Small and Marginal Farmers of Indian Agriculture: Prospects and Extension Strategies

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ABSTRACT

Agriculture remains the mainstay of Indian economy and major source of livelihood of rural household, predominantly by small and marginal farmers, and securing the food and nutritional security. These farmers face several problems of credit, input supply, proper linkage with market as so on. Women farmers are lagging behind in adopting the drudgery reduction technologies followed by health and nutrition of farm families. Their livelihood can be enhance by utilizing various strategies of information and communication technologies (ICTs), capacity building, combating climate change and increasing food production. A budgetary requirement should also be taken care. Market oriented research and investment should also be increased to save our farmers from glut situation and fetching more income by adopting the concept of FPOs/FPCs in larger context.

Key words: *Small and Marginal farmers; Extension Strategies; ICT; Climate Smart Agriculture;*

Although global food production has increased in the past few decades, almost 800 million people still have insufficient food in South and Southeast Asia, the Caribbean, and SubSaharan Africa (*FAO*,2015). Moreover, global food production must double by 2050 to match population and income growth (*Alexandratos et al.2012*), and much of this must happen in Asia and Africa.In India small and marginal holding farmers cultivate around 44 per cent of the area, and they produce around 60 per cent of the total food grain production (49% of rice, 40% of wheat, 29% of coarse cereals and 27% of pulses) and over half of the country's fruits and vegetables production (*Agricultural census, 2014*). In India, small and marginal farmers' average size of holdings is about 0.38 ha when compared to 17.37 ha for large farmers, which cannot generate adequate employment and income from crop cultivation (*Dev, 2017*). In India small and marginal holding farmers cultivate around 44 per cent of the area, and they produce around 60 per cent of the total food grain production (49% of rice, 40% of wheat, 29% of coarse cereals and 27% of pulses) and over half of the country's fruits and vegetables production (*Agricultural census, 2014*). Further, small and marginal farmers are generally more efficient than the large farmers in terms of per hectare output and cropping intensity (*Chand et al. 2011*). The role of small farms is well recognized in the contribution towards total food grain production and poverty reduction and similarly the contribution of marginal and small farmers to the total output is higher as compared to share in the total land holdings (*Gururaj et al. 2017*). According to the agricultural census 2010-11, marginal and small farmers had accounted for around 85 per cent of the operational holding in India. Similarly, the area operated by the marginal farmers was around 51 per cent in 1970-71, which has been increased to 67 per cent in 2010. This fact indicates that the small holding farmers in Indian agriculture are much more prominent today than before.

Major problems which have disturbed the income of small and marginal farmers during the last few years can be summarized as below (*Hegde, 2019*):

- Erratic climate change and lack of suitable technologies to cope with changing environment,

thereby affecting crop yields.

- Poor irrigation facilities due to inefficient distribution of available water resources and slower progress of new irrigation projects. Interrupted supply of electricity further posed a hindrance in use of the available water resources for irrigation.
- Rising cost of inputs, small and fragmented land holdings and increasing labour costs have resulted in high cost of production and lower crop yields.
- In the absence of decentralized storage and processing facilities, small and marginal farmers could neither hold their produce till the realization of higher price nor process for value addition
- Poor agricultural extension and information services about selection of suitable crops, improved technologies, weather forecasts, types of pests and disease prevailing in the region, information on demand and price for various farm produce, etc. could not empower the farmers to take suitable corrective measures on time.
- Lack of required credit to procure various inputs well in time, high premium for crop insurance, and delay in settling the claims of farmers, created a cash crunch, beyond their ability to tide over the crisis.
- Low productivity of livestock high cost of feeding due to shortage of feed and fodder, inability to dispose of old and unproductive cattle and lack of clarity about the economics of dairy husbandry, created uncertainty about the future.

The declining total factor profitability and increasing risk is being considered as major challenges in improving the livelihoods of the farmers in India (*Kumar et al.2019c*).

