



Tribal Sub-Plan Programme

ANNUAL REPORT

2015-2016

A Step Towards Improving Livelihood of Tribal Farmers Through Improved Technology Interventions in Integrated Agri-Aquaculture



ICAR-National Institute of Abiotic Stress Management

Malegaon, Baramati, Pune, Maharashtra, India 413 115

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Director, ICAR-National Institute of Abiotic Stress Management, Malegaon, Baramati, Pune, MH, India 413 115.

Foreword

Indian tribal people play a key part in constructing the cultural heritage of India. They occupy a major part in the history of India as they are considered as the true habitants of India. The tribal people are scattered in different parts of India and they form a considerable number of the population of India. The traditional and cultural distinction of each tribal community has made them distinguishable from each other and their cultural and traditional heritage add colour and variation to the Indian culture as a whole and form a compact culture. Indian tribal people reside in approximately fifteen percent of the country's area. There is a need to address the farmers about importance of complementary agribusiness enterprises like backyard poultry, livestock and fishery, besides doing the farming using improved scientific practices. In addition, proper marketing for improving their livelihood is also required. Tribal agriculture is characterized by low technology and low input resources and therefore, the nature of the agricultural productivity of various crops in the tribal areas is very low. For overcoming these lacunas, Tribal Sub Plan (TSP) on behalf of ICAR, New Delhi, National Institute of Abiotic Stress Management, Malegaon constituted TSP implementation committee to take an initiative towards the livelihood improvement of tribal farmers through sustainable integrated farming. I thank the TSP Implementation Committee, led by Dr KK Krishnani, who made tremendous efforts for implementation of improved technology intervention in Agri-aquaculture. The committee has worked with a moto to assist the sustainable development of livelihood of tribal farmers by improved technology interventions in field Crops, horticultural crops, Livestock and poultry, Fisheries and integrated agri-aquaculture. The important activities related to implementation of improved technology interventions in field and horticulture crops, dairy, poultry, fish farming and integrated agri-aquaculture by the TSP Implementation Committee in tribal villages of Navapur tehsil have been documented in this annual report. I am sure that this information will be a very useful and practical guide to all those involved with implementations of various community development programmes, especially in tribal areas.

(Narendra Pratap Singh)

Preface

The nomadic tribes of Maharashtra are spread over large areas, mainly in Nandurbar and Gadchiroli districts. These tribes have a rich heritage of culture that is distinctly different from other social groups. The major occupation of tribal community is Agriculture. The land holding of this community is very small and fragmented. So the economic condition of most of the rural tribal community is poor. At the same time, agriculture inputs and new information about agriculture are to be reached optimally to these areas. Considering such situation in tribal area NIASM has been working at Navapur tehsil and Nandurbar district of Maharashtra. The grass root constraints were decided by undertaking baseline surveys and group discussions. By focusing these constraints and available resources, Tribal Sub Plan (TSP) Implementation Committee has decided to work with moto "Implementation of Improved agriculture technology interventions in Field crops (rice and sugarcane), Horticultural crops (Banana, Dragon fruit, Onion, other vegetables), Livestock and Poultry, Fisheries and integrated agriaquaculture/Integrated farming for livelihood improvement of Tribal farmers. Various training programmes, field demonstrations, farmers/group meets, and exposure visits were organised by a TSP implementation committee, which has a positive effect on livelihood of tribal farmers by accepting the knowledge and experience shared by the committee. Also tribal farmers got additional benefits through successful implementation of backyard poultry, and dairy units. The experience of working with tribal farmers has given an opportunity not only for the tribal farmers, but also for us to interact with them. This has definitely enhanced their knowledge besides uplifting livelihood which leads to a great success due to the sincere efforts of the TSP Implementation Committee.

We express our deep sense of gratitude to all those individuals and institutions for extending their help and cooperation in implementing the TSP programme successfully. Not only the scientists and experts of the ICAR and Non-ICAR institutions, assistance and cooperation extended by MPKV (Rahuri), MSSC (Mahabeej), and KVK (Baramati, Babhaleshwar) deserves special mention. We are thankful to our dedicated team Shri Shrikant Karale (YP-I-TSP), Shri Kishan Gavit, and Shri Vilas Vasave who have worked tirelessly in the field and were behind the conduct of various field demonstrations and organization of various HRD programmes.

Chairman TSP Implementation Committee

Executive Summary

The Nandurbar District is one of the tribal districts of Maharashtra, which offers a very conducive climate for the growing variety of horticultural and plantation crops. Major field crops are paddy, kharif and rabi jowar, bajara, wheat, tur, soybean, gram, groundnut, cotton, sugarcane etc. Major fruit crops are mango, banana, papaya, ber, custard apple, anolla, guava, chiku, pomegranate, tamarind etc. The important vegetables grown in the district are onion, tomato, brinjal, beans, okra and pumpkin. The farmers concentrate mainly on crop production, which is subjected to a high degree of uncertainty in income and employment to the farmers. In this contest, it is imperative to evolve a suitable strategy for augmenting the income of a farm. Integration of various agricultural enterprises viz., cropping, animal husbandry, poultry, fishery and integrated agri-aquaculture has great potentialities in the agricultural economy. In this direction, ICAR-NIASM has implemented improved technology interventions in field crops, horticulture, livestock, poultry, fisheries and integrated agri-aquaculture in various villages of Navapur Tehsil in Nandurbar District for improving the livelihood of resource poor farmers as part of Tribal Sub-Plan (TSP). These activities not only provided additional income to the farmers, but also created employment opportunities in the rural areas for a whole year. The integration of fish culture with livestock or cash crops, holds a considerable potential for augmenting production of animal protein, generation of employment opportunities in the rural areas and improvement of socio-economic conditions of the farmer. Various training programmes, field days, exposure visits pertaining to technology interventions in rice, sugarcane, banana, rabi onion, fodder, dairy, backyard poultry, fish farming, and integrated agri-aquaculture were conducted. Availability of fish seeds from a nearby hatchery was encouraging for farmers to adopt agri-aquaculture. Improved technology interventions led to higher production/marketable yield of rice, Sugarcane), onion, banana, milk, eggs and fish.

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About The Tribal Plan

Balanced growth and economic development is the ultimate aim of every country and the strategic plans (Fifth five year plans as in case of India) are designed accordingly. After 25 years of independence, and successful completion of four five year and three annual plan, it was realized by policy makers that the Scheduled Tribes are still way behind the mainstream development process. Apart from this, it was also been realized that the general plan schemes and programmes designed for the overall development of the economy hardly improved their socioeconomic status. Similarly, the benefit of such general welfare schemes did not percolate down towards the development of the STs population of the country in any significant manner. In order to address these issues, the Tribal Sub-Plan was initiated during Fifth Five Year Plan) for the socioeconomic amelioration of the tribal communities.

The basic objective of Tribal Sub-Plan is to channelize the flow of outlays and benefits from the general sectors in the Central Ministries/Departments for the development of Scheduled Castes and Schedules Tribes at least in proportion to their population, both in physical and financial terms. The Mid Term Appraisal of the Eleventh Plan has noted that several Central Ministries/Departments have not earmarked adequate funds to TSP, proportionate to the share of STs in the population.

Consequent upon the implementation of the recommendations of the Task Force constituted under the Chairmanship of Member, Planning Commission for review of the operational guideline implementing of Tribal Sub-Plan (TSP), the Competent Authority in the Indian Council of Agricultural Research has approved the creation/setting up of a 'Tribal Sub-Plan (TSP) Cell at ICAR Headquarters. This cell shall function under the overall supervision of the Liaison Officer, who would also be the Nodal Officer for ensuring effective and meaningful implementation of the Tribal Sub-Plan under Plan outlay shall be the responsibility of the PIM Section of the Council, the TSP Cell would be responsible for proper monitoring of Tribal Sub-Plan funds and also for looking after the interests of Scheduled Tribes in the Council with the clear objective of bridging the gap in socioeconomic development of the Scheduled Tribes.

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TSP implementation committee

ICAR - National Institute of abiotic stress management, Malegaon, Baramati has purposefully selected Nandurbar District for livelihood improvement of tribal farmers through improved technology interventions in field crops, horticultural crops, livestock, poultry, fisheries and integrated agri-aquaculture. In order to focus each and every aspect of objectives, multi-disciplinary TSP implementation committee has been constituted, that was the pillars of the bridge between the tribal farmers and improved livelihood through sustainable agricultural development.

Scientist	Designation	Specific contribution
Dr. PS Minhas	Director, ICAR-NIASM,	Guidance and Monitoring of TSP activities
	Baramati	related to implementation of improved
		technology interventions in crops, livestock
		and fisheries.
Dr. KK	Principal Scientist	Implementation of Improved technology
Krishnani	(Agricultural Chemicals)	interventions in field crops, horticulture crops,
	I/c-Head-School of	livestock, poultry, fisheries and aquaculture;
	Edaphic Stress	Organisation of training programmes, Field
	Management	Day, Exposure visits and group meetings; Soil
		health assessment/card based fertilizers
		recommendations; Integrated nutrient
		management in field and horticulture crops
Dr. NP.	Principal Scientist	Implementation of Improved technology
Kurade	(Veterinary Pathology)	interventions in livestock and poultry:
		Organisation of training programmes related
		to dairy farming, backyard poultry and goat
		rearing techniques, breeding, feeding and
		disease management.

