



STATE SPECIFIC STRATEGIES FOR DOUBLING FARMERS INCOME - 2022



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KARNATAKA

Karnataka is an agrarian economy and overall development of the State is mainly depending on the growth and development of agriculture and allied sectors. A large tracts of the state practice rainfed agriculture and hence the state is a victim of frequent droughts in the recent past. There is a wide-spread concern about distress in agriculture and falling incomes of farmers. There is also an unequivocal support for the cause of improving the livelihood conditions of farmers by enabling the farm families to earn a decent livelihood.

Karnataka State falls in Zone X (Southern Plateau and Hilly region) and Zone XII (West Coast Plains and Ghat region) as per the Agro-Climatic Regional Planning. The State is divided into 10 Agro-Climatic Zones and has six major soil types. Due to its varied agro climate, almost all cereals, pulses, oilseeds and commercial crops (fruits, vegetables, spices etc) are cultivated in different parts of the State.

Total geographical area of Karnataka is 190.50 lakh ha, out of which 122.47 lakh ha is total cropped area. Cropping intensity of the state is 121.93%. Around 16.% of the area was covered under forests, 6.67% area was under non-agricultural uses, 4.13% land was barren and uncultivable land and 2.15% land was cultivable waste. Permanent pastures, grazing land and miscellaneous tree crops constituted 6.20% of the total geographical area. About 11% of the total area falls under current fallow and other fallow land.

13.1 Productivity Gaps And Major Constraints

India's farm yields are much lower as compared to other developing countries. Per hectare rice production in India is 3.6 tonnes compared to 6.7 tonnes in China, 5.1 tonnes in Indonesia and 5.6 tonnes in Vietnam. Similarly, per capita wheat production in India is 3.1 tonnes compared to 5.0 tonnes per hectare in China. Similarly, it was observed from the results of FLD's data with improved production technologies that there exists a wide yield gap under real farm situations across crops in Karnataka. The yield gap varied from 11% in linseed to 30% in bajra. Hence, there existed a vast potential for increasing the existing level of production by adopting improved technologies advocated for different agro-ecological situations.



Table 1:- Potential for increasing the existing level of production

	Average yield at farm	FLD yield	(Kg/ha)	
Crops	(Kg/ha) 2014-15	2014-15		Yield gap (%)
Paddy	4534		5150	11.96
Sorghum	1392		1913	27.23
Bajra	1060		1525	30.49
Maize	5126		6001	14.58
Ragi	1985		2278	12.86
Wheat	2584		3169	18.46
Chickpea	766		913	16.10
Tur	2639		3141	15.98
Urad	501		593	15.51
Groundnut	1516		1838	17.52
Niger seed	250		306	18.30
Soybean	1540		1936	20.45
Sunflower	1406		1826	23.00
Linseed	731		821	10.96
Cotton	1365		1826	25.25
Sugarcane	2114	2499		15.41

Source: Annual Report 2015-16, ICAR-Agricultural Technology Application Research Institute, Bengaluru.

Karnataka state is having second largest area under rainfed agriculture next only to Rajasthan. The State also is one of the most drought prone States of the country. For instance, of the 176 blocks, over 140 were declared as drought hit during the year 2016-17. Despite this, the state has been contributing significantly to the nation's food basket. However, farmers in general and those in particular engaged in rainfed agriculture are facing wide spread distress due to increase in cost of living and decreasing profitability.

The impetuous being accorded to *Doubling the Farmer's Income* is very timely and the dire need of the hour especially in the State of Karnataka. There is ample scope as evidenced by several important studies that the farming is support by required inputs at affordable cost and the farmers realizes higher market prices for his produce, the goal of *Doubling the Farmer's Income* within the given time frame is very much achievable.

Certain studies have shown that unless the farmers share in the consumer rupee increases from the current 22%-24% to an expected 55-60%, farming will remain an unprofitable proposition. However, realizing higher share for farmers in the consumer price is fraught with several challenges.





Primarily it calls for major market reforms. Improved grading and processing infrastructure besides technology led weather forecasting, market intelligence and insurance. Improving production by adopting better planting materials and improved agricultural technology will enable to contribute approximately 30% to the farmer's income.

Another 30% of income contribution can be realized by adding value through grading, primary processing and cost reduction through improvement in input use efficiency. The remaining 30-40% increase in income must be realized through institutional innovations such as reforms in pricing, aggregation of producers into companies to have a collective bargaining power in terms of buying inputs and selling output and a robust agricultural insurance product covering all gamut of farming including crop, livestock, fishery, horticulture, sericulture etc. The noble goal of *Doubling Framers Income* will only be realized if there is a concerted effort in all sectors and by implementing an action plan at the ground level involving all the stakeholders.

13.2 The strategies for Doubling Farmer's Income in different zones

Karnataka has enormous potential for development of horticulture, livestock, fisheries and agro-forestry sectors due to its varied Agro Climatic Zones. The strategies for Doubling Farmer's Income based on potentials to develop different sectors in different zones have been given below:

A. North Eastern Transition Zone

- i. Protective irrigation for pulse production.
- ii. Facilitating minimal processing of Dal.
- iii. Integration of small ruminants in agriculture.
- iv. Bio-ethanol production from sugarcane cultivation.
- v. Dryland horticulture coupled with post harvest processing and cold storage facilities.
- vi. Intercropping in sugarcane with vegetables and pulses.
- vii. Crop cultivation with cash crops like ginger, turmeric and flowers.
- viii. Promotion of mango cultivation.

