

# Status Paper on Rice in Goa

**V.S.Korikanthmath*, B.L.Manjunath and K. K. Manohara**

*Director
ICAR RESEARCH COMPLEX FOR GOA,
OLD GOA-403 402, GOA



**For more Information contact:** Visit Rice Knowledge Management Portal http://www.rkmp.co.in
**Rice Knowledge Management Portal (RKMP)**
Directorate of Rice Research,
Rajendranagar, Hyderabad 500030. Email: naiprkmp@gmail.com, pdrice@drricar.org, shaiknmeera@gmail.com
Ph: 91-40-24591218, 295 Fax: 91-40-24591217



**I. Name of the State**: Goa

**II. Introduction:**

Rice is the predominant staple food crop of Goa occupying more than 37 per cent (49,966 ha) of the net cultivated area in the State. It is cultivated under three distinct ecologies during k*harif* (34,278 ha) season. In *morod* lands (lateritic uplands covering about 16.4 % of area), midlands or *kher* lands totaling to 32 per cent of area and the *khazan* lands 32 per cent and the rest covered under *rabi* season (15,688 ha).

The rice based cropping systems include rice-pulse (local cowpea), rice-groundnut under residual soil moisture situations in rice fallows from early December to March and rice-vegetables, rice- sweet potato in areas where life saving irrigation can be provided by traditionally developed sunken wells mostly in *kher* lands. These constitute the predominant cropping pattern which dominates nearly 42-45 per cent of the agrarian scenario in the region.

**III Zonal information**

a. **Climate**

The State of Goa is situated well within the tropics. It has tropical maritime and monsoon type of climate, with profound orographic influence. Accordingly, the climate is humid throughout the year. The main feature of the Goa's climate is the monsoon, which occurs between June and the end of September.

**Soil type/nutrient management**

The main types of soils found in the State of Goa are Coastal Alluvial soil, mixed red and black soil, laterite soil and red sandy soil, which are sub-divided into 32 soil series. Soil type of Goa predominantly includes Laterites (73.4%), Alluvial & Marshy (11.7%), Coastal sandy soils (10.11%), Saline soils (4.79%) with soil pH ranging 4.5 -6.5. The soils in general fairly good in organic matter and respond well to the application of N and P fertilizers.



**For more Information contact:** Visit Rice Knowledge Management Portal http://www.rkmp.co.in
**Rice Knowledge Management Portal (RKMP)**
Directorate of Rice Research,
Rajendranagar, Hyderabad 500030. Email: naiprkmp@gmail.com, pdrice@drricar.org, shaiknmeera@gmail.com
Ph: 91-40-24591218, 295 Fax: 91-40-24591217





### b. Rainfall and its distribution pattern

Goa is in the path of the Southwest monsoon, thereby experiencing a dry period lasting six to eight months of the year, followed by the annual rainfall, which occurs over the remaining four months. During the two months preceding the onset of the monsoon the humidity increases dramatically, and the normally clear skies become hazy and then cloudy. During the monsoon, 250 cm to 300 cm of rain is normal, although in the Western Ghats the downpour is considerably high than on the Coast. The region receives an annual rainfall of 2500 to 4000 mm in 100 to 120 days between June to September with uni-modal pattern.

### c. Agro-climatic zones

The entire State of Goa falls under 12$^{th}$ agro ecological zone of India *viz.*, **West Coast Plains and Ghats region.**

### d. Rice and cultural heritage in the state

Rice is the staple food crop of the region as rice-fish curry being the main diet of the majority of the population. Further, rice is a part of the cultural heritage of the region by all the different religions of the society. Rice is being used in all the functions right from birth day parties, marriages to death ceremonies. The Christian community also celebrates harvest season of rice through churches.

## IV. Rice production scenario

### a. Area

Although all out efforts are being made by the State departmental agencies to bring more area which lies fallow during each season, the pressure from other sectors of the State's developmental processes like booming tourism industry and mining has had a telling effect in this area.

Compilation of data during the period from 1998-99 to 2008-09 has given a *negative trend* in terms of area coverage under this staple crop as can be seen from the Table below:



**For more Information contact:** Visit Rice Knowledge Management Portal http://www.rkmp.co.in
**Rice Knowledge Management Portal (RKMP)**
Directorate of Rice Research,
Rajendranagar, Hyderabad 500030. Email: naiprkmp@gmail.com, pdrice@drricar.org, shaiknmeera@gmail.com
Ph: 91-40-24591218, 295 Fax: 91-40-24591217





**Area coverage (ha) under rice during the period 1998-99 to 2008-09**

| Year | Kharif | Rabi | Total |
|---|---|---|---|
| 1998-99 | 40963 | 15750 | 56713 |
| 2004-05 | 35284 | 17158 | 52442 |
| 2008-09 | 34278 | 15688 | 49966 |

Source: Statistical wing, Directorate of Agriculture, Govt. of Goa

It is seen from the Table that the overall area under rice has decreased by 6747 ha (11.9 %) during a period of 10 years. The decrease in area is mainly in k*harif* season (16.3%) due to various socio economic factors including scarcity and high cost of labour and inclement weather whereas in the *rabi* season, it has shown an upward trend upto 2004-05 with increase of 8.93 % constituting 1408 ha, which however was further reduced below 1998-99 level by 2008-09 clearly suggesting the necessity of policy intervention to retain the rice cropped area in the region.

