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Research Article

Scientific rationalization of indigenous technology knowledge on nutrient management in lateritic soils of Palakkad district in Kerala

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SUMMARY : A suite of 164 traditional practices (indigenous technical knowledge, ITK) were documented in different cropping systems of which 39 were pertaining to coconut cultivation at Palakkad district in Kerala. In case of coconut production system, aspects such as seed selection and treatment (23.1%), nursery and seedling selection (15.4%), plant protection (15.4%) and yield and harvest (17.9) constituted the dominant categories of indigenous knowledge. All practices were analyzed for their scientific rationality. Of the 39 practices, 34 were found to be rational, while the rest five were adjudged as irrational. The scientific rationale/operational principles behind 34 rational ITK were also elucidated in this study. The different ITK practices which were collected clearly indicate that the farming community has developed these practices over generations through careful observation, trial and error methods weighing the pros and cones.

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KEY WORDS :
Coconut, Indigenous practices, Rationality, Traditional knowledge, ITK

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BACKGROUND AND OBJECTIVES

India over several millenniums had been the treasure of biological wealth, intellectual knowledge and spiritual wisdom. The importance of indigenous technology and practice to sustainability is being brought through pooling of traditional knowledge, short listing and evaluating them in the context of modern scientific and technological environment and harnessing it for sustainable agriculture growth. A blend of indigenous knowledge and modern technology may be most appropriate for sustainable development (Radhakrishnan *et al.*, 2009). The capital and technological skill requirements in the use of traditional technologies are generally low and their adoption often requires little restructure of the traditional societies. Indigenous practices in agriculture are organic in nature; never causes any damage to the air, water and soil, free from environmental pollution and safe to mankind. These practices are dynamic, region specific, depending upon soil type, rainfall, topography etc., and are often modified by the local farmers.

Indigenous knowledge is unique, traditional, local knowledge existing within and developed around the specific condition of women and men indigenous to a particular geographic area (Grenier, 1998).

International Institute for Rural Reconstruction (IIRR, 1966) defines Indigenous knowledge as the knowledge that the people in a given community have developed over time and contribute to develop which is based on the experience, often tested over centuries of use, adapted to local culture and environment and is dynamic and changing. Most ITK systems are eco-centric, objective as well as intuitive, and derived from the practical and innovative life of generations of indigenous people (Rajagopalan, 2003). These are also readily available, socially acceptable, economically affordable, and sustainable, besides involving minimum risk to farmers and consumers, and above all, resource conserving (Grenier, 1998). However, with the passage of time and with the advent of modern scientific knowledge systems, most of these useful traditional practices are continually being lost. Hence, there came an urgent need to document the indigenous practices systematically in agriculture and validate them, before they become extinct. This is relevant in the present context of Intellectual Property Rights (IPR) regime and up scaling ITKs in agriculture along with modern agricultural practices.

Coconut (*Cocos nucifera* L.) is the principal crop of Kerala (India) and has been a principal source of livelihood for a vast majority of small and marginal farmers in the state for a long time. It is also a traditional crop, with a long history of cultivation and considerable indigenous wisdom (Kumar, 2008). In view of this, the present study was being undertaken with the specific objectives of collecting information on ITK related to coconut cultivation in Palakkad district of Kerala and documenting the same, and analyzing the scientific rationale of selected ITKs.

RESOURCES AND METHODS

The investigation was undertaken with the main objective of rationalization of ITK in production management of coconut production systems of Palakkad district in 2002. Keeping in view of the objectives of our study, expost facto research design was considered as the appropriate design for the investigation. The locale of the study was Palakkad district, the Rice bowl of Kerala which has wide crop diversity and encompasses five agro eco zones out of the 13 agro eco zones of Kerala and occupies the central east position in the state. Multistage sampling was followed for selection of samples for the study. Out of the 13 developmental blocks, 5 were selected based on the criteria of highest agricultural predominance and presence of at least three production systems out of the five envisaged in the study namely rice based, homestead based mixed farming system, plantation including spices, seasonal crops and annual crops. One of the blocks was selected to represent one agro ecozone and four panchayaths were selected within each block based on the same criteria thus making the involvement of 20 panchayaths in the district.