B. North Eastern Dry Zone

- i. Integrated crop management in Red gram and Bengal gram.
- ii. Establishment of mini Dal mills at Panchayat level for primary value addition.
- iii. Establishing of processing and packing industry at district level.
- iv. Rainwater harvesting through watershed development approach.
- v. Hi-tech horticulture/protected cultivation with recharged groundwater.
- vi. Integrated crop management in cotton and floriculture, groundnut and sunflower cultivation.
- vii. Reclamation of problematic soils.





- viii. Replacing rice under bore well irrigation with floriculture, and olericulture.
- ix. Facilitating processing of papaya, pomegranate and fig.
- x. Expanding irrigation facility by completing lift and tank irrigation projects.
- xi. Promoting FPO of oilseed growers with complete value chain (Eg Erode of TN).
- xii. Integration of small ruminants with rainfed farming in areas with high rainfall variability.
- xiii. Horticulture based IFS.

C. Northern Dry Zone

- i. Groundwater augmentation through watershed development.
- ii. Integration of dry land horticulture and small ruminants and buffalo calf rearing with agriculture.
- iii. Bio-remedying of excavated soils in mining areas.
- iv. Building farmers' capacity for seed production of oilseeds.
- v. Intercropping in orchards with Greengram, Cowpea, Horse gram, sunflower and millets in dry conditions.
- vi. Intercropping in orchards with vegetable crops like Beans, Chilli, Onion, Watermelon, Ridge gourd, Cucumber and Okra under limited irrigation.
- vii. Promotion of pomegranate and grape cultivation.

D. Central Dry Zone

- i. Soil and moisture conservation and RWH through watershed approach.
- ii. Dry land horticulture (mango and sapota, pomegranate, amla) and alternate land use systems.
- iii. Large scale production of short duration crops: green gram, sesame, onion, groundnut.
- iv. Small ruminant and poultry production.
- v. Enhancing yield potential of maize and cotton based cropping systems.
- vi. Introduction of efficient intercrops in arecanut plantation.
- vii. Increasing compost/manure production for improvement of soil fertility status.
- viii. Dryland horticulture (amla, pomegranate, custard apple, mango, sapota, cashew) medicine/ aromatic plants.
- ix. Alternate land use systems - agro forestry, horti-pasture, agri-horti, silvi-pastures.
- x. Promotion of Mango + Cowpea intercropping.

E. Eastern Dry Zone

- i. Soil moisture conservation & soil fertility improvement through watershed approach.
- ii. Soil enrichment through composting/green manuring/ tank silt application.
- iii. Alternate land-use systems like Agri-horti system for arable lands (mango, sapota,





tamarind, jack fruit etc.), Horti-silvi system (mango, sapota + silver oak, casurina, teak), Silvipasture (block plantation of acacia, silver oak, casurina, D.sisso, Melia azardicta, cassia and muthuga + S. hamata, S. scabra, calaproimum, anjan, Guinea macuaena, etc.) for non-arable lands.

- iv. Dryland vegetables (chillies, beans, brinjal, tomato, cluster bean, gourds etc.), Floriculture (chrysanthemum, jasmine, crossandra marigold, roses etc.) fruits (guava, amla, sapota, cashew and mango), sericulture and coconut plantations.
- v. Livestock component (dairy, sheep, piggery, rabbitry).
- vi. Facilitating processing, value addition and export of fruit products and flowers.
- vii. Protective farming in vegetable crops (tomato).

F. Southern Dry Zone

- i. Watershed development for augmenting surface and groundwater.
- ii. Development of orchards - mango, cashew, jack and sapota.
- iii. Water-saving irrigation methods and cost-saving planting methods for irrigated ginger and turmeric.
- iv. Fruits and vegetable cultivation with dairying in conjunction with feed and fodder development.
- v. Promotion of millets, sericulture and small onions cultivation.

G. Southern Transition Zone

- i. Development of cashew, mango, sapota, (dryland orchards) and oil palm, banana, coconut, papaya, guava with seasonal irrigation.
- ii. Promotion of vermi composting and organic farming.
- iii. Alternatives to tobacco based cropping systems.
- iv. Promotion of exotic fruits like rambutan, avacado, etc.

H. Northern Transition Zone

- i. Watershed development for soil and water conservation.
- ii. Development of sheep, dairy and fodder/pasture production.
- iii. Promotion of intercropping in mango and sapota orchards with legumes and vegetables.
- iv. Promotion of exotic vegetables for export.
- v. Recirculatory aquaculture using minimum water and area.
- vi. Promotion of seed production.

I. Hilly Zone

- i. Promotion of hi-tech horticulture and exotic fruits and orchids with agro-eco tourism.
- ii. Management of soil health in low lands or valley areas.