Type of support systems:

Natural resource management: Small and marginal farmer to overcome the climatic changes and preferring the consumer choices of food there is need to adopt suitable cropping system and crops which will convert into enhancing income of farmer as well providing good food to consumer. More emphasis should be given to mixed farming where livestock and crops can be cultivated focusing to fodder crops. Farmer income can be supplemented with adoption of tree based farming which is less prone to climatic changes and ecofriendly.With the advent of new technologies Greenhouse cultivation need to promoted intensively for high value cropping fetching high income. To overcome climatic changes use of climate resilient technologies in pulses, oilseeds and millets should be promoted. Micro-Irrigation (drip irrigation, sprinkler irrigation system, micro-sprinklers, micro-jets, rain guns, gravity fed drip system and semi-permanent sprinkler system) is a combination of technologies which are having ample potential to achieve higher irrigation and cropping intensity with a considerable impact on resource and cost economy, crop yield followed by farm productivity with the potential of bringing around 42.2 million ha under drip and sprinkler irrigation, Out of this, about 30.5 million ha are suitable for sprinkler irrigation for cereals, pulses and oilseeds a part of fodder crops followed by drip with a potential of 11.7 million ha under cotton, sugarcane, fruits and vegetables, spices and condiments; and some pulse crops like red gram, etc. The maximum actual area under drip irrigation was found in Maharashtra (0.48 m ha) followed by Andhra Pradesh (0.36 m ha), Karnataka (0.18 m ha), Gujarat (0.17 m ha) and Tamil Nadu (0.13 m ha). (*Gurjar et al. 2017*).

Soil health management: Soil is one of the major part of agriculture which needs care and management. The constant decline in soil health is often cited as one of the reasons for stagnating or declining yields, soils are low in soil fertility but the inadequate and imbalanced nutrient use and neglect of organic manures is causing multi-nutrient deficiencies in many areas with time and showing a net negative balance of nutrients as every year there is a net deficit of about 10 million tonnes of nutrients added and extracted from the soil (*Naas, 2018*). For reducing soil erosion losses adoption of Contour bunding, land leveling, Tree plantation at bunds of field in watershed and un-irrigated areas need to be promoted. As the chemical fertilizers are expensive which increases the cost of cultivation, need to encourage the production of organic manures by giving incentives for producing Biogas slurry, NADEP compost, green manures and bio fertilizers, promoting more use of Bio pesticides, Bio-fertilizers including PSB for pulses. Promotion of Neem coated urea which is an excellent step for fertilizer use which will slow down the process of denitrification of urea. The Government of India in support of soil health has also launched several programmes like Soil Health Cards, selling of neem oil coated urea, nutrient-based subsidy policy for

Phosphorus and Pottasic fertilizers, organic/natural farming, Paramparagat Krishi Vikas Yojna (PKVY), National Mission on Sustainable Agriculture, National Water Mission, etc.

Animal sciences: Livestock rearing is one of the most important economic activities in the rural areas of the country contributing significantly to the national economy. It provides supplementary income to most of the family dependent on agriculture and for many landless families, the income generated through the livestock rearing activities has been the mainstay. Livestock sector has a favourable distributional impact. Marginal producers and smallholders, who account for about 67 per cent of landholdings, constitute the core livestock production sector (they own about 75% of bovines and 79% of ovine population). Medium and large landholders, on the other hand possess on 9.8 per cent of bovine population and major challenge in livestock development is the yield gap (ranging between 28-52%) followed by deficit in dry fodder, green fodder and concentrate are by 11 per cent, 35 per cent and 28 per cent concentrate, respectively (*Anonymous, 2019*). As India is leading in milk production, Conservation of best milch breeds should be promoted for better germplasm and producing best breeds. Similarly upgradation of best milch breeds with native breeds and cross breeds should be taken on priority. Number of male has been increasing as it producing burden on small and marginal farmers for their feeding and health care practices. To overcome this there is need to reduce the unwanted male population by sexually sorted semen. Livestock based integrated farming system should be promoted and is the need of the hour which can increase economic yield per unit area per unit time to small and marginal farmers. Similarly there is need to increasing the number of *paravets* to provide minor veterinary services, establishment of fodder banks decentralises complete feed production units and a well normed insurance schemes should be introduced to overcome the losses. Following the smart livestock farming different actions and plans need to be implemented in collaboration with ICT based programme and systems. There is need to upgrade the knowledge of veterinarian and extension functionaries for reaching the all sectors of farmers (*Kumar et al. 2019a*).

