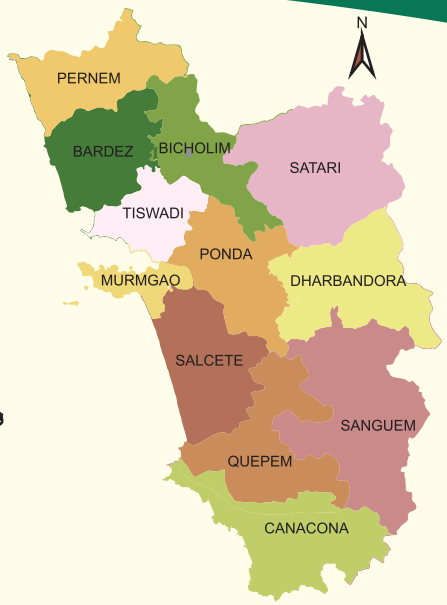
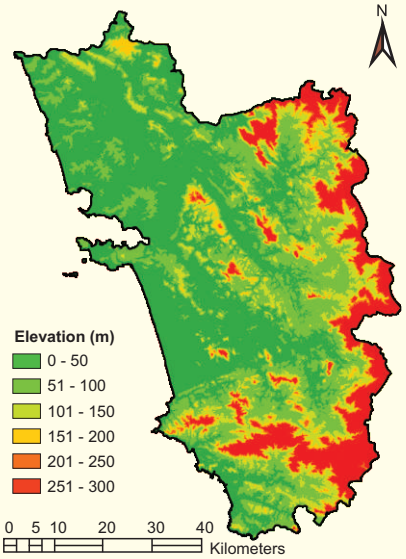
Technical Bulletin No. 63/2017

AGRO-ECOLOGY SPECIFIC ACTION PLAN FOR DOUBLING FARMER'S INCOME IN GOA





GOA STATE COORDINATION COMMITTEE
(Constituted by ICAR)
ICAR-Central Coastal Agricultural Research Institute,
Old Goa, Goa

AGRO-ECOLOGY SPECIFIC ACTION PLAN FOR DOUBLING FARMERS' INCOME IN GOA

Technical Bulletin No. 63/2017

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Director (A)
ICAR - Central Coastal Agricultural Research Institute
Old Goa-403 402, Goa, India
Tel : 0832-2285381, 2284677/678/679
Fax: 0832-2285649
E-mail : director.ccari@icar.gov.in
Website : www.ccari.res.in

Authors : **Dr. N Shivasharanappa**
Dr. M Thangam
Dr. R Ramesh
Dr. GR Mahajan

Technical Assistance : **Mr. Sidharth K Marathe**

Cover page citation : **Maps of Goa indicating Talukas and Geographical Elevation**

Preface

As a Chairman of the Goa state coordination committee for formulating strategies on doubling of farmer's income by March, 2022, it gives me immense pleasure to present the comprehensive action plan for Goa state and I hope this document will help policy makers and planners to achieve the task of doubling the income of farmers.

The State of Goa comprises of two districts with a total geographical area of 3.61 lakh ha. Against the total area, 35% is under forests and 44% is gross cropped area. The economy of Goa is primarily driven by tourism followed by agriculture, animal husbandry and fisheries activities. Agriculture contributes to 3.74% of State GDP while secondary and tertiary sectors comprising of industries and services contribute to 80% of the GDP. The latest Agricultural Census report 2010-11 shows that there are 78020 land holdings and the average size of the land holdings is 1.14 ha.

The first state level coordination committee meeting for doubling the farmer's income by 2022 was conducted on 27.3.2017 at ICAR-CCARI, Goa under the chairmanship of SSC and Director, CCARI, Goa. After considering the outcomes of the meeting as well as the inputs received from ICAR institutes in this region, various strategies are proposed for formulating the action plan.

The proposed action plan for Goa state include mainly the productivity improvement in major crops like paddy, cashew and coconut, diversification in agriculture, creation of integrated farming system models, mechanisation, value addition and policy reforms in agriculture.

Date: 21.09.2017

(E B Chakurkar)
Chairman
Goa State Coordination committee

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1 Composition of State-wise Coordination Committee (SCC) for doubling Farmer's income by March, 2022 for the state of Goa

INDIAN COUNCIL OF AGRICULTURAL RESEARCH
KRISHI BHAWAN, NEW DELHI

F.No.5-4/2017-Cdn (Tech) Dated: 6th March, 2017

OFFICE ORDER

Secretary (DARE) & DG, ICAR is pleased to constitute a State-wise Coordination Committees for doubling Farmer's income by March, 2022.

The composition of the Goa state Coordination Committee is depicted below:-

i)	Director, Central Coastal Agricultural Research Institute, Ela Old Goa, North Goa-403 402	: Chairman
ii)	Director, ATARI, Zone VIII, Pune	: Convener
iii)	Director, Agriculture, Govt. of Goa	: Member
iv)	Director, Horticulture Govt. of Goa	: Member
v)	Director, Animal Husbandry, Govt. of Goa	: Member
vi)	Director, Fisheries, Govt. of Goa	: Member
vii)	Director, CMFRI, P.B.No.1603, Ernakulam North-682 018, Cochin, Kerala	: Member
viii)	Director CIFT, Matsyapuri-682 029, Cochin, Kerala	: Member
ix)	Nominee of Secretary DAC&FW	: Member
x)	Nominee of Secretary, DAHDF	: Member
xi)	Nominee of Secretary, Ministry of Food Processing Industries	: Member

The Chairman and the Convener of all the State Coordination Committees (SCCs) are requested to convene the meetings of their respective SCCs within March 2017 and develop the concrete action plan for doubling the farmers' income for their respective states and share with the council in a time bound manner not later than 15th of April 2017. The committees may study the existing productivity and income levels in the respective states, to develop strategy needed to double the income of farmers/ agricultural labourers by March 2022. Area specific technology modules along with all possible combinations may be developed for various agro ecological sub-regions as well as for different socioeconomic backgrounds within the state. The approach towards doubling farmer incomes may focus on raising productivity and diversification into high-value

agriculture as well as providing avenues for diversification of farm employment into non-farm high-income generating activities. The committees may also make clear-cut recommendations on the institutional mechanism to review and monitor implementation of the action plan to realise the goal and suggest midcourse corrections.

The Director, NCAP, New Delhi and the NITI Aayog documents/site may be consulted extensively while finalizing the action plan. Senior representatives from CGIAR system, commodity boards and the farmers' organisations may also be co-opted as additional members in the coordination committees wherever needed.

(S.P.Kimothi)
ADG-Coordination (Tech.)

Distribution:

1. All the Chairman and Members of the coordination committees.
2. All DDGs, ICAR
3. Sr.PPS to Secretary, DARE & DG, ICAR.
4. PPS to Additional Secretary (DARE) & Secretary, ICAR
5. ADG(PIM)
6. Director(F)
7. Information System Officer, DKMA, KAB-I, Pusa, New Delhi for placing the above office order on ICAR Website.
8. Guard file.

2 Scenario of Agriculture in Goa

The State of Goa comprises of two districts with a total geographical area of 3.61 lakh ha. Against the total area, 35% is under forests and 44% is gross cropped area. The economy of Goa is primarily driven by tourism and mining followed by agriculture, animal husbandry and fisheries activities. Agriculture contributes to 3.74% of State GDP while secondary and tertiary sectors comprising of industries and services contribute to 80% of the GDP (@ current prices, 2015). The latest Agricultural Census report 2010-11 shows that there are 78020 land holdings and the average size of the land holdings is 1.14 ha. 15% of the land holdings and 17% of the area are operated under tenancy and remaining area by wholly owned farmers. Marginal and small land holdings (< 2 ha) constitute 89% of the holdings, but area–wise they constitute only 51% of the total area. Goa has impressive socioeconomic indicators, as compared to the other states of the Country. The State ranks 4th in the Country with 86% literacy rate as per the 2011 census and has the highest per capita income.

