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Problematizing 'Continuity' in the Green Revolution discourse: *A case of Turmeric cultivators*

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Abstract:

Green revolution is credited to have brought large scale socio-economic changes with implications on political and cultural aspects of rural India. Reflecting on the impact of green revolution in the past five decades, social science discourse highlights the agricultural knowledge dissonance, capitalistic transformation of agriculture and social relations. However, shadowed in the overwhelming agrarian discourse is the continuity of community knowledge in the cultivation of certain crops. The present paper, problematizing continuity observes that conventional knowledge that evolved indigenously is preferred by farmers in certain practices of agriculture than adopting scientific knowledge. The paper, presenting the case of turmeric crop cultivation in a particular geographical and socio-economic context, argues that agency tries to retain the knowledge that withstood the test of times. Based on the empirical findings the paper observes that the wider socio-cultural and historical context provides a cognitive frame which helps them, analyzing the risks associated with scientific knowledge and market oriented crop cultivation.

Key words: Green Revolution, Traditional Knowledge, Scientific Knowledge, Cropping practices

Introduction:

Since 1960s Indian agriculture witnessed tremendous changes which are advocated the largely attributed to the introduction of green revolution (GR). The strategy of green revolution, use of high yielding variety seeds, chemical fertilizers and augmentation of irrigation facilities, in fact impacted rural social structure wherein peasants evolved into farmers. Green revolution 'may be characterized as the new technological paradigm that replaced the conventional practices characterized by subsistence farming' (Parayil 1992: 738). Mechanization of cultivation operations, introduction of new crops, competitive crop cultivation have been the key factors contributing to change in the Indian agriculture in the later phase of green revolution. Labeled as modernist, rational and scientific, introduction of such changes gained legitimacy not just with the state apparatus but also in the larger socio-cultural milieu in rural India. Green revolution is a package, involving both ideology and practice, of 'large scale application of modern science and technology to agriculture' (Dhanagare1987: 137) and hence it is understood as a broader ideology of rural transformation. It was envisaged that such transformation was for the betterment of rural people as well as nation at a larger level. However, in the process of change, as Parayil (1992) observes, G R replaced one way of life with another within a short span of two decades. The peasant cultivators became farmers for whom agriculture was a calling beyond subsistence. Replacing the subsistence farming, green revolution in a way advanced market interests in rural areas, thus making the farming community vulnerable.

The initial phase of green revolution impacted a few farmers because majority of them lacked resources, or were

institutionally precluded from taking advantage of the new agricultural trends (Ladejinsky 1970). The later phase of green revolution saw its spread into fragile agro-climatic zones and vulnerable land holdings. Those farmers who lacked resources to go for green revolution mode cultivation, with the lure of prospects as experienced by the progressive farmers, began a hasty entry through initiatives such as land development[1], electrification of pump sets, lift irrigation, which were, however beyond their economic means. Such initiatives came in the later phase of green revolution, after 1980s, from the small and marginal farmers belonging to non-command areas and areas which are resource poor. Switching over to new crops, new ways of cultivation, although helped the resource rich farmers, the small and marginal farmers became vulnerable. Apart from other factors the shift from traditional practices of cultivation to new ways of cultivation induced dissonance in the knowledge and know-how of agriculturists (Vasavi 2009).

Science and agriculture

The entry of science into agriculture, particularly in crop production, began in Europe in the first half of the nineteenth century. 'The application of science in agriculture began in 1834 when Boussingault laid the foundations of agricultural chemistry' (Howard 1940: 112). Boussingault, a French chemist, was the first researcher in agriculture to devise a theory on plant nutrition which was labelled as humus theory. Humus theory, which explained the role of humus as a source of plant nutrients, was later on demolished by the mineral theory of plant nutrition proposed by Liebig (McCosh 1984). The mineral theory with its strong foundation in chemistry, in fact carried agriculture science into the fold of chemistry (Howard 1940). With the scientific establishment of the importance of chemical

[1]Digging of bore well/tube well for assured irrigation, land leveling for paddy, etc.

fertilizers namely, nitrogen, phosphorous and potash, in short NPK, it may be claimed that soil science, with heavy inputs from chemistry, was the first science that evolved in agriculture. Social chemistry was a watershed in the history of agriculture not only for exponential expansion in sciences in agriculture in the years to come but also for heralding industrial incursion into agriculture. When the limitations of chemistry to address the problems of soil deficiencies were realized, other branches of sciences began to emerge. For example, Pasteur's work on soil organisms and Charles Darwin's account of complex life of soil, and Winogradsky's work on nitrification of organic matter, and other advances led to the emergence of sciences like soil bacteriology, pedology (Howard 1940).