Infrastructural support: As the market progressing there is need to strengthen the supply chain for agricultural produce grown by small and marginal farmers. For income generating activities Value addition and processing for marketing through cooperatives should be put on priority list. Similarly promotion and scaling up of initiatives like e-choupal should also be promoted for better pricing of farmers produce without middlemen involvement. As government is providing Minimum Support Price for fetching remunerative price should be fixed for produce at market. For promoting group farming there is need to establish Farmer Producer Company (FPO) with farmers at village level for better forward and backward linkages for increasing their income. The reason for high growth of FPC as perceived by *ASA (2009)* is energetic management team and the board of directors, cooperation from banking institutions which provided hassle free loans to the PC for working capital, and a clearly identified business opportunity that gives a high return on investment.

Extension and training: An efficient and holistic extension system should be capable of meeting the need of small and marginal farmers in this fast changing scenario is the need to enhance the income securing sustainable growth of farmers. As there is need to reduce the extension functionary to farmer ratio (Hilly areas-1:400, Irrigated areas-1:750 and rainfed-1:1000 (*Singh, 2019*) which are the bridge between research and farmers. There is need for Skill development/ capacity building of extension personnel to meet evolving needs of farmers and perform better for farmers' satisfaction. Extension functionaries providing high quality extension services need to be appropriately incentivised to accelerate the momentum. For producing a robust system there is need to conducting benchmark surveys for problem identification through Agro-ecosystem analysis which elicits major farm problems and priority areas for research. These research areas need to be prioritised research and should be converted into the short, medium and long term extension targets. Based on identified problem there is need to conduct on-farm trials on selected technologiesfor seeing its location specific suitability. Similarly there is need to Sensitizefarmers for social acceptance of new technologies. Up scaling of different successful innovations and technologiesshould be done to make these technologies useful for other farmers with suitable modification at on farm as well as off farm activities. Keeping in view the significance of ICTs in overall

agricultural advancement, it is necessary to promote ICT based agricultural information dissemination to enhance agricultural productivity and also to provide sustainable agricultural information delivery mechanism (*Atibioke et al. 2012*).Making farmers enriched with scientific knowledge (Use of leaf colour chart, INM, IPM) and Mobile Apps. For providing door step services a mobile van for soil testing and diagnostic services should be provided. There is need to Promote custom hiring centres for promoting farm mechanization. For promotion of best practices identification of Innovative farmers and their strategies should be done and scaling up should be done. For better functioning, there is need to develop linkages with other departments on convergence mode (public-private partnership Mode).

Women empowerment & gender mainstreaming: As agriculture sector is predominantly engaged by rural women, they are the basis of family and the health management. In process to this there is need of empowerment of rural women through self-employment by SHG's promotions in the field of fruits, vegetable & millets processing for fetching income and become self-sustain in the society. For marketing of processed products there is a way to develop packaging, labeling& marketing skill among the SHG's and facilitating then for FSSAI Licensing. Similarly there is need to promote improved farm tools and to reduce laborious work through improved farm tools for reducing drudgery among the farm women. Family hygiene & improvement in nutritional health status should also be promoted among rural women and adolescent girls. To meet the daily requirement of family about fruits and vegetables, concept of nutrition garden providing a path for meeting the requirement and making farm women empowered through their behavioural changes. Farm income should also be supported with different Social intervention like Nutri-sensitive Agricultural Research and Innovations (NARI) which focuses ongender empowerment & nutrition by carrying out demonstrations to promote nutrition - sensitive agriculture, capacity development and gender mainstreaming with special focus on family farming, linking agriculture to nutrition, skill development among women and youth, bio-fortification of locally available food, round-the-year dietary pattern, nutri-thali, Nutrition Smart villages, etc.SAMPADA (Scheme for Agro-Marine Processing and Development of Agro-Processing Clusters) for creation of modern infrastructure with efficient supply chain management from farm gate to retail outlet providing big boost to the growth of food processing sector, Creating huge employment opportunities,Reducing wastage of agricultural produce, enhancing the export of the processed foods providing better returns to farmers and is a big step towards doubling of farmers income. Value Addition and Technology Incubation Centers in Agriculture (VATICA), operated for incubation and skill development in KVKs and in some FPOs.