Table: Socio-economic indicators of State of Goa

Parameter	District		Total/average
	North goa	South goa	
Population	8,17,761	6,39,962	14,57,723
Human density (Number /km2)	471	326	398.5
Livestock density (Number/km2)	377	578	477.2
Forest area (km2)	923	1296	2219
Forest cover (%)	53.17	65.92	59.54
Cropping intensity (%)	100.81	100.51	100.66
Land degradation (000 ha)	536.33	539.82	1076.15
Net Sown Area (000 ha)	76.8	54.4	131.2
Net irrigated area (000 ha)	15	20	35
Fertilizer consumption (kg/ha)	58	49	53.2
Rural female literacy (%)	82	80	81
Ground water availability (Hectare-meter)	8554	5989	14543

Goa, being in the tropical zone and near the Arabian Sea, has a hot and humid climate for most of the year with moderate temperature variation between 17 to 35°C. The month of May is the hottest, seeing day temperatures of over 35°C coupled with high humidity. The monsoon rains arrive by early June and provide a much-needed respite from the heat. Goa receives heavy precipitation (2500 to 3200 mm) and most of its annual rainfall is received through the South West monsoon which last till late

September. Soils of Goa are mostly laterite (red coloured) with acidic soil reaction. The soils are rice soil organic carbon, deficient in soil available nitrogen, potassium, calcium, magnesium, zinc and boron and medium to sufficient in soil available potassium, iron, manganese, copper. The soils often have poor water holding capacity. Typical agricultural areas in the State are upland and lowland. The coastal saline soils (locally called Khazan) is spread over about 18000 ha area.

Census report shows that there are only 31000 cultivators and 27000 agricultural labourers as compared to the total population of 14.58 lakh. Most of the farmers are not fully dependent on agriculture and they have supplementary sources of income through mining related activities, business, private or Govt. jobs and foreign remittances. It is estimated in the 70th round of NSSO that the average income of farmers in Goa is Rs.91,098 of which Rs. 16,893 is through farming, 15,097 is through Dairying, Rs. 12,243 through non-farm activities and 46,865 through wage labour and salary. The major food crops grown in the state are paddy, cereals, pulses, oilseeds, sugarcane and vegetables. The important horticultural crops of the state are cashewnut, coconut, arecanut, mango, banana, pineapple and spices. Fishing is another important activity covering mainly marine fisheries. Inland fisheries is becoming popular considering the growing demand. The milk production is not sufficient to cater to the demand and is imported from neighbouring states. As such, there is good scope for animal husbandry activities. Community dairy scheme introduced by the State Govt. for large scale integrated dairy development is expected to give a big boost for the dairy sector.

The marginal or small farmers of the region have very limited land which is getting further fragmented with each generation and therefore farm enterprises requiring less land but higher productivity and employment opportunities, needed to be integrated with crop production. A judicious mix of one or more intercrops along with the main crop has a complimentary effect through effective recycling of wastes and crop residues and encompasses additional source of income to the farmers. These systems are often less risky, if managed efficiently, they benefit from synergisms among the crops, diversity in produce, and environmental soundness. Further, integration of allied enterprises in the system adds profitability and stability with intermittent returns through better recycling of resources.

An overview of major crops, livestock their productivity, prevalent varieties and breeds and improved varieties and technologies by ICAR – CCARI are present in a tabular form as follows,

Table: Major crops and livestock, productivity and improved varieties for State of Goa

Commodities/ activities	Productivity	Prevalent varieties/breeds	Technologies by ICAR-CCARI, Old Goa
Crops			
Rice	4.1 t/ha	Jaya, Jyothi, Korgut	Varieties: Goa Dhan –1, Goa Dhan - 2
Cowpea		Local (Alsando)	Variety: Goa Cowpea - 3
Mango	1220 kg/ha	Mankurad, local	Variety: Cardozo Mankurad
Cashew	310 kg/ha	Vengurla 4, 7	Variety: Goa Cashew-2, Goa Cashew-3, Goa Cashew-4
Coconut	5010 nut/ha	Benaulim, Calangute	Farming system based approach for to improve productivity of coconut gardens
Livestock			
Cattle	-	Crossbreeds	Production technologies for dairy farming of indigenous breeds like Gir, Sahiwal and Red sindhi
Buffalo	-	Murrah	Production technologies for dairy farming of Murrah
Piggery	-	Local, crossbreds	Registered pig breed - Agonda Goan and Crossbreeds
Goat	-	Local and non-descript	Production technologies for goat farming of Konkan kanyal
Poultry	-	Local and backyard	Introduction of Shrinidhi, Gramapriya, Vanaraja for backyard poultry farming



CCARI, Goa released and two high yielding salt tolerant rice varieties viz. Goa dhan-1 (KS-12) and Goa dhan-2 (KS-17) and Goa cowpea-3 for cultivation in the state of Goa



CCARI, Goa released three high yielding cashew varieties viz. Goa Cashew-2, Goa Cashew-3, Goa Cashew-4




Agonda Goa-registered pig breed of Goa state, cross breed pig, Konkan Kanyal goat breed and backyard poultry to boost livestock and egg production in Goa state



Cardozo Mankurad mango, nutmeg, kokum and jackfruits from Goa state for horticulture value addition

3 Baseline information about area, production and productivity of major crops, livestock and fisheries of Goa state

North Goa: The geographical area of North Goa district is 1463 sq km and accounts for 40% of the total geographical area of Goa State. North Goa has 166 villages with 102 Village Panchayats. The average annual rainfall of the district is 3473 mm. Mandovi, Tiracol and Chapora are the major rivers in the district. The types of soil available in the district are sandy, red loamy, coastal alluvium and laterite. Two talukas of the District, Bicholim and Sattari are rich in iron ore deposits. As per Census, 2011, the district has total population of about 8.18 lakh (56.10% of the total population of the state), the sex ratio is 959 per 1000 males and literacy rate is 81.06%.

- North Goa District has five talukas and it is estimated that there are 15,000 cultivators and 14,000 agricultural labourers in the District. There are 45,891 landholdings with total area of 51,375 ha.
- The average size of land holding is 1.12 ha and 80% of it is below 1 ha. The marginal and small landholdings (<2 ha) constitute 91% of the total land holdings which is 51% of the area of landholdings. The cropping intensity is as low as 121%
- Plantation crops, viz., cashew, arecanut, coconut and food crops like paddy and vegetables are the major agricultural crops in the District.

The area, production and productivity of major crops in the district are given below:

Crop	Avg. area (ha)	2013-14		2014-15		2015-16		
	(last 5 yrs)	Area (ha)	Prodn	Area	Prodn	Area	Prodn	Productivity
Paddy	25400	22010	97526	17225	76324	17554	73288	4175
Pulses	8589	6775	7466	7210	6806	7724	6797	840
Groundnut	3108	2591	6589	2271	4290	1898	4035	2126
Sugarcane	143	140	7902	124	7553	119	6068	50989
Vegetables	3701	3829	43693	3338	38080	3277	37384	11408
Total	**41886**	**35345**		**30168**		**30572**		

Area in ha, Production in MT & Productivity in average yield (kg/ha.) (Source: NABARD and Directorate of Agriculture, Goa)

The area, production and productivity of major plantation crops in the district are given below:

SN	Crop	2014			2015			2016		
		Area under prodn (ha)	Avg. yield (kg/ ha)	Prodn (MT)	Area under prodn	Avg. yield (kg/ha)	Prodn. (MT)	Area under prodn	Av-gyield (kg/ha)	Prodn (MT)
1	Cashew	40712	435	17710	37355	446	16660	37516	310	11630
2	Arecanut	1468	1664	2443	480	1654	794	496	1660	794
3	Pepper	421	318	134	274	320	88	284	330	94
4	Tree Spices	59	29	2	51	30	2	513	35	2.03
5	Sugarcane	140	54666	7653	129	60910	7857	119	50989	6068
6	Mango	1431	1856	2656	977	1835	1793	997	1220	1216
7	Banana	1253	11320	930	1253	11295	14153	952	11310	10767
8	Pineapple	192	16610	3189	110	16580	2824	112	16595	2859
9	Coconut (lakh nuts)	11379	4977	566	8911	4955	442	8925	5010	447
10	Oil palm	336	2469	1330	335	2460	824	322	2470	795
11	Other garden crops	2258	10690	24138	1650	10665	17597	1662	10680	17750
12	Vegetables	3829	11411	43693	3338	11408	38080	3277	11408	37384
Total		63130		171578	63478		43 825	54720		88806

Area in ha, Production in MT & Productivity in average yield (kg/ha.) (Source: NABARD and Directorate of Agriculture, Goa)

Livestock and fisheries

Dairy: The total demand of milk in the State is around 3.25 lakh litres per day, while the estimated production is 1.5 lakh litres per day. Accordingly, there is a shortage of 1.75 lakh litres per day and the same is met by importing from neighbouring states. There is no specific descript breed of cattle/buffalo in the district.6092 households are engaged in cattle farming and 3557 households in buffalo rearing.As per the livestock census 2012, the total livestock population of the district is 2,90,901 of which the bovine population is 48,995, details are as under:

Particulars	Cattle		Total
	Male	Female	
Cross bred cattle	858	8706	9564
Indigenous cattle	6845	13613	20458
Buffalo	3967	15006	18973

State Govt. is implementing 9 schemes for dairy development, viz., Sudharit Kamdhenu Scheme,Revised modern dairy scheme, Scheme for cattle feed subsidy, Scheme for incentives to milkproducers, Pashupalan scheme, Green fodder scheme, Dairy equipment Scheme, Infrastructuredevelopment Scheme, Community Dairy scheme and Dairy kits Scheme.

