Role of N-Carb® a fermented organic manure in reclamation of soil having impediments viz, low organic carbon, salinity, deficient in macro element nitrogen, phosphorous & potash and other essential nutrients in Rice crop.

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Abstract

The aim of the present study is to depict the benefits of N-Carb a fermented organic manure (FOM) commercially available in the market. The present study explores the benefit of the product N-Carb clinically proven by Adasca for its extensive benefits which is found acting best for reclamation of soil having low organic carbon, deficient in macro element nitrogen, phosphorous & potash and other essential nutrients. The composition of this fermented organic manure N-Carb consists of fermented organic extract that abundantly supply organic Nitrogen Phosphorus, Potassium & micronutrients that improves organic matter in the soil by enhancing the organic carbon in the soil structure rapidly. Soil is thus protected from degradation, erosion, and the soil aeration is improved. This is conducive for beneficial carbon fixing microbes in the soil to enrich soil organic carbon that is favourable for adequate photosynthesis by the plant. The organic extract of hydrolysed mass in N-Carb facilitate crop plants to absorption through roots the essential nutrient in plant system under adverse soil condition. It also optimizes the soil moisture holding capacity at the root zone to withstand various biotic and abiotic stress with special reference to salinity, drought and nutrient stress for both organic and conventional agriculture.

Index Terms – Organic carbon, Moisture, Aeration, Salinity, Photosynthesis, Fermented extract, Holding capacity, Biotic and abiotic stress, Hydrolysed mass, Organic manure,

I. INTRODUCTION

Importance of soil and its preservation is immense in agriculture. Soil being a vital natural resource on whose proper use depends the life supporting systems of a country and the socio-economic development of its people. Soils provide food, fodder, fibre and fuel for meeting the basic human and animal needs. With the ever-increasing growth in human and animal population, the demand on soil for more food and fodder production is on the increase. However, the capacity of a soil to produce is limited and the limits to the production are set by its intrinsic characteristics, agroclimatic setting, use and management. There is a tremendous pressure on land and water resources, which is causing decline in soil-health and stagnation in productivity. The soils have been degrading at an estimated rate of one million hectares per year and ground water levels have been receding at an alarming rate resulting in decline in the ground water resource with increase in salinity level and poor organic carbon. The area available for agriculture is about 51 per cent of the total geographical area and more than 60 per cent of the people are still dependent on agriculture for their livelihood.

II. LAND CAPABILITY CLASSIFICATION AND SOIL RECLAMATIION

As per land capability class soil has been broadly categorized on the basis of its cultivation facilitation. Class I contains soils having few or slight limitations that restrict their use for cultivation. Class II contains soils having some or moderate limitations that reduce the choice of crops or require moderate conservation practices for cultivation. Class III contains soils having severe limitations that reduce the choice of plants or require special conservation practices for cultivation. Class IV contains soils having very severe limitations that reduce the choice of plants and require special conservation practices, for cultivation as per the class the soil reclamation plan has to be derived and acted but prior to any action the specific reclamation objectives are to set, by identifying the specific measure that needs to be delivered in the ground.

Three key Soil reclamation objectives are elaborated as per situation arising mentioned below of from which the exact reclamation has to be targeted depending upon the agriculture need.

i)Improvement of the lands that are under adverse water regime conditions manifested in either excess moisture or its shortage as compared to the quantity that is deemed sufficient for efficient use of the area for economic purposes.

ii)Improvement of the lands that are liable to damaging physical impacts, i.e., water and wind erosion consisting in the formation of ravines, development of landslides, soil scattering, and so on.

iii)Improvement of the lands that are under adverse physical and chemical properties of soil (heavy clay. Muddy or sandy soils, low organic carbon, salinity, or higher acidity or alkalinity, etc.

Later part the demonstration activities would be discussed with reference to the serial number three (Srl. No iii) as mentioned above. based on which the trial demonstrations were taken.