*Information and communication technology (ICT) and knowledge managemen*t : Indian agriculture, which involves millions of small and marginal farmers and many of those smalland marginal farmers are illiterate and have little or no access to resources to access modern technology in agriculture (*Yadav et al. 2015*). ICT has is an emerging tool for achieving meaningful societal transformation and it is an emerging tool for achieving meaningful societal transformation (*Meera et al. 2004*). The goal of Information and Communication Technology (ICT) is to provide the benefits of information revolution to the rural masses by enhancing farming efficiency, farm productivity and farmers' income (*Sangeetha et al. 2015*). So there is a need to tap the full potential of ICT to deliver farm information in minimum time.Creation of national level farmers database in coordination with Agricultural technology application research institute (ATARI) in each zones of ICAR systemfor delivery of farm specific advisory which makes agriculture sector look more organised and help in agricultural research and which will provide location specific information in real time. Similarly there is need to establish a web interface with social media and networking platform. For providing latest information for farm problems acrop specific mobile apps (Diagnostic purposes) and video modules for different farming practices should be developed.Updating of regular information there is need to maintain KVK website with new technologies and success stories followed by linking of market and crop insurance information on website with Agmarknet / *e*NAM for latest information for market intelligence.An effort is needed for developing ICT-based agricultural information management and delivery system and effective and relevant modification and redesigning in available technologies and setting up of awareness and capacity building programmes for farmers (*Kumar et al. 2018d*).

Technology	Adaptation/mitigation potential
Water-smart	Interventions that improve water use efficiency
Rainwater Harvesting (RH)	Collection of rainwater not allowing to run-off and use for agricultural in rainfed/dry areas and other purposes on-site
Drip Irrigation (DI)	Application of water directly to the root zone of crops and minimize water loss
Laser Land Levelling (LL)	Levelling the field ensures uniform distribution of water in the field and reduces water loss (also improves nutrient use efficiency
Furrow Irrigated Bed Planting (FIBP)	This method offers more effective control over irrigation and drainage as well as rainwater management during the monsoon(also improves nutrient use efficiency)
Drainage Management (DM)	Removal of excess water (flood) through water control structure
Energy-smart	Interventions that improve energy use efficiency
Zero Tillage/Minimum Tillage (ZT/MT)	Reduces amount of energy use in land preparation. In long-run, it also improves water infiltration and organic matter retention into the soil
Nutrient-smart	Interventions that improve nutrient use efficiency
Site Specific Integrated Nutrient Management (SINM)	Optimum supply of soil nutrients over time and space matching to the requirements of crops with right product, rate, time and place
Green Manuring (GM)	Cultivation of legumes in a cropping system. This practice improves nitrogen supply and soil quality
Leaf Color Chart (LCC)	Quantify the required amount of nitrogen use based on greenness of crops. Mostly used for split dose application in rice but also applicable for maize and wheat crops to detect nitrogen deficiency
Intercropping with Legumes (ICL)	Cultivation of legumes with other main crops in alternate rows or mixed. This practice improves nitrogen supply and soil quality
Carbon-smart	Interventions that reduce GHG emissions
Agro Forestry (AF)	Promote carbon sequestration including sustainable land use management
Concentrate Feeding for Livestock (CF)	Reduces nutrient losses and livestock requires low amount of feed
Fodder Management (FM)	Promote carbon sequestration including sustainable land use management
Integrated Pest Management (IPM)	Reduces use of chemicals
Weather-smart	Interventions that provide services related to income security and weather advisories to farmers.
limate Smart Housing for Livestock (CSH)	Protection of livestock from extreme climatic events (e.g. heat/cold stresses)
Weather based Crop Agro-advisory (CA)	Climate information based value added agro-advisories to the farmer
Crop Insurance (CI)	Crop-specific insurance to compensate income loss due vagaries of weather
Knowledge-smart	Use of combination of science and local knowledge
Contingent Crop Planning (CC)	Climatic risk management plan to cope with major weather related contingencies like drought, flood, heat/cold stresses during the crop season
Improved Crop Varieties (ICV)	Crop varieties that are tolerant to drought, flood and heat/cold stresses
Seed and Fodder Banks (SFB)	Conservation of seeds of crops and fodders to manage climatic risks