- iii. Effective management of animal menace.
- iv. Strengthening of traditional water storage structures.
- v. Improve the productivity of livestock.
- vi. Promotion of different Integrated Farming System modules.
- vii. Promotion of aquaculture in seasonal water bodies.
- viii. Plantation based IFS.

J. Coastal Zone

- i. Rain-shelter horticulture and value addition for export.
- ii. Management of soil acidity and associated problems.
- iii. Management man-animal conflict.
- iv. Strengthening of traditional water storage structures.
- v. Improve the productivity of livestock.
- vi. Brackish water aqua culture; backwater cage culture; bioflock method of prawn culture.
- vii. Feeding with fish dressing waste in cage culture.
- viii. High density cashew plantations.

Role of Technologies for doubling the farmers' income

1. Agriculture

It is essential to bridge the yield gaps, enhance the productivity and profitability, minimize risk and improve the livelihoods of millions of people dependent on agriculture through agricultural technology. Improved and tolerant varieties along with the proper management practices can enhance the productivity through risk reduction in vulnerable environments. Considering the need, State Agricultural Universities in Karnataka have developed several improved crop varieties. The field trials showed that the yield of the new improved varieties can add 20-25 % to increased productivity, even if other components of production remain the same. A recent study revealed that improved crop management technology packages (integrated nutrient management, integrated pest management, conservation agriculture etc) increased average productivity up to 205% and average farm net income by 160%.



**Table: Technologies Related to Agriculture for doubling the farmers' income**

S. No.	Technology Title	Brief description	Potential income increase due to adoption of technology(in percentage)
1.	Improved varieties/ hybrids of different crops	Paddy- GGV-05-01(Gangavati sona), IET 19251, GNV-10-89, Pigeonpea: TS-3R, GRG-811, Greengram: BGS-9, Chickpea- GBM-2, Sunflower- RSFH-1887, RSFH-130, Cotton; SCS-793, SHH-818	15-20%
2.	Direct seeded rice in irrigation command	University of Agricultural Sciences, Raichur has developed production technologies and popularized direct seeded rice in Tungabhadra and Upper Krishna Project of domain area. Advantage of DSR over transplanted rice include requires 17-35 % less water, timely sowing of the crop, Less seed rate (8-10 kg/acre), Puddling is not required, saving in energy (diesel 8-10 l/acre), Saving in 25-30% fertilizers, less cost of cultivation and high net returns and savings of Rs. 7-8000/acre. Due to continuous efforts of the university DSR has spread to more than 60,000 ha and farmers are university DSR has spread to more than 60,000 ha and farmers are	20-25%
3.	Integrated farming systems models for rainfed and irrigated condition	<p><u>Rainfed model (Zone-2)</u> Components detail: Crops: Pigeonpea+ Navane/greengram (1:2), clusterbean-jowar, Clusterbean-safflower 40-60% Vegetables: Amaranthus, pundi, palak, chilli, onion-15% (5mx5m) Animal husbandry: Female goat (5) + male goat (1) Azolla unit Silo-pits Drumstick, Karileaf on bunds</p> <p><u>Irrigated model (Zone-2)</u> Components detail: Crops: Bt-cotton, Maize, Chickpea 40-60% Vegetables: Amaranthus, pundi, palak, tomato, chilli, avare -15% Animal husbandry: Female goat (5) + male goat (1) Dairy: Crossbreed cows: 2 Poultry birds: 50 Home garden: Banana/avare/drumstick Vermicompost: Biodigester tank Crops on bunds: Perennial grasses/Hybrid Napier, Guinea grass</p>	2-3 times





S. No.	Technology Title	Brief description	Potential income increase due to adoption of technology (in percentage)
4.	Use of growth regulator in pulses	Pulse Magic is developed by combining Nutrients (Major & Minor) and PGRs and the results are encouraging. The product is a combination of important nutrients and PGRs for boosting yield of Red gram. Developed and tested for the last three years on the farm and Farmers field. The product is use full in management of Flower and pod drop and enhance yield in Redgram. Spray @ 10 g/liter of water at 50% flowering and 15 days after 1st spray. Treat seeds in 2% CaCl ₂ solution for 7-8 hours and then dried in shade will increase drought resistance in green gram. When green gram is at maturity stage, spraying 5 ml Paraquat in 1 lit of water will defoliates the leaves facilitating easy harvesting.	10%
5.	Climate Resilient Maize Hybrids	Maize hybrids deployed by CIMMYT for the major maize agro- ecologies of Karnataka (Kharif maize in central Karnataka and Rabi maize in Belgaum and Dharwad).	20%

2. Horticulture

Technological change has been the major driving force for increasing crop productivity and promoting horticulture development in Karnataka. Several income augmenting technologies in terms of higher productivity, saving production costs and minimization of horticultural crop losses have been demonstrated by Agriculture Universities and ICAR institutes in Karnataka. For example, planting of cashew under ultra density planting technique developed by ICAR-Directorate of Cashew Research, Puttur in selected cashew varieties such as VRI-3, Ullal-1, NRCC Sel-2 and hybrid H-130 has been successfully demonstrated in farmers field. About 3-4 tones of nut yield per ha can be harvested in the early stage of orchard life from ultra high density orchards. These technologies are package intensive and are more successful in increasing the income by 100-200%. In mango high density planting, use of vigour regulating root stock, application of growth retardants and canopy management increases the income by 150%. Similarly, planting ICAR-IIHR developed Guava hybrid “Arka Kiran” doubles the farmer’s income as compared to other traditional varieties.

