



DIVERSIFICATION OF AGRICULTURE IN JHARKHAND: PROCESS, PATTERN & ISSUES

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Agriculture is the backbone of Indian economy because of its high share in employment and livelihood creation. The share of Agriculture in the GDP has registered steady decline yet this sector provides direct employment to more than 50% of total workforce in the country and large proportion of the population depends upon agro based industries and trade of agriculture products. About 60% of the population of our country is rural and the main occupation is agriculture. So, a large proportion of the land of the country is used for agriculture and allied activities. If the productivity in agriculture and horticulture improves with the help of mechanization, advanced technology, this sector may have a leading role India's economic development. So, need of the hour is sustainable agriculture diversification in favour of high valued cash crops and livestock production.

INTRODUCTION

At present, Indian agriculture is different from that of green revolution period. During the period of green revolution, agriculture growth was largely achieved by supply driven policy instruments such as irrigation, power, extension services, price support whereas in the post-reform period the agriculture growth is demand driven, urbanization, increase in per capita income and changing consumption taste and pattern have shifted the consumer demand from food grains to livestock and horticulture products. A large number of farmers still depends on traditional food crops for their livelihood. The contribution of area to the output growth has drastically diminished the expansion of gross cropped area through double cropping has increased. Since low yield and low value coarse cereals were replaced by high value oilseeds as well as Rice and Wheat, without and adversely affecting food grain output. Bhalla and Singh (1997)

Adams and Bumb (1993) and Singh and Singh (1993) examined the growth rates of area production and productivity. Berabih and Herdra (2007) examined the utilization of low level agricultural technologies, risks related to natural occurrences such as streams and diseases outbreak to be the major sources of the decline in productivity. As a result development in order to maximize land productivity. Horticulture production provides an opportunity for intensive production and increase small holders farmers participation in the market. Deogharia (2011) finds that horticulture sector in Jharkhand has a great potential and improvement in marketing system is required for increased aggregate agriculture productivity.

The Post-Green Revolution period saw diversification of the agricultural sector towards the crops that have experienced higher growth in the yield, which was characterized as technology-led diversification. Much of the area was diverted towards high value food-grain crops including rice, wheat and maize. This has led to emerging scenarios of specialization in many states of the country. Surprisingly, not only the agricultural growth slowed down in 90s but also agricultural production remained highly volatile compared to 80s. Annual real rates of gross capital formation declined sharply between the early and late 90s and during the same time, the public investment in the agriculture sector has witnessed a declining trend (from 33 to 22 per cent). In addition, many concerns were emerged regarding the traditional food baskets, which favoured rice-wheat combination and resulted specialization in the cropping pattern.

These concerns are mainly related to the increased risk of farmer's income and related to the negative externalities it generated in terms of environment degradation and regional disparities. On the one hand, the contribution of agriculture to the GDP is declining overtime whereas the number of people engaged in agriculture and its allied activities are still in large numbers raising concerns of both land and labour productivity. Consequently, the policy makers started emphasis on changing the way agriculture sector works in order to tackle negative externalities it creates and at the same time find ways to remove inconsistencies and achieve better levels of food security for poor and malnourished people. This calls for alternative production systems or opportunities that can generate new employment, growth and enhances incomes (Barghouti et al., 2004).

AGRICULTURE SECTOR IN JHARKHAND

Jharkhand state falls under the agro-climatic zone VII (Eastern Plateau and Hilly region), which has been further divided into three subzones. The state receives annual rainfall of 1200 - 1600 mm and the climate ranges from dry semi humid to humid semi arid types. Undulating top sequences of the State and rainfed agriculture have led to massive degradation of soil, diverse agricultural practices and low productivity. About 82% of annual rainfall occurs within the monsoon season, which lasts from mid June to September. Available moisture over the entire monsoon period determines the opportunity for the various cropping system practiced by the farmers. In general, the soils of Jharkhand are low to very low in available phosphorus and sulphur, medium in available nitrogen and potassium status and deficient in available boron. About 1.6 million ha (19% of total geographical area) is acidic. The region has a major problem of slight to moderate soil erosion as 74% of the areas are located on very gentle to gentle slopes.

Despite good rainfall, the cropped area and cropping intensity are low. The level of technology adaptation is also poor leading to lower productivity. The cultivable area is estimated around 3.8 million ha but the net sown area is 2.56 million ha and only 12% of cropped area is under irrigation. The total cultivable land in the State is 52% as compared with 55% of the country, but only 43% area of this is under net sown area compared to national average of 76%. The State as a whole suffers from several critical gaps in agriculture and allied sectors though a number of opportunities exists to make the state self-sufficient in agricultural production.

Although large number of farmers still depends on traditional food crops for their livelihood, however fifty percent of the agricultural GDP comes from horticulture and live stocks products. So, this is high time to have policy support to diversify the agriculture from traditional low-valued crops to high valued horticulture and livestock commodities. For the purpose of achieving higher income and employment growth in agriculture, diversification of farm activities is emerging as important instrument. The policy makers are also emphasizing on changing the way the agriculture sector works in order to tackle the inconsistencies in the farm sector and achieve food security. On this backdrop, the diversification of agriculture towards high-value commodities (HVCs) like fruits, vegetables, dairy, poultry, meat and fish products, etc. is suggest as a viable solution to stabilize and raise farm income, enhance agricultural growth, increase employment opportunities and conserve natural resources.

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agriculture sector works in order to tackle negative externalities it creates and at the same time find ways to remove inconsistencies and achieve better levels of food security for poor and malnourished people. This calls for alternative production systems or opportunities that can generate new employment, growth and enhances incomes (Barghouti et al., 2007).