The objectives of the study necessitated the involvement of 3 types of respondents *viz*., farmers, extension personnel and scientists, the groups referred as farmers subsystem (FSS), extension sub system (ESS) and research subsystem (RSS), respectively. Hundred key informant farmers (KIF) representing different farming systems were selected for the study under FSS and under ESS 40 respondents were selected which included agricultural officers, veterinary doctors and agricultural assistants of different panchayats in the district. The scientists of both agriculture and veterinary discipline from Kerala Agricultural University who formed the researcher respondents of the study constitute the RSS. Various categories were delineated under the production system and 100 KIF were interviewed with the help of interview schedule to collect various ITK s under each category. The list of ITKs collected under various categories of production system were categorized and circulated among the multidisciplinary team of RSS for scientific reasoning so as to rationalize the ITKs.

Evaluation of ITK by KIF was also done by presenting the collected list of ITK to the KIF in order to get the response in range of 0-10 based on their belief and willingness of adoption. For this purpose, key informant workshops were conducted in different locations. Evaluation of ITK by ESS was done by circulating the list among the extension personnel in the form of a questionnaire to assign a score in range of 0-5 based on their perceived effect and scientific rationality. Correlation analysis was performed to find the relationship between the scores of FSS and ESS assigned for the ITKs under each crop.

OBSERVATIONS AND ANALYSIS

A suite of 164 ITKs were documented in different farming systems as apart of this study and a crop-wise summary is presented in Table 1. The different farming systems included plantation and spice based cropping systems, seasonal based cropping systems, rice based cropping systems, homestead based mixed farming system and annual crop based systems. Out of this, 39 were purely dealing with the different aspects of coconut cultivation.

Kerala is the land of coconuts and it is known as the 'kalpavriksha' of the state. The tree is surrounded with numerous beliefs and rituals and there were lot of traditional practices followed in this crop from time immemorial for protection and promotion of the crop. Thirty nine items of

Table 1 : Crop wise classification of the documented indigenous technical knowledge (ITK) in Palakkad

Crop	ITKs collected under each crop
Plantation crops and spices	49
Cococnut	39
Ginger	6
Pepper	4
Seasonal crops	46
Cowpea	22
Ash gourd	8
Bittergourd	11
Chilly	4
Pumpkin	1
Rice based cropping system	33
Homesteads	23
Annual crops	13
Banana	7
Tapioca	6
Total	164

Table 2 : Classification of the documented indigenous technical knowledge (ITK) on coconut in Palakkad

ITK categories	Practices under each category	Frequency (%)	Practices rationalized
Seed selection and treatment	9	23.1	6
Nursery and seedling selection	6	15.4	5
Water management	5	12.8	5
Manuring	3	7.7	3
Planting in the main field	3	7.7	3
Plant protection	6	15.4	5
Yield and harvest	7	17.9	7
Total	39	100	34

ITK were documented in case of coconut cultivation as part of this study and a category-wise summary of the same is presented in Table 2.

The technological dimension in which the ITK abounds highlights the cultivation category of seed selection and treatment (23.1%), followed by yield and harvest (17.9), nursery and seedling selection (15.4%) and plant protection (15.4%) in succession. This was in conformity with the findings of Manju (1996) who had collected various indigenous practices in coconut.

Rationality analysis revealed that out of the 39 practices evaluated, 34 were rational and the remaining five irrational. The underlying scientific rationale of the rational practices is presented in Table 3.

Various ITK practices associated with different cultivation stages are still in use and this depicted the confidence of the farmers regarding the technologies developed by their forefathers through trial and error. Many of the practices are still in use while some are mere recollection of farmers and still a certain category of ITK practices have blended, modified or attained newer uses through technology advancement. Correlation analysis was performed to find the relationship between the scores of FSS and ESS assigned for the ITK and presented in Table 4.

Table 3 : Scientific rationale of the indigenous technical knowledge (ITK) on coconut cultivation in Kerala

ITK No	ITK	Rationalization
1.	Coconuts form the middle of the bunches selected as seeds	They were not much affected by shocks during harvest and transport
2.	Detecting functional eye by floating the nut in water	The portion which comes up when dipped in water is the position of functional eye
3.	Those nuts which float with stalk portion up, will sprout earlier	Well developed nut both in terms of endosperm and husk. The uniform shape help the nut to float in this manner
4.	Soaking seeds in water for more than one month after drying in shade	Fiber will become soft and emergence of leaf will become earlier
5.	Removal of some husk at the eye portion of coconut is good	Emergence of the leaves was made easier by removal of some husk portion
6.	Nuts were brought down with the help of ropes	If nuts fall on hard ground, the endosperm gets injured resulting in defective seedling
7.	Select seedling with higher collar girth	The seedling with high collar girth is believed to be early bearers
8.	Seedlings with narola were healthy and early bearers narola refers to the leaf having a fiber connecting the leaflets along the margin	Narola is seen in well managed seedlings and so highly productive too
9.	Sowing in slanting position preferred	Prevent water stagnation in the depression near functional eye
10.	Planting seeds with eye portion down for 2 weeks and then in normal position	The embryo will be in full contact with the liquid endosperm till it emerges out
11.	Planting seed nuts in poly bags or medium sized pots	Damage to the roots during transplanting is avoided so that the seedling establishes easily
12.	Drip irrigation using clay pot and thread	Water loss is decreased and ensures continuous availability of water
13.	Burial of pseudostem of banana in the basin of the palm	The water holding capacity is increased and organic matter content also increases
14.	Burial of salvinia and eichornia in the basin	It increases water holding capacity