Embarking on modernist paradigm India pursued the agenda of scientization of agriculture. The process of introducing science began with state's goal to meet the country's food challenges. Set up over a period with the assistance from the US various agricultural institutions in the country pushed the GR technology initially into the pockets of agriculture intensive areas. In the later phase farmers of uncovered regions switched over to GR model through their own efforts. The agricultural knowledge before being scientized was local specific, communitarian, open and embedded in culture. Knowledge was local specific in the sense that cumulative knowledge was developed based on trial and errors of farmers in that region. It addressed the concerns of farmers with relation to suitable seeds, methods of cultivation, pests and diseases, etc. It was communitarian because it evolved through collective enterprise of farmers. Such knowledge was available to all the farmers of the region either directly or indirectly. The local knowledge was also embedded in culture as many practices of cultivation are closely intertwined with religious, cultural, ethical dispositions of the farming community of the region. Often quipped for the stagnation of

agriculture for a long period the local knowledge must also be credited for the sync it achieved with the environment of the region.

With the adoption of GR, such knowledge became irrelevant to a great extent. Changes in the content of inputs altered the contours of knowledge of cultivation radically. Inputs such as improved seeds, fertilizers, insecticides, herbicides, and use of mechanical power have become important factors of cultivation in the GR paradigm. And knowledge about these new inputs became obligatory. They have substituted organic manure, animal power and farm retained seeds. The knowledge system that evolved in sync with nature – soil, living organisms depend on plants, water, etc., over centuries have been rendered irrelevant as external input intensive agriculture made into the cognitive frame of farmers. Crop rotation, intercropping, trap crops, use of cattle for agricultural and related operations, have become obsolete as they don't seem to be augmenting productivity directly. Traditionally, Indian farms were small plots of land protected by windbreaks and tree cover. The farmers employed sound methods of organic husbandry that had been used for centuries. The practices of crop rotation and leaving fields fallow for long periods of time allowed the soil to retain nutrients. Due to this, the demands on the land were low, allowing farmers to establish a stable relationship with the environment. Maintaining a state of equilibrium with soil enables farms to recover after disastrous events, such as droughts or monsoons (Das 1999).

Indigenous knowledge Vs scientific knowledge:

'Indigenous Knowledge system is a cumulative body of knowledge and belief, handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their

environment' (Kumar 2010: 7). IK is unique to a given culture or society. It contrasts with the modern scientific knowledge system generated by academia, research institutions in the sense that it is uncertified.

IK is passed down from generation to generation through social and cultural structures and practices. With the introduction of the GR paradigm and the commercialization of agriculture, a shift from indigenous practices to the scientific knowledge based practices has taken place. Pushed under the label of best management practices, agricultural universities, research stations through the army of agricultural extension personnel privileged the knowledge of agricultural institutions. Such emphasis on scientific knowledge (SK) marginalized IK with which farming community has been sustaining for centuries. Of course in the process of prioritization of productivity, which got into the cognitive frame of farmers as well, IK became irrelevant or inadequate as its knowledge base was unable to prove or answer certain concerns. Empiricist positivist GR paradigm substituted the IK based non-positivist, holistic approach of crop production. Changes in the cognitive frame among farmers towards productivity and inputs resulted in marginalization of IK.

The erosion of IK base in cultivation is gradual and significant. In certain crops like paddy, wheat, maize, cotton the use of IK is marginalized to a great extent while in crops like turmeric it still plays a significant role. It is of sociological importance as to how in crops like turmeric IK is still found to be relevant. Given the same geographical conditions, how in some crops scientific knowledge based practices made deep inroads while in turmeric crop IK is privileged over SK. Adopting a constructivist method the present paper attempts to understand the social and cultural factors in the cultivation of crops. It argues that a certain amount of agency goes into sense making of the alternate knowledge systems while choosing the cultivation practices. Through an empirical examination of

cultivation practices of crops from a comparative perspective, the paper brings out the significance of cognitive frame in influencing farmers' towards cultivation practices.