Agricultural diversification indicates the changes in crop-mix, enterprises-mix and activity-mix at household level (Chand, 1999). It is considered a shift of resources from monoculture to a large mix of crops and livestock. The need for agricultural diversification arises due to various factors. As many parts of India have witnessed quite a high number of farmer suicides, diversification of the crop mix can be an efficient mechanism for diminishing the impact of risk on farmers' welfare (Jorge and Valdes, (1995). Diversification also allows the Indian farmers to produce high-value horticulture and livestock products for the growing affluent foreign and domestic consumers. Moreover, dominance of the wheat-paddy cropping system has led to serious economic, social and ecological problems, such as deceleration in productivity growth, drop in agricultural self-employment, over exploitation of ground water resources and decline in soil fertility (Chand, 1999).

Diversification of Agriculture in Jharkhand

Jharkhand is known for mono cropped rice cultivation under rainfed condition. Occurrence of frequent drought at intervals, low rainfall, long dry spell during crop season leads the farmers to shift towards low water requiring crops like Pulses, oilseed and cereals like Ragi and Jowar. Diversified cropping pattern and helps to cope with risk and uncertainty of crop failure. Support needs to be extended to input- optimising and cost-minimising options in rainfed areas. In a high risk situation, low paid out costs in cultivation is a risk minimization strategy. With the increase in irrigation potential farmers used to grow 2-3 crop depending upon the situation. If we go through the coverage of different crop for the last three years it shows increase in area of pulses & oil seed and decrease the area of rice.

Table-01 : Yearwise and Area Wise Coverage of Crops in Jharkhand
(Area - 000 ha)

Sl. No.	Crop	2011-12	2012-13	2013-14
1	Rice	1693.796	1414.462	1255.873
2	Total pulses	538.784	586.995	566.841
3	Total Oilseed	263.470	2250.586	275.816

Source: Directorate of Agriculture, Jharkhand, Ranchi

The above table indicates that the area under rice is gradually declining and the area of Pulses and oilseed is in increasing order. The rice grown on upland and part of medium land is substituted by pulses and oilseed crops. It shows the adjustment of cropping pattern depending upon change in rainfall pattern as well as Benefit: Cost ratio of the crop grown by the farmers. Pulses and oilseeds are low input and low water requiring crops on one hand and it needs less care and management on the other hand in comparison to rice, which leads the farmers to adopt the oilseeds & pulses crop where

ever feasible.

Majority of the pulses and oilseed crops are grown in the agro - climatic condition of the Jharkhand state. With development of high yielding / hybrid crop varieties of pulses & oilseeds crop and adoption of package of practices by most of the growers the cultivation of these diversified crop almost become sustainable due to least risk with minimum investment.

Agriculture diversification may be discussed under two heads;

- a) Crop Diversification and
- b) Production of Live Stocks (Animal Husbandry)

A. CROP DIVERSIFICATION IN UPLAND

In Jharkhand Agriculture land is being classified as Don (Up low land) Unbunded uplands constitute about 0.2 million ha in the State where rice was being grown. With better productivity of rice in the medium and low land with availability of comparatively more water there paving way for diversification of upland rice system . Intensification of high yielding varieties of millet, pigeonpea, blackgram, cowpea, bajra, sorghum, groundnut and maize as sole crops or intercrops and diversification to vegetables or other horticultural crops would be the best alternative replacing upland rice system.

I. HORTICULTURE

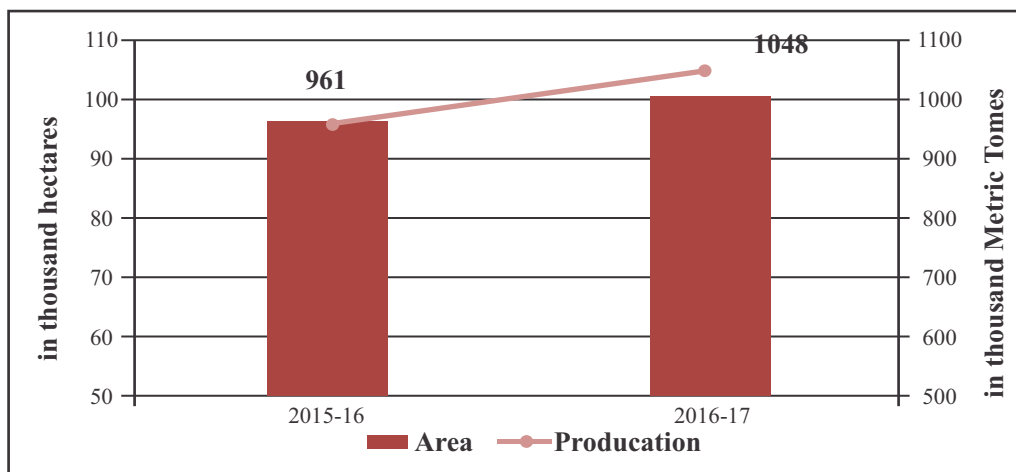
Horticulture plays an important role in Jharkhand. Jharkhand has the required climate and soil to grow virtually anything here. The region across its length and breadth. The state government with the support of Horticulture and Agro forestry Research Centre (HAFRC) helps by imparting horticulture techniques to the farmer and the scope for prospective entrepreneurs. Horticulture improves with the help of mechanization advance technology, this sector can leading role in Jharkhand economy development.