As already mentioned, that depending on a focused purpose, different types of reclamation measures are followed, various reclamation measures options available are as below:

a) Drainage reclamation - The reclamation oriented to remove excessive moisture from an area is called drainage reclamation. It is used, in agriculture, when carrying out curative measures on swamp areas (wetlands), and other land development activities.

b) Irrigation reclamation - The reclamation intended to eliminate water shortage in the soil of agricultural fields is referred to as irrigation reclamation.

c) Reclamation of physical properties - Soil with adverse physical properties is aimed at improving soil aeration, porosity and permeability. To this effect, proper crop rotation practice is introduced, sand is applied and mole drainage is performed which contributes to air and water permeability of deep soil layers.

d) Reclamation of chemical properties – soils with adverse chemical properties consists in removing harmful salts by leaching, lowering soil acidity by applying lime, raising organic carbon in the soil, increasing nutrition power by applying organic & inorganic fertilizers, and introduction of proper crop rotation.

Subsequently the fourth case (Srl. No d) based on which the demonstration was taken with N-Carb to demonstrate and disseminate the awareness of N-Carb role in soil reclamation in the districts of Yadgir and Raichur of Karnataka state, where the organic carbon is very low and have patches of salinity and low nitrogen and phosphorous nutrient content in the soil.

III. EXPERIMENTATION

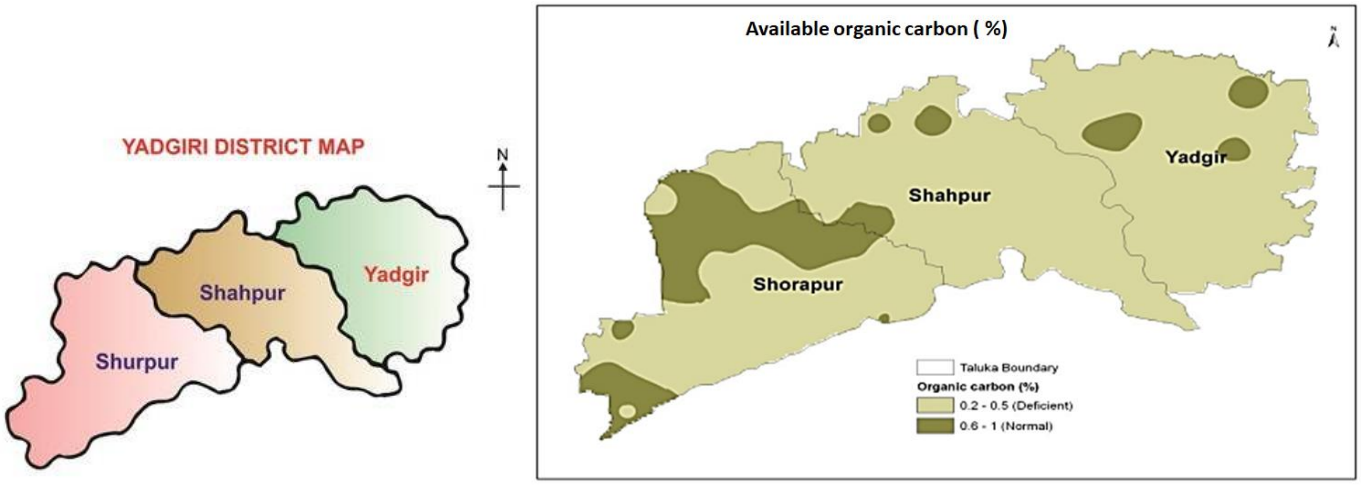
3.1- Material and Method

The geographies having soil impediments like low organic carbon, salinity and nutrient stress were identified with an objective to conduct the experiments with N- Carb so as to demonstrate and spread awareness on successful soil reclamation of Rice fields by applying N-Carb. Yadgir and Raichur districts were focused and as per the soil organic map of the district those areas were identified having Rice cultivation but the soil having low organic carbon, salinity patches as well as deficiencies in minerals, nutrients stress, the production and productivity were low and yield per acre were restricted to between 18 -20, quintals against a potential to reach 25 to 28 quintals per acre in these two important Rice growing districts of Karnataka. Keeping the sentiments and cost of cultivation economics of the farming community, the N-Carb application was fit in the schedule of their fertilizer application during final land preparation for transplanting.