Goat and pig: The Livestock Census, 2012, indicates that there are about 5871 goats, 1280 cross bred pigs and17779 indigenous pigs in the district. Pig rearing units could be seen only in Ponda and Bardeztaluks as traditional household activity. Sheep and Goat rearing is taken up mainly by landlessagricultural labourers, both as primary and supplementary activity.

Poultry: Poultry activity, especially Layer and Broiler rearing, provides subsidiary income and gainfulemployment to farmers throughout the year.There is huge demand for poultry eggs and meat in Goa. The demand for poultry products is 1.5lakh broilers per week and only one third is met by local supply. Back yard poultry is slowly getting a presence in the State as a household activity as both meatand eggs have local preference and fetch better sale price. As per Livestock Census, 2012, there are 2,92,000 poultry birds (including backyard poultry,poultry farm birds, ducks, turkey, etc.), of which 1,86,982 poultry birds are in North Goa, as givenbelow.

Sl no	Particulars	Numbers
1	Layer birds	60255
2	Broiler birds	67358
3	Backyard poultry birds	59209
4	Others (ducks, turkey etc.)	160
	Total	186982
5	Households involved in backyard poultry	6805
6	Private poultry farms	9
7	Households involved in poultry rearing	808

Fisheries: Fishing is one of the major economic livelihoods of the fishermen in the State and fish is the staplediet of a major section of the Goan population.There are four fishing taluks, viz., Tiswadi, Bardez and Pernem in North Goa. The district has acoastline of 42 km and 130 km brackish water estuaries along the banks of Tiracol, Chapora,Mandovi and Zuari rivers.The total fishermen population of Goa is about 10545 (Marine Fisheries Census of CMFRI, 2010)of which 36 % are located in North Goa.

Total fish catch during 2015-16 is 1,11,911 MT which is about 5% less than the previous financialyear. Of this, marine catch is 1,07,069 MT and inland fish catch is 4,842 MT. Fish exported during2014-15 is 44,684 MT (value Rs. 569.54 cr.) (Source : Dept. of fisheries)

South Goa

The geographical area of South Goa district is 2239 Km. The boundaries of the district are well defined in the north by river Zuari, in the east by Belgaum district, in the south by Uttar Kannada district of Karnataka State and in the west by the Arabian sea. The district is endowed with rich natural resources such as forests, navigable rivers and valuable mineral deposits like iron ore, manganese ore, agriculture land, natural harbour and beautiful coastline. The major food crop of the district is paddy and plantation crop is sugarcane. Besides horticulture crops like cashew, coconut, mango and arecanut are also grown in the district. South Goa is a biodiversity rich region located along the Western Ghats, with 65% of geographical area under forest cover.

Two perennial rivers viz, Zuari, Galgibag and three ephemeral rivers, viz., Sal, Saleri, Talpona flow in South Goa. The average rainfall of the district is 3085 mm and 90% of the rains are received from June to September. Of the Net Sown Area of 63697 ha, 23% of area is under irrigation in the district. Salaulim Irrigation Project is the only irrigation project with Culturable Command Area of 9537 ha. The predominant economic activities of the district are mining, tourism and farming. The Micro Small and Medium Enterprises sector covers a wide spectrum of rural based industries. There are nine Industrial Estates in the district, with the prominent being Verna Industrial Estate.

Major cultivated crops of the district are paddy, sugarcane, pulses and vegetables. Cashew and coconut are the major plantation/horticulture crop, while mango, arecanut, oil palm and spices like pepper and nutmeg are also cultivated. However, the productivity levels of crops are much lower than other States. More than 50% of the demand of fruits, vegetables, milk and meat are met from the neighbouring States.

Out of 63697 ha net sown area of the district, cashew accounts for 19093 ha i.e. 30 % of net sown area. Vengurla 4, Vengurla 7 and Balli 2 are the suitable varieties grown in the district. Cashew liquor industry is unique to Goa. It is the only State where the cashew apple is commercially used for distilling liquor, popularly known as "Feni.", for which Geographical Indicator status has also been accorded. The local Goan varieties of Mango, viz., Mancurad fetches high price in the local market. Besides, there are a number of minor fruits like kokum, noni, jamun, jackfruit, etc., which are yet to be commercially used.

South Goa District has seven talukas and it is estimated that there are 16000 cultivators and 13000 agricultural labourers in the District. There are 32129 land holdings of which 88% are cultivated by marginal and small farmers, constituting 52% of the total holding area of holdings. The average land holding of farmers is 1.17 ha. While Sanguem, Darbandora, Quepem and Cancona are predominantly agricultural areas, Ponda, Salcete and Mormugao blocks are comparatively urbanised. The cropping intensity is low at 120%. Plantation crops, viz., cashew, arecanut, coconut and food crops

like paddy and vegetables are the major agricultural crops in the District.

Crop	Av. Area (last 5 years)	2013-14			2014-15			2015-16		
		Area (ha)	Production (MT)	Productivity (kg/ha.)	Area (ha)	Production (MT)	Productivity (kg/ha.)	Area (ha)	Production (MT)*	Productivity (kg/ha.)*
Paddy	21340	20810	92209	4431	23995	106322	4431	23790	99323	4175
Pulses	1473	1343	1480	1102	1343	1268	944	1328	1116	840
Sugarcane	730	732	40016	54666	684	41662	60910	1020	52008	50989
Vegetables	3022	3175	36230	11411	3850	43921	11408	3963	45210	11408

Area in ha, Production in MT & Productivity in average yield (kg/ha.) (Source: NABARD and Directorate of Agriculture, Goa)

The area under cultivation of different fruits, vegetables and plantation and horticulture crops and their production in South Goa during last three years are below:

SN	Crop	2013-14			2014-15*			2015-16*		
		Area under prodn.	Avg. yield (kg/ha)	Prodn. (MT)	Area under prodn.	Avg. yield (kg/ha)	Prodn. (MT)	Area under prodn.	Avg. yield (kg/ha)	Prodn (MT
1	cashew	15224	435	6622	187241	446	8351	19093	310	5919
2	Arecanut	272	1664	453	1270	1654	2101	1287	1660	2136
3	Pepper	316	318	100	490	320	157	499	330	165
4	Tree Spices	109	29	3	127	30	4	135	35	4.8
S	Mango	3388	1856	6288	3866	1835	7094	3887	1220	4742
7	Banana	1071	11320	12124	1450	11295	16378	1462	11310	16535
8	Pineapple	103	16610	1711	257	16580	4261	266	16595	4414
9	Coconut (million)	14371	4977	71.52	16875	4955	83.6	16893	5010	84.6
10	Oil palm	503	2469	1242	507	2460	1247	512	2470	1265
11	Other garden crops	1581	10690	16901	2217	10665	23644	2247	10680	23998
12	Vegetables	3175	11411	36230	3850	11408	43921	3963	11408	45210
	Total	**40113**		**15319**	**40113**		**19077**	**55859**		**16441**

Area in ha, Production in MT & Productivity in average yield (kg/ha.) (Source: NABARD and Directorate of Agriculture, Goa)

Animal Husbandry:

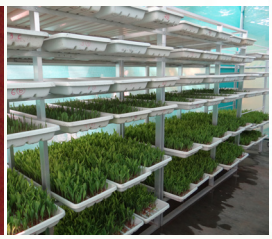
Dairy: As per the last livestock census 2012, the total livestock population of the district is 2,23,202ofwhich the bovine population is 40,283 as detailed below:

Particulars	Cattle		Total
	Male	Female	
Cross bred cattle	998	6964	7962
Indigenous cattle	10059	9437	19496
Buffalo	2737	10088	12825
Total	13794	26489	40283

As per the latest livestock census, 5188 households are engaged in cattle farming, while 1836households are involved in buffalo rearing. The State does not have recognized breeds of cattle or an organized cattle market. Nearly, 70% of available cattle are local and non-descript breed. Goa Dairy, is a cooperative federal body of dairy societies, with a processing capacity of 1.10 lakh litres/day.

Poultry: Poultry farming is a supplementary source of income for rural households and farmers, especially women. The per capita poultry consumption in Goa is estimated at about 80 eggs and 3 kg of meat as against the national average of 55 eggs and 2.2 kg of meat. This may be mainly due to large number of tourist inflow. The demand for poultry products is 150,000 broilers per week, and local supply is just one third of the demand. As per the Livestock census, 2012, there are 2,92,000 poultry birds (including backyard poultry, poultry farm birds, ducks, turkey, etc.), of which 1,04,969 poultry birds are in South Goa district.