Methodology

The paper is based on the findings of the study conducted in a village named Nainala in South India. The village is located in Warangal district of Telangana, which falls under the semi-arid tropical climate. The village has a long history of agriculture as its major occupation. It is located about five kilometers from the lowest revenue headquarters indicating the greater amount of exchange of communication with the outside world. For decades, farmers in the village have been cultivating multiple crops in semi dry and dry land. Major crops grown in the village are paddy, maize, cotton, turmeric. Crops are cultivated in both seasons, namely Kharif and Rabi. Using the Ethnographic approach data was collected from 100 farmers in the village. Field work was carried out in the village for a year from 2012 to 2013 covering both the crop seasons.

Agriculture in the village

The primary occupation of a majority of Nainala villagers is agriculture. Village revenue records suggest that the total cultivable area of the village is 1550 acres, out of which 1143 acres of land is cultivable. 1143 acres include 740 acres of dry land and 403 acres of irrigated land. Sources of irrigation are village tank, and tube wells. During the Kharif season depending on the rainfall village tank is used for irrigating crops under its command area. Otherwise, in both Kharif and Rabi seasons there is complete dependence on tube wells which work on electricity. Commonly grown crops are Paddy (*Oryza sativa*), Cotton (*Gossypium hirsutum*), Turmeric (*Curcuma*

longa), Chili (*Capsicum annum*), Groundnut (*Arachis hypogaea*), and Maize (*Zea mays*).

Over the years, even in non-command areas the area under paddy cultivation has been rising sharply. It is not that paddy is an alien crop in these regions. Historically, almost every village in Telangana region has been cultivating paddy either under village tanks or by drawing irrigation water using animate sources of power from open wells. However, the extent of area used to be very low. Sociologically stating, these paddy cultivable holdings were under the control of upper castes to a large extent. With the spread of GR which made a heavy impact on paddy making it as a remunerative crop, other farmers belonging to other backward classes and scheduled castes in the villages of Telangana begun to convert their dry holdings to irrigated holdings by digging open wells and subsequently tube wells. Tube wells have been a revolutionary as the advanced technology enabled farmers irrespective of farm size to dig one. Most of the tube wells dug in Telangana region have been aimed at converting dry land into irrigated land for cultivating paddy.

Table No: 1: Major crops cultivated in the village

Crop	Area under cultivation in acres (percentage of crop area to the total cultivable area)	No. of farmers*
Paddy	300 (26.24)	220
Cotton	380 (33.42)	140
Turmeric	190 (16.62)	189
Chili	140 (12.24)	80
Maize	70 (6.12)	35
Other crops	63 (5.51)	50
	1143 (100)	278

Source: Survey conducted in the study village during 2012

* Each farmer may grow more than one crop in a particular season. This data is for Kharif season.

The study village is a typical of Telangana villages. The cropping pattern, as given in Table 1 suggests that paddy is grown in 300 acres, accounting for 26 percent of land. Not only

in terms of acreage cotton ranks high, but also in terms of number of farmers, paddy is placed on top with as many as 220 farmers out of a total of 278 farmers cultivating it. It is not just a staple crop, but as mentioned above, has become a remunerative crop. Cotton, which can be grown under rain fed as well as irrigated conditions (semi-dry), has emerged as the important non-food commercial crop. In the study village cotton is cultivated in 380 acres (33 percent) by 140 farmers (58%) out of 278 farmers. The average cotton acreage is 2.71 acres, while average acreage under paddy is 1.36 acres.