Dr. DP Patel	Principal Scientist	Implementation of Improved technology
	(Plant Physiology)	interventions in field crops (Rice and
		Sugarcane); Organization of farmers field day/
		training programmes on Four point rice
		production technology
Dr. AL	Scientist	Implementation of improved technology
Kamble	(Agricultural Economics)	interventions field plant crops and livestock;
		Impact assessment of technologies
		disseminated to tribal farmers; Marketing
		strategies related to plant crops and livestock
Dr Neeraj	Scientist	Implementation of improved technology
Kumar	(Fish nutrition)	interventions in fisheries
Dr AV.	Chief Technical Officer	Training and assistance in Implementation of
Nirmale	(Animal Nutrition)	improved technology interventions in
		livestock and poultry

Based on the resource assessment, characterization and baseline survey carried out in the tribal areas of different Tehsils of Nandurbar District, concentrated efforts were taken up by the TSP Implementation Committee to help generate additional income by the small and marginal farmers and landless labours from major field and horticulture crops besides subsidiary occupations/other allied activities including dairy, goatery, poultry, and fisheries. Tribal farmers from three different Tehsils were adopted after consultation with the tribal council and village captains to improve the farming system through integrated farming system approach.

Socio-economic profile of the identified tribal area: Nandurbar District

The topographically Nandurbar district has vast diversity. The Agriculture mostly is rain-fed. Availability of water during summer is a major concern in some of the villages. The traditional livestock farming in the villages selected was highly primitive. Vast stretches of grazing land and existing livestock based economy are in tune with the available agroecological situation. With this plus point of natural resources there is tremendous scope for Animal husbandry in the upliftment of livelihood and economic condition of the tribal families.

Nandurbar district is the 4th largest Tribal District of Maharashtra. The population of the district is 16.48 lakhs of which 69% population is Tribal. The District has now been declared as most backward and undeveloped District of Maharashtra. The District comprises of six Tehsil's viz., Nandurbar, Navapur, Taloda, Shahada, Akkalkuwa and Akrani. As a whole, the District is divided into two river basins viz., Tapi and Narmada. Tapi river flow from East to West in the District. The Tapi river basin in the southern part is a fertile plain. Narmada flow through Satpuda Mountain ranges a very little hilly part of the District lies in Narmada basin.



District wise Total and Tribal Population of Maharashtra State (as per 2011 Census)

Sl. No	State/Division/District	% Tribal Population		
Maharashtra State		9.35		
1.	Mumbai City	0.81		
2.	Thane	13.95		
3.	Raigad	11.58		
4.	Ratnagiri	1.28		
5.	Sindhudurg	0.82		
Total - K	Conkan Division	7.01		
6.	Nashik	25.61		
7.	Dhule	31.55		
8.	Nandurbar	69.30		
9.	Jalgaon	14.28		
10.	Ahmednagar	8.32		
Total- N	ashik Division	23.33		
11.	Pune	3.70		
12.	Satara	1.00		
13.	Sangli	0.64		
14.	Solapur	1.81		
15.	Kolhapur	0.77		
Total - Pune Division		2.15		
16.	Aurangabad	3.86		
17.	Jalna	2.14		
18.	Parbhani	2.23		
19.	Hingoli	9.52		
20.	Beed	1.28		
21.	Nanded	8.39		
22.	Osmanabad	2.17		
23.	Latur	2.32		
Total-Au	rangabad Division	3.98		
24.	Buldhana	4.83		
25.	Akola	5.51		
26.	Washim	6.77		
27.	Amravati	13.98		
28.	Yavatmal	18.54		
Total-Ar	nravati Division	10.87		
29.	Wardha	11.53		
30.	Nagpur	9.41		
31.	Bhandara	7.42		
32.	Gondia	16.18		
33.	Chandrapur	17.65		
34.	Gadchiroli	38.68		
Total- Na	agpur Division	14.42		

Geographical Details

Nandurbar is located in the North western side of Maharashtra State. The District Head Quarter of Nandurbar District is Nandurbar. The district is bounded to the south and southeast by Dhule district, to the west and north is the state of Gujarat, to the north and northeast is the state of Madhya Pradesh. The northern boundary of the district is defined by the great Narmada river. The district comprises 6 tehsils. These tehsils are Akkalkuwa, AkraniMahal (also called Dhadgaon), Taloda, Shahada, Nandurbar and Navapur. There is one LokSabha constituency in the district, which is Nandurbar (ST) reserved for ST. There are four Maharashtra Assembly seats namely Akkalkuwa (ST), Shahada (ST), Nandurbar (ST), Nawapur (ST). Sakri (ST) and Shirpur (ST) assembly seats from Dhule district are also part of Nandurbar LokSabha seat. Nandurbar is primarily a tribal (Adiwasi) District.

Area	5034 Sq. Km.
Location	21.0 to 22.03 North axis 73.31 to 74.32 East axis.
Main Rivers	Tapi, Narmada
Climate	Dry
Rainfall	859 mm
Adjoining States	Gujrat, Madhya Pradesh
Adjoining Districts	Dhule From Maharashtra

Demographics of Nandurbar District

As of 2001 India census, Nandurbar District had a population of 1,311,709 being 50.62% male and 49.38% female. Nandurbar District has an average literacy rate of 46.63%, male literacy is 55.11%%, and female literacy is 37.93%. .Languages/Dialects used in Nandurbar District are Ahirani, Bhili, Pardhi, Marathi, Hindi, Gujari.

District	Tehsil	Total Population,	Tribal Population,	% Tribal
		(Nos.)	(Nos.)	Population
	Taloda	159654	123634	77.44
	Akrani/Dhadgaon	195754	187806	95.94
NT 1 1	Akkalkuwa	245861	209586	85.25
Nandurbar	Nandurbar	367446	167431	45.57
	Navapur	271852	232501	85.52
	Shahada	407728	220975	54.20
Average Tribal Population (%)				69

Tehsil wise Total and Tribal Population of Nandurbar District (as per 2011 Census)

Climate

The Climate of Nandurbar District is generally hot and dry. Summer is from March to mid of June. Summer season is usually hot and dry. During the month of May the summer is at its peak. Temperatures can be as high as 45 degree Celsius during the peak of Summer. The Monsoon sets in during the mid or end of June. During this season the weather is usually humid and hot. The northern and western regions receive more rainfall than the rest of the region. The average rainfall is 859 mm through the district. Winters are mildly cold but dry.

Seasons	Start	End
Summer	March	Mid June
Monsoon	Mid June	October
Winter	November	February

Agriculture

Main Crops	: Jowar, Wheat, Rice, Toor, Groundnuts, Chilly.
Annual Crops	: Sugarcane, Cotton.
Area under Cultivation	: 2,53,413 Ha.
Crop Pattern	: Kharif (approx. 800 villages)
	Rabi (approx. 130 villages)
Fruits	: Mango, Custard Apple, Banana

The agriculture department considers farmer as the focal point and the whole department is organized in such a fashion that a single mechanism is working to facilitate the farmer for adoption of advanced technology and sustainable use of available resources. Every agriculture assistant working at the village level has a jurisdiction of three to four villages with a number of farmers limited to 800 to 900 which facilitates more interaction for easier transfer of technology.

Agriculture Assistant at village level undertakes soil conservation work, horticulture, plantation and various extension schemes. He is supervised by the Circle Agriculture Officer at circle level. Administrative control, lesion with other departments, monitoring and training programs, etc. are facilitated by Tehsil Agriculture Officer at Tehsil level, Sub Divisional Agriculture Officer at subdivision level, District Superintending Agriculture Officer at district level and Divisional Joint Director at division level. In addition, Agriculture Officer at Panchayat Samiti level, working under Agriculture Development Officer, Zilla Parishads at district level also implements various agro-inputs related schemes.

All the schemes implemented in the field are supervised technically and administratively by respective directorates of Soil Conservation, Horticulture, Extension and Training, Inputs and Quality Control, Statistics, Monitoring and Evaluation and Planning and Budget at the state level in the Commissionerate of Agriculture. Also separate sections are there for the Establishment and Accounts related matters.

