



Article ID: AEN-2020-01-01-018

## **Crop Diversification an Approach towards Increasing Farmers Income**

Priyanshi Talaviya\* and Nayana Nisarata

PG Scholar, Department of Agronomy, C.P. College of Agriculture, Sardarkrushinagar Dantiwada Agriculture University, S.K. Nagar, Gujarat

\*Corresponding author. E-mail: talaviyapriyanshi@gmail.com

The concept of diversification conveys different meaning to different people at different levels. Crop diversification is an increasing the farmers income through different cropping pattern. Increasing with income also improve soil health and maintain dynamic equilibrium of the agro-ecosystem. Crop diversification is a process of a gradual movement out of subsistence food crops toward diversified market-oriented crops that have a larger potential for returns to land. High value crop can increase the employment generation in farmers' family and also increase the income and status of farmers. Main region of Gujarat like North Gujarat, Saurashtra and South Gujarat farmers diversified cropping system from traditionally grown crop under rainfed and dryland condition. In this study included needs of diversification, process of diversification, how many stages under study, advantages, government policy and overall strategies are included in this paper.

### **Introduction**

In the changing agricultural scenario in the world as a result of globalization. Agriculture in India has to face new challenges to compete at the global level in many agricultural commodities. Indian agriculture is now facing second generation problems like raising or lowering of water table, nutrient imbalance, soil degradation, salinity, resurgence of pests and diseases, environmental pollution and decline in farm profit.

Crop diversification refers to a shift from the regional dominance of one crop to regional production of a number of crops, to meet ever increasing demand of cereals, pulses, vegetables, fruits, oilseeds, fiber, fodder, grasses, etc. In another term, a shift of a crop or cropping system to another crop or cropping system. A shift from less profitable and sustainable crop or cropping system to more profitable and sustainable crop or cropping system. It aims to improve soil health and maintain dynamic equilibrium of the agro-ecosystem.

The necessity for crop diversification arise on account of the need for (i) reducing risks associated with yield, market and prices (ii) arresting the degradation of natural resources and the environment and (iii) attaining national goals like employment generation, self-reliance in critical crop products and for earning foreign exchange. Diversification is the process to take advantage of emerging opportunities created by technology, new markets, changes in policy etc. to meet certain goals, challenges and threats and to reduce risk (Chand and Chauhan, 2002).

Diversification can increase price response, market infrastructure, and availability of resources, public interventions and globalization of agriculture. It is powerful enough to mitigate seasonal and unemployment of Labour. Increase farm incomes and to reduce risks and uncertainties in crops yields due to climatic and biological condition. Increased urbanization and changing lifestyle forcing to adopt to crop diversification which has changed the demand for food consumption from food grains to non-food grains like vegetables and high value crop. The crop shift also takes place due to governmental policies and thrust on some crops over a given time in India.



Crop diversification takes into account the economic returns from different value-added crops. It also implies the effective use of environmental as well as human resources to grow a mix of crops with complementary marketing opportunities, and it entails shifting of resources from low value crops to high value crops. Due to globalization, crop diversification in agriculture is also a means to increase the total crop productivity in terms of quality, monetary and quantity value under specific, diverse agro-climatic situations all over the world. (Satyasai and Viswanathan, 1997, Thakur, 2010). Many economists advocate crop diversification as a tool of risk management. It is a strategy that involves doing more than one activity at any given time. It involves in mitigating price risks and production risks of falling output (Chaplin, 2000).

### **Need of crop diversification**

Crop diversification has become an important option to attain several objectives viz.

- Natural resources sustainability
- Ecological balance
- Output growth
- Buffer stocks
- Employment generation
- Risk coverage: Mono cropping high risk, etc.

### **Process of Crop diversification:**

The process of diversification can be classified into horizontal and vertical diversification.

1. **Horizontal** diversification is one of the most common phenomena in India. Through this approach the diversification takes place by adding more crops in the existing cropping system as a way to improve the overall productivity of a farm or region's farming economy, or a shift from subsistence farming to high value crops.
2. **Vertical** diversification stands for the addition of value in the existing cropping system through processing, packaging and branding or other efforts to enhance the product value (Jana, 2006 and Singh, Boukerrou and Miller, 2009).

### **Stages of Crop Diversification**

As quoted by (Chaplin, 2000) the process of diversification of agriculture may pass through four stages.