N-Carb a Fermented Organic Manure (FOM) in liquid form containing organic extracts a proprietary molecule of Adasca, also FCO certified by Government of India. This product provides soil reclamation process with an abundant supply of organic Nitrogen Phosphorus, Potassium & micronutrients that improves organic matter

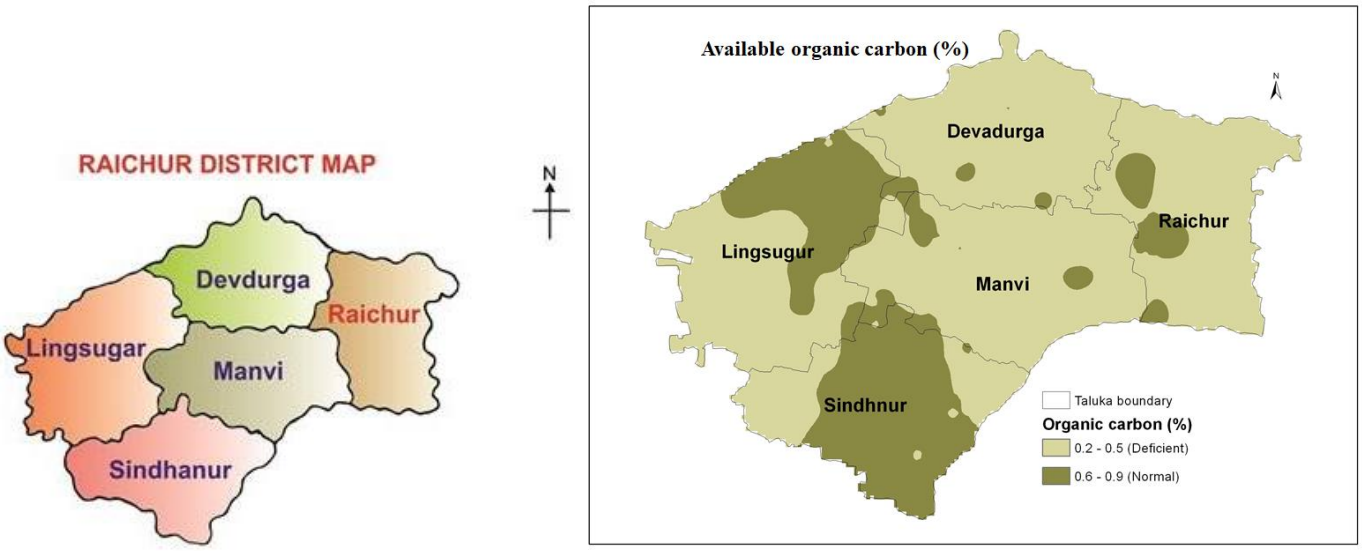
in the soil by enhancing the organic carbon in the soil structure rapidly in turn the crop can withstand the basic shock of adverse soil conditions and get future ready to produce more.
Soil dominated by sand tends to bond weakly, hence the organic component is required to improve the bonding. N-Carb facilitate that bonding to improve the soil structure and organic matter content. The soil is thus protected from degradation, erosion, and the aeration is improved, optimizes the soil moisture holding capacity at the root zone to withstand stress from drought.

3.2 - Study of the district profile:
(i) Yadgir district -The Geographical area of the is 5.16 lakh Ha. The net area sown is 3.39 lakh Ha, about 0.79 lakh Ha is sown more than once and the cropping intensity works out to123%. It lies in the Northern part of Karnataka between 16^0 11'–16^0 50' N latitudes and 76^0 17' - 77^0 28' E. longitudes, with a geographical area of 5270 Sq. Km. consist of three blocks ie, Shahapur, Shorapur and Yadgir. The district has been blessed by the incessant flowing of two main rivers Krishna and Bhima.In addition to these two rivers, a few tributaries also drain in this region. Yadgir is principally an agricultural district with potential scope to establish agro based industries.



The soil organic carbon map of Yadgir is self-explanatory that serious depletion of organic carbon is seen estimated 90% to 95% range. Two tehsils of Yadgir districts are over 95% of depletion level. Hence the demonstration with N-Carb was decided to create awareness among the farmers for its need to include in the farming schedule.