Sl no	Particulars	Numbers
1	Layer birds	23542
2	Broiler birds	9510
3	Backyard poultry birds	71416
4	Others (ducks, turkey etc.)	501
	Total	104969
5	Households involved in backyard poultry	8463
6	Private poultry farms	2
7	Households involved in poultry rearing	10


Artificial Insemination in pigs, Boar semen extender, Hydroponic fodder and Bypass fat to increase the livestock production in Goa state


Heliconia flower production technology and Integrated farming system models for Goa state




Nutmeg pericarp syrup, jam, mouth freshener, candy and cashew apple crunch are important value-added productions of nutmeg and cashew as an alternate source of income to farmers

4 Problems/Constraints faced by farmers in Goa state

- Unavailability of quality seed and planting material of paddy, cashew, coconut and other important crops
- High labour cost and unavailability of harvesters in coconut and other areas of agriculture
- Wild animal menace in agriculture is important and major problem in Goa
- Lack of cold storage and warehouses, small scale paddy processing units
- There is a wide gap between demand and production of milk, meat and eggs in Goa which is currently depends on neighboring states.
- Unavailability of quality feed and fodder for dairy sector
- Lack of ccapacity building of farmers, youth, field veterinarians about improved animal husbandry practices
- Presently, there is an acute shortage of Field Veterinarians and Veterinary Assistants at all field establishments which limit better veterinary services to the farmers.
- Unavailability of labour in poultry, dairy and other animal husbandry sectors
- Lack of slaughter houses/meat processing units for small animals (goats, pigs and poultry) for meat production and value addition.
- Unavailability of quality seeds in fisheries sector is a major concern. Besides, storage facilities, lack of awareness about advanced technologies, lack of proper marketing chain and facilities are also matter of concern.
- Establishment of coastal zone coordination agriculture committee minimum support price
- Lack of coordination among different government departments.
- Facility /data of kisan card should be made valid for availing all the schemes of development departments to get support in terms of subsidy/support price etc.
- Farmers also expressed issues like capacity building of weaker sections, attracting youths to agriculture, and publications of success stories, providing agriculture inputs and providing facilities for by products processing.

5 Proposed Roadmap/Action Plan for Doubling the Farmers Income by 2022

The first state level coordination committee meeting for doubling the farmer's income by 2022 was organized on 27.3.2017 at ICAR-CCARI, Goa under the chairmanship of Director, CCARI, Goa. After considering the outcomes of the meeting as well as the input received from various ICAR institutes for identifying the suitable technologies for the state of Goa, the following strategies are proposed for formulating the action plan.

1. Productivity improvement in crops
2. Crop Diversification, Intensification and Integrated Farming System (IFS) approaches (Integration of potential crops, animal and fishery) and advanced management practices like nutrient management and plant protection measures
3. Production improvement in animal and fishery sector
4. Mechanization in agriculture and allied activities
5. Creating value chain-supply network by Post-Harvest management and Value addition
6. Policy reforms in Land reforms and community farming and optimising support price for agricultural produce

1. Productivity improvement in crops

Crops	Strategies	Milestone					
		2017-18	2018-19	2019-20	2020-21	2021-22	Agency responsible for Implementation
Paddy	Introduction of High Yielding Varieties (HYV): Area coverage in %	10	20	30	40	50	• Directorate of Agriculture, Goa (for distribution of HYV seeds) • ICAR-CCARI, Goa (Recommendation of suitable HYV for Goa)
	Increasing the Seed Replacement of Ratio (SRR) of existing popular varieties-SRR rate in %	20	40	60	80	100	• Directorate of Agriculture, Goa (for distribution of seeds) • KVK (North Goa) and KVK (South Goa) (for distribution of seeds)
	System of Rice Intensification (SRI)- Area expansion in %	5	10	15	20	25	• Directorate of Agriculture, Goa (for Demonstration) • KVK (North Goa) and KVK (South Goa) (For popularization of SRI technology)

	Certified seed production of HYV as an enterprise- Quantity in quintal (q)	20	50	100	200	500	• Directorate of Agriculture, Goa (for certification, procurement and distribution) • KVK (North Goa) and KVK (South Goa) (For identifying entrepreneurs for seed production) • ICAR-CCARI, Goa (For providing foundation seed)

Crops	Strategies	Milestone					
		2017-18	2018-19	2019-20	2020-21	2021-22	Agency responsible for Implementation
Cashew	Replacement of senile plantation with HYV (% area to be covered)	5	10	20	30	40	• Directorate of Agriculture, Goa (for distribution of HYV grafts/plants) • ICAR-CCARI, Goa (Recommendation of suitable HYV for Goa)
	Nutrient management (INM and IPM) in cashew. (% area to be covered)	5	10	20	30	50	• Directorate of Agriculture, Goa (for popularization of INM practices and supply of necessary inputs) • KVK (North Goa) and KVK (South Goa) (for demonstration and dissemination of INM practices)
	High density planting of HYV (Area in hectares)	5	10	20	30	40	• Directorate of Agriculture, Goa (for distribution of HYV grafts/plants) • ICAR-CCARI, Goa (Recommendation of suitable HYV for Goa)
Mango	Creation of new orchards of improved local verities by high density planting (Area in hectares)	5	10	20	30	40	• Directorate of Agriculture, Goa (for distribution of HYV grafts/plants) • ICAR-CCARI, Goa (Recommendation of suitable HYV for Goa) • KVK (North Goa) and KVK (South Goa) (for distribution and demonstration of HYV)

Crops	Strategies	Milestone					
		2017-18	2018-19	2019-20	2020-21	2021-22	Agency responsible for Implementation
Coco-nut	Introduction of Dwarf – HYV in coconut (Area in hectares)	10	20	30	40	50	• Directorate of Agriculture, Goa (for distribution of HYV grafts) • ICAR-CCARI, Goa (Recommendation of suitable HYV for Goa)
	Inter cropping management – Forage / Spices / Fruits / Floriculture (Area in hectares)	10	20	30	40	50	• Directorate of Agriculture, Goa (for popularization and supply of necessary inputs) • KVK (North Goa) and KVK (South Goa) (for dissemination and demonstration of technologies)

2. Crop Diversification, Intensification and Integrated Farming System (IFS) approaches (Integration of potential crops, animal and fishery) and advanced management practices like nutrient management and plant protection measures

Crops	Strategies	Milestone					
		2017-18	2018-19	2019-20	2020-21	2021-22	Agency responsible for Implementation
Utilization of rice fallow lands for pulses like cowpea, green gram (Mung) & Ground nut (Area in hectares)	Area expansion under paddy fallow lands	2000	5000	8000	10000	12000	• Directorate of Agriculture, Goa (for distribution of HYV pulses) • ICAR-CCARI, Goa (Recommendation of suitable HYV for Goa)
Vegetables	Introduction of varieties along with production and protection technologies (area in hectares)	50	100	150	200	250	• Directorate of Agriculture, Goa (for distribution of HYV seeds) • ICAR-CCARI, Goa (Recommendation of suitable HYV for Goa and production technologies)

High value Horticultural crops and spices	Introduction of varieties along with production and protection technologies (area in hectares)	50	100	200	300	500	• Directorate of Agriculture, Goa (for distribution of seeds, planting materials) • ICAR-CCARI, Goa (Recommendation of suitable HYV for Goa and production technologies)
Creating models of IFS in farmer filed with different components (in numbers)	IFS models in South and North Goa with best components	10	15	20	25	30	• Directorate of Agriculture, Goa (for popularization of IFS, supply of critical components and schemes) • ICAR-CCARI, Goa (Recommendation of IFS models for Goa)

3. Production improvement in animal and fishery sector

(I) Dairy sector

a. Area expansion under green fodder production.

Crops	Strategies	Milestone					
		2017-18	2018-19	2019-20	2020-21	2021-22	Agency responsible for Implementation
Green fodder production	Area expansion of green fodder cultivation through extension activities and schemes	2,000 ha	2000 ha	2000 ha	2000 ha	2000 ha	• Directorate AHVS • ICAR-CCARI, Goa (Recommendation of suitable HYV for Goa)
Advance technology like Hydroponic fodder for landless farmers	Demonstration and establishing models in field	10 in each tahasil	20 in each tahasil	50 in each tahasil	100 in each tahasil	200 in each tahasil	• Directorate AHVS (for formulation of schemes) • ICAR-CCARI, Goa (Hands on Training)

b. Breeding policy.

i. Introduction of exotic germplasm through AI not exceeding 50% genetic makeup

For high yielding, crossbred dairy cattle may be promoted but not exceeding exotic blood level more than 50%. Replacement of stock at least 10 % with units can improve the production.

ii. Introduction and conservation of Indigenous breeds: In the scenario of climate change it is very much essential to identify and conserve local germplasm of cattle suited for local coastal climate . Through selective breeding and purifying local breed development is essential. The indigenous high yielding breeds of Indian continent also needs to be introduced as per requirement of farmers.

iii. Community Dairy Farming: For creating self-employment and to engage youth in dairy farming community dairy farming concept will be useful.

iv. Organization of cattle markets for facilitating sale/purchase of high quality breeding animals of farmers among themselves.