A part from agriculture products, growing of horticulture has added significance from the point of view of its contribution to national income and employment generation. From the economic point of view, cultivation of vegetables gives high return. Horticulture crops which include vegetables have the potential of earning almost four times more income per hectare than food crops (Srivastava, 1993). Higher income elasticity and the growing demand for vegetables have forced the government to diversity the crop plans. So in different five year plans emphasis has been given on the development of these crops.

a) Fruit Crops

The area under different varieties of fruit crops in Jharkhand has increased from 97 thousand hectares in 2015-16 to 101 thousand hectares in 2016-17. During this period, an increase of 4.4 percent has been noticed. In terms of production, the different varieties of fruit crops have also witnessed increase. In 2015-16, production increased from 961 thousand metric tonnes to 1048 thousand metric tonnes in 2016-17. During this period, the production of different varieties of fruit crops in Jharkhand has seen a 9 percent increase.

figure – 01: Area and Production of Total Fruit Crops in Jharkhand
(Area in 000 ha and production in 000 metric tonnes)



Source: Horticulture Area Production Info System (HAPIS), Ministry of Agriculture and Farmers Welfare, Government of India

Table -02 : Area and Production of Different Varieties of Fruit Crops in Jharkhand
(Area in 000 ha and production in 000 metric tonnes)

Fruits	Area (000 Ha.)		Production (000 metric tons)	
	2015-16	2016-17	2015-16	2016-17
Bael	0.52	0.53	35.59	36.22
Aonla/Gooseberry	0.28	0.29	1.31	1.41
Guava	8.10	8.17	80.05	88.84
Banana	12.53	9.06	33.28	31.63
Ber	0.48	0.64	2.83	10.41
Jackfruit	12.33	14.74	117.46	124.77
Litchi	3.45	7.01	40.01	47.80
Mango	50.41	50.56	393.67	438.
Papaya	1.78	2.53	106.69	109.88
Pomegranate	0.01	0.01	0.04	0.01
Other Fruit	1.80	1.70	102.54	104.50
Limes and Lemons	4.84	5.55	47.74	53.96
Total	96.53	100.79	961.21	1047.97

Source: Horticulture Area Production Info System (HAPIS), Ministry of Agriculture and Farmers Welfare, Government of India (data is based on the Final Estimates)

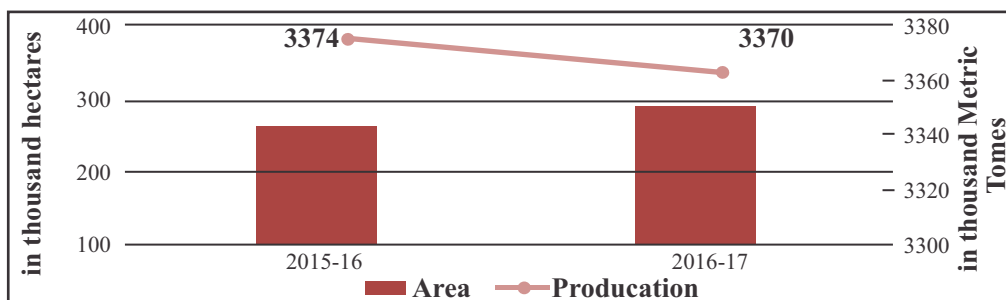
The production of different varieties of fruits in Jharkhand during 2015-16 to 2016-17, ber has observed the maximum percentage increase in the respective period, which is followed by litchi, limes-lemons, mango, guava and amla/gooseberry. A decline in production has been observed in the fruit crops of pomegranate and banana. The percentage change in area under different fruit crops for the period of 2015-16 to 2016-17 reveal that litchi has the highest percentage increase, which has been followed by other fruits such as papaya, ber, jackfruit, limes and lemon (Table 02). Whereas, banana fruits have observed a decline in the area during the respective period.

b) Vegetables Crops

The area under overall vegetables in Jharkhand has increased from 264 thousand hectares in 2015-16 to 294 thousand hectares in 2016-17. The increase of 11.1 percent has been noticed in this period. In terms of production of total vegetables, production has declined slightly from 3374 thousand metric tonnes to 3370 thousand metric tonnes in 2015-16 to 2016-17. During this period, the production of total vegetables of Jharkhand has observed minor decline of 0.1 percent. (Fig. - 02)

Figure -02: Area and Production of Total Vegetables in Jharkhand

(Area in 000 ha and production in 000 metric tonnes)



Source: Horticulture Area Production Info System (HAPIS), Ministry of Agriculture and Farmers Welfare, Government of India.

**Table - 03 : Area and Production of Different Varieties of Vegetables in Jharkhand
(Area in 000 ha and production in 000 metric tonnes)**

Vegetables	Area (000 ha.)		Production (000 metric tons)	
	2015-16	2016-17	2015-16	2016
Beans	10.38	12.62	154.55	226.72
Bitter Gourd	1.42	1.60	12.31	13.20
Bottle Gourd	1.63	1.55	13.96	13.34
Brinjal	22.96	80.05	219.65	241.00
Cabbage	30.50	19.32	475.99	322.46
Capsicum	18.63	2.95	17.35	32.55
Carrot	0.65	1.06	6.97	11.65
Cauliflower	20.70	21.19	258.64	292.17
Green Chilly	11.99	14.79	144.84	180.65
Cucumber	0.37	1.68	25.70	18.55
Kaddu/Pumpkin	0.27	0.77	3.60	18.56
Okra/Ladies Finger	32.87	4.84	452.12	101.47
Onion	14.86	17.48	254.63	292.59
Peas (Green)	13.85	15.19	192.21	341.88
Potato	44.93	52.73	627.01	668.66
Radish	1.05	2.81	11.73	39.85
Tomato	18.16	19.75	230.19	231.46
Other Vegetables	19.00	23.15	272.36	323.26
Total	264.22	293.53	3373.81	3370.02