(ii) Raichur district- This comprises 3 taluks (Devdurga, Manvi, Raichur) primarily agrarian in character with about 75.33 per cent of its geographical area under cultivation. It comes under North-Eastern dry Zone of the Agro-climatic zones classified in the state which lies in the 16^0 15″ North latitude and 77° East longitude. The district has varied climatic, topographical, soil and water resources and cropping systems and has an altitude of 398l.23 mts from MSL. The district is bestowed with varied soil resources comprising 57.6% black and 42.4 % red soils. Within the black soils, 44.2% is deep black soils followed by 41.6% medium black and 14.2 % shallow soils. Among the red soils, 48.9 % area is constituted by loamy soils while remaining 51.1 % comprises of sandy soils. The soils is of very low in organic carbon, poor in nitrogen, phosphorous, zinc and iron but rich in potassium. The North Eastern Dry Zone, spread over 17,626 sq.km., accounts for 9.26 % of the total geographical area (1,91,791 sq.km.) of Karnataka State.



The soil organic carbon map of Raichur district is self-explanatory that serious depletion of organic carbon in a range of 0.2 to 0.5 a deficient range is seen in almost 85% to 90% area. Three Tehsils of Raichur districts are estimated over 95% of depletion level. Hence the demonstration with N-Carb was decided to create awareness among the farmers for its need to include in the farming schedule.