Project Details

Project Title: A Step Towards Improving Livelihood of Tribal Farmers Through Improved Technology Interventions in Integrated Agri-Aquaculture

Strategies for tribal farming system improvement



Six strategies adopted by TSP implementation Committee for improving tribal farming system in Nandurbar District

- 1. Constitution of TSP implementation Committee for improving tribal farming system: In order to focus each and every aspect of objectives, TSP implementation committee consisting of multi-disciplinary scientists was constituted that has undertaken activities related to improved technology interventions in field crop, horticulture, livestock, poultry, fisheries for improving the livelihood of resource poor tribal farmers in different village of Navapur Tehsil of Nandurbar District during 2015 to 2016 as part of Tribal Sub-Plan (TSP).
- 2. Input support / Introduction of suitable high yielding varieties / animals breeds / fish species: In tribal villages, high yielding varieties, (rice certified seeds of improved variety, Improved late kharif and rabi onion varieties of quality potential and long storability, virus free tissue culture banana plants), Fertilizer briquettes, and dual purpose chicks along with designed poultry cages, dairy animals and IMC/Fish seeds/fingerlings were distributed to the tribal farmers of different villages of Navapur Tehsil of Nandurbar District during 2015 to 2016
- 3. Implementation of improved technology interventions in Integrated agriaquaculture: In order to capitalize on the potential of the agricultural sector in the Nandurbar District so as to improve the productivity in this sector and thus enhance the livelihood of resource poor farmers, and the incomes of farmers, TSP implementation committee has successfully implemented integrated agri-aquaculture in terms of improved technology interventions in field crop (rice, sugarcane), horticulture (Rabi onion, virus free tissue culture banana, livestock (dairy farming), fodder, backyard poultry farming, fisheries (Indian major carps aquaculture) and integrated Crop-Livestock-Fisheries.
- 4. Capacity building: The success of any technology depends on the effective dissemination and its adoption by the stakeholders. Hence, efforts were made to organize number of capacity building programmes such as trainings, field day, on farm demonstrations, exposure visits to Institute research farms / KVK / animal/ fish farms of line departments / successful farmers apart from effective use of local news media for popularization of the technologies and innovative approaches to enhance livelihood of tribal farmers. Feedback was also obtained from the tribal farmers in order to further improve the programmes.
- 5. Assessment and mitigation of abiotic and biotic stresses: Integrated nutrient management/ Nutrient use efficiency / Resource use efficiency / Soil health assessment-card based fertilisers recommendation / innovation in Integrated pest management in field and horticulture crops; Application of Deworming medicines, bypass fat and mineral

mixture in dairy; Application of zeolite based nanocomposite for mitigation of multiple stresses in aquaculture; Soil and water quality management.

6. **Improvement of the livelihood security of the tribal farmers:** The basic approach was to significantly improvement of livelihood of tribal farmers through agricultural diversification, value addition, improvement in water productivity within the tribal social system and dissemination of suitable technologies to improve the production of field and horticulture crops, livestock and fish.

Conceptualization of research / extension work

Considering the physical, socio-economic limitations and all other above facts, ICAR-National Institute of abiotic stress management, Baramati has purposefully selected various villages of Navapur Tehsil of the Nandurbar District and accordingly, improved technology interventions in Integrated farming for livelihood improvement of tribal farmers were conceptualized with the following objectives:-

- 1. Characterizing and upgrading existing farming systems.
- 2. Assessing the effect of climate change, abiotic and biotic stresses on the production and developing suitable adaptation strategies.
- 3. Disseminating improved technology interventions / technologies for agricultural diversification major field and horticulture crops.
- 4. Disseminating improved technology interventions / technologies in livestock (Dairy) and poultry for livelihood improvement of tribal farmers.
- 5. Disseminating improved technology interventions / technologies in fisheries and aquaculture for livelihood improvement of tribal farmers.
- 6. Enhancing livelihood and nutritional security in tribal areas through introduction of suitable crop varieties/animals breeds/fish species and production technologies
- 7. Development of household based other off-farm activities including backyard farming supported by technological innovations through value addition for income diversification.
- Organising training programmes / exposure visits / field day / workshops related to improved technology interventions in field & horticulture crops, livestock, poultry and fisheries.

Tribal villages / tribal farmers targeted:

Based on the resource assessment, characterization and baseline survey carried out in the tribal areas of different Tehsils of Nandurbar District, concentrated efforts were taken up by the TSP Implementation Committee to generate further income of small and marginal farmers and landless labours from the major field and horticulture crops and subsidiary occupations/other allied activities including dairy, poultry, and fisheries. Tribal farmers from Navapur Tehsil were adopted after consultation with the tribal council and village captains to improve the farming system through improved technology interventions in field and horticulture crops, livestock, poultry and fisheries.

Gadad	Bandharpada	Wagadpada	Pimplad
Jamtalav	Neemdarda	KaranjiBk	Wadsatra
Savrat	KaranjiKh	Pimpran	Kamahka
Vadsatra	Philwandpada	Bhardu	Baedipada
Devakipada	Mugdhan	Kanahal	Maharkadu
Wagdi	Bhaware	Bardipada	Kolda
Chitvi	Bokulsar	Mahakukud	Pimplapada
Nagjhari	Bhawre	Tilasar	Chowky
Bokhaljhar	Lawadpada	Wadhavpada	Borepada

Villages from Navapur Tehsil of Nandurbar District

Sub-project	Objectives	Activities			
Improved technology interventions in field crops	Improved technology interventions in rice	 On-farm demonstration of "Four point ric production technology" on farmers field Yield performance of rice variety Indrayani Organization of farmers field day on rice crop 			
	Improved technology interventions in sugarcane	 Demonstrations on "Water efficient crop production technology in sugarcane" Organization of farmer's field day on Sugarcane crop 			
Improved technology interventions in horticultural	Improved technology interventions in banana	 Training of farmers regarding scientific banana cultivation. Virus free tissue culture banana cultivation 			
crops	Improved technology interventions in onion	 Onion nursery raising in tribal areas of Navapur High yielding and long storage varieties of <i>Rabi</i> onion 			
Improved technology interventions in livestock	Improved technology interventions in dairy	 Deworming and mineral mixture supplementation Fodder production/demonstration plots Dairy Buffalo farming with better breed 			
	Improved technology interventions in backyard poultry	 Group meetings with tribal farmers on "Backyard Poultry Farming" Organization of training programmes at two different villages Distribution of fabricated cages for poultry. Distribution of improved Vanraja backyard poultry birds Distribution of other inputs viz. waterers, feeders, and feed to selected farmers. 			
Improved technology interventions in fisheries and aquaculture	Improved technology interventions in IMC aquaculture	 Distribution and stocking of IMC seeds Demonstration of Farm pond preparation On farm demonstration of measurement of water quality parameters Organization of farmer's field day on fish culture 			
Improved technology interventions in Integrated agri- aquaculture	Improved technology interventions in Integrated IMC aquaculture	 Integrated dairy cum Fish farming Integrated poultry cum Fish farming Integrated Agri-aquaculture 			

The planned milestones

Organisation of Research/Extension work

Multidisciplinary team/TSP implementation committee analyzed the existing farming systems, identified the constraints and potentialities of target areas, then planned and implemented improved technology interventions in field crops, horticulture crops, dairy, goatery, poultry and fisheries, integrated agri-aquaculture through the proper coordination among scientific team, targeted tribal society and other stakeholders in following SIX steps



- 1. Socioeconomic analysis and selection of farmers for distribution of inputs
- i. Baseline survey of a large number of villages of different Tehsils of Nandurbar District and selection of villages in Navapur Tehsil.
- ii. Socioeconomic analysis of tribal farming systems for prioritization of constraints
- iii. Climate change, abiotic and biotic stresses and impact studies.
- iv. Setting of milestones individually and collectively by the multidisciplinary TSP team.

- v. Selection of tribal farmers / beneficiaries / enthusiasts by TSP implementation committee.
- vi. Distribution of necessary inputs (capital and general) to the identified tribal farmers for improving the efficiency of various farming activities.Distribution of necessary inputs (capital and general) to the identified tribal farmers for improving the efficiency of various farming activities.

2. Development of technologies for improving the productivity and diversification of existing farming system

- i. Implementation of improved technology interventions in rice through making participatory demonstration of four point rice production technology.
- ii. Promoting plantation of Gliricidia as live fences, and green leaf manure for crop production and animal forage as well
- iii. Implementation of improved technology interventions in sugarcane through making participatory demonstration of "Water efficient crop production technology in sugarcane"
- iv. Implementation of improved technology intervention in rabi and late kharif onions through proper nursery and transplanting management in improved rabi onion varieties with high yield, quality potential and long storability
- v. Improved technology intervention in banana through water use efficiency in virus free tissue culture cultivar and suckers
- vi. Implementation of improved technology interventions in livestock farming (dairy farming) and fodder
- vii. Implementation of improved technology interventions in animal fodder
- viii. Implementation of improved technology interventions in IMC aquaculture

3. Development of household based other off-farm technologies

- i. Backyard poultry farming
- ii. Preparation of fish feed
- iii. Compost preparation in HDPE composts production units
- iv. Soil sampling and analysis for 12 different parameters for the generation of Soil health cards / Soil health assessment / card based fertilizers recommendation

4. Development of entrepreneurship among the potential tribal farmers through agricultural diversification strategies for nutritional security

- i. Implementation of commercial fish farming through creating awareness about advantages of farm pond preparation, IMC aquaculture.
- ii. Implementation of integrated crop-livestock-poultry-fisheries.

5. Technology dissemination

- i. Imparting necessary skills through conduct of several on station and on farm capacity building programs in the form of trainings, field day, Field visit to successful farmers field, expert visits, group interaction, field day, training programmes, group meetings and exposure visit to research farms/KVK.
- ii. Agricultural soil health assessment based fertilizers recommendation:
- iii. Technology dissemination through local news media print media, apart from publication of folders, bulletins etc.