Source: Horticulture Area Production Info System (HAPIS), Ministry of Agriculture and Farmers Welfare, Government of India (data is based on the Final Estimates)

It can be observed from table-03, that in terms of production of different varieties of fruits in Jharkhand during 2015-16 to 2016-17, kaddu/pumpkin has observed maximum percentage increase in the respective period, which is followed by radish, capsicum, carrot, peas (green), and beans. A decline in production has been observed in cabbage, cucumber, okra/ladies finger and bottle gourd. The percentage change in the area under different vegetables for the period of 2015-16 to 2016-17 reveal that cucumber has the highest percentage of increase, which is followed by other vegetables such as brinjal, kaddu/pumpkin, radish and carrot (Table - 03). Whereas, capsicum, cabbage, and okra/ladies

finger have observed a decline in the area during this period.

Crop diversification towards cash crops like vegetables must be supplemented by better marketing system which may provide to farmers. The efforts towards increase in vegetable production cannot be sustained for long unless increase in production results in increasing incomes for farmers and ensures remunerative prices and fair deals in the disposal of their product.(Deogharia,2017)

B. ANIMAL HUSBANDRY/LIVESTOCK PRODUCTION

Animals of Jharkhand usually have low productivity due to inadequate nutrition, low-level animal management, tropical heat and diseases. The aim of the Animal Husbandry Division is to develop it as a source of beneficial employment by improving the productivity of animals by proper development of the animal husbandry sector. This division is liable for affairs associating with livestock production, preservation, and protection from disease and improvement of stocks and dairy development. It also looks after all matters pertaining to fishing and fisheries, inland and marine. The objective of this department is to increase livestock production such as milk, egg & meat; enhance the draught capacity of bullocks by intensive implementation of controlled breeding programmes; consolidate and strengthen existing infrastructure facilities for livestock development in the state; promote animal husbandry as a viable subsidiary source of income for the rural population by providing improved facilities of crossbreeding; creation of awareness amongst livestock and poultry keepers; training of staff dealing with extension etc.

Jharkhand state has a total livestock and poultry population of 18.10 and 11.23 million, respectively; cattle (8.78 M) and goat (6.59M) contribute maximum to the livestock population. The productivity of existing livestock and poultry in Jharkhand is very poor and there is also a wide gap in production and requirement of livestock products like milk productivity of cow is 1.59 kg per day against the national average of 3.0 kg per day. Annual per capita availability of milk, meat and eggs is 47.45 kg, 1.42 kg and 13 eggs, respectively in Jharkhand against the national average of 96.0 kg, 3.32 kg and 51 eggs, respectively. In this section of the paper we are going to discuss the different live stocks product in Jharkhand.

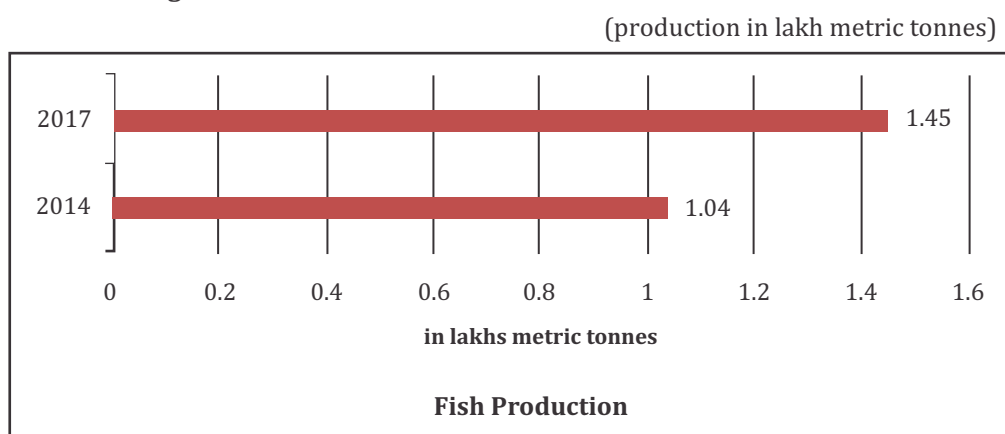
1.Fishary

Inland fisheries hold a large untapped potential in rainfed areas of Jharkhand. Small reservoirs, tanks, water harvesting ponds created as a part of watershed have potential for fisheries development. There is a large gap in the potential and actual yields in these rainfed water bodies. The fish production can be increased by about 3 to 5 times considering the present low productivity levels. Fisheries productivity needs to be improved with quality seed and feed availability along with mobilization of fisheries cooperative to achieve blue revolution.

In Jharkhand reservoirs (115000 Ha.) are the major source of aquaculture resources. Tanks are regarded as major focus resources (85% of tanks with 72% share in the TSA in private sector) for development. The fishery is another animal-based activity which is utilized to increase income, employment, production and overall ecological well-being. The promotion of fishery among the rural population has led to the annual production of 1.16 lakh tonnes of fish. The government aims to increase the fishery through cage culture and R.F.F. It wants to promote it via distributing local feeds among the fishermen. The fishery is promoted among the youth by providing encouragement amounts. Further, fishermen are provided with output insurance and residence. Further, it is promoted through the panchayat among the youth as a prime source of livelihood. Fish production, producer and

fish seeds in Jharkhand have observed an increase during 2014-15 and 2016-17. During this period, fish production in Jharkhand has increased from 1.04 lakh metric tonnes to 1.45 lakh metric tonnes, which has witnessed a 39 percent increase. From 2014-15 to 2016-17, the fish producer has increased from 0.86 lakhs to 1.28 lakhs. The fish producer during this period has witnessed a 48 percent increase in the respective period. The fish seeds production in 2014 was 108 crores, which has increased to 415 crores in 2017. During this period, more than 200 percent increase has been observed (Figure 03).