Dairy cattle	Strategies	Milestone					
		2017-18	2018-19	2019-20	2020-21	2021-22	Agency responsible for Implementation
	Introduction of exotic germplasm through AI not exceeding 50% genetic makeup (number of crossbreeds)	5000	5000	5000	5000	5000	• Directorate of AHVS (for AI programmes) • ICAR-CCARI, old Goa (for evaluation and recommendation of breeds)
	Introduction of indigenous breeds: Gir, Sahiwal and Red Sindhi (Number of cows)	5000	5000	5000	5000	5000	• Directorate of AHVS (for supply of indigenous breeds and maintenance of germplasm) • ICAR-CCARI, old Goa (for evaluation and recommendation of breeds)
	Community dairy farming (numbers)	10	20	30	40	50	• Directorate of AHVS (for proposal of schemes and incentives)
	Cattle markets (each in district)	Nil	01	01	Nil	Nil	• Directorate of AHVS (organisation of cattle markets)

c. Meat

i. Introduction of improved breeds in Goats, Pig, Poultry.

ii. Slaughter house and meat processing units for small animals.

iii. Strengthening the veterinary services.

Improvement in Meat and egg production	Strategies	Milestone					
		2017-18	2018-19	2019-20	2020-21	2021-22	Agency responsible for Implementation
Goat	Introduction of coastal goat breeds (Konkan Kanyal) under stall feeding (number of breeding units in farmer's field and govt.\units)	10	20	30	40	50	• Directorate of AHVS (for supply and multiplication of goat breeds, formulation of schemes) • ICAR-CCARI, Old Goa (Technology evaluation and training to farmers about scientific goat farming)
Pig	Introduction and conservation of indigenous and cross breed pigs (number of pigs)	10,000	10,000	15,000	15,000	15,000	• Directorate of AHVS (for conservation and multiplication and supply, formulation of schemes) • ICAR-CCARI, Old Goa (Technology evaluation and training to farmers)
Poultry	Improvement in backyard poultry and coloured broilers for meat and egg production (Number of poultry)	1,00,000	1,00,000	1,00,000	1,00,000	1,00,000	• Directorate of AHVS (for multiplication and supply of chicks, formulation of schemes) • ICAR-CCARI, Old Goa (Technology evaluation and training to farmers)

4. Mechanization in agriculture and allied activities

Mechanization in agriculture and allied activities	Strategies	Milestone					
		2017-18	2018-19	2019-20	2020-21	2021-22	Agency responsible for Implementation
	Mechanisation of Land preparation, planting and harvesting (Area covered in %)	15	20	30	40	50	• Directorate of Agriculture –subsidies and creation of machinery bank • ICAR-CCARI, Ela, Goa- training and sensitization
	Mechanization in coconut harvesting (Area covered in %)	10	15	20	25	30	• Directorate of Agriculture –subsidies and creation of machinery bank • ICAR-CCARI, Ela, Goa- training and sensitization

5. Creating value chain-supply network by Post-Harvest management and Value addition

Value addition in agriculture and allied activities	Strategies	Milestone					
		2017-18	2018-19	2019-20	2020-21	2021-22	Agency responsible for Implementation
Paddy							
	Establishment of community agro- processing centres (in numbers) Establishment and promotion of storage structures	2	4	6	8	10	• Directorate of Agriculture –subsidies and creation of machinery bank • ICAR-CCARI, Ela, Goa- training and sensitization
Coconut	Establishment of processing units for virgin coconut oil and other products (in numbers)	2	4	6	8	10	• Directorate of Agriculture –subsidies, ICAR-CPCRI, Coconut board and • ICAR-CCARI, Ela , Goa- training and sensitization
Cashew	Cashew apple value addition including feni Cashewnut value addition	2	4	6	8	10	• Directorate of Agriculture –subsidies and creation of machinery bank • ICAR-CCARI, Ela, Goa- training and sensitization
Other fruits/ crops	Establishment of community multi product processing plants for value addition of Kokum, Jackfruit, Breadfruit, Jagoma, Wax Apple, Jamun Karonda, star fruits, etc. (in numbers)	2	4	6	8	10	• MOFPI &Directorate of Agriculture –incentives and funding • ICAR-CCARI, Ela, Goa- training and sensitization
Dairy and meat products	Establishment of units for value addition in Dairy milk products and pork and mutton products (in numbers)	1	2	3	4	5	• MOFPI & Directorate of Agriculture –incentives and funding • ICAR-CCARI, Ela, Goa- training and sensitization

Fisheries sector:

- There is a wide scope to improve the income and livelihood of fishermen through diversification of fish species to increase stock density, better availability of the fish seeds, promotion of mussel farming, capacity building and awareness creation, etc.
- Improved storage facilities – cold ice plants, insulate vehicles, etc can also play an important role for marketing of the fish catch.
- Development of integrated farming systems with fishery as an important enterprise can ensure regular income and improved production.
- Post-harvest handling, value addition, allied activities like ornamental fish farming also have potential to contribute to improvement in income.
- Iimproved technologies like cage culture technology, satellite hatcheries for raising cultures can help farmers to increase their fish catch.
- Providing subsidized cages and ensuring timely and adequate supply of fish seeds to the farmers are essential to boost farmer's income.
- Fish production strategies like diversification of inland fish production through new finfish species and methodologies and promotion of ornamental fish culture through self-help groups

6. **Policy reforms in Land reforms and community farming and optimising support price for agricultural produce :** Government of Goa need to take certain reforms in rule related to Landowning and subsidies as well as support price for agricultural produce.

6 Summary of action plan

The State-wise Coordination Committee (SCC) constituted to design road map for doubling Farmer's income by March, 2022 for the state of Goa by Secretary (DARE) & DG, ICAR New Delhi vide order F.No.5-4/2017-Cdn (Tech) dated 6th March, 2017. The main objective of the committee is to develop the concrete action plan for doubling the farmers' income for Goa keeping in view of existing productivity and income levels of farmers in Goa state, to develop strategy needed to double the income of farmers/ agricultural labourers by March 2022. The first SCC meeting was convened on 27th, March, 2017 under the chairmanship of Director, ICAR-CCARI, Goa and other members. The detailed deliberations, baseline information and area specific technologies suitable to double the income of farmers were discussed.

The proposed action plan for Goa state include mainly the productivity improvement in major crops like paddy, cashew and coconut, diversification in agriculture, creation of IFS models, mechanisation, value addition and policy reforms in agriculture.

Further, the committee suggested constituting a district level monitoring and evaluation committee under the chairmanship of project director, ATMA and project coordinator, KVK as convenor with the representatives from all line departments as members of this committee for both South and North Goa for effective monitoring of action plan.

7 PROCEEDING OF THE GOA STATE COORDINATION COMMITTEE (SCC) MEETING ON DOUBLING OF FARMERS' INCOME BY MARCH, 2022 HELD AT ICAR-CCARI, OLD GOA, GOA ON 27th MARCH, 2017.

Goa State Coordination Committee (SCC) meeting on Doubling of Farmers' Income by March, 2022 was convened at ICAR-Central Coastal Agricultural Research Institute, Old Goa, Goa on 27th March, 2017 under the chairmanship of the Director, ICAR-CCARI, Old Goa.

Dr.Eaknath B. Chakurkar, Director, ICAR-CCARI and Chairman of the Committee briefed the objectives of the SCC meeting and emphasized to focus on major field and horticulture crops, dairy and fisheries sectors, value addition/post harvest management, integrated farming systems, agri- entrepreneurship and region specific technologies needs considered for doubling the farmer's income in the state of Goa. He also hoped that the committee would formulate actionable strategic plan which can be monitored effectively by March, 2022 as desired by the Council.

Dr. D. V. Srinivas Reddy, Principal Scientist representing ICAR-Agricultural Technology Application Research Institute (ATARI), Bengaluru as convener made a brief presentation on scope, action plan and potential agriculture technologies required for Goa state to double the farmer's income. Progressive farmers who attended the meeting expressed major problems like wild animal menace, minimum support price and linking kisan card with all the schemes of development departments to get support to continue in agriculture for their livelihood.