Besides paddy and cotton the most important crop in the economy of farmers of Nainala village is turmeric (*Curcuma longa*). It is cultivated in 190 acres, accounting for only 17 percent of total holdings, but cultivated by 189 (67%) farmers in the village. Turmeric is an annual crop, which yields once a year. It is cultivated where assured irrigation facilities are available. Although in Kharif it is largely managed with rainfall during Rabi it requires intermittent irrigation. Hence farmers who have reliable irrigation source i.e. irrigation facility even during non-monsoon period (monsoon season is from June to October) would cultivate turmeric. The average area under turmeric in the study village is 1.05 acres. The other important crops of the village are chili cultivated by 80 farmers in 140 acres, with an average of 1.75 acres and maize (35 farmers in 70 acres).

Socio-economic significance of turmeric

Of all the crops turmeric presents an intriguing picture as far as its cultivation practices are concerned. Before we go into the details of turmeric cultivation practices let us understand its social significance. Turmeric occupies a socially significant place in the cognitive frame of farmers in the village on two counts. Referred to as *pasupu* in local language turmeric is

considered as a '*saviour crop*' and '*golden crop*'[2]. It is called as '*saviour crop*' because it is believed that irrespective of weather conditions in a cropping season, market conditions and other factors of crop production turmeric is said to offer more than minimum returns. In terms of yield[3], and market price turmeric is believed to be a saviour crop for the farmers in the village. Interestingly, the role of the state in promoting of turmeric crop through agricultural extension, in terms of offering new high yielding varieties, minimum support price, fair market machinery, is absent. In spite of the lack of state support the community evolved the idea of cultivation of turmeric which offers them minimum returns. Compared to cotton, which recorded erratic trends in terms of yield and market price, turmeric has been stable. Farmers believe that at times of other crop failures and the resultant debts[4] turmeric saves them. Thus, it may be pointed out that although Telangana witnessed large number of farmers' suicides and Warangal district is at the top of the table, no single case of farmer's suicide was reported in the village.

Table No. 2: Area under cultivating by the turmeric farmers

Area under cultivating	Marginal	Small	Semi Medium	Medium	Total
Less than ½ acre	52	41	00	00	93
½ acre to 1 acre	00	38	45	01	84
One acre to 2 acre	00	00	02	10	12
Total	52	79	47	11	189

Source: Survey conducted in the study village 2012.

The importance of turmeric crop in farmers' economic life may be ascertained from Table 2 which shows the distribution of area under turmeric cultivation in the study village. Of the 189 farmers cultivating turmeric 79 are small, 52 are marginal and

[2]Because of its colour as well as its economic significance for it is equated with gold.

[3]Farmers believe that even in the worst scenario it gives a safe yield.

[4]Particularly those farmers who cultivate cotton, in the case crop failure incur heavy debts.

47 are semi-medium farmers. It may be stated that small and marginal farmers' preference for turmeric is due to the remunerative support it gives to the cultivators. All the 52 marginal farmers cultivate turmeric in less than half-an-acre. This proves the point that over the years, turmeric gained the confidence of farmers whose holdings are increasingly becoming vulnerable in the emerging agrarian scenario in India. Followed by this category are the small farmers who cultivate turmeric in less than one acre. A large majority of medium farmers cultivates turmeric in more than one acre. It may be said that across the spectrum of land holding turmeric is considered as the viable crop even in the period of great uncertainty associated with agriculture.

Historical understanding of turmeric cultivation in the village suggests that it began with upper caste farmers. It is because, upper caste farmers were the ones who had greater access to irrigation round the year. As turmeric needs irrigation during non-monsoon season it is only the upper caste farmers who ventured to cultivate it. Over the years as new technology in tube well irrigation broke the scale barrier farmers of the village have shifted to turmeric cultivation. It is worth mentioning that when compared to other crops like paddy and maize turmeric is an input intensive crop requiring cultivators to invest higher amounts on its cultivation. Despite such demand why even marginal and small farmer chooses to cultivate turmeric is an important question? The answers to this question are arrived at through the sociological explanation of cultivation practices of turmeric stated below.

Turmeric Crop cultivation: continuity and change

Turmeric is a commercial crop grown purely for marketing purpose. It is largely grown in semi-dry land areas. Unlike paddy and maize which can be grown twice in a year the

duration of turmeric crop takes eight to nine months[5]this only one crop in a year can be harvested. In contrast to the fast paced changes in the cultivation of other crops such as paddy, maize, cotton, etc. turmeric witnessed few changes. It is a significant observation as it raises questions as to why there is continuity in the traditional practices of turmeric cultivation and what factors are contributing to the sustenance of traditional practices and resisting change.