## b. Production (mt)

The production of rice in the State during the period from 1998 to 2004 showed an upward trend with an additional 12,068 tonnes improvement which however declined sharply by 2008 mt (13.9 % from 1998) which may be due to the combined effect of both decreased area and productivity especially during *rabi*.

**Production of rice (mt) in the State during the period 1998-2008**

| **Year** | **Kharif** | **Rabi** | **Total** |
|---|---|---|---|
| 1998-99 | 139506 | 66118 | 205694 |
| 2004-05 | 150918 | 66844 | 217762 |
| 2008-09 | 120206 | 56875 | 177081 |



**For more Information contact:** Visit Rice Knowledge Management Portal http://www.rkmp.co.in
**Rice Knowledge Management Portal (RKMP)**
Directorate of Rice Research,
Rajendranagar, Hyderabad 500030. Email: naiprkmp@gmail.com, pdrice@drricar.org, shaiknmeera@gmail.com
Ph: 91-40-24591218, 295 Fax: 91-40-24591217



### c. Productivity (kg/ha)

Coupled with a reduction in area under rice due to various socio-economic factors, there has been a overall decrease of rice productivity (7.5 %) during the ten years period from 1998-99 to 2008-09. Although rice productivity improved during *kharif* season (especially upto 2004-05) due to the decrease during *rabi* season there was an overall decline suggesting the need for better production technology adoption during the season.

**Per unit productivity of rice during 1998-99 to 2008-09**

| Year | Kharif | Rabi | Mean |
|---|---|---|---|
| 1998-99 | 3466 | 4198 | 3832 |
| 2004-05 | 4277 | 3896 | 4152 |
| 2008-09 | 3507 | 3625 | 3544 |

### d. Yield gap and its reasons

The average productivity of rice in the state is fairly higher in related to other states (3544 kg/ha). However, there is a scope to improve further the productivity as observed in the demonstration yields at the institute as well as at the farmer's field especially in high yielding varieties as well as hybrids. Adoption of medium duration of high yielding varieties like Karjat-3 which is progressively increasing over the years has a yield potential of about 6.3 t/ha. During the current year 38 t of TL seed of the variety has been distributed by the State Directorate of Agriculture covering an area of about 550 ha which on further multiplication will definitively boost the productivity levels. Similarly, about 18,000 ha of salt affected area where the local salt tolerant variety Korgut is cultivated gives an average yield of 1.5 to 2.0 t/ha. The research and demonstration trials conducted by the institute as well as by the KVK have amply proved that the yield levels can be increased up to 4 t/ha by adoption of high yielding salt tolerant rice varieties like CSR 27. However, this bridging of yield gap



**For more Information contact:** Visit Rice Knowledge Management Portal http://www.rkmp.co.in
**Rice Knowledge Management Portal (RKMP)**
Directorate of Rice Research,
Rajendranagar, Hyderabad 500030. Email: naiprkmp@gmail.com, pdrice@drricar.org, shaiknmeera@gmail.com
Ph: 91-40-24591218, 295 Fax: 91-40-24591217





requires concerted efforts by both the research and developmental agencies for improving the productivity in the region.

### e. Major contributing factors in different ecologies

As the rice is cultivated in three distinct ecologies during the rainy season namely upland, lowland and saline soils, research and developmental interventions specific to the ecology will aid in improving the production and productivity. For the uplands short duration high yielding rice varieties coupled with drought resistance will help in mitigating the short duration breaks in the monsoon period with higher productivity. In the lowlands availability of medium duration rice varieties with lodging resistance will help in increasing the productivity. Similarly in the saline lands availability of high yielding salt tolerant rice varieties in bulk will help in enhancing the total production from the ecosystem. Further, following an integrated nutrient management including profitable cropping systems will further accelerate the rice production in different ecologies.

## V. Region-wise/district-wise rice ecosystems

Of the total rice area of 49,966 ha in two districts of Goa State, North Goa comprising six talukas viz., Tiswadi, Bardez, Pernem, Bicholim, Sattari and Ponda covers an area of 28,119 ha accounting to 56.3 per cent of the area while another district South Goa comprising five talukas *viz.*, Sanguem, Canacona, Quepem Salcete and Murmagoa covers the rest of the area. While upland rice cultivation dominates the rice ecosystem in talukas adjacent to Western Ghats, the low land rice and the salt tolerant rice (in the ingressed area of sea water all along the sea coast) dominates the coastal eco system.

## VI. Rice production and Economic analysis

The economics of rice cultivation in the region is not all that encouraging mainly due to the dependence on migrated labour for field works, the availability of which becomes crucial at times coupled with higher wages.

The cost of production per hectare is estimated at Rs.24, 000-30,000 depending on the labour wages under an average farming situations with a net income of Rs.10,050/ha leading to a cost benefit ratio of 1:1.41. Although the returns of rice production are not that remunerative, it can be improved with cultivation of scented types through milling.



**For more Information contact:** Visit Rice Knowledge Management Portal http://www.rkmp.co.in
**Rice Knowledge Management Portal (RKMP)**
Directorate of Rice Research,
Rajendranagar, Hyderabad 500030. Email: naiprkmp@gmail.com, pdrice@drricar.org, shaiknmeera@gmail.com
Ph: 91-40-24591218, 295 Fax: 91-40-24591217

| Particulars | Quantity (t/ha) | Rate/ kg (Rs) | Amount (Rs) |
|---|---|---|---|
| Produce (grain) | 5.3 | 6.00 | 31800 |
| Straw | 4.5 | 0.50 | 2250 |
| Gross income (A) | | | 34050 |
| Cost of cultivation (B) | | | 24000 |
| Net income (A-B) | | | 10050* |
| C:B ratio | | | 1:1.41 |
| Cost of producing kg of paddy | | | 4.50 |

*

By use of improved implements and machinery through self help group, cost of cultivation can further be reduced.