IV. OBSERVATION

Experimentation in Yadgir

Fig -1

Fig - 2

Experimentation in Yadgir

Fig- 3

Experimentation in Raichur

Fig -4

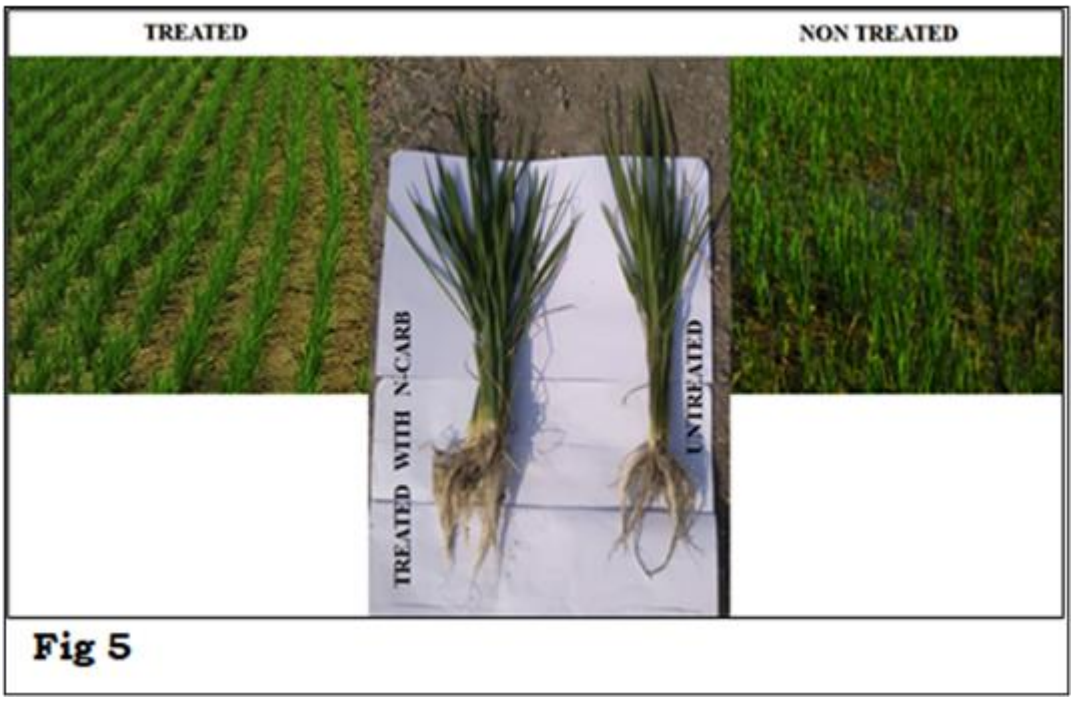


Fig 5

V. RESULTS AND DISCUSSION

Experimentation in Yadgir Fig 1 and Fig 2 This identified village Abbe Tumakur of Yadgir Taluka of district Yadgir grow Rice. The Farmer Sri. Basava Reddy growing Rice in this area was contacted and explained about the situation of organic carbon deficiency in the soil with some patches of salinity issue. The team highlighted the inherent properties of N-Carb which can be used for soil reclamation with ensured benefits of increasing organic carbon in the soil. Accordingly, 1 acre area out of his 2 Acre cultivated land was identified by the farmer where the soil type is neutral to alkaline soil but having salinity issue with very low organic carbon as historically known, the reason he harvested less yield. Here the demonstration was conducted with N-carb. The product was used during final land preparation for transplanting keeping the normal agronomic practices and RDF followed by the farmer. The method of application was broadcasting by mixing 2 Litre N-Carb for one acre with fertilizer during the final land preparation for transplanting.

The agronomic details as per farmers normal practices were noted from time to time like variety cultivated was RNR (TR-RNR-21) a medium duration transplanted Rice, the transplanting date was 30th December'21, first fertilizer application was with of DAP 50 Kg and 50 Kg Urea and the second application was 50 Kg Complex Fert 10:26:26 and 50 Kg Urea.

Observation and Inference: Visited the plot after a month of transplanting 31st January'22, it was observed that every rice hill of the treated plot was having vigorous growth in comparison to the non-treated plot. On random count the number of tillers in the N-Carb applied plot was 8 numbers on an average in each hill. The highest recorded was 9. Whereas the non-treated plot the rice hill was having an average of 3 per hill where the highest count was max 4.

Agronomically the leaf area index (LAI) of the treated plants were found superior to the non-treated plants. Further analysis reveals that double the number of tillers in the N-Carb treated field per hill than the non-treated plants per hill will yield more tillers as a result more panicle initiation. This is the basic bench mark set for higher yield than untreated. Further observation on the growth stage reveal that the treated plants are of 7-10 days in advance growth stage over the non-treated plant Hence the former would use maximum photo period exposure to have higher photosynthesis that would translate into significant more yield from the treated plot than the untreated plot.

It was well observed that N-Carb treated plot was having improved soil permeability hence the number of tillering release was significantly very high in comparison to untreated plants. This also entails the inherent property of N-Carb that optimized the capacity of holding the soil moisture for the root zone. It broke the soil

compactness with appropriate aeration that helped to grow soil microbes including bacteria and fungi for soil activation of nutrient availability to plants. The product is highly enriched in carbon that is favourable for adequate photosynthesis by the plant and also conducive for carbon fixing microbes in the soil.

Experimentation in Yadgir Fig 3 This area was identified as having low organic carbon and saline patch area in Yadgir district from the historical data, where the farmer Sri. Sharan Gouda has 35 acre of Rice cultivation and not satisfied with the 18-20 quintal per acre against the expectation of state average of 25-28 quintal per acre. This was primarily due to the soil chemical characteristics with low fertility and patches of salinity. The soil organic carbon was low as identified in the map resulting to the critical factor for low fertility. Only one acre area was been taken for N-Carb application to compare the other non-treated area. The soil impediments were explained and the features of N-Carb a fermented organic manure in liquid form, containing organic extracts a proprietary molecule of Adasca a FCO certified product by Government of India. This provides the crop with abundant supply of organic Nitrogen, Phosphorous, Potassium and micronutrients that improves soil organic matter by increasing the soil organic carbon in the soil structure rapidly. This helps water holding capacity of the soil to maintain optimum water layer that keep salinity at bay. N carb was used during final land preparation for transplanting on 6th Jan'22 by broadcasting method using dry field soil. The farmer used Fertilizer DAP, Urea, Complex fertilizer 20:20:00:13. The first application of the fertilizer was DAP 100 kgs during land preparation and 2nd application after 30 days of transplanting, where 125 Kg Complex grades 20:20:00:13 and Urea 25 Kg were used. All the agronomic practices and RDF were followed as per the farmers normal practices keeping the sentiment and economics in mind only included N- Carb 2 Litres for one acre.
Observation and Inference: The plot was visited 35 days after transplanting, randomly one hill each from treated and non-treated plot was pulled out. We along the farmer observed the root development in the NCarb treated field having better Rice hill growth with better tillering having strong primary root and more numbers of secondary roots with distribution of tertiary roots comparison to the non-treated rice hill. The nontreated hill had suppressed growth with a smaller number of tillers with poor root mass having lack of secondary and tertiary roots (Refer Fig 3). Seeing the overall improved parameters in N-Carb treated plot, the farmer's confidence level was very high and is happily expecting higher yield from the treated plot.