6. Periodical review/Monitoring for formulation of developmental strategies and improvement

- i. Farming system and socio-economic characterization in the tribal dominated areas of Navapur Tehsil of Nandurbar District.
- ii. Periodic review of the progress of various activities related to improved technology intervention and planned developmental activities to improve the livelihood security and agricultural diversification at the institute level by TSP implementation / monitoring committee / Director.
- iii. Formulation of developmental strategies for the improvement and diversification of the tribal farming systems based on the constraints, capabilities and priorities expressed by the farmers.

Improved technology interventions in field crops

Rice and sugarcane are the two major field crops grown by most of the tribal farmers in the selected villages of TSP project area of Navapur Tehsil in Nandurbar district of Maharashtra. However, productivity of both the crops is far below as compared to other parts of Maharashtra. Therefore, demonstration of technological interventions in rice and sugarcane was planned for the year 2015-16.

Demonstration of improved technological intervention in rice

A large number of villages in Navapur Tehsil of Nandurbar district were surveyed and farmers were contacted for demonstration of improved technological interventions in rice crop. During meetings held with various group of farmers, detailed information related to pre-sowing seed treatment, raising of healthy and water efficient rice nursery were given to the farmers. Certified seeds of rice varieties Indrayani were distributed to each of all the selected farmers for raising nursery for transplanting in one acre area each. Participatory demonstration of "Four point rice production technology" have successfully been implemented. In addition, plantation of *Gliricidia* has been promoted among the farmers selected for rice crop intervention as live fences, which can also be used as green leaf manure for crop production and animal forage.

Urea briquettes to improve N-use efficiency:



The Urea-DAP briquettes agro-technology is known to considerably improve fertilizer use efficiency. But due to non-availability of Urea- DAP briquettes in local markets, adoption of 'Charsutri' (four line) method of paddy cultivation in Navapur was hampering. Hence, farmers training programmes were organized on 8th and 9th July 2015 at Visarvadi and Navapur, respectively for creating awareness about "Four point rice production technology" among the tribal farmers of the Navapur Tehsil of Nandurbar district. A large number of farmers participated in the training programme at Visarvadi (182) and Navapur (139). During the training programme farmers were also sensitized for growing of *Gliricidia sepium*- a multipurpose forage grain legume tree. 600 saplings of Gliricidia were also distributed to 120 farmers. Farmers were advised to grow Gliricidia as hedgerow on field boundaries in place of Jatropha plants for protection of their crops from grazing/stray animals. Loppings of Gliricidia can be used as green leaf manure for crop production and fodder for animals.

Farmer's field day on rice crop was organized on 3rd & 4th November 2015 at Gadad and Chitvi villages, respectively, where more than 250 farmers from nearby villages participated and exchanged their idea. Crop cutting from 1.0 meter x 1.0 meter was also done in presence of farmers for assessment of yield performance of rice variety Indrayani. Farmers were also taken to the rice fields grown with local varieties and hybrid rice and their performance were compared with given variety Indrayani.



The yield performance of var. Indrayani under demonstration was found more or at par with best hybrid rice variety grown in the area. Interaction and discussion was also held with farmers for assessment of the overall impact of various technological interventions on performance of rice crop var. Indrayani over local practices compared to local and hybrid rice.

Average yield achieved in this area ranged from 6.2-10 tonnes/ha, with the gross return of Rs 1.21 Lakhs/ha. Implementation of improved technology intervention led to adoption of four point rice production technology in Navapur villages.

Demonstration of improved technological intervention in sugarcane

A large number of villages in project area of Navapur Tehsil of Nandurbar district were surveyed and farmers were contacted for demonstration of technological interventions in sugarcane. Farmers were sensitized through personal contact and meetings about the importance of limited availability of water for irrigation, of which a large amount is being used for cultivation of rice and sugarcane following the flood method of irrigation. Farmers were convinced for adapting the water efficient cultivation technologies in sugarcane. Farmer's participatory demonstration on "water efficient crop production technology in sugarcane" was planned and discussed with the farmers. Regular monitoring of progress in sowing and management of sugarcane crop was done through training, interaction with individual farmers and farmers group. Most of the selected farmers adopted improved method of planting along with drip system of irrigation.

Improved technology interventions in horticulture

Improved technology interventions in onion:

Maharashtra is the largest producer of Onion producing about 33% of the total production of onion in the country, involving 4.91 m MT from an area of 0.42 M ha, having productivity of 11.8 MT/ha. It is mainly grown in Nasik, Ahmednagar, Pune, Satara, Sholapur, Dhule and Jalgaon districts. There is a huge demand of onion in the export market. The state contributes to about 85% of the total onion export. With the setting up of processing industries, the demand for processable varieties, having high TSS has also increased. The Maharashtra State Agri Marketing Board along with the Directorate for Onion & Garlic Research, Rajgurunagar and NHRDF has developed technology for onion storage, which is being promoted in the state. During 2015-16, improved technology intervention in Rabi onion (var. AFLR, N-241, Bhimakiran) have successfully been demonstrated to 971 tribal farmers / beneficiaries in 21 villages of Navapur.

Nursery raising

Proper nursery management is important operations in the onion crop. About 0.05 hectare nursery area is enough for getting seedlings to transplant in one hector. Seeds were sown in lines at 50mm to 75mm apart to facilitate the removal of seedlings for transplanting and quick weeding etc.

Transplanting

Proper care was taken by the farmers while selecting seedlings for transplanting. Over and under aged seedlings were avoided for better establishment. At the time of transplanting, one third of the seedling top was cut to get good establishment. The optimum spacing of 15 cm between the rows and 10 cm between plants were maintained.

Average yield achieved in this area ranged from 36.11-63.68 tonne/ha. The average price received by farmers is Rs 5000 per tonne, with the gross return of Rs 1.8-3.18 Lakhs/ha. Implementation of improved technology intervention in vegetable crops led to adoption of rabi and late kharif onions in Navapur and Nandurbar villages.

Improved technology interventions in banana

Maharashtra is the second largest producer of Banana after Tamil Nadu in the country and contributes to about 14.4% of the total production of banana in the country. The state produces about 4.3 m. MT of banana from an area of 0.08 m ha with a productivity of 52.5 t/ha. Main varieties grown in the state are Dwarf Cavendish, Basrai, Robusta, Lal Velchi, Safed Velchi. The cultivation is concentrated in the Jalgaon, Ahmednagar, Dhule, Nanded, Parbhani regions of the state. There is a lack of post-harvest infrastructure for banana. Substantial quality of the produce is being marketed outside the state.

DBT and ICAR-NRCB certified virus-free tissue culture banana plants var. Grand Nain were procured and distributed to identified farmers at Chitwi and Vadsatra villages. During meetings held with the farmers, detailed information related to the pit preparation, application of FYM, Neem cake, application of water soluble fertilisers with drip irrigation and methods for preventing insects were disseminated to the farmers. The use of drip irrigation led to adoption of water and nutrient use, efficient cultivation technologies in banana. The banana have been traded in organized markets with average price of Rs. 5/kg with a gross return of Rs. 3.15 Lakhs.

Improved technology interventions in livestock

Vast stretches of grazing land and existing livestock based economy are in tune with the available agro-ecological situation. With this plus point of natural resources there is tremendous scope for Animal husbandry in up-liftment of livelihood and economic condition of the tribal families.

The preliminary survey conducted revealed that the animals used for milk were nondiscript and low yielding. The farmers were not aware about scientific feeding practices and high yielding animal breeds. Some of the farmers, although, knowing about better quality animals, could not afford to purchase such animals. The daily milk collection of the villages, by dairy Co-operatives, was very low. There were many misconceptions of the farmers regarding animal rearing.

In general very few farmers were growing fodder for feeding their animals. There was a lack of knowledge about fodder growing and improved fodder varieties. None of the farmers visited were using silage making technology. Feeding of concentrates was minimal and only to lactating animals.

The purpose of these activities was to boost the milk production to meet the day-todays requirement of the tribals and also improve their livelihood with livestock rearing. The major interventions and implementation strategies thereof may be as follows:

- Organization of exposure visits / trainings at advanced dairy units / farms
- Organization of on-farm trainings at innovator dairy farmers' houses
- Surveys for milk production and availability of marketable surplus
- Facilitation for nutritional, health, shelter, financial, marketing, insurance, record,
- management programs in existing animals
- Raising high yielding fodder crops on tribal farmers' fields
- Formation of milk producers' co-operative societies in tribal villages
- Facilitation for cattle breeding and animal health services
- Introduction of high yielding improved breeds of milch cattle and buffalos
- Formation of dairy farmers group

Based on the above points, for up-liftment of livelihood of tribal farmers, planned and executed TSP activities related to dairy, and backyard poultry in Navapur tribal areas. Various training programmes were organised by the TSP implementation Committee, particularly regarding management of backyard poultry and scientific management of dairy animals. More than 1000 farmers were benefited through four trainings organized throughout the year. Distributed various inputs such as mineral mixture, deworming medicines, poultry cages, birds, feed, feeders and waterers etc. Due to the various training programmes farmers now know about feeding management of dairy animals and are more aware about health management of their livestock.