- 1) At the first stage the cropping system shifts from monoculture to multiple cropping. This phenomenon generally occurs in the developing countries and most of the third world countries are under this category.
- 2) At the second stage the farmers start more than one enterprise. For example crops and animal husbandry, beside the number of crops in a year is more than one.
- 3) Thirdly, initiation of mixed farming.
- 4) In the last stage of diversification, the activities which are incorporated are beyond the agricultural domain such as adding the value through the processing, packaging and producing by products e.g. jam, pickles etc.

### **Major driving forces for crop diversification**

- Increase income on small farm holdings.
- Withstanding price fluctuation.
- Mitigating ill-effects of aberrant weather.
- Balancing food demand.



- Improving fodder for livestock animals.
- Conservation of natural resources (soil, water etc.)
- Minimizing environmental pollution.
- Reducing dependence on off-farm inputs.
- Decreasing insect pests, diseases and weed problems.
- Increase the community food security.

**Crop Diversification in Rainfed and Dryland conditions:**

Crop diversification in rainfed regions aims to make rainfed agriculture achieving nutritional security, more employment and income generating, eco-friendly, poverty alleviation and comparative advantage in new trade regime (Vittal *et al.*, 2007). Some of the issues and functions provided by diversification in rainfed regions are given below in Table 1.

**Table-1. Issues and Functions provided by diversification in rainfed regions**

Issue	Functions provided by diversification
<b>Productivity and stability</b>	Increased yield, reduce intra seasonal variation and improved stability through diverse components viz Crop, tree, plant and animal
<b>High risk and high cost</b>	Risk and cost minimization through yield and income from annual and perennial mixtures
<b>Unabated land degradation</b>	Minimization of kinds, effect and extent of land degradation by appropriate land care through alternate land use systems
<b>Inadequate employment</b>	Staggered employment round the year
<b>Low profitability</b>	High income generation from various Components
<b>Poor energy management</b>	Energy efficient implements

**Table-2. Some factors affecting decisions on in crop rotation of Agroforestry in crop diversification in dryland regions of India**

<b>Short term profit factors</b>	<b>Soil degradation, nutrient loss, tree/forage establishment. Risk factors. Yield variability, price variability, flexibility of the enterprise in response to changed conditions, the farmers attitude to risk.</b>
<b>Dynamic factors</b>	Total arable area, machinery, total feed requirements financial support, labour availability, quality and cost the farmer's objectives (profit, risk reduction, sustainability), traditional wisdom.



## Advantages

- Better use of land, labour and capital for adoption of crop rotations, steady employment of farm and family labour and more profitable use of equipment are obtained in diversified farming.
- The farmer and labour engaged all the year round in different activities. The by-products of this crop can utilize properly as cattle, poultry, birds, etc. are related with crop production.
- Regular and quicker return is obtained from various enterprises.
- Soil erosion, soil fertility can be checked as land kept under cultivated throughout the year.
- Diversified farming is less risky than specialized farming.
- Best use of equipment easily available.

## Government policies and strategies for crop diversification

- Implementing National Agriculture Insurance Scheme.
- Operational zing Technology Mission on Cotton.
- Provision of Capital Subsidy of 25 percent for Construction / Modernization / Expansion of Cold Storages and Storages for Horticultural Produce.
- Creation of Watershed Development Fund.
- Strengthening Agricultural Marketing.
- Seed Crop Insurance.
- Seed Bank Scheme.
- Cooperative Sector Reforms.

## Over all strategies for crop diversification

- Diversion of high-water requiring crops to less water intensive crops.
- Diversion of cotton to pulses, oilseeds and maize in light textured and shallow soils.
- Replacement of low yielding low value coarse cereals to high yielding high value crops like pulses.
- Inter cropping or mixed cropping be promoted in dry areas.
- Shift high risk crops with short duration pulses and drought resistant oilseeds crops.