**VII. Rice and rice based cropping systems**

The rice based cropping systems include rice- cowpea (Alsando), rice-groundnut under residual moisture situations in rice fallows from early December to March and rice-vegetables, rice-sweet potato in areas where life saving irrigation can be provided by traditionally developed sunken wells in rice lands mostly in *kher* lands (coastal sandy loam soils with high water table). The official figures indicate that out of the total area rice in the State, 35,710 ha is available for taking up cultivation of crops like pulses (1,1540ha), seasonal vegetables (8,213 ha) and groundnut (2,640 ha) leaving an area of 6,042 ha as fallow annually. Due to heavy rainfall (2800-3000mm) from June to September with abundant moisture availability in *kher* lands rice occupies predominant place. This natural resource offers a vast potential for crops like pulses and groundnut which are leguminous crops. The work carried out under this eco system revealed that the productivity levels of groundnut



**For more Information contact:** Visit Rice Knowledge Management Portal http://www.rkmp.co.in
**Rice Knowledge Management Portal (RKMP)**
Directorate of Rice Research,
Rajendranagar, Hyderabad 500030. Email: naiprkmp@gmail.com, pdrice@drricar.org, shaiknmeera@gmail.com
Ph: 91-40-24591218, 295 Fax: 91-40-24591217



are quite high (22-23q/ha) which can be further enhanced to over 28 q/ha with two supplementary irrigations in February. Rice-vegetable is a profitable sequential cropping system followed under protective irrigation after rice harvest during *rabi*-summer season. Traditional irrigation practices like dug out ponds utilizing the shallow ground water table is a common site where traditional vegetables like Bhendi, cluster beans, chillies, brinjal, ammaranthus, raddish, sweet potato etc are cultivated.

There is ample scope to improve both the productivity and profitability in the system by identifying suitable genotypes and through intensive management so as to enhance the returns for a rice grower and sustain the crop cultivation in the region.

**VIII. Rice growing seasons**

Rice is cultivated both during *kharif* mostly as a rainfed crop with the abundant and continuous rain received during the period. Of the total area of rice nearly two-third is cultivated in the *kharif* under three distinct situations of upland, lowland and saline soils. The productivity levels of the crop during *kharif* are relatively lower (3507 kg/ha) as compared to rabi season. During *rabi,* the crop is mostly cultivated in low lying areas with availability of water and the productivity levels are relatively higher(3625 kg/ha).

**IX. Recommended package of practices**

**a. Varieties/Hybrids**

Jaya and Jyoti are the predominant varieties grown in in low lands. Cultivation of improved varieties have proven yield increase over the ruling varieties. The following improved varieties are suitable for cultivation in Goa.

| Variety | Grain Character | Duration (Days) | Yield Potential (T / Ha) |
|---|---|---|---|
| Karjat– 3 | Short Bold | 120 | 6.30 |
| KRH-2(Hybrid) | Medium Slender | 125 | 7.30 |
| Revathy ( MO-17) | Red Kernelled | 125 | 4.50 |



**For more Information contact:** Visit Rice Knowledge Management Portal http://www.rkmp.co.in
**Rice Knowledge Management Portal (RKMP)**
Directorate of Rice Research,
Rajendranagar, Hyderabad 500030. Email: naiprkmp@gmail.com, pdrice@drricar.org, shaiknmeera@gmail.com
Ph: 91-40-24591218, 295 Fax: 91-40-24591217



| | | | |
|---|---|---|---|
| Sahyadri- 1 (Hybrid) | Medium Slender | 130 | 7.50 |
| Pusa Sugandh-5 | Scented long slender | 130 | 4.70 |

**b. Management inclusive of mechanization**

Seedlings are raised either by dry or wet method. Ploughing should start with first shower of monsoon to a depth of 15 cm with the help of power tiller or mould board plough. Apply well decomposed FYM (10 MT) after the first ploughing. This operation is to be completed atleast 15 days before sowing of the seed. Green manures (Finely chopped) like *Glyricidia* (grown on bunds / fences), *Dhaincha* etc. or any biomass from major weeds on uplands like *Eupatorium* be incorporated as per availability. Proper leveling and bunding should be ensured for better water and soil conservation. The seedlings need to be planted at the age of 21-25 days on a puddle soil with 3-4 seedlings/hill at a spacing of 20 x 10 cm ensuring atleast 50 hills / sq.m. Shallow transplanting favours more tillering and consequently higher yield.

FYM @ 10 MT / ha or any other available organic / green manure can be incorporated 2-3 weeks before sowing. Apply Rock Phosphate @ 45 kg./ha at least one week before sowing both as a source of phosphorus and as soil conditioner.

Recommended fertilizers -100:50:50 kg NPK / ha. Apply all phosphate ($P_2$ $O_5$), 50% nitrogen (N) and 50% potash ($K_20$) as basal dose at the time of sowing or transplanting. After 25-30 days, apply 25% nitrogen as first top dressing. Later, in another 20-25 days, apply balance 25% nitrogen and 50% potash as second top dressing. Weed the field and drain water wherever possible before top dressing. Use of combination of straight fertilizers is economical, with better crop response.