Distribution of buffaloes to selected farmers:

14 tribal dairy farmers interested for rearing of buffaloes were selected. 14 Mehsana breed buffaloes were procured from the local market. Dairy demonstration units with buffaloes (Mehsana buffaloes) were distributed to 14 tribal farmers from Navapur tehsil. All the farmers were imparted necessary training and information regarding scientific management of Dairy animals. The buffaloes characteristics are intermediate between Surti and Murrah. Jet black skin and hair are preferred. Horns are sickle-shaped but with more curve than the Surti. The udder is well developed and well set. Milk veins are prominent. Average body weight of adult male is 570 kg. Body weight of an adult female is 430 kg. Buffaloes are traditionally managed under domestic conditions, together with the calf. They are hand-milked twice a day. They are fed different kinds of roughages: barley and wheat straw, corn stalks, sugarcane residuals. In addition, they are given concentrate mixtures.



Distribution of buffaloes benefitted to poor tribal farmers, particularly tribal ladies which gave some additional work engagement for them. One lady from Nagzari village told that she no more required to go out to work in other farmers field and she is busy in management of the buffaloe. This has fulfilled her family requirement of milk and she is getting at least Rs 100/- daily as additional income.

Fodder production and Nutritional management

Farmers at Gadad and Jamtalav villages were identified for dairy farming, and fodder interventions. Root slips of Hybrid Napier "Phule Jayawant" variety were procured and fodder demonstration plots were established with the Hybrid Napier grass. Dairy demonstration units with buffaloes (Mehsana buffaloes) were distributed to 14 tribal farmers with fodder plots from Navapur tehsil.

Deworming and mineral mixture supplementation

Trainings were conducted about parasitic disease of livestock and poultry and its management at Visarwadi and Navapur. More than 500 livestock farmers were provided with a broad spectrum, pregnancy safe, single dose anthelminthic preparation for deworming. After deworming, the dairy animals were supplemented with specially formulated area specific mineral mixture.



Technology interventions in backyard poultry farming

Issues / Problems identified

- There is no hatchery for dual purpose poultry birds for backyard poultry in the district.
- Avian flu had taken a heavy toll of the industry all over the district.
- There is a 50.56 % decrease in backyard poultry number in 2012 as compared to 2007.
- Lack of knowledge about backyard poultry rearing, using improved stock.
- Annual egg production of birds was reported to be 40-50 eggs/bird.
- The majority of the tribal farmers were not providing any shelter for their backyard poultry birds.

Keeping the above points in mind technology intervention in backyard poultry farming has successfully been demonstrated in the Navapur area in Gadad and Jamtalav villages. The cages for backyard poultry units to house 20 birds each were designed, fabricated and supplied to 150 tribal farmers. 3000 Vanraja birds (Dual Purpose) were supplied to these farmers after training and imparting skill for backyard poultry farming. The farmers were also provided with feeders, waterers and feed for the initial month. The training programme and the group meetings with tribal farmers on "Backyard Poultry Farming" were organized on the 18thDecember 2015 at Gadad village and on the 10th February 2016 at Jamtalav, where more than 300 tribal farmers participated and were benefitted. This intervention proved to be a huge success as the birds grew faster and were giving at least 4-5 eggs daily. The male birds grew up to 4-5 kg body weight and were utilized for breeding and meat purpose. This has helped the farmers for getting some additional income as well as providing protein requirement of the family. There was improvement in the knowledge of farmers regarding nutrition and health management of birds. The cage provided to farmers has become a permanent asset for them and they are using it for housing their birds.



Implementation of Improved technology interventions in fisheries/ IMC aquaculture

Six villages of Navapur Tehsil namely Karanji, Bhomdipada, Borepada, Jamtalav, Chowky and Chitvi were selected for IMC aquaculture. Indian major carp (IMC) fingerlings (size 5-6 g) were stocked in farm/fisheries ponds (stocking density@ 10,000/ha). At villages namely Karanji, Bhomdipada, Borepada, Chowky and Chitvi, water quality parameters such pH, DO and ammonia were measured. Research on fish ponds led to the optimal water quality and plankton primary productivity. In Jamtalav pond, ammonia was found to be higher. In order to control ammonia level, zeolite (stilbite) trapped with silver nanoparticles was applied in the pond. This has helped in alleviation of multiple abiotic and biotic stresses in the pond with the result of higher fish production. Water analysis kit was also used for measurement of these parameters in the field. More than 2000 kg/ha fish were produced with the selling price of Rs. 100-120/- per kg.

Agricultural Soil Health Assessment-Soil Health cards

A Committee constituted for issuing soil health cards, visited villages in Navapur Tehsil (Nandurbar District) during 29 Sept. to 1 Oct 2015 and identified more than 250 farmers from 14 different villages as per the prescribed guidelines.

Soil characterization in relation to fertility status of a region is an important aspect in the context of sustainable agricultural production. The information on macro and micro nutrients status in the study area is meagre. Therefore present study was undertaken to know physicochemical characteristics, the micro and macro-nutrient status of the soils. Composite soil samples were collected as per the Geo position (GPS) based on the latitude and longitude. Physico-chemical characteristics such as pH, EC, organic carbon, macro-nutrients such as available N, P, K, S and micronutrients such as Zn, Cu, Mn, Fe and B were determined in 263 soil samples collected as a part of the soil health card programme. Based on the results of soil quality parameters, fertilizers recommendations for the reference yields have been made. The Tehsil agricultural soil in general is deficient in nitrogen and sulfur. In 99.62% soil samples, levels of nitrogen content were low. Data showed that while most of the agricultural soil samples (79.5%) had moderate/optimum phosphorous levels, its village wise content varied, other soil samples (20.53%) had low levels of P. Potassium, manganese, and copper contents in the soils of Navapur Tehsil was found to be moderately in the high range.

Soil characteristics	Range/Test value	Unit	Reference	
рН	5.88-8.13		6.5 - 8.5	
EC	0.08-0.61	dS/m	0-1	
Organic Carbon (OC)	0.09-1.55	%	0.4-0.8	
Available Nitrogen (N)	38-364	kg/ha	280-420	
Available Phosphorus (P)	0.32- 101	kg/ha	15-28	
Available Potassium (K)	131 - 1712	kg/ha	150 - 200	
Available Sulphur (S)	0.50 - 71.00	mg/kg	0-1	
Available Zinc(Zn)	0.09 - 4.96	mg/kg	0.6 - 1	
Available Boron (B)	0.00 - 3.58	mg/kg	0.5	
Available Iron (Fe)	1.63 - 54.00	mg/kg	4.5-10	
Available Manganese (Mn)	1.80 - 45.45	mg/kg	2-5	
Available Copper (Cu)	0.37 - 8.50	mg/kg	0.2-0.4	



	Number of soil samples (Out of 263)				
Soil characteristics	Deficient/ Below	Moderate (Optimum level)	Sufficient (More	Percent samples within optimum and sufficient range	
	optimum level		optimum level)	Total number	%
рН	Nil	263	Nil	263	100
EC	Nil	263	Nil	263	100
Organic Carbon	26	146	91	237	90.11
Available Nitrogen (N)	262	1	NIL	1	0.38
Available Phosphorus (P)	54	94	115	209	79.47
Available Potassium (K)	Nil	27	236	263	100
Available Sulphur (S)	218	24	21	45	17.11
Available Zinc (Zn)	102	96	65	161	61.22
Available Boron (B)	186	77	Nil	77	29.28
Available Iron (Fe)	38	68	157	225	85.55
Available Manganese(Mn)	2	28	233	261	99.24
Available Copper(Cu)	Nil	1	262	263	100

Organization of Field Day / Training programmes / Exposure visits

 A "Farmers Field Day on Sugarcane" was organised at Karanji Bk village of Navapur Tehsil to showcase the Farmers Participatory demonstrations on "Water efficient crop production technology in sugarcane" to the farmers of adjoining village/area. More than 150 farmers from various villages namely; Karanji Bk., Chitvi, Vadstra, Mahalkadu, Bhardu, Pimpla, Kolda, Pimpran and Bokaljhar participated in the programme and shared their views through discussions. This programme provided enough opportunity to a large number of farmers to visit the crop and exchange their ideas and at the same time also helped in making awareness about efficient use of water among farmers of the project area.



- Training programme pertaining to technology interventions in rice, banana, fodder crops, farm pond preparation and integrated agri-aquaculture were conducted on 8 July 2015 at Visarvadi, where more than 180 tribal farmers from Navapur villages participated and were benefitted. Farmers were given training on farm pond preparation, water quality management, fertilisation of ponds, primary productivity, procurement of IMC seeds from nearby hatchery, feeding and nutrition, harvest and post-harvest technologies, fish marketing and integrated agri-aquaculture.
- Training programme pertaining to technology interventions in rice, banana, fodder crops, farm pond preparation and integrated agri-aquaculture were conducted on 9 July 2015 at Navapur, where more than 135 tribal farmers from Navapur villages participated and were benefitted. Farmers were given training on farm pond preparation, water quality management, fertilization of ponds, primary productivity, procurement of IMC seeds from nearby hatchery, feeding and nutrition, harvest and post-harvest technologies, fish marketing and integrated agri-aquaculture.