Experimentation in Raichur Fig 4 and Fig 5 Identified this progressive farmer, Sri. K. Satyababu, from village Bhaguda of a Rice growing belt of Raichur district where the soil of his rice field was having low organic carbon and saline patches. This low fertility was primarily due to the inherent trait of soil chemical characteristics having low organic carbon with and patches of salinity as per the historical record.
The soil has not been reclaimed to improve organic carbon as evident from the soil organic carbon map where it can be seen Raichur district was significantly low soil organic carbon. One acre area was been taken for N-Carb application to demonstrate soil reclamation with N-Carb. The problems were explained to the farmer and the remedy through N-Carb is possible as it is a fermented organic manure in liquid form this provides the crop with abundant supply of organic Nitrogen, Phosphorous, Potassium and micronutrients that improves soil organic matter by increasing the soil organic carbon as N-Carb contain organic extracts a proprietary molecule of Adasca a FCO certified product by Government of India. During final land preparation for transplanting N-Carb @ 2 Litre for an acre was used along with the other normal fertilizer practices.
Observation and Inference: The field was visited after 35 days after transplanting and the farmer saw the real difference as captured in the image (Refer Fig 4 &5). The differences between the treated and the non-treated plot were checked by pulling out randomly one Rice hill from the treated plot and another from the non-treated plot. Both were washed with clean water for taking the observation in presence of the farmer.
The Rice hill taken from the treated plot shows very sturdy growth, vigorous tillering, the primary root was having significant length root mass was thick and plenty of secondary and tertiary roots growth. The treated rice hill vigour in comparison to the non-treated one as estimated by the farmer was in 7- 10 days advanced growth stage.
However, the Rice hill picked up from the non-treated plot was having comparatively weak growth, with a smaller & lesser number of tillers. The length of the primary root was significantly short in comparison to the Rice hill picked up from the treated plot. The root mass was also less and there were very few secondary roots but no tertiary roots observed.

Fig 6- Experimentation plot projected for mass awareness campaign to farmers in the locality of Yadgir taluka of Yadgir district on soil reclamation from salinity and other soil impediments using N-Carb to improve soil organic carbon to increase productivity.