Table 3 contd…

Contd….. Table 3

15.	Plant banana around coconut seedling	It will prevent direct sunlight and give moist atmosphere and gives enough water to the seedling
16.	Arranging coconut husk inside planting pit	It increases water holding capacity and suplies potassium
17.	Clay from bottom ponds is a good manure	Riverine alluvium is a good manure
18.	Application of common salt in the planting pit	If salt applied, it results in soil dispersion, hence more root penetration and increased productivity
19.	Application of a mixture of sand, salt and ash in the pit before transplanting	Salt application result in soil dispersion. Ash provides potassium. Sand makes root penetration easier and so the productivity increases
20.	Transplanting at 'Katti koombu' stage	At this stage roots do not pierce the outer cover of seeds. Rooting occur directly in transplanted pits
21.	Transplanting during 'Karkkidaka vaarcha'	This is the period when south west monsoon was ceased and north east monsoon is yet to begin. At this time soil will be so wet that irrigation is not required
22.	Transplanting in 'Kumbha bharani'	Second half of February and first half of March. So seedling will establish before heavy monsoon
23.	Planting chilly seedlings along with coconut seed nuts planted in the nursery will decrease incidence of weeds	Smothering effect of chilly on weeds might be the possible reason
24.	Burning of waste from coconut tree in the basins improves yield	Carbon dioxide comes from the smoke. It increases rate of photosynthesis and thus improves yield and the smoke also decreases mite attack
25.	Planting arrowroot in coconut nursery decrease incidence of termites	The root exudates of arrowroot are found to have some repellent effect on termites
26.	To decrease weeds, use tamarind leaves for mulching	Allelopathic effect
27.	Burning of waste in the basins decrease incidence of pests and diseases	Smoke has got insect repelling property. Moreover ash gives potassium
28.	Smoking in coconut gardens will increase the yield	Smoke has got some hormones that improves seed set
29.	Toddy tapping increase yield of coconut	It gives rest to the palm and later there will be rejuvenating effect for the palm
30.	Cultivation of betel vine in coconut gardens increases yield of coconut	Betel vine roots add organic matter to the rhizosphere
31.	Removal of old roots will increase yield	It results in formation of new roots, which were more vigorous
32.	Fixing bee hives in coconut gardens increases the yield	Bees are good pollinators, increase rate of pollination and hence the yield
33.	Dig the coconut basin to a depth of 30 cm and 1 m diameter and fill the pit with chaff rice grains @ 10 baskets per plant per year	Rice chaff grain reduces bulk density of the soil increasing water holding capacity. Moreover addition of silica rich materials increases productivity
34.	Application of decomposed hay in the basin increases the yield of palm	It increases water holding capacity and hence the yield

Table 4 : Correlation co-efficients between the scores of FSS and ESS for the ITKs

Perceived effects (PE)	Scientific rationality (SR)
0.514	0.512

The positive and significant correlation obtained for the PE and SR by the farmers and extension personnel indicate the continued adoption of those ITK practices extensively. The farmers might be practicing the ITK techniques widely without being aware of their scientific reasoning. It can be inferred that the farmers and the extension personnel were in agreement regarding their opinion about various items included in the study. This was in concurrence with the results of Kashem and Islam (1999) who revealed that farmers attitude towards ITK was positively related to their rationality at one per cent level of probability.

Conclusion:

The present study documented 164 indigenous technical knowledge of which 39 were on coconut cultivation practices. Majority of the ITK analyzed for their rationality were adjudged as rational by experts. Such rational and effective ITK may directly be recommended by the extension system for adoption. Unlike modern technologies, indigenous practices do not involve hazardous chemicals as they generally utilize locally available resources. Thus, indigenous practices may be promoted not only for the benefit of the people but also for maintaining agricultural sustainability and ecosystem integrity through integration with the modern science.

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