Weed infestation is a chronic problem in rice cultivation. The loss caused by weeds ranges from 30–40% including quality deterioration of the grain. The first 35– 40 days of the crop is the critical period for weed competition.The weeds can be effectively controlled by using Cono weeder (low cost manually operated interculture implement) in line sown crops with availability of thin film of water in the field. Herbicide formulations like Butachlor 5 G @ 20 kg / ha or Benthiocarb 20 G can be mixed with water and blanket spray with high volume sprayer three days after sowing is recommended. Granular herbicides are convenient to apply as it eliminates the use of spray pump.



**For more Information contact:** Visit Rice Knowledge Management Portal http://www.rkmp.co.in
**Rice Knowledge Management Portal (RKMP)**
Directorate of Rice Research,
Rajendranagar, Hyderabad 500030. Email: naiprkmp@gmail.com, pdrice@drricar.org, shaiknmeera@gmail.com
Ph: 91-40-24591218, 295 Fax: 91-40-24591217



Alternatively, mix the above formulation with 80-90 kg of fine sand and broadcast evenly in the field. For use of granular herbicides application, drain the water from the field. In low lands, where there is standing water, broadcast Benthiocarb 10 G granules, a week after direct sowing or within 8 days of transplanting. Maintain 3-5 cm of water level in the field after granular application so that soil is under water but leaves are above water. Do not allow water to flow from one field to another. This control a wide range of weeds for 30-35 days after application. However, if *Cyperus* and broad leaved weeds are present, spray 2,4, D @ 2.5 kg./ hectare about three weeks after transplanting or 4 weeks after sowing.

Harvesting paddy at the right stage is vital for getting high quality grains. It also helps in proper storage of grains. Harvest the crop, when 5-10 % of the grains at the bottom of the panicle are still to dry but the rest of the grains on the panicle are fully matured. Vaibhav sickle developed by B.S. KKV, Dapoli is an improved implement for harvesting. The sickle helps to cut paddy near ground level, thereby minimizing the incidence of paddy stem borer, besides improving the work efficiency. Special care need to be taken for shedding varieties to avoid grain losses. The harvested produce need to be threshed immediately so as to avoid damage to grain during staking, that also enables better quality for seed purpose. Machineries like harvesters / threshers / combine are found to be efficient in saving labour.

Gradual drying preferably in the morning and evening hours avoiding direct exposure of grain to the sun during noon hours is essential. This prevents formation of minute cracks on the grain which leads to breakage during milling and avoids grain infestation in storage. Paddy heaping during noon time and spreading only during morning / evening is suggested for uniform drying. Bring down the moisture content of the grain by sun drying to less than 12–13% for better milling and storage of the produce.Store paddy in proper storage structures after adequate drying. Take precautions to avoid infestation by the stored grain insects and the fungal infections. Use of locally available organic insect repellants like neem, lingad, tirphal, etc, so as to prevent damage from insect and rats are also suggested. Modern rubberized mills or paddy rollers are effective to get higher milling efficiency. With parboiling, the milling recovery cum further be improved.



**For more Information contact:** Visit Rice Knowledge Management Portal http://www.rkmp.co.in
**Rice Knowledge Management Portal (RKMP)**
Directorate of Rice Research,
Rajendranagar, Hyderabad 500030. Email: naiprkmp@gmail.com, pdrice@drricar.org, shaiknmeera@gmail.com
Ph: 91-40-24591218, 295 Fax: 91-40-24591217



**Mechanization of Paddy cultivation:**

Considering the labour intensiveness of paddy crop, it is essential to adopt farm implements / machinery as per the situations and availability. Vast scope exists for reducing the labour cost by interventions of farm machinery right from ploughing to harvesting / threshing.

Suitable implements / machines such as Seed dressing drum, Drum seeder, Power tiller, rotavator, Cono weeder, Transplanters, Reapers, Combine (harvesting, threshing, winnowing and bagging), Thresher (manual / power operated) can be adopted specially on a community basis to reduce the cost of production.

**X. Indigenous technical knowledge (ITKs) specific to the state**

Farmers of the area especially in village Nerul of North Goa district use a unique method of establishment of rice seeds locally known as "*Chobo"*method. During the month of May, with the expectation of rains, the land will be scooped out at regular intervals and the rice seeds are placed in the scooped out soil and covered up. With the receipt of rains, the rice seeds will be germinated and the established plot will look like a transplanted crop.

**XI. Byproducts / extended use of rice specific to the state**

Rice is the main staple food of Goan which is consumed along with fish as "Fish Curry Rice". In Goa, farmer's preference is for red colour bold type varieties which is consumed as a whole grain and also products like

1. Rice flakes
2. Rice puffed
3. Popped rice

Products prepared out of rice flakes are

1. Rice flakes chiwda
2. Rice flakes laddu
3. Rice flakes cutlet
4. Rice flakes in caramel, are some of the commonly consumed product of rice flakes



**For more Information contact:** Visit Rice Knowledge Management Portal http://www.rkmp.co.in
**Rice Knowledge Management Portal (RKMP)**
Directorate of Rice Research,
Rajendranagar, Hyderabad 500030. Email: naiprkmp@gmail.com, pdrice@drricar.org, shaiknmeera@gmail.com
Ph: 91-40-24591218, 295 Fax: 91-40-24591217





Puffed rice is used as

1. Rice puffed chiwda
2. Rice puffed laddoo
3. In bhel mix

Parboiled rice is preferred by the farmers along with fish curry and the products prepared out of parboiled rice are

1. Laddoo
2. Dosa
3. Idli
4. Ganji

**XII. Rice and commerce (Exports and revenue generation)**

Although rice is the major crop in the low lying areas of State and the production levels are fairly higher, the state is not self sufficient in the requirement of rice. It imports part of its rice requirements from other rice growing states especially of that of fine grained rice. As the crop is mostly under subsistence cultivation, the trade of locally cultivated is relatively less. However, a substantial quantity of rice is traded into the state by the other rice producing states.