The State is one of the major producers of variety of horticulture crops. Fruits (such as Sapota, Grapes, Pomegranate, Watermelon, Mango, Jackfruit, Papaya, Lime/ Lemon, Orange, Banana, Guava etc), Vegetables (such as Onion, Potatoes, Gherkins, Capsicum, Green Chilly, Tomato, Cucumber, Carrot, Beans etc), Plantation & Spice Crops (such as Coffee, Arecanut, Tamarind, Coconut, Vanilla, Black Pepper, Cloves, Cardamom, Dry Chilly, Turmeric, Cashewnut, Ginger, Garlic etc) and Flowers (such as Rose, Jasmine, Gerbera, Carnation, Anthurium, Orchids,





Lillies, Chrysanthemum, Tuberose, Crossandra, Aster, Marigold etc.) are grown in the State. Horticulture production area in the State accounts for about 16% of the total cultivable area. It includes plantation crops (45%), vegetables (23%), fruits (20%), spices (10%) and other commercial crops like flowers, medicinal and aromatic plants (2%). During the year 2013-14, the State has produced 66.26 Lakh MT of Fruits, 82.50 Lakh MT of Vegetables, 4.85 Lakh MT of Plantation Crops, 6.56 Lakh MT of Spices, 2.14 Lakh MT of Commercial Flowers, 11351 MT of Medicinal Plants, 14282 MT of Aromatic Plants. In Karnataka, only about 1% of the total production of fruits and vegetables is currently being processed for value addition. About 25–30% of post harvest loss is estimated due to inadequate cold storage, required transport, poor handling, insufficient processing and other value addition facilities. A recent study jointly conducted by the management consultancy firm, McKinsey & Co. and the Confederation of Indian Industry (CII), determined that at least 50% of the production of fruits and vegetables in the country is lost due to wastage and value destruction. The cost of wastage is estimated at Rs. 23,000 crores on an annual basis. Levels of wastage differ in accordance with the fruit or vegetable concerned. At present in Karnataka, there are only 98 cold storage units having 2.97 Lakh MT for handling fruits and vegetables. Of these units, 2 are in co-operative, 90 are in private and 6 are in public sector. Suitable post harvest infrastructure in terms of cold storages, processing units and road networks in inaccessible areas can give a big boost to the horticulture sector by promoting value addition and food processing. Value addition plays a significant role in improving farm income of small scale farmers. For example, presently, the cashew farmers sell their produce to major processors at a lower price. In case they themselves adopt small scale processing, the overall returns will be higher by 50-60%.

Table : Technologies Related to Horticulture for doubling the farmers' income

S. No.	Technology Title	Brief description	Potential income increase due to technology
	Ultra high density planting	Planting of cashew under ultra density planting technique (3 m x 3 m or 2.5 m x 2.5 m) 400 to 600 plants per by super imposing regular productive pruning using selected cashew varieties such as VRI-3, Ullal-1, NRCC Sel-2 and hybrid H-130 has been successfully demonstrated in farmer's field. About 3-4 tones of nut yield per ha can be harvested in the early stage of orchard life from ultra high density orchards. These technologies are package intensive and are more successful in hilly terrains of coastal and main land tracts.	100 – 200 %





S. No.	Technology Title	Brief description	Potential income increase due to technology
1.	Intercropping in cashew	In the high rainfall zones and also in the regions of availability of irrigation facilities, intercrops such as locally important marketable vegetables, pulses and medicinal plants can be grown as intercrops in widely spaced cashew plantations in the initial years of cashew crop. The suitability of season and type of intercrops is a most critical factor.	50 – 100% Depending on selected crop
2.	High yielding varieties/ hybrids	Till date, 43 high yielding cashew varieties have been released and recommended for cultivation of these; regionally suitable varieties can be grown successfully in different zones. A few hybrids viz., H-130, H-126, H-32/4 and NRC 493, NRC 301 with big apple and bold nut are under evaluation and in pipeline for release. Most of these are very high yielding (20-30%) and with premium kernel grade recovery (W 110 to W 180).	50 – 60 %
3.	Value added products	Protocols for the products from cashew apple such as cashew apple juice (RTS), jelly, jam, halwa and cider (low alcoholic beverage) have been standardized and market acceptability is being evaluated. This activity ensures effective utilization of cashew apple which is presently going waste, and will enhance the total income from cashew orchards.	20 – 40 %
4.	Homestead cashew processing units	Presently, the cashew farmers sell their produce to major processors at a lower price. In case they themselves adopt small scale processing the overall returns will be much higher. Further the retail rural economy will get a boost.	40-50 %
5.	Converting wastelands into cashew orchards	The existing wastelands can be converted into cashew plantations through appropriate soil management practices. By this effective land utilization can be achieved and additional quantity of raw nut targeted can be obtained to meet the local processing needs of the nation.	50 – 60 %