Figure – 03 : Achievements in Fish Production, 2014 to 2017



Source: Department of Animal Husbandry & Fisheries, Govt. of Jharkhand

The Department of Fisheries has also started focusing its attention on the use of abandoned coal pits and stone quarries. But there are certain limitations in this area. Development of fisheries depend upon seeds and the technical support to the faemers. In Jharkhand following steps has been taken in this regard;

a) Fish Seeds Production

Fisheries sector growth largely hinges on effective seed supply system in position. The State has realized the importance of private sector participation in fish seed production in order to enhance seed availability within the catchment of fish production sites spread out across the Fish seed growers get them registered in the training programmes and pay their own to get a tailor made training for fish seed production.

b) Training and Technical Support

Government of Jharkhand is providing technical support and training to fish seed growers. In the current financial year 2015-16 the department has trained and registerd 4500 fish seed growers from different districts of the State. In 2016-17 till date training has been imparted to 3255 fish seed growers. It has been planned to register and train 5000 seed growers across the state .

There are 14 fish seed hatcheries in Jharkhand run by the state government sector. The State has achieved almost self sufficiency in fry and fingerlings production but it is trying its level best to be self sufficient in spawn production.

Figure – 04 : Cage Culture in Jharkhand



Source: Department of Animal Husbandry and Fishery, GOJ

Presently the seed production has gone up to 172 crore annually. The Department has also drawn a road map for private participation to internalize seed rearing and supply keeping in view demand of seed estimated at 275-300 crores annually by 2020 A.D.

Since majority of ponds in Jharkhand are seasonal in nature farmers in private sector have taken this opportunity for producing more and more seeds in a big way. It rewards their income in just 3 months and the residual seeds in their ponds are sold on high price before onset of the next summer. Considering the ongoing growth trends in fish seed production department is ready to hold the hands of fish seed growers by facilitating the sale of 3-4 months old fingerlings to farmers having perennial water bodies or stocking of reservoirs through the Cooperative Societies and purchase of locally available fish seeds.

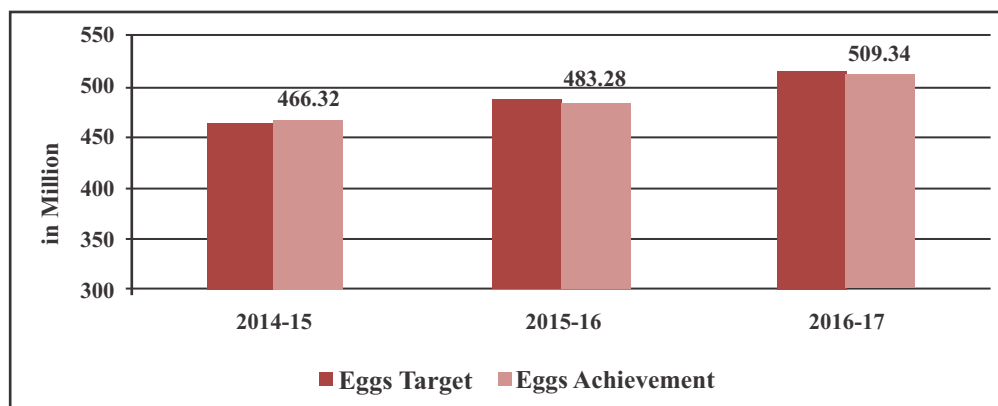
2. Poultry

In Jharkhand, the rural population specially the tribal are engaged in livestock farming. They give ducks, cocks and even goats. But it is necessary to establish nucleus of herds/flocks of improved breeds to ensure availability of quality germplasm for livestock and poultry improvement. Thus artificial Insemination center should also be increased from existing 815 to 1500 in the state.

For Poultry Development it is necessary that;

- a) Registration of state, district level poultry farms.
- b) Strengthening the state departmental poultry farms to encourage "Backyard Poultry Farming" among the unorganized sector of marginal farmers, landless labourers, women and socially backward population of the state by providing inputs to them. In remote areas the poultry farming is still trailing behind in the form of very small scale enterprise. Poultry is the main source of eggs, during 2014-15 -2016-17, the production of the egg has increased from 466.32million to 509.34 million. The production of eggs has observed 9.22 percent increase in this period (Figure 04).

Figure – 05 :Target and Achievement in Egg Production, 2014-15 to 2016-17
(Production in millions)