About 30 participants including Directors of Directorate of Agriculture, Animal Husbandry & Veterinary Services and Directorate of Fisheries, Govt. of Goa, representatives from NABARD, Horticulture Corporation, Dr.Balasaheb Sawant Konkan KrishiVidyapeeth, Dapoli (MH), ICAR-CMFRI- Karwar centre, progressive farmers from Goa and scientists of ICAR-CCARI attended the meeting and contributed to prepare detailed strategic plan.

The detailed proceedings were noted below:

Dr. M. Thangam, Principal Scientist, Horticulture Section of ICAR-CCARI, Old Goa welcomed the delegates. Dr. DV Srinivas Reddy, PS, ATARI, Bangaluru presented a brief background of SCC meeting and points to be discussed before the committee.

The participants of the meeting included below:

List of delegates attended the meeting	List of members absent for the meeting
Dr E B Chakurkar, Director, ICAR- CCARI, Old Goa, Goa	Director, CIFT, Matsyapuri, Cochin, Kerala
Dr.DVSrinivasreddy, PS and Representative of Director, ATARI Bangaluru.	Nominee of Secretary DAC&FW
Dr. Santosh Desai, Director, Directorate of Animal Husbandry and Veterinary Services, Govt. of Goa	Nominee of Secretary DAHDF
Dr.Shamila Monteiro, Director, Directorate of Fisheries, Govt. of Goa,	Nominee of Secretary Ministry of Food Processing Industries
Shri. UlhasPaiKakode, Director, Directorate of Agriculture, Govt of Goa.	Representative from VC, UAS, Dharwad
Dr.ParagHaldankar, Associate Dean & Representative of VC, Dr.BalasahebSawant Konkan KrishiVidyapeeth, Dapoli (MH).	
Representative from NABARD	
Managing Director, Horticulture corporation, Goa	
Shri Babu N Komarpant, Progressive farmer on IFS from South Goa	
Shri Ashok Joshi, Progressive farmer of protected cultivation from North Goa	
Mrs.Deepti Joshi Progressive farmer as entrepreneur for value addition from North Goa	
Dr.JayasreeLoka, CMFRI, Karwar centre and Representative of Director, CMFRI, Cochin	
Scientists & PC,ICAR-KVK, North Goa	

A. Agriculture sector

The Director of Agriculture, NABARD, Horticulture Corporation officers deliberated on status and scope of agriculture in Goa and emphasized on gap between demand and production of food grains, vegetables, fruits etc. The state depends on neighbouring states for afore mentioned commodities. Baseline information on existing farmer's income, land holdings, production and productivity needs to be studied to formulate the strategies for doubling farmer's income. Paddy, cashew and coconut are three important crops for Goa. The salient points of discussion are as follows:

- Diversification of existing cropping pattern like intercropping in cashew, coconut with possible intercrops and adoption of integrated farming system based approach (crops, livestock, fish, etc) can augment the income of farmers
- Adoption of best management practice like quality seed, nutrient management, irrigation, pest and disease control.
- Improved availability of irrigation water through rain water harvesting and irrigation infrastructures strengthening
- Improved availability of quality seed and planting material of paddy, cashew, coconut and other important crops
- Considering the labour cost and unavailability of harvesters in coconut, dwarf varieties/hybrids can be introduced and popularised
- Considering a good potential for organic farming in the Goa state, technological development and policy formulation to promote organic farming in paddy, cashew, vegetables etc. is required
- Necessary steps needs to be taken up to reduce and control the damage caused by wild animals in agriculture
- Secondary agricultural activities like value addition to different agricultural produce, establishment of cold storage and warehouses, small scale paddy processing units and allied enterprises like vermicomposting, etc needs to be undertaken.
- Capacity building through development of master trainers, use of social media platforms, farmer-scientist forum for wider dissemination of improved production technologies.

B. Animal husbandry sector:

The Director, AHVS presented the status of animal husbandry in Goa and main problems like labour, feed and lack of availability of good quality animals for dairy farming. The present milk production in Goa is 1.2 Lakh litters per day.

There is a wide gap between demand and production of milk, meat and eggs in Goa which is currently depends on neighbouring states. Further, step wise strategies to improve the farmer's income were discussed. The salient points are as follows:

- Initiatives are required to take up for improved availability of quality feed and fodder by adopting improved fodder varieties and modern managemental practices.
- Community dairy farming with all the facilities like, veterinary services, vaccination and collection of milk and its marketing can be initiated.
- Encouraging existing farmers and motivating youth to undertake dairy farming through formulation of policies and schemes. Capacity building of farmers, youth, field veterinarians about improved animal husbandry practices needs be undertaken
- Presently, there is an acute shortage of Field Veterinarians and Veterinary Assistants at all field establishments which limit better veterinary services to the farmers. Thus necessary steps to be taken to strengthen the veterinary services.
- Initiatives like organization of cattle markets for better availability of quality dairy cows needs to be undertaken
- Adoption of mechanisation in poultry, dairy and other animal husbandry sectors is required to minimise the dependence on labour.
- Establishment of slaughter houses/meat processing units for small animals (goats, pigs and poultry) for meat production and value addition.

C. Fisheries sector

Director of Fisheries, Govt. of Goa, presented briefly about the fish production, problems and scope associated with it. Among several problems, important are availability of quality seeds is a major concern. Besides, storage facilities, lack of awareness about advanced technologies, lack of proper marketing chain and facilities are also matter of concern. Further she elaborated the scope to improve the income and livelihood of fishermen through diversification of fish species to increase stock density, better availability of the fish seeds, promotion of mussel farming, capacity building and awareness creation, etc. Improved storage facilities – cold ice plants, insulate vehicles, etc can also play an important role for mar-

keting of the fish catch. Development of integrated farming systems with fishery as an important enterprise can ensure regular income and improved production. Post harvest handling, value addition, allied activities like ornamental fish farming also have potential to contribute to improvement in income.

The representative from ICAR – CMFRI, Karwar deliberated on improved technologies like cage culture technology, satellite hatcheries for raising cultures, etc and requirement of the capacity building for it. Providing subsidized cages and ensuring timely and adequate supply of fish seeds to the farmers are essential to boost farmer's income.

Progressive farmers who attended the meeting expressed major issues like wild animal menace, establishment of coastal zone coordination agriculture committee minimum support price and linking kisan card with all the schemes of development departments to get support to continue in agriculture. Farmers also expressed issues like capacity building of weaker sections, attracting youths to agriculture, and publications of success stories, providing agriculture inputs and providing facilities for by products processing.

The committee suggested constituting a district level monitoring and evaluation committee under the chairmanship of project director, ATMA and project coordinator, KVK as convenor with the representatives from all line departments as members of this committee for both South and North Goa.

The meeting was concluded with the remarks of Chairman.

8 Technologies available

Technologies with Potential for Doubling Farmer's income by March, 2022 Suitable for the state of Goa: inputs from ICAR-CPCRI, Kasaragod – 671124, Kerala

Technology Title	Brief Description	Potential income increase due to adoption of technology (in %)
1.Kalparasa (neera) tapping and its processing into value addition	Tapping of phloem sap from the coconut spadix with the use of 'coco-sap chiller' developed by ICAR-CPCRI not only collects the sap unfermented but also hygienic. It is a sweet, delicious and nutritive sap and as such can be sold as health drink. Further it can be processed into various value added products like coconut sugar, jaggery, syrup or concentrate which are in great demand both domestically and internationally.	Experience in various states of India as well as internationally it is 8 to 10 times more profitable to tap than selling the nuts.
2.Virgin coconut oil – Hot and fermentation process	VCO is obtained from fresh and mature coconut by mechanical or natural means, with or without use of heat, no chemical refining, bleaching or de odorizing and maintains the natural aroma and nutrients. Fully matured 11-12 months old coconut is selected for VCO production. The VCO production process involves dehusking, deshelling, testa removing, blanching, pulverizing, milk expelling, cooking / fermentation, filtering and packaging. ICAR-CPCRI has standardized the process technology and developed the machineries for the production of both hot and fermentation process VCO. It has also developed the technology for the value addition of by-products such as mature coconut water (converted into vinegar, jelly, RTE squash etc.), testa (bakery and confectionary products), coconut milk residue and VCO cake (used in bakery, confectionary and extrudate products). About 35 entrepreneurs had adopted CPCRI VCO technology till now.	It is estimated that at least 45% profit can be realized for the minimum processing of 500 coconuts per day. It is concluded that after producing 4200 kg of hot process virgin coconut oil, the no profit no loss point will occur which will correspond to a respective sales volume of Rs. 33.5 lakhs and this respective stage will arrive after 168 days of functioning of the unit. Therefore the VCO making unit will start earning profit from sixth month after installation.