S. No.	Technology Title	Brief description	Potential income increase due to technology
6.	Mango	Arka Saka Nivarak (to control spongy tissue in Alphonso mango)	60%
		Regular & synchronized flower inducer formulation	60%
		Mango micronutrient foliar formulation	40%
		AM Fungi culture, Arka Microbial Consortium	25%
7.	IPM for mango, banana, tomato, brijal, cabbage, gerbera and carnation	IPM for major pests (lure traps, crop sanitation, need based insecticide application)	20%-25%
8.	Improved varieties of flowers	Planting recently developed Flower and vegetable varieties by ICAR-IIHR.	2-4 times
9.	Mango, Custard apple, Grapes and hybrid guava capsicum	High density planting, Use of vigour regulating root stock, application of growth retardants and canopy management	2.3 times
10.	PHM technologies for mango, guava, papaya, banana, sapota, oranges, capsicum	Existing technologies to reduce postharvest losses & increase farmers income through PHM technologies	30%-75%
11.	Protected cultivation	Maintenance and efficient use of Protected structures like green house, shade net, poly house etc. Protected cultivation of flowers and vegetables. Bringing the beneficiaries of Krishi Bhagya Yojana (Protected cultivation) on a common platform to educate them for profitable use of the structures.	2 fold increase
12.	Minimal processing and grading at the farmers level and marketing directly to the consumers.	<ul style="list-style-type: none"> ❖ Minimal processing of Fresh fruits and vegetables ❖ Modified atmosphere packaging (MAP); ❖ Use of Natural food preservatives, Integration across the supply chain. ❖ Grading is sorting of vegetables and fruits into different grades according to the size, shape, colour, and volume to fetch high price in market. 	2 fold increase





S. No.	Technology Title	Brief description	Potential income increase due to technology
13.	Promoting Low cost or no cost technologies for the management of pests, diseases and weeds.	<ul style="list-style-type: none"> ❖ Prevention practices and monitoring ❖ Traps to monitor insect pests ❖ Curative methods ❖ Trap cropping ❖ Biological control 	5 fold increase
14.	Value addition, packing and marketing	<ul style="list-style-type: none"> ❖ Tetra packaging ❖ Bamboo mat holed boxes ❖ Polypropelene boxes ❖ Corrugated fibre board ❖ Vacuum packaging ❖ Conventional raw materials into finished or semi finished products 	
15.	Reducing the cost of cultivation by adopting organic practices	<ul style="list-style-type: none"> ❖ Crop diversity ❖ Soil Management ❖ Weed Management ❖ Controlling other organisms ❖ Livestock 	2 fold increase
16.	Efficient use of farm resources to reduce the cost of purchased inputs	<ul style="list-style-type: none"> ❖ Low external input and sustainable agriculture (LEISA) ❖ Organic agriculture ❖ Precision agriculture ❖ Conservation farming (CF) 	2 fold increase
17.	Enhancing production per unit area using latest technologies	<ul style="list-style-type: none"> ❖ Per Drop More Crop ❖ GM Technologies ❖ Hi-tech horticulture ❖ Precision Farming ❖ High Value Horti Commodities Cultivation ❖ Hybrid seed production 	2 fold increase
18.	Incorporating the allied Agril. activities	<ul style="list-style-type: none"> ❖ Dairy, poultry, goat & sheep rearing, apiculture or Sericulture 	10 fold increase





S. No.	Technology Title	Brief description	Potential income increase due to technology
19.	Agri-Horti-Silvi practices	<ul style="list-style-type: none"> ❖ Horti-silvi- Livestock ❖ Agri-silvi-horticulture ❖ Agri-horti-silviculture ❖ Agri-horticultutre 	10 fold increase
20.	Measures to avoid in the marketing system of agri, horti, vet. products.	Marketing channels Direct to Consumers Regulated Markets Cooperative Marketing Societies (CMS) Commodity Groups Direct Channel- Farmers- Processors/ Bulk consumers	10 fold increase

3. Livestock and Fisheries

Livestock and fisheries sector has gained prominence during the past three decades owing to its impressive growth and increasing GDP contribution within the agricultural sector. Livestock rearing practices have dramatically changed in recent years from subsistence to commercial, subsidiary to main-occupational and unorganized to intensively organized systems. In Karnataka, livestock sector plays an important role in improving the economic status of the rural farmers who are dependent on the livestock for their livelihood. Karnataka is the 9th largest state in cattle and buffalo population in the country, accounting for 4.3 per cent of the total population as per the latest Livestock Census, 2012. It has 2.9 crore of livestock and 5.3 crore of poultry population. The share of livestock sector in gross state domestic product of agriculture and allied activities was 20.27% during 2014-15. The share of Karnataka in all India poultry and livestock population was 5.41% and 7.33% respectively. Government of India has declared the State as a render pest disease free zone. To provide health care to the animals and for improvement and development of breeds of animals, various programmes are implemented successfully by the Department of Animal Husbandry and Veterinary Services, through its institutional network.