- The Farmer's field day on Rice crop for higher productivity and income was organized on 3rd November 2015 at Gadad and Karanji, where more than 100 tribal farmers from several villages of Navapur Tehsil participated and were benefitted. Participatory demonstration of "Four point rice production technology was successfully done on farmers field.
- Farmer's field day on Rice crop for higher productivity and income was organized on 4th November 2015 at Vadsatra and Chitvi, where more than 120 tribal farmers from several villages of NavapurTehsil participated and were benefitted. Participatory demonstration of "Four point rice production technology was successfully done on farmers field.
- The Farmers field day on "Fish culture and Integrated agri-aquaculture" for higher productivity and income, were organized on 3 November 2015 at Karanji, where more than100 tribal farmers from Navapur villages participated and were benefitted. Integrated agri-aquaculture has successfully been demonstrated. Farmers were taken to the aquaculture / farm ponds, stocked with IMC seeds and their primary productivity were compared.
- The Farmers field day on Fish culture and Integrated agri-aquaculture" for higher productivity and income, were organized on 4 November 2015 at Chitvi, where more than 120 tribal farmers from Navapur villages participated and were benefitted. Integrated agri-aquaculture has successfully been demonstrated. Farmers were taken to the aquaculture / farm ponds, stocked with IMC seeds and their primary productivity were compared.
- Training programme on "Backyard Poultry Farming" was organized on the 18th December 2015 at Gadad village, where more than 250 tribal farmers participated and were benefitted.
- On 10 February 2016, Technology intervention in backyard poultry farming has successfully been demonstrated to more than 250 tribal farmers at Jamtalav village.
- Exposure Visits: Three days Exposure visit related to "Improved technology interventions in field & horticulture crops, livestock & poultry, & IMC aquaculture for livelihood improvement of Tribal farmers" were conducted on 28-30 March 2016: (Beneficiaries 80 farmers). Three days Exposure visits related to "Recent advances in field & horticulture crops, poultry, dairy and aqua-farming and Integrated agriaquaculture for livelihood improvement of Tribal farmers" were conducted on 2-4 March 2016 (Beneficiaries 90 farmers). During exposure visit at KVK Bhabhleshwar, tribal

farmers got acquainted with onion seed production, midow-orchading in guva, livestock management, poultry management etc. While in MPKV Rahuri, farmers got abreast with Triveni breed of cow, Goat farm, Sugarcane field, Onion Field, Rice cultivation, Various types of nursery bed for rice, cultivation of onion for seed production, Poultry rearing, Plant Nursery, various verities of sugarcane, ATIC centre etc. Also at KVK-Baramati, farmers got exposure on sugarcane field, Mandarin orange cultivation, Breeds of Poultry, Livestock Unit and HF breeds of cow, Goat Raring, Vermi-composting Unit, Silage preparation, Hatchery, Plant Nursery, Agro tourism Centre, Cultivation of bel paper in playhouse, Automated Irrigation System, Farm pond, Solar Water Pump etc. At ICAR-National Institute of Abiotic Stress Management, farmers visited research farm where various crops like Sugarcane, Green Gram, Wheat, Fish Pond, Cactus Plantation, Orchard of Pomegranate, Guava, Grape, Mango, Palm, Custard Apple, Orange and highly attracted towards the orchard of Dragon Fruit are planted.



World Soil Day was celebrated at Navapur Tehsil of Nandurbar District on the 5th December 2015, where more than 500 farmers participated. Total 263 soil health cards were distributed to tribal farmers. Importance of soil health cards in ensuring balanced use of fertilizers, enhancing crop productivity along with reduction in cost of cultivation and the soil health card based farming soil health assessment, soil test based nutrient recommendations, edaphic stresses and their management through integrated farming and INM were popularized among all tribal farmers to improve the production and quality of the produce, which in turn uplift the socio-economic status of the farming community.

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• Group meetings:

- Participatory demonstration of improved technology intervention, water efficient crop production technology in banana, has successfully been demonstrated to tribal farmers at Navapur villages.
- Improved technology interventions in Rabi onion (var. AFLR,N-2-4-1, Bhimakiran) and late kharif (var. Bhimashakti) have successfully been demonstrated (Beneficiaries 971tribal farmers).
- **Group meeting** was conducted to demonstrate establishment of fodder plots with hybrid Napier grass. Dairy demonstration units with animals (Mehsana buffaloes) were distributed to 14 farmers of two Navapur villages.

Summary of the training programmes/Field Day organized

Sl.	Programme	Duration and	Beneficiaries
No.	5	place	
1	Training programmes pertaining to	8-9 July 2015	More than 315
	technology interventions in rice, banana,	Visarvadi and	tribal farmers
	fodder crops, farm pond preparation and	Navapur	
	integrated agri-aquaculture		
2	Farmers field days on Fish culture and	3-4 November	More than 180
	Integrated agri-aquaculture for higher	2015,	tribal farmers
	productivity and income.	Karanji and	from Navapur
		Chitvi	villages
3	Farmer s field day on Rice crop and	3 November	More than 220
	Participatory demonstration of "Four point	2015 at Gadad	tribal farmers
	rice production technology for higher	and Karanji	
	productivity and income	4 November	
		2015 at Chitvi	
		and Vadsatra	
4	Training programme on backyard Poultry	18 th December	More than 500
	Farming".	2015 and 10	tribal farmers
		February 2016	
5	Exposure visit related to "Recent advances	2-4 March 2016	90
	in field & horticulture crops, poultry, dairy		
	and aqua-farming and Integrated agri-		
	aquaculture for livelihood improvement of		
	Tribal farmers"		
6	Exposure visit related to "Improved	28-30 March	80
	technology interventions in field &	2016	
	horticulture crops, livestock & poultry, &		
	IMC aquaculture for livelihood		
	improvement of Tribal farmers"		

Details of technology disseminated and area covered/inputs distributed

Sl.	Name of the	Quan	Total	Benefici	Tehsil	Villages	Technology
No.	input	tity	amount,	aries I/F/		U	disseminated
	-	-	Lakh Rs.	SHG, *			
				Nos.			
1	Fabricated	150	779625	150 (F)	Navapur	Gadad, Jamtalav	Improved
	poultry cages						technology
2	Waterers	150		150 (F)	Navapur	Gadad, Jamtalav	interventions
3	Feeders	150		150 (F)	Navapur	Gadad, Jamtalav	in backyard
4	Vanaraja chicks	3000	244420	150 (F)	Navapur	Gadad, Jamtalav	poultry farming
5	Poultry feed	3750 kg	94010	150 (F)	Navapur	Gadad, Jamtalav	
6	Compost production units	48 (F)		48 (F)	Navapur	Gadad, Karanji, Savrat, Vadsatra, Devakipada, Wagdi, Chitvi, Nagjhari	Improved technology intervention in Organic farming
7	Soil Health Cards to farmers	263		263(I)	Navapur	Various villages of Navapur	Soil health assessment based fertilizers recommendati on
8	Rice seeds (var. Indrayani)	1396 kg		138 (F) 138 acres	Navapur	Gadad, Bandharpada Chitvi, Bokhaljhar, Vadsatra, Devalipada, Neemdarda.	Four point rice production technology
9	Micronutrient s	2400 kg	96824	138 (F)	Navapur	Gadad, Chitvi, Bokhalihar, Vadsatra.	
10	Fertilizers	454 qtl		138 (F)	Navapur	Devalipada, BandharpadaNeemdar da.	
11	Okra seeds	100 kg	42400	100 (I)	Navapur	Various villages	Improved technology
12	Tissue culture banana plants (Grand Nain)	7000	98000	4 (F) 5 acres	Navapur	Chitvi, Vadsatra	intervention in vegetable (Okra) and fruit crop
13	Pheromone funnel, yell- ow sticky traps, neem cake pesticid- es, etc)	Misce llaneo us	14550	4 (F)	Navapur	Chitvi, Vadsatra	(virus free tissue culture banana)
14	Rabi onion seeds (var. AFLR, N-2-4-1, Bhimakiran)	600 kg	AFLR 21000 + N241 300000 +	635 (I)	Navapur	Karanji Kh, Philwandpada, Mugdhan, Bhaware, Bokulsar, Chitwi, Wadsatra, Bhawre, Bokhaljhar,	Improved technology intervention in onion with high yield, quality