## Data of Gujarat state different region crop diversification:

- 1) In north Gujarat region traditionally cropping patten in potato crops but they are diversified with oilseed crop of groundnut, pulses crop of green gram, vegetable crop of muskmelon and spices crop like fennel, fenugreek are cultivated in their field. So, they benefited in yield and economic increase farmers condition. (Patel *et al.* (2018) at Sardarkrushinagar Dantiwada Agriculture University, Sardarkrushinagar)



**Table: 3 Economics influenced by different cropping systems for North Gujarat condition (Pooled of 2011-12 to 2015-16)**

Treatments	Cropping system	Gross return (kg/ha)	Net return (kg/ha)	B : C ratio
T <sub>1</sub>	Pearl millet-Mustard- Fallow	130527	59238	0.83
T <sub>2</sub>	Green gram+ Sunhemp-Castor- Green gram	241466	124021	1.06
T <sub>3</sub>	Green gram+ Cowpea-Castor- Fodder Sorghum+ Fodder Cowpea	213716	103394	0.94
T <sub>4</sub>	Green gram+ Sunhemp-Castor- Bottle Gourd	237925	124085	1.09
T <sub>5</sub>	Bt. Cotton+ Sunhemp-Castor- Bitter Gourd	267222	138310	1.07
<b>T<sub>6</sub></b>	<b>Green gram - Fennel+ Cauli Flower-Fennel conti.</b>	<b>340983</b>	<b>256918</b>	<b>3.06</b>
T <sub>7</sub>	Green gram– Mustard+ Lucern	198615	160814	2.25
T <sub>8</sub>	Bt. Cotton + Green gram – Castor	266331	145752	1.21
S.Em.±		7923	7922	
<b>CD at 0.05</b>		<b>2403</b>	<b>24031</b>	
CV (%)		5.78	9.86	

- 2) In saurashtra region traditionally cropping pattern have only groundnut, wheat, cotton grown but mostly farmers are changing their pattern from them and grown chickpea, green gram like pulses, cumin and coriander like spices and fodder crops are also grown in their field. Some innovative farmers grown turmeric, ginger like value additional crop in their field. (Solanki *et al.* (2018) at Junagadh Agricultural University, Junagadh)



**Table 4: Groundnut equivalent yield and economics of different cropping systems for Saurashtra region**

Treatment No.	Cropping system			GEY (kg/ha)	Gross income (Rs./ha)	Net income (Rs./ha)	B : C Ratio
	<i>Kharif</i>	<i>Rabi</i>	Summer				
T <sub>1</sub>	Groundnut	Wheat	Fallow	3892	175152	122744	2.34
T <sub>2</sub>	<b>Groundnut</b>	<b>Coriander</b>	<b>Sesame</b>	<b>6123</b>	<b>275544</b>	<b>212196</b>	<b>3.35</b>
T <sub>3</sub>	Groundnut	Chickpea	Greengram	5364	241364	176376	2.71
T <sub>4</sub>	Groundnut+ Pigeonpea	Pigeonpea conti.	Sunnhemp	3520	158406	93093	1.43
T <sub>5</sub>	Groundnut+ Pearlmillet	Wheat + Lucerne (Seed)	Blackgram	4283	192745	91947	0.91
T <sub>6</sub>	Groundnut + Castor	Castor cont.	Sorghum	4241	190860	118787	1.65
T <sub>7</sub>	<b>Groundnut+ Sorghum (F)</b>	<b>Lucerne (F)</b>	<b>Sweet corn</b>	<b>6202</b>	<b>279102</b>	<b>189244</b>	2.11
T <sub>8</sub>	<b>Groundnut+ Maize (F)</b>	<b>Drilled Fennel</b>	<b>Groundnut + Sesamum</b>	<b>6979</b>	<b>314039</b>	<b>199256</b>	1.74
T <sub>9</sub>	<b>Bt Cotton + Blackgram</b>	<b>Bt Cotton conti.</b>	<b>Groundnut + Cowpea</b>	<b>6455</b>	<b>290468</b>	<b>188408</b>	1.85
T <sub>10</sub>	Brinjal + Clusterbean	Cumin	Greengram + Sesamum	4873	219297	122002	1.25
<b>S.Em.±</b>				<b>308</b>	<b>13882</b>	<b>13882</b>	
<b>C.D. at 5%</b>				<b>917</b>	<b>41247</b>	<b>41247</b>	

3) South Gujarat climatic region where rainfall receive higher so mostly farmer grown rice and sugarcane cultivation but now a day their farmer taken pulses crop, vegetable crop, fodder crop etc so they can improve their soil as well as increase their income. (Arvadiya *et al.* (2018), All India Coordinate Research Project – Integrated Farming System, Navsari)