However, according to the latest research conducted by ICAR on foot and mouth disease (FMD) in livestock, the reoccurrence of foot-and-mouth Disease (FMD) outbreaks remain a major challenge. India is losing a whopping Rs 18,000 crore annually due to the dreaded foot and mouth disease (FMD) in livestock and indirect losses due to FMD are to the tune of Rs. 30000 – 35000 crores annually. These losses are because of lower milk production and meet of infected animals is not good for consumption.

Development of livestock and fisheries must receive a high priority in the efforts for diversifying agriculture and doubling farmer's income. Over the past few decades, research institutes working on this sector offered a number of technological options that could raise the productivity of different species if adopted area-wide. These include genetic enhancement of indigenous





breeds through crossbreeding with exotic breeds, improvement of nutritive quality of feed and fodder through biological and chemical treatments, development of vaccines against animal diseases, improved livestock management practices, and post harvest management. Karnataka government and Veterinary University’s animal health care or disease control programs as well as improved veterinary services and other farm management programs have helped mitigate animal losses, maintain disease-free status and increase the farmers income. For example, clean milk production and control of sub clinical mastitis can increase farmers income by 40% and adoption of improved breeds instead of local goats as well as supplementation with assured health care service delivery can increase the famers income by 50%.

Table: Technologies Related to Livestock and Fishery for doubling the farmers’ income

S. No.	Technology Title	Brief description	Potential income increase due to technology (in percentage)
1.	Clean milk production and control of sub clinical mastitis	A better diagnostic and strategic control measures have been developed which reduced the occurrence of mastitis cases both in cows and buffaloes after imparting knowledge and skills on the mastitis detection and control techniques. The keeping quality of milk has also improved in both cow milk and buffalo milk. There was one lakh reduction in the somatic cell count of cows and buffaloes milk by the adoption of the practices. As a whole, the effort of multidisciplinary team in prevention and control of SCM at field conditions will help in improved production performance	40%
2.	Strategic feeding regimen to boost production and reproduction in dairy animals	Strategic feeding regimen of 30 kg of cereal green fodder, 5 kg leguminous green fodder 4 kg dry fodder and concentrate feed 2.5 kg for an animal yielding 10 litres of milk per day. This helps to increase in milk yield to the tune of 3.0-5.0L per animal. In addition, improvement in the quality of milk in terms of SNF and Fat encouraged the farmer to adopt the recommended feeding regimen.	25%
3.	Up gradation of local goats, supplementation with assured health care service delivery	The improved breeds namely, Osmanabadi, Telicherry, Boer, beetel breeds of goat can be introduced for up gradation of local goats through community based groups. In addition, 250 g of concentrates may be supplemented in last two months of gestation and one month after kidding. Further, regular deworming and vaccination against PPR, HS and ET has to be carried out. It will increase in the annual income to a tune of Rs.20.000/-. In addition, an asset of goats boosts the confidence of rural farmers to lead their livelihood.	50%





S. No.	Technology Title	Brief description	Potential income increase due to technology (in percentage)
4	Integrated sheep management practices	<ul style="list-style-type: none"> ❖ Selective breeding with elite rams of far off farms to overcome inbreeding depression results in increased birth weight, growth rate and marketable weight. In addition, it reduces genetic abnormalities and inbreeding depression ❖ Strategic supplementation of 200-250 g of concentrate in last two months of gestation and one month after lambing improves mothering ability, birth weight and marketable weight and better returns. In addition, it reduces kid mortality to a tune of 15-20% ❖ Health care service: regular deworming and vaccination against PPR, HS and ET to improve general health and production ❖ Marketing intervention: Marketing of sheep on the basis of body weight by taking actual weight instead of approximate lumbar assessment through regulated market / farm. 	40%
5.	Ram lamb fattening	The majority of shepherds sell ram lambs at the age of 2-3 months to optimize their flock size and replacement stock. Instead, these ram lambs can be well reared for another 6-8 months to harvest higher meat and income by stall fed rearing system. A flock of 30-50 ram lambs of 2-3 months old can be easily reared by a farmer or an entrepreneur for another 8 months yields net profit of Rs, 2500- 3000 per ram lamb. In addition, it also strengthens the food security needs.	30%
6.	Rural hatchery to augment Back yard poultry production	In recent years, local bird's meat and eggs gaining lot of demand in the market. In response to this, many of the farmers are rearing local birds and fetching better returns. But, the farmers are finding difficulty in getting day old chicks of local birds/ improved birds at reasonable price. In addition, their production cost is also high because of low FCR. Hence, a rural hatchery unit of capacity from 202-1000 eggs can be very well established at farmer's door step/ community based group to meet the local demand of chicks and better returns	15%