**XIII Special development programmes in rice sector of the state**

Directorate of agriculture, Government of Goa, is implementing several development schemes for improvement of rice production and productivity in the State. The schemes include both centrally sponsored as well as State sponsored schemes. These include

1. 50 % assistance on use of quality seeds with high yielding varieties
2. Rice minikit programme for popularization of high yielding varieties and hybrids
3. Support price @ Rs. 5 per kg for paddy sold to recognized cooperative agencies / societies
4. 50 % subsidy on mechanization–custom service to farmers by farm machinery division of Directorate of Agriculture



**For more Information contact:** Visit Rice Knowledge Management Portal http://www.rkmp.co.in
**Rice Knowledge Management Portal (RKMP)**
Directorate of Rice Research,
Rajendranagar, Hyderabad 500030. Email: naiprkmp@gmail.com, pdrice@drricar.org, shaiknmeera@gmail.com
Ph: 91-40-24591218, 295 Fax: 91-40-24591217





5. 70 % subsidy for purchase of machinery for rice cultivation both by an individual and group.

**XIV. Status of recent rice production / technologies**

### a. SRI method

As the Goa State receives a continuous rainfall during the monsoon period, the most of the rice fields are inundated, there is a little scope for SRI method of rice cultivation during rainy season. However, the practice needs to be validated for rabi season on the pilot basis especially for the low lying areas with feasibilities of water management.

### b. Hybrid rice

To offset the yield barriers, hybrid rice technologies was introduced through the UNDP sponsored Front Line Demonstrations of Directorate of Rice Research, Hyderabad during the last one decade. Further, the programme was supported with the evaluation of released/pre-release rice hybrids evaluation of both private and public sectors through the MLT on hybrid rice under AICRP on rice. Front line demonstrations were undertaken covering an area of over 350 ha in all the talukas of the State and organizing field days at the respective locations during different periods. Technology is well received by the farmers as well by the State Directorate of agriculture which is continuing the popularization of rice hybrids through its mini kit programme in each season. The feedback from the farmers indicates the necessity for development of hybrids with better grain type suitable for the region and hybrids without any smell and having good milling recovery.

### c. Aerobic rice / conservation agriculture

The research efforts on aerobic / conservation agriculture are yet to be taken up in the feasible ecosystem.

### d. Biotechnological intervention / golden rice

Not yet attempted.

### e. Integrated pest management / Integrated disease management



**For more Information contact:** Visit Rice Knowledge Management Portal http://www.rkmp.co.in
**Rice Knowledge Management Portal (RKMP)**
Directorate of Rice Research,
Rajendranagar, Hyderabad 500030. Email: naiprkmp@gmail.com, pdrice@drricar.org, shaiknmeera@gmail.com
Ph: 91-40-24591218, 295 Fax: 91-40-24591217





The state is having a office of Central Integrated Pest Management Centre of Directorate of Plant Protection Quarantine and Storage of the Ministry of Agriculture, Government of India. Combined roving surveys are periodically undertaken during the crop growth period with the collaboration of CIPMC, Directorate of Agriculture and ICAR Research Complex for Goa. The necessary pest and disease management practice are being advised periodically if the pest damage exceeds the threshold level. Further, use of integrated approach including field sanitation, variety selection, agronomic measures are being propagated based on the need to manage both the pest and diseases.

### f. Integrated Nutrient Management

The rice soils of the region are fairly rich in organic matter. However, due to the undulating terrain and predominance of lateritic types of soils especially in the uplands, there is a good response for application of N and P fertilizers. Further, there is growing concern by few of the progressive growers to maintain the soil organically so as to produce healthy rice and to capture the niche market of Goa, being an internationally acclaimed tourist destination. Efforts are being made to identify integrated nutrient management approaches for rice production involving use of organic sources including FYM, compost, green leafy manures as well as the recycling of organic residues coupled with supply of soil test based nutrients to meet the specific nutrient demands.

### XV. Organizations (Government and Non-government)

Different organizations involved in the development of rice production in the region include

1. **ICAR Research Complex for Goa**: A region based multi-disciplinary multi-commodity research organization under ICAR, New Delhi, the mandate of which include production and productivity improvement of all the potential crops of the region including rice.
2. **Directorate of Agriculture, Governement of Goa-** A Department under the State Government of Goa involved in the transfer of technologies and implementations of various developmental schemes of both Central and State sponsored for all the potential crops including rice.
3. **Krishi Vigyan Kendra**: The two KVKs located in the State one each for North and South Goa district, respectively are involved in training , on-farm testing and front line demonstrations in different crops and commodities including rice.