*(I): Individual; (F): Families; (SHG): Self-help groups

SI. No.	Name of the input	Quan tity	Total amount, Lakh Rs.	Benefici aries I/F/ SHG, * Nos.	Tehsil	Villages	Technology disseminated
			Bhimakir an 300000 Total Rs 810000			Lawadpada; Pimpran, Wagadpada, Wadsatra, Nagajhari, Karanji Bk, Chitwi, Devakipada, Bhardu, Kanahal, Bardipada, Tilasar, Mahakukud, Sawarat, Garad, Nagjhari, Kolda, Wadhavpada, Pimplad, Wadsatra, Kamahka, Baedipada, Maharkadu, Vadsatra, Jamtalav, Pimplapada.	potential and long storability
15	IMC feed	2625 kg		18 (I)	Navapur	Karanji, Chitvi, Chowky, Jamtalav, Borepada,	
16	IMC seeds	Fish seeds/ Finger lings		9 (I)	Navapur	Chitvi, Karanji, Borepada, Jamtalav, Chowky	Improved technology interventions in IMC
17	HDPE sheet for lining of farm pond preparation	900 sqm	94000	1 (F)	Navapur	Chitvi	aquaculture
18	Vitamin mineral mixture for animal nutrition	1800 kg		14 (F)	Navapur	Gadad, Jamtalav Chitvi, Nagzari Vadsatra	Improved technology intervention in dairy
19	Medicines For deworming	1500 doses		14 (F)	Navapur		farming
20	Fodder root slips	Root slips	21576	14 (I)	Navapur	Gadad, Jamtalav	
21	Mehsana Buffaloe	14	306030 306282 244420	14 (I)	Navapur	Gadad, Jamtalav	
22	<i>Gliricidia</i> plants	600 saplin gs	7200	100 (F)	Navapur	Gadad, Bokhaljhar, Vadsatra, Chitvi, Devalipada, Bandharpada Neemdarda.	<i>Gliricidia</i> as live fences, and green leaf manure for crop production and animal forage

*(I): Individual; (F): Families; (SHG): Self-help groups

Sl. No.	Project / Scheme	No. of Beneficiaries	Location
	Tribal Sub-	As per	Navapur tehsil of Nandurbar district comprising of
	Plan 2015-	Annexure-I	7 villages namely; Gadad, Bokalzhar, Chitavi,
	16	attached	Devlipada, Vadsatra, Neemdarda and Bandharpada

Quarterly Progress Report (April to June, 2015)

Financial & Physical Achievement of TSP in 1st Quarter (April to June, 2015)

Amount	Financial	Physical Achie	vement		
Earmarked (2015-16)	Achievement (Rs.)	Numbers of beneficiaries/ village	Physical Assets created	Types of Assets created	Any other information
Capital = Rs. 16.37 Lakh	Capital = Rs. 0.00 Lakh				
Revenue = Rs. 45 Lakh	Revenue = Rs. 1.91 Lakh	121/7 villages	No		
Total = Rs. 61.37 Lakh	Total = Rs. 1.91 Lakh				

Quarterly Progress Report (April to June, 2015)

Sl. No.	Strategies/Initiatives/Activities	Period/Date	No. of tribal Beneficiaries
	Demonstration on improved rice cultivation	June 2015 to October 2015	121
		Total	121

Quarterly Progress Report (July to September 2015)

Sl.	Project /	No. of	Leastion
No.	Scheme	Beneficiaries	Location
1.	Tribal Sub-	121	Seven Villages (Chitavi, Vadsatra, Devlipada,
	Plan 2015-16		Neemdarda, Bandharpada, Gadad and Bokaljhar)
	(Demonstration		of the project area at NavapurTehsil, Nandurbar,
	of technology		Maharashtra
	interventions in		
	Field Crop)	250	Navapur (Nearby villages)
		>100	Sixteen Villages (Gadad, Bardipada, Bhardu,
			Canala, Tilasar, Mahalkadu, Savrat, Devlipada,
			Vadshatra, Chitvi, Kolda, Karanji BK, Bhavre,
			Pimpran, Mugdhan and Waghlpada) of the
			project area at Navapur, Nandurbar, Maharashtra

2.	Tribal Sub-	631	Twenty seven Villages (Karanji Kh, Bilmanjari,
	Plan 2015-16		Mugadhan, Bhavare, Bokalzar, Waghalpada,
	(Demonstration		Nagazari, Karanji Bk, Pimpran, Chitavi,
	of technology		Wadsatra, Deolipada, Bhardu, Kanhala,
	interventions in		Wadipada, Mahalkadu, Tilsar, Savrat, Gadad,
	Horticulture)		Kolda, Wadkalambi, Sonkhadke, Dhudipada,
			Nandanwan, Mohanpada, Bhomdipada, Jamtalav)
		102	Nine Villages (Mughdhan, Nagajhari, Vadsatra,
			Chitvi, Bodvad, Devalipada, Bandharpada,
			Nimdrda, Mahalkadu)
3.	Tribal Sub-	9	Five villages (Chitvi, Karanji Bu, Borpada,
	Plan 2015-16		Jamtalav, Chowky)
	(Demonstration	180	Navapur (Nearby villages)
	of Fisheries)		
4.	Tribal Sub-	150	Two villages (Gadad and Jamtalav)
	Plan 2015-16	75	Gadad village
	(Demonstration	200	Two villages (Gadad and Jamtalav)
	of technology	12	Two villages (Gadad and Jamtalav)
	interventions in		
	Livestock and		
	Poultry)		

Quarterly Progress Report (October to December 2015)

Sl. No.	Strategies/Initiatives/Activities	Period/Date	No. of tribal Beneficiaries
1.	Participatory demonstration of "Four point rice production technology" for higher productivity and income.	May 2015 to November 2015	121
2.	Farmers field day on rice crop was organized at Gadad and Chitvi villages, respectively	3 rd & 4 th November 2015	250
3.	Participatory demonstration of "water efficient crop production technology in sugarcane".	Nov. 2015 to December 2015	100
4.	Demonstration on improved technology intervention in Onion (var. AFLR, N-2-4-1, Bhima kiran)	October- December 2015	631
5.	Demonstration on improved technology intervention in Okra	December 2015	102
6.	Demonstration on improved technology intervention in IMC aquaculture	October to December 2015	9
7.	Farmers field day on fish culture was organized at Karanji and Chitvi villages	3 rd & 4 th November 2015	180
8.	Fabricated and Distributed 150 cages for Backyard Poultry Farming in two villages Gadad and Jamtalav	December 2015	150

9.	Supplied 1500 Vanaraja chicks of 5 weeks age for Backyard Poultry Farming to 75 farmers of Gadad village	December 2015	75
10.	Conducted Training programme on "Backyard Poultry Farming" at Gadad village	18 December 2015	200
11.	Field Visit to the dairy farmers' fodder demonstration plots	December 2015	12
		Total	1830

Financial Achievement (Rs.) (During 3rd Quarter) (Oct-Dec 2015)

	Financial		Physical Achievement				
Amount Earmarked (2015-16)	Achievement (Rs.) (During 3 rd Quarter) (Oct-Dec 2015)	Numbers of beneficiaries/ village	Physical Assets created	Types of Assets created	Any other information		
Capital = Rs. 16.37 Lakh	Capital = Rs. 0.0 Lakhs				Physical assets related		
Revenue = Rs. 45 Lakh	Revenue = Rs. 3.30 Lakhs	1830/35	No		interventions		
Total = Rs. 61.37 Lakh	Total = Rs. 3.30 Lakhs				and dairy are being created		

Quarterly Progress Report (Jan to March 2016)

Sl. No.	Project / Scheme	No. of Beneficiaries	Location
1.	Tribal Sub-Plan 2015-16	90	Kolada, Savrat, Mugdhan, Nagzari,
	(Exposure visits related to		Waghalpada, Karanji (Bk), Borpada,
	Improved technology		Pimpran, Mohanpada, Bokalzar
	interventions in field &		
	horticulture crops,	74	Wadstra, Chitavi, Deolipada,
	livestock & poultry, &		Bharad, Mahalkadu, Tilasar,
	integrated farming for		Kanhala, Wagadi, Bardipada,
	livelihood improvement of		Ganadi, Nimdarda
	Tribal farmers).		
2.	Tribal Sub-Plan 2015-16	75 (Birds)	Jamtalav Village
	(Demonstration of		
	technology interventions	150 (Training)	Jamtalav village
	in Livestock and Poultry)		
		14 (Buffaloes)	Four villages (Gadad, Jamtalav,
			Chitvi, Nagzari)
3.	Tribal Sub-Plan 2015-16	47	Karanji (Bk), Chitvi, Gadad,
	(Organic farming)		Nagzari, Wadsatra, Savrat,
			Deolipada

SI. No.	Strategies/Initiatives/Activities	Period/Date	No. of tribal Beneficiaries
1	Supplied 1500 Vanaraja chicks of 5 weeks age for Backyard Poultry Farming to 75 farmers of Jamtalav village	March 19, 2015	75
2	Training programme on "Backyard Poultry Farming" at Jamtalav Village	March 19, 2015	150
3	Distributed dairy animals to 14 farmers	Jan-March 2016	14
4	Three days Exposure visit related to "Improved technology interventions in field & horticulture crops, livestock & poultry, & IMC aquaculture for livelihood improvement of Tribal farmers".	March, 3-5, 2016	90
5	Three days exposure visit related to recent advances in integrated farming	March, 28-30, 2016	74
6	Distributed Compost production units to 48 farmers	Match, 1, 2016	48
		Total	450

Quarterly Progress Report (January to March, 2016)

Financial & Physical Achievement of TSP in 4th Quarter (January to March, 2016)