S. No.	Technology Title	Brief description	Potential income increase due to technology (in percentage)
7.	Dairy Enterprise Farming Model	Enterprise farming Model: in this model he will become an entrepreneur. He will produce good quality milk, convert into value added product and sell directly consumers in nearby places against online orders from them, instead of through intermediaries by itself may double the income of farmers.	16%
8.	Area specific mineral mixture for dairy animals in Karnataka	Mineral mixture was formulated based on survey of mineral status of soil, feeds/fodders and in dairy animals of different agro-climatic zones of Karnataka, field tested and found to improve reproductive efficiency and health in dairy animals. The technology is cost effective for adoption at field level and has been commercialized. The product is available in dairy cooperative societies and in retail market for end users.	15%
9.	Mineral mixture for small ruminants	Specific mineral mixture for sheep and goat were formulated based on the most limiting minerals, specific requirements and commonly deficient minerals in feeds and fodders of small ruminants. The formulation was field tested and found to improve growth and immunity. The Technology is commercialized and the product is available in retail market for end users.	10%
10.	Areca sheath as source of dry fodder	Use of shredded areca sheath as dry fodder as an alternative to paddy straw in the form of total mixed ration to dairy animals has shown improvement in milk yield and milk quality. The technology is simple to adopt, reduced the cost of feeding and successfully adopted in diary cooperative societies in coastal Karnataka.	20%
11.	Pineapple fruit residue silage as source of green fodder	Silage technology from residue of pineapple fruit processing was developed and evaluated as a source of green fodder and found very useful in terms of nutritive value to cattle and sheep. The technology is simple to adopt and being used in areas of Uttara Kannada in Karnataka.	20%





S. No.	Technology Title	Brief description	Potential income increase due to technology (in percentage)
12.	Strategies for methane amelioration in livestock	Enteric methane amelioration strategies were developed using tanniferous phyto-sources at specified levels in straw based basal diet. About 20 per cent reduction in enteric methane emission was achieved during in vivo studies without any adverse impact on feed fermentation. If, these strategies propagate across the country, about 2 million ton less methane and 50 million ton less CO ₂ will be dispensed annually from Indian livestock. This saved biological energy will be diverted for other productive functions in the body.	10%
13.	Enhanced egg production with red lighting	Red lighting (LED 4 Watts) in commercial poultry farm improved the egg production by 2% in high performing white leghorn layers and reduced electricity consumption in the farm. It is cost effective and adopted in a layer poultry farm near Mysore in Karnataka.	10%
14.	Semen quality assessment test	Low quality semen is one of the reasons for less conception and repeat breeding. A novel test has been developed to identify the sub-fertile bulls. Use of this test in semen stations will help to improve fertility rate.	5%
15.	Azolla cultivation	Cultivation of azolla as a backyard activity and supplementation as green feed improves milk yield and milk quality.	10%
16.	Grain sprouts as fodder source	Sprouting of cereal grains like maize with water sprinkling with or without straw bedding has shown to be a supplementary green fodder source as a contingency measure and also improves water use efficiency.	15%
17.	Ration balancing using Feed chart and Feed Assist	Tools for Balancing major nutrients in dairy animals using local feed resources have been developed. This will improve milk yield and health of animals.	20%
18.	Fishery farming	Transforming one acre of paddy farming into fish farming increases the farmer's income by 15 folds. One rears the fish seed separately for 2-3 months and then stock the ponds scientifically there are very less chances of failure in fish culture. Using local cheap feed material one could reduce the cost of cultivation to a greater extent and increase the net income.	15 fold increase





Summary Recommendations:

Karnataka state is having second largest area under rainfed agriculture next only to Rajasthan. The State also is one of the most drought prone State of the country. For instance, of the 176 blocks, over 140 were declared as drought hit during the year 2016-17. Despite this, the state has been contributing significantly to the nation's food basket. However, farmers in general and those in particular engaged in rainfed agriculture are facing wide spread distress due to increase in cost of living and decreasing profitability. The impetuous being accorded to Doubling the Farmer's Income is very timely and the dire need of the hour especially in the State of Karnataka.

There is ample scope as evidenced by several important studies that the farming is support by required inputs at affordable cost and the farmers realizes higher market prices for his produce, the goal of Doubling the Farmer's Income within the given time frame is very much achievable. Certain studies have shown that unless the farmers share in the consumer rupee increases from the current 22%-24% to an expected 55-60%, farming will remain an unprofitable proposition. However, realizing higher share for farmers in the consumer price is fraught with several challenges. Primarily it calls for major market reforms. Improved grading and processing infrastructure besides technology led weather forecasting, market intelligence and insurance. Improving production by adopting better planting materials and improved agricultural technology will enable to contribute approximately 30% to the farmer's income. Another 30% of income contribution can be realized by adding value through grading, primary processing and cost reduction through improvement in input use efficiency. The remaining 30-40% increase in income must be realized through institutional innovations such as reforms in pricing, aggregation of producers into companies to have a collective bargaining power in terms of buying inputs and selling output and a robust agricultural insurance product covering all gamut of farming including crop, livestock, fishery, horticulture, sericulture etc. The noble goal of Doubling Framers Income will only be realized if there is a concerted effort in all sectors and by implementing an action plan at the ground level involving all the stakeholders.

