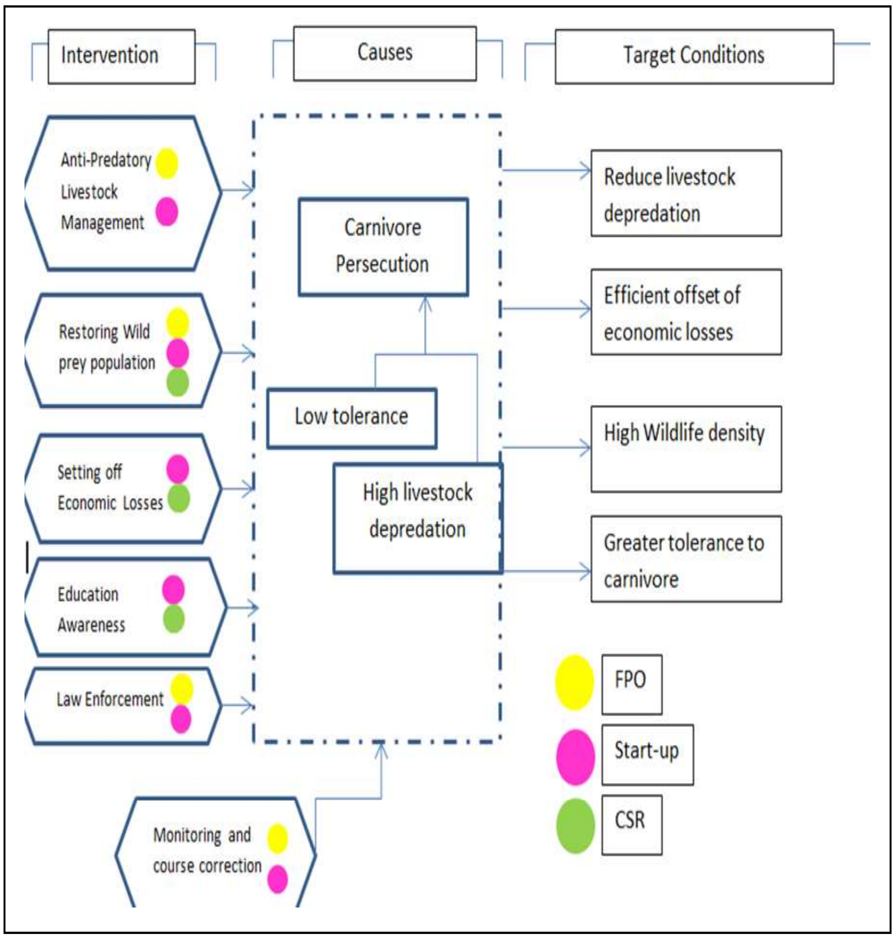

Figure 4: Start-up, FPO & CSR on Karl Morris Framework

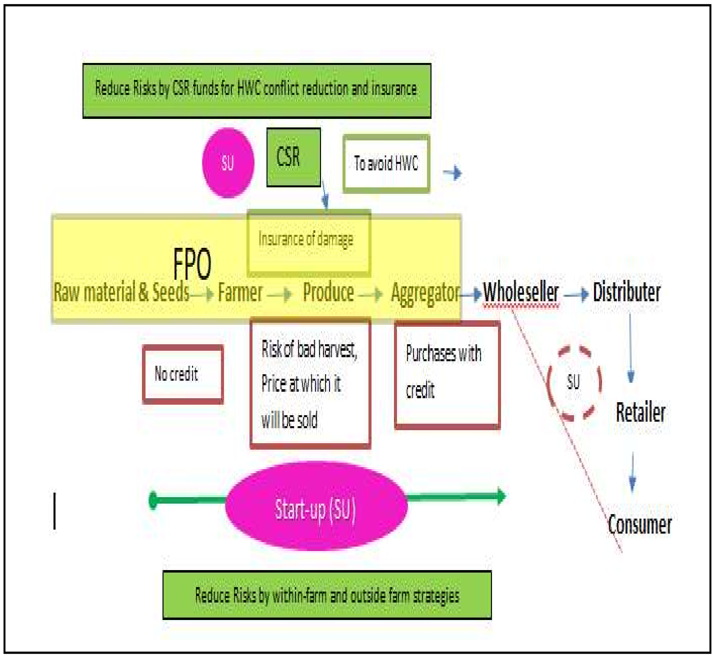

Figure 5: The Conceptual Framework

Limitation of research:

The research is a multi-dimensional interdisciplinary research and has been done on a conceptual level. It is based on review of literature review. The risk mitigation strategies suggested in the article have not concluded which will be most effective. Negative correlated factors may have been considered and needs investigation. The research limits itself to the production risks due to human-wildlife conflict. Though start-ups can play a role in building applications to manage demand fluctuations and in the value chain from after the produce is sold, our article does not dwell in that zone.

Future Research:

A future research with empirical evidence to support the suggestions can be done. The food chain is a complex web with multiple actors. We suggest a system dynamic model building to test the risk mitigation strategy and balanced portfolio building. A dynamic balanced scorecard will also be an area of further research for this application.(Raja Ghosh, 2019)has applied a dynamic balanced scorecard and CSR in the health sector. Further research on policy formulation for the CSR Act specific to FPO is advised.

Conclusion:

The article provides an overview of the human-wildlife conflict in the context of FPOs constructed for the food security program in India. It suggests how the innovative technologies can reduce this conflict, where the start-ups can play a vital role. These start-ups can act as a fulcrum between the mobilization of CSR funds to deploy such technology as well as build risk mitigation strategies with portfolio diversification and insurance with the FPOs. The conceptual framework for such an application has been providedhere.

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