	Financial	Physical Achievement					
Amount Earmarked (2015-16)	Achievement (Rs.) (During 4 th Quarter) (Jan-March 2016)	Numbers of beneficiarie s/ village	Physical Assets created	Types of Assets created	Any other informatio n		
Capital = Rs. 16.37 Lakh	Capital = Rs. 16.36357 Lakh		14	Dairy	Total expenditure for the		
Revenue =	Revenue =	450/21	14	animals	financial		
Rs. 45	Rs. 24.24869	430/21	150	Poultry	16 is Rs		
Lakh	Lakh		150		10 13 KS.		
Total =	Total =			cages	00.00001 Lokh		
Rs. 61.37	Rs. 40.61226				Lakii		
Lakh	Lakh						

Financial achievement/Total Budget received and utilized (2015-16):

Sl. No.	Budget received (Rs in lakh)			Budget utilized (Rs in lakh)		
	Capital	Revenue	Total	Capital	Revenue	Total
	16.37	45	Rs. 61.37	16.37	45	Rs. 60.868

Name of State	Amount earmarked for TSP 2015-16	Expenditure 2015-16	Achievement (only 10 bullet points)
ICAR-National Institute of Abiotic Stress Management- Baramati Maharashtra (Navapur Tehsil of Nandurbar District)	Rs 61,37,000	Rs. 60,86,881	Training programmes pertaining to technology interventions in rice, banana, fodder crops, farm pond preparation and integrated agri- aquaculture were conducted on 8-9 July 2015, where more than 315 tribal farmers from Navapur villages participated and were benefitted. Farmers field days on "rice crop" and "fish culture" were organized on 3-4 November 2015 for higher productivity and income, where more than 430 tribal farmers from Navapur villages participated and were benefitted. Integrated agri-aquaculture have successfully been demonstrated through demonstration on improved technology intervention in IMC aquaculture, field and horticulture crops. Compost production units were distributed to tribal farmers Participatory demonstration of "Four point rice production technology" have successfully been implemented (Beneficiary 121 tribal farmers). Participatory demonstration of improved technology intervention in banana and okra and water efficient crop production technology in sugarcane have successfully been demonstrated to tribal farmers at Navapur villages. Improved technology intervention in Rabi onion (var. AFLR, N-2-4-1, Bhima kiran) have successfully been demonstrated (Beneficiaries 631 tribal farmers)

Annual progress Report/achievement for the year 2015-16

Name of State	Amount earmarked for TSP	Expenditure 2015-16	Achievement (only 10 bullet points)
	2015-16		
			Training programme and the group meetings with farmers on "Backyard Poultry Farming" were organized on the 18 th December 2015 and the 10 February 2016, where more than 250 tribal farmers participated and were benefitted. Technology intervention in backyard poultry farming has successfully been demonstrated. 150 fabricated cages for Backyard Poultry along with 3000 Vanaraja chicks were distributed to 150 tribal farmers.
			Three days Exposure visit related to "Improved technology interventions in field & horticulture crops, livestock & poultry, & IMC aquaculture for livelihood improvement of Tribal farmers" and recent advances in integrated farming were conducted on 2-3 March 2016 and 28-30 March 2016 (Beneficiaries 164 farmers)
			Dairy demonstration units with animals (Mehsana buffaloes) were distributed to 14 farmers of two Navapur villages. Fodder plots were established with hybrid Napier grass.
Total	Rs 61,37,000	Rs. 60,86,881	

Post Technology Intervention Assessment

Productivity enhancement

Research efforts, farmer education and training, advice and information are shifting towards balancing economic efficiency with environmental and social sustainability. The focus of research and advice was to increase production, productivity and profits, whereas now the emphasis is on achieving those aims in a sustainable way, which often implies changing farming practices and using different technologies. As has often been the case, agriculture is drawing on and adapting technologies developed in or for other sectors of the economy. Although research is increasingly "problem based" rather than seeing as exogenous, it is not always clear which technologies are profitable for farming to develop and which farm practices will contribute to sustainable farming systems in the long-term.

ICAR-NIASM has successfully implemented integrated agri-aquaculture, benefitting tribal farmers in terms of adoption of improved technology interventions in field crops (rice and sugarcane), horticulture crops (banana and onion), dairy farming (Fodder and Mahsana buffalo), backyard poultry (Vanaraja) farming, fisheries and Integrated agri-IMC aquaculture. These interventions led to higher production of rice (Indrayani 6.2–10 tonnes/ha), Onion (Var.N-2-4-1, 38–83 tonnes/ha, Var. AFLR 25–82 tonnes / ha, Var. Bhimakiran 25–85 tonnes/ha), banana (partial harvest 11,000-27,300 kg), and fish (> 2000 kg/ha). The farmers reported an improved weight gain and egg production from the poultry birds. The field crop and fruit and vegetable production increased due to proper soil and nutrient management, micro-irrigation, adoption of integrated nutrient and pest and disease management measures in the selected areas.

Income enhancement

Farmers like to adopt appropriate technologies, invest in and implement sustainable technologies and farm practices if they anticipate the investment will be profitable, if they have the right education, information and motivation. Agricultural policies can alter, however, the prices facing farmers for their inputs and outputs, which in turn will influence their decisions on investment and can lead to unsustainable farming practices. Implementation of improved technology interventions by ICAR-NIASM in field crops (rice, sugarcane), horticulture (onion, banana), livestock (dairy), fodder, poultry (backyard poultry), fisheries (IMC aquaculture) and Integrated agri-IMC aquaculture benefitted tribal farmers, enhancing income of the tribal

farmers of Navapur Tehsil of Nandurbar District. Though it is not possible to quantify each and every benefit emanated from the project activity, some of the quantifiable activities are presented below. By integration of crop, fish and animal components, net farm income of tribal farmers increased up to 44% even in climate change prone selected areas.

Variety	Cultivat ed area (ha)	Number of Beneficiari es	Straw Yield Avg.(Tonne/ ha)	Paddy Yield (Tonne/ha)	Gross return (Rs. in lakhs/ha)	Gross return (Total lakh Rs.)
Indrayani	415	1079	9.5-18	6.2-10	1.21	500

Improved technology intervention in rice

Improved technology intervention in rabi onion

Onion variety		Cultivated area (ha)	Number of Beneficiaries	Yield Tonne / ha	Averag e yield Tonne / ha	Rate / tonne (Rs.)	Gross return (Rs. in lakhs/ ha)	Gross return (Total Rs in lakhs)
Rabi	N-2-4-1 AFLR Bhima Kiran	20 37 18	160 315 160	38 - 83 25 - 82 25 - 85	63.68 55.14 36.11	5000 5000 5000	3.18 2.76 1.80	198

Virus free tissue culture banana

Variety	Cultivated Area (ha)	Number of Beneficiaries	Partially Harvested (kg)	Rate/kg (Rs.)	Gross Return (Total Rs. In lakhs)
Grand Nain	2	4	11000-27300	5.0	3.15

Innovations introduced

Improved technology interventions in Integrated agri-aquaculture in terms of field and horticulture crops, livestock, poultry and fisheries have improved livelihood of tribal farmers. Based on constraints identified during resource assessment and impact of climate change, abiotic and biotic stresses on agriculture, technological interventions and sustainability of these techniques were devised and integrated during the planning itself. The interventions in the form of improved rice varieties have immensely benefited the farming community. Research on fish ponds led to the optimal water quality and plankton primary productivity. Availability of fish seeds from nearby hatcheries and training on Farm pond preparation has encouraged farmers to adopt agri-aquaculture.

The main focus was on skill up-gradation, motivation, social networking, economic stability, market access and linkages. "Four point rice production technology", "Water efficient production technology in sugarcane", "Virus free tissue culture banana cultivation using suckers, High yielding and long storage *late kharif* and *rabi* onion cultivation and seed generation, backyard poultry farming, fodder and high yielding dairy farming, IMC aquaculture, Integrated agri-aquaculture have been adopted by the farmers.

Following interventions proved to be innovations introduced for tribal farmers of the Nandurbar district.

- 1. Four point rice production technology.
- 2. Promotion of *Gliricidia* plantation for rice cultivators as live fences, and green leaf manure for crop production and animal forage.
- 3. Water efficient crop production technology in sugarcane
- 4. Improved technology intervention in cultivation of late kharif and rabi onion with high yielding and long storage and seed generation.
- 5. Cultivation of virus free tissue culture banana and suckers of the same cultivar.
- 6. Economically viable compost production for organic farming.
- 7. Improved technology intervention in kitchen gardening of dragon fruit.
- 8. Improved technology intervention in fodder production and high yielding dairy farming with nutritional and disease management.
- 9. Improved technology intervention in backyard poultry farming.
- 10. Economically and environmentally viable farm pond preparation.
- 11. Intensive aquaculture of Indian Major Carps.
- 12. Development and application of zeolite based nano-composite for alleviation of abiotic and biotic stresses in farm pond aquaculture.

- 13. Optimization of water quality in fisheries/farm ponds through best management practices.
- 14. Integrated farming in terms of field and horticulture crops, dairy and poultry farming, Fish farming and Integrated agri-aquaculture.

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