SUCCESS STORIES

1. Integrated Farming System: a success story in Karnataka

Shri Basavaraj Huchchayyanavar, S/o Shri Virupakshappa Huchchayyanavar of Chikkamalligawad village, is a BA graduate and has completed Diploma in Dairy. He has got 4.0 ha. land with irrigation facility at Chikkamalligawad village of Dharwad taluka. Shri Basavaraj Huchchayyanavar has adopted Integrated Farming System (Agri-Horti-Silvi-Pasture system, Animal husbandry, Production and use of organic manures and pesticides, Soil and water conservation techniques and Sericulture). With his self interest and motivation, cultivating field crops (0.6 ha), horticulture crops (1.0 ha), involved in sericulture (2.0 ha), vermicomposting (0.4 ha), agro-forestry, dairy, poultry and fishery.

He has adopted innovative technologies such as labour saving equipments and tools viz., tractor,





sprayers, bullock and tractor drawn implements and other minor agricultural implements. Shri Basavaraj has adopted integrated farming system and strongly endorses organic farming in all his agricultural practices. He grows a versatile crops including field crops such as jowar, maize, paddy etc., He is cultivating mango, guava, lime, sapota, as well as vegetables and has grown teak, fodder crops, acacia and sandal wood all along the bunds. He has attained household food security which is self-sustainable. He has constructed large scale open pit for production of vermicomposting (75'x75') and 4 small pits (4'x20') through which he produces 90 tons of vermicompost every year. Besides, he also produces vermicompost of 90 tons/ year in heap system (40'x 40') with minimum labour engagement. He has enhanced production of vermicompost through utilization of bio gas and bio-digester slurry. He has adopted wider row spacing (5'x3') in sericulture with improved mulberry varieties (V-1) and growing vegetables as intercrop. He is also rearing sericulture eggs at farm level which is transported and marketed to Mysore. He has cultivated mango with guava, lime and mulberry as intercropping in organic form. Bio gas generated from agri and animal waste is utilized for cleaning Chandrike. The innovative farmer is cultivating local/native varieties of paddy so as to protect and preserve endangered local paddy varieties. He is conserving resources through collection of run of water through contour bunding, insect and pest management through need based pesticides application, use of pheromone traps, growing of trap crops, regular spray of panchagavya etc. Integrated water management practices in the form of drip with fertigation has been implemented. Indigenous technical knowledge such as smudging in mango, neem based pesticides, application of organic manure @ 5 tons/ha and tank silt @ 20 tons/ha are being practiced for mango. For adoption of IFS and outstanding innovations in the field of organic farming and sericulture, he has been credited with the several awards. Before adoption, his farm income was Rs. 6,12,800/-. After the adoption of IFS with multi-enterprise agriculture enhanced his annual income by 62% (Rs. 9,90,000).

2. Benefits of FPO: a success story in Karnataka

Since Karnataka does not have an exclusive market to sell their organic produce, farmers who followed the organic methods of farming were unable to market their produce. This resulted in the ending up in a common market, thereby defeating the whole purpose. At this juncture, Sahaja Samrudha, an organisation led by farmers and farming experts has developed a connectivity network of consumers and producers for procurement and marketing under the brand name "Sahaja Organics". Sahaja Samrudha Organic Producers Company Ltd., has been formed to market organic produce. Presently, the company has over 750 organic producers, who are also the shareholders. This apart, the company has around 2500 farming families (30 farmers' group) in its network.

The Producer Company will facilitate farmers to exhibit and sell their produce with a good price ear marked. The produce is procured directly from the farmer and supplies it to the network outlets. This chain has been created for the produce to reach the consumer directly. The firm pays a premium price of 15-20 percent higher than the traditional market price, while it retains a nominal amount for its sustenance.





Sahaja promotes only organic and traditional crops of rice, millets and pulses. These crops are in great demand in the urban areas for their nutritional value and medicinal value, especially the millets and red rice. Being one of the largest wholesalers of organic grains in the state, it supplies organic products to around 80 retail outlets in Bangalore and around. However, the company has only one storehouse and retail outlet.

In addition, as a direct sales initiative, it organizes annual red rice melas, seed festivals and safe food melas in cities, tier-2 and tier-3 towns in which the farmers sell their produce to consumers at a fair price. These dedicated farm markets allow consumers to have access to locally grown, farm fresh produce, enables farmers the opportunity to develop a personal relationship with their customers, and cultivate consumer loyalty with the farmers who grows the produce.

Initially, being a producer company, Sahaja started with a policy that it will solely depend on farmers' money. The producer company in the year 2010, started with a capital of Rs 5 lakh, raised through pooled funds from farmers and farming groups. In 2014-15, the company's turnover increased tremendously to Rs 3.6 crore and it made a profit of Rs 30 lakhs. Out of this, Rs 5 lakh was distributed to the farmers and some money was pooled back into the business.

According to a 66-year-old farmer, Mr. Nagaraj from Hosahalli, who grows carrot and beetroot says that, after the direct market access, he has benefitted a lot and his income level has doubled since last four years. "If the market price for the carrot of normal variety is Rs 12-18, I get about Rs 25-35 for my organic produce through Sahaja. Even if we deduct a nominal charge for the Sahaja initiative, we still end up getting 60-80 percent higher for our produce," Nagaraj says.

Though farmers in this region have small plots that range from 0.5 acres to 2.5 acres, farmers here leading a dignified life due to marketing of their produce through FPO.