Climate smart agriculture: Climate-smart agriculture (CSA) is an approach for transforming and reorienting agricultural systems to support food security under the new realities of climate change with the widespread changes in rainfall and temperature patterns threaten agricultural production and increase the vulnerability of people dependent on agriculture for their livelihoods, which includes most of the world's poor which has disrupted food markets, posing population-wide risks to food supply. Threats can be reduced by increasing the adaptive capacity of farmers as well as increasing resilience and resource use efficiency in agricultural production systems (*Lipper et al. 2014*).The impacts of climate change on crop yields indicate that yield losses may be up to 60%, depending on crop, location, and future climate scenario (*Challinor et al. 2014*). Promotion of Climate Smart Agriculture (CSA) through the Climate-Smart Village (CSV) approach for technological and institutional options for dealing with climate change in agriculture. Providing weather-based

insurance; Use of ICT for dissemination of climate information based agro-advisories for Development of decision-support tools for planning and investment. Emphasis on organizations as mechanisms for linking between national-level and community-level adaptation, and associated range of activities, Selection of technologies to local contexts, mapping local institutions and working in partnership across institutions, Gender and social inclusion in climate change adaptation and developing Success factors include participative and locally driven vulnerability assessments and tailoring of adaptation measures. Farming practices are threaten to several, interconnected ecological, economic and social pressures provoked by climate change and there is need to enhance investment flows and public–private partnerships to strengthened and establish well-networked with local organizations for effective measure in adaptation to climate change (*Kumar et al.2019b*).

CONCLUSION

The success of Indian agriculture depends on sustaining small and marginal farmers by utilising their land resources for increase production and increasing total income. They should be provided with basic and necessary support systems for accumulating more knowledge and adoption of scientific method of farming. Marketing and Linking farmers with appropriate market channels are a mammoth act. FPOs/FPCs have emerged as an promising and effective solution to overcome market risk. There is need for implement right most workable and scalable plan/models and support system with appropriate technical expertise. They should be a part of supply value chain which can be strengthened with formation of FPOs/ FPCs. For that Infrastructural support should be provided for collective marketing. With the special focus on women farmers they should be treated equal in resource, information and wage sharing. Adoption of drudgery reduction technology needs to be promoted intensively. Technology should be developed in consultation with farmer in research planning and implementation on farmer to scientist mode. Climate smart technologies should be promoted to overcome climatic changes and resilient technologies should be promoted and adopted. By adoption of these practices our small and marginal can sustain for livelihood and can find a way for income generation on integrated mode.

REFERENCES

Alexandratos, N. and J. Bruinsma (2012). World agriculture towards 2030/2050: the 2012 revision. ESA Working paper No. 12-03. FAO, Rome, Italy.

All India report on number and area of operational holdings. Agriculture Census New Delhi: Ministry of Agriculture: 2010-11.

Anonymous (2019). Expectations of livestock sector from Union Budget in 2019-2020. Animal Science Division, ICAR, New Delhi: *Indian Farming*, **69**(01):72–76; January 2019.

Anonymous (2010-11). All India report on number and area of operational holdings. Agriculture Census New Delhi: Ministry of Agriculture.

ASA. (2009). Manual for producer companies-Volume-I and II. Action for Social Advancement (ASA). Prepared for district poverty initiatives programme (DPIP), Madhya Pradesh.