3.Coconut chips	Coconut chips are crunchy, crispy and healthy snack food in place of present day junk food. It is rich in protein, fibre and anti oxidant compounds. 8-9 months old coconut is selected for chips production. The process involves dehusking, deshelling, testa removing, slicing, blanching, osmotic dehydration, drying and packaging. ICAR-CPCRI has standardized the process technology for the production of different varieties of coconut chips.	Coconut chips production venture provide at least 65% profit for a processing level of 250 coconuts per day. The break even period of 60 days is attained in this venture.
4.Tender coconut processing machineries (Tender coconut punch and cutter & Snowball tender nut machine)	ICAR-CPCRI has developed a simple tender nut punch and cutter to make hole in the tender nut and cut open the nut after drinking water. This will avoid the present day drudgery practice. ICAR-CPCRI has also developed snow ball tender nut machine to serve the tender nut in the form of ball with water intact after removing the shell.	These machines will raise the income of farmers cum entrepreneurs by at least 50%.

Directorate of Agriculture, Govt. of Goa: inputs for SCC on Doubling Farmers income by 2022

Directorate with a vision for Doubling Farmers income by 2022 is focusing on some of the important crops of Goa, through various initiatives of the Government implemented by the Department as follows:-

Cashew

1. Promoting use of high yield varieties like V-4, V-8, V-7, V-9, besides new varieties using promising local strains released by Research Station i.e Balli-2.
2. Promoting balanced use of nutrients through organic farming.
3. Promoting the installation of drip irrigation through the scheme through the PMKSY scheme "Per drop more crop" for intercrops.
4. Integrated farming in cashew plots during the initial years with minor crops like drumstick, spices, kokum, amla, pineapple, vegetables, etc. where irrigation is possible.
5. Promoting soil and water conservation measures.
6. Promoting value addition at farmers/ farmers group level
7. Providing assured price to farmers to overcome the low farm gates rates and to provide assured/ remunerative prices to overcome fluctuating market rates and to maintain sustainability.
8. Insulating farmers against damage to crops due to advance climatic conditions
9. Promoting value addition and food / agro processing

Coconut

1. Promoting the CDB scheme for area expansion and rejuvenation of coconut gardens.
2. Promoting the balanced use of nutrients.
3. Integrating farming using suitable cropping patterns using minor crop in the initial years like banana, kokum, amla, pineapple, spices etc. through the NHM/MIDH scheme.
4. Promoting suitable irrigation systems through the scheme through the PMKSY scheme "Per drop more Crop"
5. Promoting suitable mechanization for undertaking various agricultural activities from farm tilling to peeling arecanut.

6. Promoting value addition and Agro Processing Technology by Commodity / Interest Groups (CIG's) (FIG's) etc and federating them into FPG's.
7. Providing assured price to farmers to overcome the low farm gate rates and to provide assured / remunerative prices to overcome fluctuating market rates and to maintain sustainability.
8. Insulating farmers against damage to crops due to advance climatic conditions.

Paddy

1. Promoting suitable HVY varieties for improving the Seed Replacement Ratio (SRR) like Karjat, Warangal, Sabhagidhar, Sampada, Kanchana, Aishwarya, KS-12, GRSI, DRR dhan etc.
2. Promoting mechanization for almost all operations through subsidized implements like weeders, transplanters, harvesters, ploughs, etc.
3. Promoting balanced use of nutrients i.e primary, secondary and micronutrients.
4. Promoting balanced use of organic matter and recycling of crop residue for improving productivity.
5. Promoting use of soil moisture residue for cultivating pulses where second rabi crops is not feasible.
6. Promoting various packages of paddy cultivation for productivity enhancement.
7. Department has undertaken seed production programme by involving local farmers for making available true to type seed of high quality to reduce dependence of National Seed Companies.
8. Providing assured price to farmers to overcome the low farm gate rates and to provide assured / remunerative prices to overcome fluctuating market rates and to maintain sustainability.
9. Insulating farmers against damage to crops due to advance climatic conditions.

Technologies with Potential for Doubling Farmers' Income: inputs from ICAR-DCR, Puttur

Organization : ICAR-Directorate of Cashew Research, Puttur

Name of Nodal Officer/Scientist's : Dr.Mohana G. S

Postal Address : Post Darbe, Puttur – 574 202, D.K., Karnataka

Mobile Number : 9902273468

Sl. No.	Technology Title	Brief description	Potential income increase due to adoption of technology (in percentage)
1.	Ultra high density planting	Planting of cashew under ultra density planting technique (3 m x 3 m or 2.5 m x 2.5 m) 400 to 600 plants per by super imposing regular productive pruning using selected cashew varieties such as VRI-3, Ullal-1, NRCC Sel-2 and hybrid H-130 has been successfully demonstrated in farmers field. About 3-4 tones of nut yield per ha can be harvested in the early stage of orchard life from ultra high density orchards. These technologies are package intensive and are more successful in hilly terrains of coastal and malnad tracts.	100 – 200 %
2.	Intercropping in cashew	In the high rainfall zones and also in the regions of availability of irrigation facilities, intercrops such as locally important marketable vegetables, pulses and medicinal plants can be grown as intercrops in widely spaced cashew plantations in the initial years of cashew crop. The suitability of season and type of intercrops is a most critical factor.	50 – 100% Depending on selected crop

3.	High yielding varieties/ hybrids	Till date, 43 high yielding cashew varieties have been released and recommended for cultivation. Of these, regionally suitable varieties can be grown successfully in different zones. A few hybrids viz., H-130, H-126, H-32/4 and NRC 493, NRC 301 with big apple and bold nut are under evaluation and in pipeline for release. Most of these are very high yielding (20-30%) and with premium kernel grade recovery (W 110 to W 180).	50 – 60 %
4.	Value added products	Protocols for the products from cashew apple such as cashew apple juice (RTS), jelly, jam, halwa and cider (low alcoholic beverage) have been standardized and market acceptability is being evaluated. This activity ensures effective utilization of cashew apple which is presently going waste, and will enhance the total income from cashew orchards.	20 – 40 %
5.	Homestead cashew processing units	Presently, the cashew farmers sell their produce to major processors at a lower price. In case they themselves adopt small scale processing the overall returns will be much higher. Further the retail rural economy will get a boost.	40-50 %
5.	Converting wastelands into cashew orchards.	The existing wastelands can be converted into cashew plantations through appropriate soil management practices. By this effective land utilization can be achieved and additional quantity of raw nut targeted can be obtained to meet the local processing needs of the nation.	50 – 60 %

Technologies with Potential for Doubling Farmer's income by March, 2022 Suitable for the state of Goa: inputs from ICAR-IISR, Kozhikode

Organization: ICAR – Indian Institute of Spices Research, Kozhikode AICRP on Spices, Kozhikode

S. No.	Technology Title	Brief Description	Potential income increase due to adoption of technology (in %)
1.	Black pepper variety – IISR Shakthi	An open pollinated progeny of cultivar Perambramundi. Tolerant to quick wilt disease caused by Phyophthora. Mean yield (dry) (kg/ha): 2253 with a dry recovery 43.0%. Piperine 3.3%, oleoresin 10.2%, essential oil 3.7%.	Suitable intercrop in coconut and arecanut plantations with 30% increased income.
2.	Black pepper variety – IISR Thevam	A selection from the germplam. Mean yield (dry) (kg/ha): 2481, with dry recovery 32.5%. Field tolerant to Quick wilt disease caused by Phytophthora. Piperine 1.6%, oleoresin 8.15%, essential oil 3.1%.	Suitable intercrop in coconut and arecanut plantations with 30% increased income.
3.	Ginger variety – IISR Varada	A good quality and high yielding ginger variety with bold rhizomes. Average yield of 22.6 t/ha. Dry recovery of 20.7%. The variety has 3.9-4.5% crude fibre, 6.7% oleoresin and 1.8% oil. The variety is ideally suited for fresh ginger, dry ginger and ginger candy. Crop duration 200 days.	Suitable as intercrop in coconut and fruit tree plantations with 25% increased income.
4.	Turmeric variety – IISR Pragathi	High yield potential variety of turmeric, short duration (180 days), tolerant to root-knot nematodes, high yield (35 t/ha) and curcumin content of 5%	Suitable as intercrop in old coconut plantations with 15% increased income.