**For more Information contact:** Visit Rice Knowledge Management Portal http://www.rkmp.co.in
**Rice Knowledge Management Portal (RKMP)**
Directorate of Rice Research,
Rajendranagar, Hyderabad 500030. Email: naiprkmp@gmail.com, pdrice@drricar.org, shaiknmeera@gmail.com
Ph: 91-40-24591218, 295 Fax: 91-40-24591217



4. **Goa Bhagayatdar Society:** The Cooperative Marketing Society involved in the distribution of agricultural inputs including rice seed, fertilizer, pesticides etc.
5. **Adarsh Cooperative Society**: For procurement of marketable surplus, milling and marketing.

**XVI. Constraints in rice production**

**a. Biotic stress – Temperature, Diseases, Nematodes, rodents, and weeds**

Being tropical region with warm humid weather, there is abundant of growth of different types of flora and fauna. Many of the pests including insects especially whorl maggot, case worm, gall midge, leaf folder are commonly affecting the rice crop in the early stages. Similarly, diseases like blast, sheath blight and occasionally grain smut is also observed. Damage due to nematodes although is not very conspicuous, often the rodents damage the crop especially in the upland short statured rice free from water stagnation in the later stages of the crop. Thus, the necessary technical guidance is being imparted to the farmers both by the Directorate of Agriculture and ICAR to take up integrated pest and disease management practices. The luxuriant growth of different kinds of weeds including grasses and dicot weeds are observed both in the cropped and non cropped areas especially during rainy season in the region owing to hot humid tropical weather coupled with availability of plenty of soil moisture. Although herbicide usage is recommended, still the usage is limited affecting the crop at the times.

**b. Abiotic stress – Temperature, cold, drought, water logging, sodic, saline problems**

The region experiences continuous rainy days during the crop growth period. Although intermittent droughts are occasionally observed especially in the recent years, the damage to the crop is not observed. Further, a substantial area is under deep water situations with varying levels of water affecting the rice production at times. Nearly 18,000 ha all along the sea coast is affected by the coastal salinity through the ingression of sea water. Although the fields have varying salinity during the different periods of the year, locally adopted salt tolerant varieties are commonly grown during the rainy period.



**For more Information contact:** Visit Rice Knowledge Management Portal http://www.rkmp.co.in
**Rice Knowledge Management Portal (RKMP)**
Directorate of Rice Research,
Rajendranagar, Hyderabad 500030. Email: naiprkmp@gmail.com, pdrice@drricar.org, shaiknmeera@gmail.com
Ph: 91-40-24591218, 295 Fax: 91-40-24591217





### c. Institutional constraints

The development of rice production technologies has been taken up by the ICAR Research Complex for Goa over a period of last three decades. The technology is further transferred to the progressive growers by the Krishi Vigyan Kendra attached to the Institute through its front line demonstrations and on-farm testing. However, the reach of technology will be limited to the beneficiaries of the programme alone. The Directorate of Agriculture has Zonal Agricultural offices at each Taluka level to cater to the development and extension programmes. However, there are no agricultural assistants attached to the department for implementation of gross root level extension strategies.

### d. Socio-economic constraints

As per official statistics available from within the operational villages and overall socio-economic scenario prevalent in the State, rice farming is rapidly becoming a non viable and sustenance activity. Few of the issues are highlighted below.

1. Fragmentation
2. Change in life styles
3. Non availability of scientific support at the grass-root level.
4. Scarce and costly farm labour.
5. Land tenancy system.
6. Non availability of mechanical equipment in place of labour.
7. Subsidy component too small for the effort to obtain it.
8. Absentee landlords.



**For more Information contact:** Visit Rice Knowledge Management Portal http://www.rkmp.co.in
**Rice Knowledge Management Portal (RKMP)**
Directorate of Rice Research,
Rajendranagar, Hyderabad 500030. Email: naiprkmp@gmail.com, pdrice@drricar.org, shaiknmeera@gmail.com
Ph: 91-40-24591218, 295 Fax: 91-40-24591217



**XVII. Economics of rice production in the State**

The region being dominated by small and marginal holdings and dependent on migrated labour for timely and crucial operations of rice production, the economics of crop is dwindling over recent times. The increase of cost of production due to the escalated input cost and lack of commercial approach to the rice production in the region with the changing socio economic and agrarian scenario is compounding the problem of poor returns from the crop. Improved productivity in consolidated land holdings with mechanization especially targeting for high value rice through value addition seem to a possible alternative for the problem. Support price incentives for the surplus produce sold to the recognized market agencies by the State Directorate is a right step in this direction. Research efforts have indicated higher returns with cultivation of scented rice and milling to capture the tourism potential of the region. A multi pronged approach with the involvement of all the stake holders including policy interventions will further aid in overcoming the emerging trend of fallowing of rice fields and lack of involvement of rural youths in the rice production.

**XVIII. Strategies and modern techniques to enhance rice production**

A cafeteria of options in selection of rice varieties for production in different situations is available with the development of technology by ICAR Research Complex for Goa. Proper extension efforts in creating awareness and out-reach programmes to sensitize the targeted growers through the State Directorate of Agriculture and two KVK's available in the State will go a long way in bridging the gap between potential yield and the actual yield observed. Use of small scale implements especially through formation of self help groups will further mitigate the situation of higher cost of production. Improving the value of rice produced through processing and a commercial approach to overall rice cultivation including exploitation of readily available market for the organic production in specific rice for the health conscious elite consumers is the right step in this direction. The follow up of integrated pest and disease management for the emerging insect pest diseases and weeds will reduce the crop losses to greater extent and further aid in enhancing the rice production in the region.