Atibioke, O.A.; I. Ogunlade; A.A. Abiodun; B.A. Ogundele; M.A. Omodara and A.R. Ade. (2012). Effects of farmers' demographic factors on the adoption of grain storage technologies. Developed by Nigerian Stored Products Research Institute (NSPRI): A case study of selected villages in Ilorin West LGA of Kwara State. *Research on Humanities and Social Sciences*, **2**: 56-63.

Challinor, A. J.; Watson, J.; Lobell, D. B.; Howden, S. M.; Smith, D. R. and Chhetri, N. (2014). A meta-analysis of crop yield under climate change and adaptation. *Nature Climate Change*, **4**:287– 291.

Chand, R., Prasanna, L.P. and Singh, A. (2011). Farm size and productivity: understanding the strengths of smallholders and improving their livelihoods. *Econ. Polit. Week*, pp. 5-11.

Dev, M. (2017). Small farmers in india: challenges and opportunities. Retrieved March 2017, from *IGIDR working paper*: http://www.igidr.ac.in/pdf/publication/ WP-2012-014.pdf

Food and Agriculture Organization (FAO) (2015). The state of food insecurity in the world 2015. Strengthening the enabling environment for food security and nutrition. FAO, Rome, Italy.

Gurjar, D. S.; Khodke, U. M.; and Kaur, Ravinder. (2017). Micro-irrigation in India – present status and future prospects. *Indian Farming*, **67** (7): 21–23.

Gururaj, B.; K.R. Hamsa and G. S. Mahadevaiah (2017). Doubling of small and marginal farmers income through rural non-farm and farm sector in Karnataka. *Economic Affairs*, **62** (4), 581-587.

Hegde, N. (2019). Empowerment of marginal and small farmers need for budgetary support. *Indian Farming*, **69** (1): 22-26.

Kumar, S.; Singh, R.; Dhandore, C.; Thombare, P. and Kale, P. (2019a). Smart livestock extension: Reaching the unreached farmers. *Indian Farmer*, **6**(8):536-541.

Kumar, S.; Thombare, P. and Kale, P. (2019b). Climate smart agriculture: Challenges, implications, innovations for achieving food and nutrition security. *AGRICULTURE & FOOD: e- Newsletter*, **1**(9): 267-271.

Kumar, S.; Thombare, P. and Kale, P. (2019c). Farmer Produce Company (FPC): A Journey of farmers from food grower to food seller. *AGRICULTURE & FOOD: e- Newsletter*, **1**(9): 42-46.

Kumar, S.; Singh, R.; Rao, D. U. M. And Chauhan, J. (2018d). Information Needs of Indian Farmers: An Elixir for Connect and Disconnect of Agriculture. *Indian Research Journal of Extension Education*, **18** (1):37-44.

Lipper, L.; Thornton, P.; Campbell, B. M.; Baedeker, T.; Braimoh, A.; Bwalya, M. and Hottle, R. (2014). Climate-smart agriculture for food security. *Nature climate change*, **4**(12):1068.

Meera, S.N.; Jhamtani, A. and Rao, D.U.M. (2004). Information and communication technology in agricultural development: A comparative analysis of three projects from India. *Agril. Res. and Ext. Network*. Network Paper No. 135, pp.13.

NAAS (2018). Soil Health: New Policy Initiatives for Farmers Welfare. Policy Brief No. 3, National Academy of Agricultural Sciences, New Delhi. 19 p.

Sangeetha, V.; Burman, R. R.; Dubey, S. K.; Sharma, J. P. and Singh, I. (2015). Attitude of agricultural stakeholders on use of short message service (SMS) in transfer of technology. *Indian Journal of Extension. Education*, **51**(1&2) : 60-65.

Singh, A.K. (2019). Expectation of agricultural extension from union budget 2019. *Indian Farming*, **69** (01):55-58.

Yadav, K.; Rasheed Sulaiman, V.; Yaduraju, N.; Balaji, V. and Prabhakar, T. (2015). ICTs in knowledge management: the case of the Agropedia platform for Indian agriculture. *Knowledge Mgt. for Dev. J.*, **11**(2).

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