5.	Turmeric variety – IISR Prathiba	A high yielding turmeric variety is developed through open pollinated progeny selection. It is a high yielding (39.12 t/ha fresh rhizomes) with reddish yellow coloured rhizome and dry recovery of 18.5%. This variety has curcumin 6.2%, oleoresin 16.2% and essential oil 6.2%. Crop duration 225 days. A stable yielder across India for high dry yield and high curcumin content.	Suitable as intercrop in coconut and fruit tree plantations with 25% increased income.
6.	Nutmeg variety – IISR Keralashree	A high yielding nutmeg variety developed through farmer's participatory breeding programme. This variety has bold nuts with entire and thick reddish mace. Economic yield starts from 5 years and yields 7500 kg nuts and 1512 kg mace /ha at 10th year with 35% and 70% mace and nut recovery. It has a nut oil 5.9%, mace oil 7.5%, oleoresin in nut 9.1% & mace 7.5%, nut butter 24.9%, myristicin in nut 1.6%, mace 9.4%.	Suitable as intercrop in coconut and arecanut or fruit crop plantations with 30% increased income.
7.	Nutmeg variety – Konkan Sugandha	Bisexual variety of nutmeg which reduces the requirement of planting male and female trees for pollination. High yielding tree (526 fruits/ tree) adapted to Konkan region.	Suitable as intercrop in coconut, arecanut or fruit crop plantations with 10-15% increased income.
8.	Cinnamon variety - PPI (C)-1	High oil recovery from the bark (2.9%) and leaf oil recovery of 3.3%, bark oil 2.9%, leaf oil 3.3%, and bark recovery 34.22%. Suitable for an altitude range of 100-500 m MSL.	Needs less care and can be harvested in 2-3 years cycles with 25% increased income generation.

9.	Ginger and turmeric pro tray technology	Rapid multiplication of ginger & turmeric using single bud rhizome saves one third of the required seed material.	Saves 60% cost on ginger seed rhizome.
10	Plant growth promoting rhizobacteria (PGPR) for black pepper and ginger	There are eco-friendly PGPR formulations specific to black pepper and ginger available in biocapsule formulations. It reduces chemical fertilizer application rate by 25% and enhances tolerance to diseases. Recommended as soil drenching or mixing with organic base (FYM) and application to spices.	Suited for organic cultivation of spices and helps in increasing the yield by 10-15%.
11.	Trichoderma harzianum IISR-P26, a promising biocontrol agent for spice crops	The Trichoderma harzianum can be used successfully to manage Phytophthorain spice crops. The formulation is recommended for use in Integrated Pest Management as well as under Organic farming system, ensures socio economic and environmental sustainability and compatible with most of the chemical at prescribed dosage.	Significant reduction in disease incidence and increased productivity by 10-15%.
12.	Crop specific micronutrient mixtures for spices (Black pepper, Ginger, Turmeric)	Recommended @ 5g/L water and applied as foliar spray at 60 days after planting and 90 days after planting for ginger and turmeric; spraying twice in a year at April – May and August – September for black pepper. Increased use efficiency of applied nutrients based on the crop requirement	Yield increase of 15 to 25% and improvement in quality recorded and realized by farmers in black pepper, ginger and turmeric.

State-wise Coordination Committees for doubling Farmer's income by March, 2022 to be held 27/03/2017

Inputs/Strategies points of ICAR-CCARI Goa:

1. Production strategies for field crops in Goa state:

- Replacing traditional rice variety Korgut with recently released high yielding salt tolerant rice varieties Goa Dhan-1 and Goa Dhan-2 in the coastal saline areas (khazan lands), which accounts for 10,000 – 12,000 ha of the total cultivated area in the state.
- Encouraging organic cultivation of rice varieties in Khazan lands, for fetching better market price.
- The seed replacement rate (SRR) should be increased in the varieties (Jaya, Jyothi and Karjat-3) recommended for rainfed shallow lowland ecology and midland ecology. Processing/ value addition by establishing rice mills to be initiated in this region to get maximum income.
- SRI in Rabi season to be followed which can increase the yield up to 30-40% in rice varieties
- Replacing traditional local cowpea with Goa Cowpea-3. Seed production should be increased to meet the demands in collaboration department of agriculture.Introduction of Moong after cowpea in areas where irrigation is available as a summer crop.
- Rice-Cowpea-Cowpea and Rice-cowpea-moong, may be adapted in the state to increase the income of the farmers

2. Production strategies for plantation crops

- **Cashew**
- The major plantation crops of Goa state are Cashew cultivated in the total area of 55,000 ha
- Grafting, nutrient management, replacement of senile plantations and introduction of suitable varieties particularly for Goa state needs to be undertaken for increasing the productivity of cashew plantations
- **Coconut**
- Total cultivated area of coconut in Goa state is about 25,000 ha. Mechanization for coconut plucking, tender coconut harvest, training for palm climbing devices,
- Strengthening existing coconut pluckers unit of Goa state Horticultural corporation with minimum 200 professional coconut climbers
- replacement of senile unproductive coconut palms by replanting with improved tall dwarf and hybrid varieties
- value addition by 20 pilot scale plants of coconut processing at major production sites such as Salcette taluka including units of large scale machine for coconut dehusking, deshelling machines, desiccated coconut units, coconut vinegar, jiggery, virgin coconut oil and coir & coir products needs to be initiated for increasing the productivity and profitability of coconut
- Promoting local artisan networks and self-help groups for coconut shell based handicrafts
- Inter/mixed cropping practices in coconut are meager mainly due to agriculture-wild life conflicts. Suitable technology interventions and ecofriendly package for combating crop damage by wild animals

3. Value addition and diversification for income generation:

- Value addition for field crops –Rice processing by establishment of rice mills

- Plantation crops- cashew apple products making in the form of small scale industry
- Coconut- tender coconut, virgin coconut oil and coconut jiggery and coir products
- Spices- nutmeg, processing of black pepper to white pepper
- Fruits- kokum and jackfruit value added products

4. Entrepreneurship development for rural youth and woman in nursery plantation production, preparation of bio control agents, seed production as off farm income generation
5. Awareness and capacity building programs:
6. Establishment of protected flower cultivations particularly for orchids, Anthurium and Gerbera in Goa. Total constructed polyhouses in Goa state are 130.
7. Promotion of organic farming practices particularly for cashew and pepper cultivation in Goa state
8. Animal husbandry strategies

- Promotion of indigenous dairy cows for milk production and as a part of integrated farming system as these cows are well adapted to coastal humid climate with minimum inputs.
- Promotion of goat farming by introduction of Konkan kanyal goat breeds which is suitable for Goa state in the form of entrepreneurship development for rural youth
- Backyard poultry production and introduction of color broilers for increasing meat and egg production
- Advance feeding technologies such as bypass fat feeding, hydrophonic fodder production and feed blocks needs to be undertaken for increasing milk production in Goa state
- Establishment of slaughter houses/meat processing units for small animals (goats, pigs and poultry) for meat production and value addition
- Intense vaccination programs particularly for Classical swine fever (CSF) disease in pigs and PPR in goats in addition to vaccination in cattle needs to be initiated to boost pork and goat meat production in the state
- Intense fodder production strategies as intercrop cultivation along with plantation crops needs to be undertaken to meet the demand of dairy fodder production.

9. Fish production strategies

- Diversification of inland fish production through new finfish species and methodologies
- Value addition and processing for fisheries resources
- Promotion of mussle culture and shrimp culture for increasing the production and farm income
- Promotion on ornamental fish culture through self help groups

10. Integrated farming system

- Suitable IFS models for Goa state needs to be promoted widely for optimum use/recycling of farm inputs for increasing income
- effective utilization of coconut fallow/ interspace for crops like turmeric/ banana/ pineapple/ heliconia, the technology standardized in our institute will be covered under IFS (plantation based)

11. Agro advisory services to be initiated via mobile applications or any other mass communication means.
12. Precession farming practices in fruits and vegetable cultivation particularly fertigation practices needs to be initiated widely
13. Promotion of low cost water harvesting technology (Jalkunds) in the farm and use of drip irrigation in fruit and vegetable crops along with mulching for insitu moisture conservation.

References

1. Annual Reports, 2015-16, 2014-15 and 2013-14, ICAR - Central Coastal Agricultural Research Institute Old Goa-403 402, Goa, India
2. N P Singh, B L Manjunath, S B Barbudhe, V Arunachalum, Manohara KK and Manjulaxmi N, Research Achievements of 25 years, ICAR (RC), Goa, 2014.
3. B. L. Manjunath, B. K. Swain, Mathala J. Gupta, R. Maruthadurai. Agricultural Technology Options. Technical Bulletin No. 30, ICAR Research Complex for Goa (Indian Council of Agricultural Research), Old Goa-403 402, Goa, India. 2013.
4. Vision 2050, ICAR - Central Coastal Agricultural Research Institute Old Goa-403 402, Goa, India, 2015
5. Vision document 2030, Directorate of Agriculture, Govt of Goa, 2017.
6. Vision 2030, Directorate of Animal Husbandry and Veterinary Services, Govt of Goa, 2017.
7. Potential linked credit plan 2017-18- North and South Goa, NABARD Goa regional office, Panaji, Goa, 2017.

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(Indian Council of Agricultural Research)

Old Goa - 403 402, Goa, India

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