Normally, turmeric cultivation process begins with the arrival of rains i.e. in the month of June when farmers start preparing the field. Although ploughing begins after one or two mild showers operations on turmeric field start with the application of farm yard manure (FYM). FYM is organic manure prepared by farmers independently in their farm or home constituting cattle dung and other agricultural waste. Compost pits are maintained throughout the year by adding cow dung, other residues from cattle farm, household waste and farm waste. As cattle form the backbone of marginal and small farm holdings, availability of farm yard manure is not a problem for these sections of farmers. Even the semi-medium and medium farmers, whose land holdings are large and the FYM generated is insufficient to use for all crops, prefer using FYM for turmeric rather than other crops.

It was observed that irrespective of land holding all farmers use FYM for turmeric cultivation. For other crops like paddy, cotton, maize and chili most of the farmers are unable to use FYM because of lack of availability. Those farmers who do not have livestock buy FYM specifically for turmeric cultivation from other farmers in the village or outside the village. This compulsory practice of application FYM for turmeric is based on the belief among farmers that turmeric crop needs fertile, loose soil for the healthy growth of the crop. They are aware that soil fertility can be augmented by adding chemical fertilizers, but they desist from using it beyond minimum dosages because of

[5]Duration of Nine months from August to April in South India.

the belief that the use of chemical fertilizers beyond a level would harden the soil. Empirical understanding of degradation of soil fertility and its composition due to continuous and indiscriminate use of chemical fertilizers has come from their observations in other crops like paddy. Farmers agree that use of chemical fertilizers has increased yields of paddy but they say that over the years soil fertility has gone down drastically. They suggest that the soil biota has changed for worse in paddy fields as they report the absence of earthworms and fauna and flora generally associated with submerged paddy cultivation. Despite knowing the fact that fertility can be enhanced by adding chemical fertilizers why do farmers desist from using them in turmeric fields? It was reported by farmers that the use of chemical fertilizers may increase yield in the immediate crop, but the soil becomes unproductive over the next few years. It is not only that for turmeric growth[6] loose soil is essential, but farmers also believe that the shelf quality of turmeric, its morphological features like colour, hardness, etc. would be affected by the use of chemical fertilizers. *Perrumalla Chandra Mouli* (56 years of age) is a marginal farmer and toddy topper by profession has been cultivating turmeric crop for more than thirty years. He observes,

> "I use animal (cow, buffalo, sheep and goat) manure sufficiently in turmeric crop fields, because I consider this crop as a "saviour crop" to me. This crop helps me to clear my debts if the price is good in the market. Two years ago, the rate of this crop went up to 18,000/- per ton and it helped me to clear debts. This crop has been cultivated by the villagers by generations since my forefather days. Farmers in village consider this crop as special crop. However, the amount of manure used has decreased year by year in the village. Due to lack of livestock at the farmer's houses these days farmers are unable to use in the farm. There is a huge demand for manure in the village, but very less supply and unable to use manure

[6]The economic output of turmeric crop is in tuber form which takes place inside the soil.

> in all their crops. Those farmers who cultivate turmeric crop use manure (sheep/ goat/ cow/ buffalo dung) in their fields even though it is scarce and compulsorily use in the turmeric crop field because it enhances soil fertility".

Farmers report that there is a decline in the soil biota for the last ten years due to the usage of chemical fertilizers and pesticides. They also say that only in turmeric fields the presence of earthworms is noticed, which they say is good for the crop as they loosen soil and increase fertility status of the soil.

Majority of farmers in the village switched over to the use of tractors for tilling replacing cattle drawn ploughs. Tractor was introduced in the village by a *Reddy* caste farmer in the year 1989. This was the beginning of the shift from animal to machinery works in cultivation. These days all farmers prefer to use tractors not only because of lack of availability of cattle, but also because of the reduction in the time consumed for ploughing. However, in the case of turmeric, tillage operations, farmers still prefer using cattle drawn ploughs. *Vasireddy Yadhagiri* (43), a medium farmer having experience of 18 years in turmeric cultivation, mentions that he never uses tractor in turmeric cultivation, because he believes that deep tillage in turmeric is not suitable. '*Due to the heavy weight of the tractor the upper layer of the soil becomes hard which is not good for turmeric cultivation'*.