**XIX. Status of seed production of major varieties / agencies involved / demand and supply.**

Keeping in view the local demand for seeds of various crops and the target fixed by the council, seed production was undertaken by ICAR Research Complex for Goa. The different



**For more Information contact:** Visit Rice Knowledge Management Portal http://www.rkmp.co.in
**Rice Knowledge Management Portal (RKMP)**
Directorate of Rice Research,
Rajendranagar, Hyderabad 500030. Email: naiprkmp@gmail.com, pdrice@drricar.org, shaiknmeera@gmail.com
Ph: 91-40-24591218, 295 Fax: 91-40-24591217





varieties/hybrids include KRH-2, Karjat-3 and red kernelled rice MO-17 (Revathy) and MO-9. During *kharif*, breeder seeds of the varieties were procured from the respective research station and the foundation were produced each season and supplied to State Directorate of Agriculture, Government of Goa as well as Goa Bhagayatdar Society, Ponda, Goa and the progressive growers. Further, during the *rabi* season parental lines of hybrid rice KRH-2 were procured for the production of hybrid rice continuously during the last 7 years and the hybrid seeds of KHR 2 produced was supplied to mini kit rice programme of State Directorate of Agriculture as well as for the Front Line Demonstrations of KVK attached to the Institute.

Further, the seeds procured by the State Directorate of Agriculture as well as by Goa Bhagayatdar Society have been multiplied in the seed farms / progressive growers' field and sufficiently large quantities of improved varieties of seeds like Karjat-3 is being distributed by the State Directorate of Agriculture with subsidy components. The NAFED has also taken up the rice seed production activities in varieties like Jyoti and the seed is available for sowing.

**XX. Modern agricultural implements used in rice production**

As the labour is scarce and costly in the region, the mechanization of agriculture has higher potential especially for the predominating small and marginal holdings. Further, due to the limited availability of draft power, the Directorate of Agriculture, Government of Goa through its Mechanical Cultivation Office (MCO) is hiring tractors on custom service basis to the farmers especially for land preparation. Further, some of the implements like power tillers, puddlers are being owned by the farmers to a limited extent for the agricultural use. Recently Directorate of Agriculture, Government of Goa is promoting transplanters and combiners on subsidy basis (up to 70 % both for the individual and group).

**XXI. Conclusion and way forward**

Rice is the staple food crop of the region and is the predominant crop in the low lying ecosystem. The crop is cultivated during *kharif* season in three different ecologies *viz*., upland, lowland and saline lands. The cultivation of this crop is being threatened in the recent times with increased fallowing of lands and decrease in area under cultivation owing to higher cost of production resulting in poor returns.



**For more Information contact:** Visit Rice Knowledge Management Portal http://www.rkmp.co.in
**Rice Knowledge Management Portal (RKMP)**
Directorate of Rice Research,
Rajendranagar, Hyderabad 500030. Email: naiprkmp@gmail.com, pdrice@drricar.org, shaiknmeera@gmail.com
Ph: 91-40-24591218, 295 Fax: 91-40-24591217





Research and technology development efforts made by ICAR Research Complex for Goa, the only research institute available in the State have indicated a variety of options for different growing situations and development of production technology to suit the local situations. Although the productivity levels of the crop are fairly better still a vast potential exists for improvement. Further, certain critical areas like production in saline areas need to be addressed.

The Directorate of Agriculture through its extension functionaries and various schemes is implementing several development programmes for the improvement of production and productivity of rice in the region.

The region is endowed with favourable climate having abundant rainfall for enhancing the productivity. Proper selection of variety / hybrid along with adoption of improved production technologies will help in reducing the yield gap between the potential and the existing yield. Further, labour saving devices on a cooperative basis through selective mechanization coupled with value addition will help in enhancing the returns for the rice growers.

**XXII. Future thrust in rice production technologies**

Although, the productivity of rice is relatively better in Goa and adjoining regions, still rice is being imported from neighbouring areas to meet the local demand. Keeping in view the potential of the crop and the feasible and practical options based on the research work carried out at the ICAR Research Complex for Goa, the following future line of research has been suggested:

1. Development of high yielding salt tolerant rice varieties, resistant to lodging through the crossing of local land races with high yielding varieties and their popularization.
2. Development and popularization of red kernelled rice hybrids suitable to uplands and mid lands.
3. Collection, conservation and cataloguing of local germplasm and its systematic use for breeding programme.
4. Intensive studies on post harvest and value addition in rice with out-reach programmes.
5. Selection of genotypes and standardization of management practices for organic rice production with suitable infrastructure development.



**For more Information contact:** Visit Rice Knowledge Management Portal http://www.rkmp.co.in
**Rice Knowledge Management Portal (RKMP)**
Directorate of Rice Research,
Rajendranagar, Hyderabad 500030. Email: naiprkmp@gmail.com, pdrice@drricar.org, shaiknmeera@gmail.com
Ph: 91-40-24591218, 295 Fax: 91-40-24591217



6. Development of suitable rice hybrids with higher heterosis, grain quality and standardization of seed production practices.