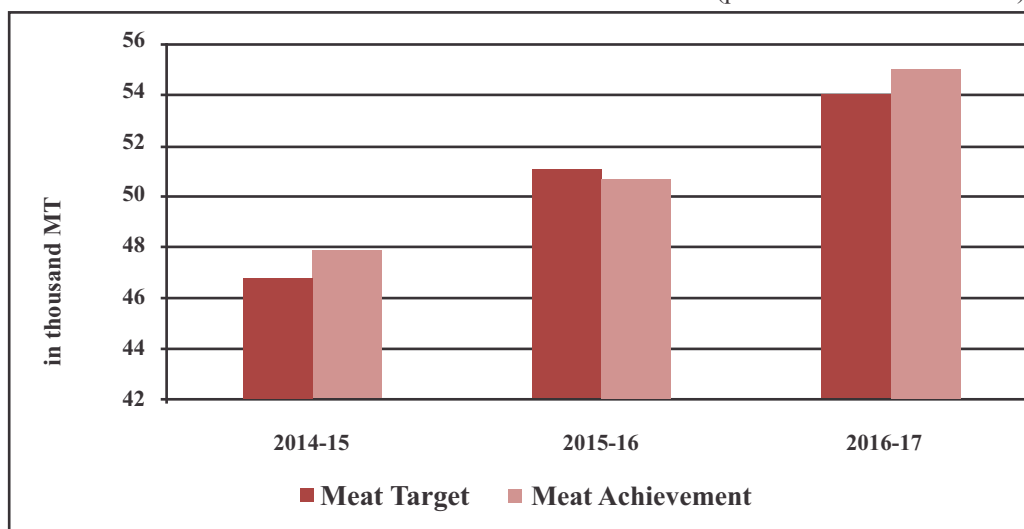


3. Goatry

Apart from poultry the state of Jharkhand is known for gouty. A significant population of rural areas are engaged in gouty. Jharkhand state has 6.5 million of goat population. Birsa Agriculture University has been doing a comandable job in gouty. The production of meat in the state has observed an increase during the period 2014-15 and 2016-17. During this period, the production of meat in Jharkhand increased from 47.86 thousand MT to 55.01 thousand MT, which has witnessed 15 percent increase(Figure 05).

Figure - 06 : Target and Achievement in Meat Production, 2014-15 to 2016-17

(production in thousand MT)



Source: Department of Animal Husbandry & Fisheries, Govt. of Jharkhand

For development of goutu in the state following steps are required;

- a) Implementation of cross breeding and selective breeding between elite and indigenous breeds of goats.
- b) Prevention of goats from different deadly diseases such as PPR, Anthrax, Enterotoxaemia etc .
- c) Implementation of artificial insemination programme for goat development.
- d) Intensive goat development as well as Cluster based goat production programme may be launched in the state.

4 Piggery

Jharkhand state has very rich potential in piggery development because of the tribal population. Piggery development in the state is good practices for enhancing the socio-economic status of the rural people of the state .

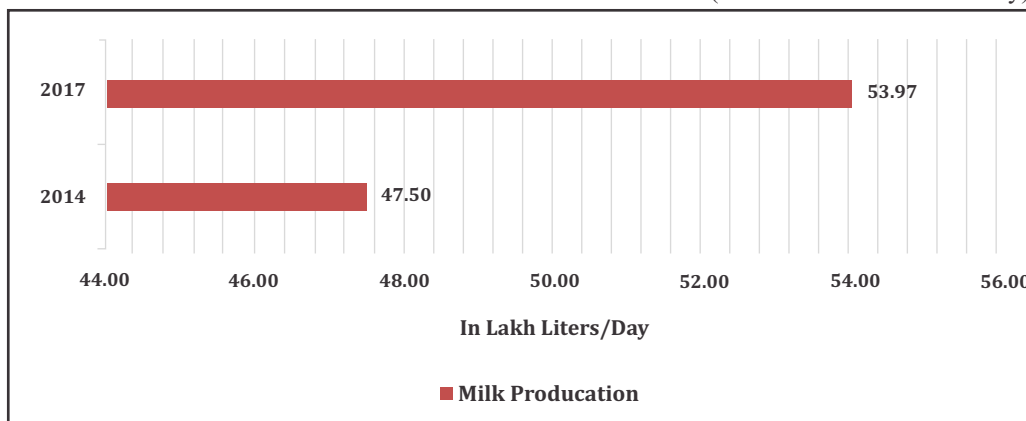
1. Distribution of T&D pig breeds to the farmers because of the suitability in the environment of Jharkhand.
2. Establishment of "Integrated Livestock Farming" with pig, poultry, duck and fish farming.

5 Dairy

Dairy farms are not popular among rural population however rural people keep one or two milch animal with them for personal use. The milk production in Jharkhand has witnessed 14 percent increase from 2014 to 2017. The milk production in 2014 was 47.50 lakh liters per day which have increased to 53.97 lakh liters per day(Figure 06).

Figure – 07 : Status of Milk Production in Jharkhand

(Production in lakh litres/day)



Source: Department of Animal Husbandry and Fisheries, Govt. of Jharkhand

The Jharkhand Milk Foundation aims to produce milk and distribute it widely. It works for the development of better machines for the greater milk output. It also works for the provision of the market by linking the producers to the larger market and facilitating the transactions. The government has allotted Rs 203.76 crore for 5 years to the Jharkhand Milk Foundation to implement the

programmes for the increment in milk production in the state. The construction of the Medha Dairy Plant in Hotwar, Ranchi has been initiated. The Rs 31.08crore worth plant will have a capacity of 1 lakh litres and will be laden with modern technology.