Experimentation in Yadgir

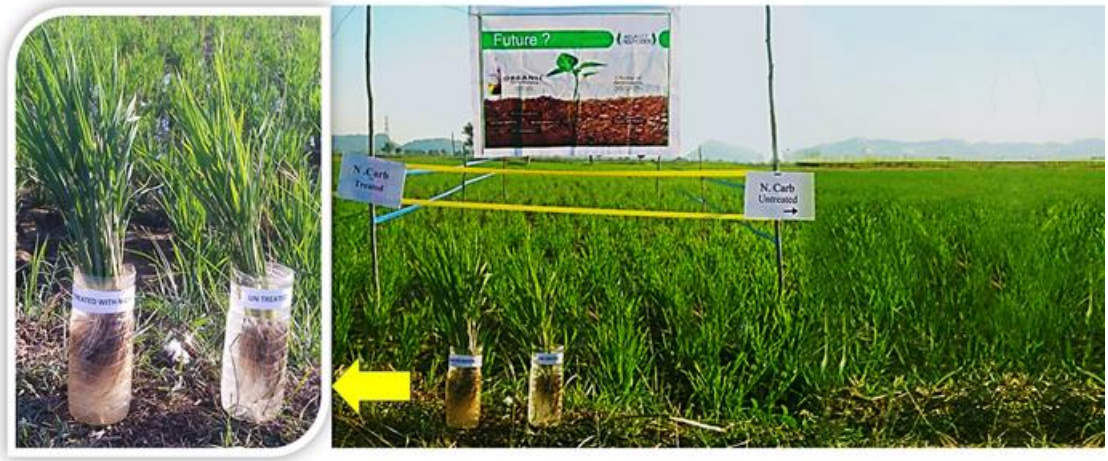


Fig 6

Experimentation in Yadgir Fig 6 The area was identified to project maximum numbers of farmer where the land had serious issue of soil salinity as well as the soil organic carbon with low nutrient capacity as a result the crop productivity is not at its best. As such no soil reclamation program has been undertaken here. Hence it was decided to start an awareness campaign with the proprietary product N-Carb by demonstrating a plot having all soil impediments and hailing a banner for the farmers of the locality to take a notice and undertake soil reclamation measures with N-Carb. An area was earmarked with appropriate demarcation and N-Carb was used during land preparation at the rate of 2 Litre per acre. The area treated was a small area with an immediate adjacent portion was kept untreated.

Observation and Inference: The field was visited between 35 – 40 Days after transplanting, and one each hill was pull out from both treated and non-treated plots, both the hills were washed carefully to remove the adhered soils from their roots. Both Rice plant hills were placed in two separate transparent plastic container filled with normal clean water so that roots of both the plants are visible to compare (as shown in the image above) .This comparative experimentation study reveals that the N- carb treated plants are having vigorous tillering along with large root mass with secondary and tertiary roots overcoming all soil impediments in comparison to the untreated plants, The treated plants were far superior and could demonstrate that N-Carb has dominated over all soil impediments to maximum level which leveraged the overall growth of plant physiological process. Application of N-Carb the fermented organic manure has given the spark to spike up the organic carbon percentage in the soil also improving the utilization of nutrients other essential elements triggered by the inherent content of N-Carb the fermented organic manure.

VI. CONCLUSION

From all the experiments conducted and after the critical observation and analysis of all the plant parameters as well as the soil condition it can be well concluded that N-Carb a fermented organic manure (FOM) a proprietary molecule of Adasca is available in the market. This confirms that it has extensive benefits which is found acting best for reclamation of soil having low organic carbon, deficient in macro element nitrogen, phosphorous and other essential nutrients. This is conducive for beneficial carbon fixing microbes in the soil to enrich soil organic carbon that is favourable for adequate photosynthesis by the plant. The organic extract of hydrolysed mass of N-Carb facilitate crop plants to absorption through roots the essential nutrient in plant system under adverse soil condition. It also optimizes the soil moisture holding capacity at the root zone to withstand various biotic and abiotic stress with special reference to salinity, drought and nutrient stress for both organic and conventional agriculture .The composition of this fermented organic manure N-Carb consists

of fermented organic extract that abundantly supply organic Nitrogen Phosphorus, Potassium & micronutrients that improves organic matter in the soil by enhancing the organic carbon in the soil structure rapidly and is the best product for soil reclamation under duress due to chemical properties,

REFERENCES

1) Land resource inventory and socio-economic status of farm households for watershed planning and development yadgir nala-1 (4d5b1e1a) micro watershed halterkini hobli, yadgir taluk and district, Karnataka …. ICAR-NBSS&LUP Sujala MWS Publ.267
2) http://maps.icrisat.org/gallery/RSGIS_gallery/GIS/Images/Soils/Karnataka_atlas/Raichur/Raichur_OC_atlas.jpg
3) http://e-krishiuasb.karnataka.gov.in/ItemDetails
4) Government Of Karnataka Department of Agriculture Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) District Irrigation Plan Yadgir District
5) Package of practices for Paddy developed by UAS Dharwad …… agropedia.
6) Karnataka (bih.nic.in)
7) AICRP on Management of Salt Affected Soils and Use of Saline Water in Agriculture (AICRP - SAS & UAS)
8) Enhancing Agricultural Productivity by Amelioration of Problematic Soils Using Sub Surface Drains

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