**Table 5: Economics of different cropping systems for South Gujarat condition**

Treatments	Cropping system			Gross return (Rs./ha)	Net return (Rs./ha)	BCR	REY (kg/ha)
	<i>Kharif</i>	<i>Rabi</i>	Summer				
T <sub>1</sub>	Rice	Green gram	Fallow	125268	61202	0.96	7592
T <sub>2</sub>	Rice	Grain amaranth	Green gram	168611	85070	1.02	10219
T <sub>3</sub>	Rice	Green gram	Pearl millet	173699	88636	1.04	10527
T <sub>4</sub>	Rice	Green manuring	Green gram	118973	44291	0.59	7210
T <sub>5</sub>	Rice	Linseed	Maize	204031	120043	1.43	12366
T <sub>6</sub>	Rice	Indian bean	Sesamum	307033	221434	2.59	18608
T <sub>7</sub>	Rice	Lucerne	Lucerne continue	285623	214351	3.01	17310
T <sub>8</sub>	Rice	Fodder sugar bea	cow pea + maize fodder	235012	153931	1.90	14243
<b>T<sub>9</sub></b>	<b>Rice</b>	<b>Cabbage</b>	<b>Bottle gourd</b>	<b>571099</b>	<b>467333</b>	<b>4.50</b>	<b>34612</b>
T <sub>10</sub>	Rice	Fenugreek (Green veg)	Cluster bean (Veg.)	488479	406457	4.26	29605
<b>CD at 5%</b>				<b>61836</b>	<b>61836</b>		<b>3747</b>
<b>CV %</b>				<b>19.20</b>	<b>19.20</b>		<b>13.36</b>

**Conclusion:**

Farmers with adequate resources can diversify the existing cropping system with the inclusion of legumes/pulses, vegetables and high value crop which provide higher yield, system profitability, system productivity give more employment can achieve higher economic return. Where diversification of cropping system may serve as a base to uplift the economic condition of farmers along with restoring soil fertility.

**References:**

Arvadiya, L. K. (2018). Annual report-2018 AICRP on IFS, NAU, Navsari.

Chand Ramesh and Chauhan Sonia (2002). Socio-economic factors in agricultural diversification in India. Agricultural situation in India. Feb.2002. pp.523-529.

Chaplin, H. (2000). Agriculture Diversification: A Review of Methodological Approaches and Empirical Evidences, Department of Agricultural Economics and Business Management, Wye College, university of London.



- Jana, B. L., (2006). Diversification in Agriculture, Agro-tech Publishing Academy, Udaipur.
- Khanam, R.; Bhaduri, D. and Nayak, A. K. (2018). Crop diversification: an important way-out for doubling farmers' income. *Indian Farming*. 68(1): 31–32.
- Kumar, S. and Gupta, S. (2015). Crop Diversification towards High-value Crops in India: A State Level Empirical Analysis. *Agricultural Economics Research Review* Vol.28 (2): pp 339-350.
- Nanher, H.; Shamim, S. A.; Tyagi, S.; Singh, A. K.; and Yadav, S. (2015). Need of diversification of cropping system in India. *Rashtriya Krishi*, Volume 10 (1):31-33.
- Patel, A. M.; Patel, P. K.; Saini, A. K.; and Patel, K. M. (2018). Diversification of cropping system as component of small holders farming systems. *Indian Agriculturist*, Vol. 62(1&2) pp 47-51.
- Reddy, B. N. (2009). Crop Diversification with Oilseed Crops for Maximizing Productivity, Profitability and Resource Conservation. pp:86-98.
- Singh, A.; Boukerrou, L and Miller, M. (2009). Diversification in Agriculture, in: Encyclopedia of Earth, Washington D. C. ([www.eoearth.org/article/Diversification\\_in\\_agriculture](http://www.eoearth.org/article/Diversification_in_agriculture))
- Solanki, R.M. (2018). Annual report-2018 AICRP on IFS, JAU, Junagadh.
- Vittal, K. P. R.; Ravindra Chary, G.; Ramarao, C. A. and Maruti Sankar, G. R. (2007). Oilseeds in crop diversification in rainfed regions. Challenging global vegetable oils scenario: Issues and Challenges before India. *Indian Society of Oilseeds Research*, Hyderabad.pp.175-200.