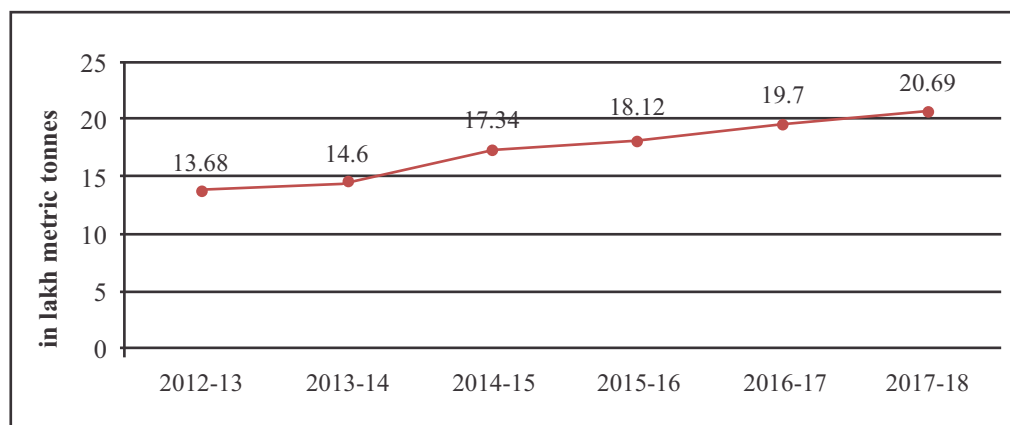
Table - 04: Establishment of Dairy and Milk Cold Centre in Jharkhand

Dairy/Name of Milk Cold Centre	Handling Capacity
Medha Dairy, Hotwar, Ranchi	100000
Lohardaga Dairy, Lohardaga	10000
Milk Cold Centre, Latehar	10000
Giridih Dairy, Giridih	5000
Deoghar Dairy, Deoghar	10000
Dhanbad Dairy, Dhanbad	5000
Koderma Dairy, Koderma	10000

Source: Department of Animal Husbandry & Fisheries, Govt. of Jharkhand

Figure – 08 : Progress in Milk Production during 12th Five Year Plan and Targets for 2017-18

(Production in lakh metric tonnes)



Department of Animal Husbandry & Fisheries, Govt. of Jharkhand

In order to increase the economic value of livestock sector and bridge the gap between requirement and availability of milk in the state, the improvement in animal healthcare, feed, fodder, drinking water, shelter, institutions etc may be addressed .

ISSUES OF AGRICULTURE DIVERSIFICATION IN JHARKHAND

Agriculture diversification is the need of the hour and Jharkhand has great opportunity of diversification of Agriculture, however new initiatives are required in this field. A paradigm shift is required in Agriculture planning if farming has to be made profitable and sustainable. The concerted efforts are required for diversification of agriculture in the state. Diversification may create additional employment opportunities, additional income to the farmers and may pave the way for the income of the farmers. Following issues are to be addressed:

a) Secondary Agriculture and Value addition

At present the secondary agriculture is virtually unexplored. Horticulture is a viable option of secondary agriculture. Solar driers can be popularized to prepare dried products of vegetables. Grading and packaging of fruits and vegetables at farmers' fields. Extraction of lycopene from tomato is one example where high value products can be derived from agricultural produce. Value addition of horticultural crops and targeting export markets offer immense opportunities for Jharkhand.

b) Integrated Approach for Crop Diversification and Animal Husbandry

Integrated approach in resource allocation on crops, Horticulture and livestock is needed depending upon the resource endowments and proportionate contribution of these sub sectors in States Agri. - GSDP. Promotion of knowledge - based Agriculture to find technological solutions with active involvement in the process of technological innovations and adoption.

c) Rice Fallow Management

Approximately 70% of the cultivated area during kharif is covered by rice in the State. Most of this area remains fallow during the rabi season, leading to cropping intensity level to 116% only as the irrigation potentials created so far is only 12% of the cropped area. The utilization of vast area under rice fallow is possible to a great extent by a shift to DSR (Direct Seeded Rice) with shorter duration varieties. There are about 1.0 million ha of rice fallow area in the state, which needs diversification particularly through pulse production every year to increase the cropping intensity to 150% in rainfed area.

d) Enhancement of Water use efficiency

The lands of Jharkhand state are undulating and in irregular slope in nature. Rainfall precipitation is approximately 1400mm inside the state, out of which 70 percent rainfall of total rainfall flowing intensively through steep slopes useless with arable valuable and fertile soil (Silt) particles and finally accumulates in Broad Rivers. The need for enhancing water use efficiency and productivity has been increasingly emphasized. This can be achieved by efficient use of available water, rain water harvesting, micro-irrigation and integrated watershed systems management.

e) Agricultural Marketing & Trade

Agriculture marketing is a major concern for agriculture development of the state. Jharkhand is a state of possibilities for Horticulture (vegetable/Fruits) production. It is estimated that the annual production of vegetables has achieved the 36 lac MT. A good proportion of these vegetables are being marketed in the neighboring states of U.P, Bihar, West Bengal, Orissa and Chhattisgarh by producers societies. The 28 APMCs are dotted with 602 nos. of Gramin hats which are the centres of trade for these agricultural produce apart from minor forest products (Deogharia P.C. 2017). The state after its

creation in the year 2000 has inherited undeveloped rural marketing infrastructures which will require huge financial resources for its restructuring.

In recent years, the state has taken steps to meet this gap. Apni Mandi Yojna in gramian hats of Ranchi APMC, is under process which comprises cleaning, grading, sorting and packing platforms along with 16 nos of cold rooms of 5 MT capacity with e-kiosk. Rural hats have witnessed manifold growth in vegetable production. It is being implemented with a view to link it to state and national markets to enable the farmers get a reasonable return at their produce.

f) Agro based Industries

Apart from above initiative it is important that the agriculture sector should be linked to industry such as food processing and other industries based upon agriculture. Development of an appropriate, farmer- centric institutional framework such as farmer producer Organizations (FPOs) to support production systems and forward linkages; and Promotion of Agriculture- industry linkages.