GR paradigm has made mixed cropping an anathema in its pursuit towards productivity and yield. However, mixed cropping is a common age-old practice in turmeric cultivation. Even at the height of GR adoption days, about 30 percent of turmeric cultivators go for mixed cropping. Maize, pulses, marigold are the preferred crops for intercropping in turmeric. Maize is one of the important commercial crops used for intercropping in turmeric because it is a short duration crop. Marigold is planted in turmeric field for its repellent properties against certain pests. It also acts as a trap crop against certain

pests. Pulses, a legume crop which is believed to enhance soil fertility, is also preferred as an intercrop. In fact, it was observed that along with maize and marigold, pulses are cultivated in the turmeric field. However, over a period with the increased scope for making little more money through maize, farmers are preferring maize ignoring the beneficial effects of marigold and pulses.

Oridholu Yakhaiah (40), a small farmer who cultivates four acres and having 18 years of experience in agriculture is credited to have introduced new commercial crops in the village. He introduced Bt. cotton, chili and seed production in paddy. He maintains that,

> "I brought Bt. cotton and chilli to my village. I also began seed production for private firm in my filed. I am not averse to adopt modern practices in cultivation. But when it comes to turmeric cultivation I practice traditional methods. I use good amount of manure in turmeric as it increases soil fertility. I don't use tractor and chemical fertilizers and pesticides in turmeric cultivation".

Conclusion

The GR discourse generally highlights the consequences in terms of change in agricultural practices while ignoring continuity. Perspectives of agricultural scientists and social scientists often take the deterministic stand and view adoption and non-adoption of modern scientific practices as problematic. The institutions of crop sciences have been prejudiced against the cumulative knowledge farmers have been using for centuries. The modern crop sciences advocate best management practices treating the time tested knowledge pool of farmers as unscientific. It also treats farmers as receivers of knowledge, ignoring their capacity to judge and decide upon adoption and non-adoption of modern agricultural technologies. In fact the terminology of diffusion literature appears problematic as the terms like progressive farmers, innovators and laggards are

'normative' and 'hegemonic'. Unfortunately, we seldom come across studies examining the contributory factors for non-adoption of best management practices. Even if there are some, they are judgemental and normative.

The social scientists' engagement with GR has been one of deterministic. The social science discourse on GR problematized modern GR paradigm and explained changes as a result of introduction of new technologies in crop production. What is absent in this discourse is an agency that farming community constitutes. The dynamics of knowledge production and diffusion among farming community indicate to the active role of farmers. It is important to recognize the fact that farmers are active agents who create, recreate and modify knowledge available to them to suit the local realities.

The present paper while ascertaining the reasons for continuity of conventional crop production practices, argues that farmers as active agents of knowledge production rework with available knowledge with them. The paper highlights that while farmers in the village adopt modern scientific crop production practices in crops like paddy, maize, and cotton they desist from adopting the best management practices advocated by the scientific community in turmeric. Farmers derive their own meanings, the bases of which are located in the social, cultural and economic spheres of their lives. Cumulative knowledge in other crops has undergone significant changes while it is retained to a large extent in turmeric cultivation. The agency centric approach adopted in the present study helped in bringing out the dispositions of farming community towards turmeric cultivation practices. Knowledge on soil fertility, soil biota, crop physiology[7] held by farmers of the study village indicate its dynamic nature which hardly finds place in modern crop science research. The paper suggests that despite significant changes in crop production practices as a result of GR, farmers continue to adhere to certain conventional

practices based on the merits which cannot be assessed by using modern positivist methodologies. Working with linear positivist methodologies by the scientific community often disregard the farmer practices and label them as unscientific. Privileging certain knowledge and marginalizing other forms of knowledge, particularly IK has been proved to be disastrous, both socially and ecologically.

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[7]As far as turmeric is concerned.