**For more Information contact:** Visit Rice Knowledge Management Portal http://www.rkmp.co.in
**Rice Knowledge Management Portal (RKMP)**
Directorate of Rice Research,
Rajendranagar, Hyderabad 500030. Email: naiprkmp@gmail.com, pdrice@drricar.org, shaiknmeera@gmail.com
Ph: 91-40-24591218, 295 Fax: 91-40-24591217





**References:**

Anonymous, 2005, Extended Summaries of National seminar on rice and rice based systems for sustainable productivity (Ed: B.L.Manjunath, J.R.Faleiro, R.Ramesh, Kartikkumar, K.Hegde and Vidhya Satarkar), 18-19 October, 2005, ICAR Research Complex for Goa, Old Goa, 269p

Anonymous 2009. Estimation of area, average yield and production of various crops in Goa State for the year 2008-09.

Manjunath B.L, H.R. Prabhu Desai, H.M.Wasni, J.R.Faleiro, R.Ramesh and Sunetra Talaulikar, 2009. Glimpses of three decades of rice research in Goa, ICAR Research Complex for Goa. Technical Bulletin No. 19, 50 p

Manjunath B.L., K.B.Vaingankar, P.G.Desai and R.N.S.Sundaram, 2002, Performance of rice varieties under Goa conditions, In : Extended Summaries of National Conference on Coastal Agricultural Research , 6-7 April, 2002, ICAR Research Complex for Goa, Old Goa, pp99-100.

**Table. 1. Area, production and productivity of rice in Goa State during 2008-09**

| Season | Area in ha | Production in tonnes | Productivity (kg/ha) |
|---|---|---|---|
| **Kharif** | 34278 | 120206 | 3507 |
| **Rabi** | 15688 | 56875 | 3625 |
| **Total** | **49966** | **177081** | **3544** |

**Table. 2. Popular and high yielding varieties/hybrids grown**

| Variety | Grain Character | Duration (Days) | Yield Potential (t /ha) |
|---|---|---|---|
| Jaya | Medium bold | 125 | 5.50 |
| Jyothi | Medium bold | 115 | 4.20 |



**For more Information contact:** Visit Rice Knowledge Management Portal http://www.rkmp.co.in
**Rice Knowledge Management Portal (RKMP)**
Directorate of Rice Research,
Rajendranagar, Hyderabad 500030. Email: naiprkmp@gmail.com, pdrice@drricar.org, shaiknmeera@gmail.com
Ph: 91-40-24591218, 295 Fax: 91-40-24591217

| | | | |
|---|---|---|---|
| Karjat–3 | Short Bold | 120 | 6.30 |
| KRH-2(Hybrid) | Medium Slender | 125 | 7.30 |
| Revati ( MO-17) | Red Kernelled | 125 | 4.50 |
| Sahyadri - 1 (Hybrid) | Medium Slender | 130 | 7.50 |
| Pusa Sugandh-5 | Scented long slender | 130 | 4.70 |



**For more Information contact:** Visit Rice Knowledge Management Portal http://www.rkmp.co.in
**Rice Knowledge Management Portal (RKMP)**
Directorate of Rice Research,
Rajendranagar, Hyderabad 500030. Email: naiprkmp@gmail.com, pdrice@drricar.org, shaiknmeera@gmail.com
Ph: 91-40-24591218, 295 Fax: 91-40-24591217

**Table. 3. List of local germplasm accessions**

| Rice accession | Mean height (cm) | Mean tillers/ hill | Mean effective tillers/hill | Mean length of panicle (cm) | Average no. of grains/ panicle | Mean grain yield (kg/ha) | Duration (days) | Lodging character |
|---|---|---|---|---|---|---|---|---|
| Damgo | 177.6 | 5.8 | .5.1 | 25.4 | 180 | 4666 | 144 | Lodgomg |
| Babri | 173.0 | 5.8 | 4.8 | 24.6 | 186 | 4740 | 142 | |
| Patni | 174.0 | 5.1 | 5.0 | 24.0 | 243 | 5222 | 126 | Non-Lodging |
| Belo | 158.0 | 5.8 | 4.5 | 25.2 | 215 | 3037 | 124 | |
| Nermar | 161.0 | 4.8 | 4.4 | 23.0 | 380 | 4074 | 122 | |
| Khochri | 162.6 | 5.1 | 4.3 | 26.8 | 237 | 3629 | 114 | |
| Kendal | 114.0 | 5.6 | 5.0 | 28.0 | 150 | 2888 | 112 | |
| Olsugo | 124.0 | 7.1 | 7.0 | 24.7 | 128 | 1926 | 112 | |
| Tamdi | 157.0 | 5.5 | 5.0 | 27.2 | 234 | 2963 | 117 | Lodging |
| Korgut (white) | 158.0 | 4.7 | 4.3 | 32.0 | 136 | 2520 | 104 | |
| Korgut (Red) | 140.0 | 5.0 | 4.8 | 30.0 | 109 | 3037 | 104 | |
| Dhavi Patni | 124.0 | 6.1 | 6.0 | 20.0 | 141 | 2800 | 92 | Non-Lodging |
| Morod Kendal | 129.0 | 5.5 | 5.4 | 26.0 | 115 | 1667 | 92 | |



**For more Information contact:** Visit Rice Knowledge Management Portal http://www.rkmp.co.in
**Rice Knowledge Management Portal (RKMP)**
Directorate of Rice Research,
Rajendranagar, Hyderabad 500030. Email: naiprkmp@gmail.com, pdrice@drricar.org, shaiknmeera@gmail.com
Ph: 91-40-24591218, 295 Fax: 91-40-24591217