STEPS TAKEN BY STATE GOVERNMENT

State government of Jharkhand has taken steps for development of agriculture and its allied sector in the state. These steps may be helpful to the farmers for employment generations and acquiring additional income. The steps taken under different field are:

a) Horticulture

• Udhvaan Development Scheme

The scheme is aimed towards establishing and extending nurseries in the state. This will have nutritious fruits, plants, and vegetables. It will further develop the nutrition level of fruits and vegetables, variety of flowers, cultivation of banana, and house gardening. An allocation of Rs 5000lakh has been proposed for the plan for 2017-18.

• Gardening Mission

The scheme aims towards increasing gardening in 17 districts. The mission aims to extend gardening in areas which had not been covered before: Dhanbad, Koderma, Bokaro, Jamtara, Godda, Deoghar, and Purbi Singhbhum. An allocation of Rs 2100lakh has been proposed for the plan for 2017-18.

The state has unique advantage for cultivation of a wide range of horticultural crops. Nearly 29% increase in total area under horticultural crops in the state during last five years as compared to 15% at national level reveals the importance and potential of horticultural crops in Jharkhand. To promote horticulture in the state, the following areas need to be focused:

- i. High density orcharding and fruit based multitier cropping system
- ii. Scaling up of technologies for rejuvenation of old and senile orchards
- iii. To bring 0.02 million ha additional land under fruit crops
- iv. Improved packaging and quick transport system with cold chain should be developed for post-harvest handling of vegetables and value addition of produce.

b) Livestock Management and Development

The livestock management has to be reoriented away from the almost exclusive focus on induction of high yielding breeds. Extensive livestock systems, depending wholly or partly on resources of

commons and Agriculture residues, needs to be strengthened. This will require improvements in animal healthcare, feed, fodder, drinking water, shelter, institutions etc. The economic value of this sector to disadvantaged area is immense. However, very limited public support is available for these extensive livestock systems. Developing a strong fodder base requires intensive effort and innovations in institutional aspects related to protection, management and sharing of usufructs. The seasonal surpluses of milk production need to be economically utilized by creating enabling infrastructure for product diversification.

In spite of many reasons in present scenario in this sector like, poor genetic potential, huge shortage of feeds and fodder and lack of institutional support for improvement, health control etc. livestock development will be an integral part of the tribal agriculture in our state esp. during the non-cropping seasons. Therefore, livestock development should be given more importance or development of agriculture allied sector. The progress of different sectors are being discussed in this section.

c) Aquaculture

The state is experiencing wider variations in species performance along with fish productivity in different areas and ultimately profits of farmers. Aquaculture diversification and cage culture has opened up a new area of feed based farming. The state has distinction of large scale promotion of reservoir cage farming on a participatory mode by actively involving members of Fisheries Cooperative Societies. It has shown a production over 3 MT. per cage of 96 m³. The state has floated nearly 1500 cages in different reservoirs and another 2000 cages are in progress. This will create a demand of nearly 18000 MT. of factory formulated fish feed per annum. Nearly 18000 MT. factory formulated fish feed is being utilized in the state.³ Traditional fish farmers are also utilizing factory formulated fish feed as they are getting better results.

d) Dairy Development

The government has proposed to increase milk production to fill the gap and increase self-sustenance. It has proposed to increase cattle by providing the facility of artificial fertilization of dairy cattle at the panchayat level. For this, the 1440 existing centers are to be increased to 2500 centers. The government wants to provide special assistance to women. About 50,000 B.P.L. rural women are provided financial assistance and training. This is achieved by providing them with two cows at 90 percent subsidy. Further, they are linked with self-help groups to engage them in economic activities to make them financially independent. The rural women are linked with the members of SakhiMandali for milk production programmes, which increases dairy production, income, and female employment.

e) Backyard Poultry Farming

Government farm will be provided to the mother unit run by any suitable NGO/SHG who will rear there birds up to 28 days. There 28 day's chicks will handed over to the beneficiary to ensure their involvement in backyard poultry farming. The farmer will rear about 50 birds till their maturity i.e. 72 weeks. Eggs produced or culled poultry in beneficiaries house will be collected by the NGO/SHG, responsible for running the mother unit in that district, thus in this way forward as well as backward linkage will be ensured in this scheme. Establishment of new poultry hatcheries in each division of the state.

CONCLUSION

Agriculture sector contributed 16.2 per cent to Nation's GDP in 2014-15 (based on 2011-12 prices)

against 15.2 per cent in the 11th Plan. The country's population is expected to stabilize at 1.6 billion by 2050. Hence, per capita availability of land, water and other finite natural resources will continue to decline. On the other hand biotic (insect - pests and diseases) and abiotic stresses like flood, drought, etc are on the rise. Hence, meeting the future projected demand for food grains of 277 million tons by 2020 would require concerted efforts by states and Centre. This is more important in view of the crisis of weather aberrations and natural calamities occurring frequently. The issues related to risk management; food and fertilizer subsidies, land policies, diversification, investments, price and procurement of farm produce require prime attention. Along with these strengthening of supply chains, improving non farm income and infrastructure and support services and improvement in agri.-research & extension, etc are also important. To address these, a task Force on Agricultural Development under the chairmanship of Vice - Chairman, NITI Aayog has been constituted.

The flagship programmes of Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), Rashtriya Krishi Vikas Yojana (RKVY), National Horticulture Mission (NHM), Artificial Recharge of Ground water, repair Renovation and Restoration of water bodies are directly linked to Agriculture. The Convergence of Central Sector schemes (CSS) will include pooling resources, both human and capital, transfer of productive and eco-friendly technologies and value addition through provision of backward and forward linkages. There are certain policy challenges that need to be addressed.

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