ORGANIC FARMING POLICY OF KERALA- A CASE STUDY OF POLYHOUSE FARMING

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By

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1. Introduction

Organic farming is now becoming a movement like the total literacy movements of the past which shaped Kerala's socio-cultural identity. Over the past ten years, Kerala both urban and rural has seen a 'vegetable revolution' of sorts where both UDF and LDF now swear by organic farming and have listed it prominently in their manifestoes. The agrarian crisis of the 1990s stimulated Kerala's state institutions into creating an organic farming movement in the late twentieth century. Therefore, one could argue that Kerala's organic farming politics have predominately been shaped by health and environmental concerns. Kerala's organic farming movement has faced different milestones along with the disoriented flow of government policies and schemes. Based on the lines of organic farming policy 2008, Kerala unveiled a policy "Organic Farming Policy 2010" by Kerala State Biodiversity Board (KSBB) under the umbrella of State Agriculture Department to convert the entire state to organic farming within ten years.

The revival of agriculture in a diversifying economy like Kerala requires tackling technology, organisation and environment through a functional planning process. A satisfactory functional planning process requires parallel movement of objectives set by the government and measures taken to achieve those objectives. But looking at agrarian schemes and policies set by the state government in past ten years, one could argue about the uncertainty and contradiction between such steps and objectives set for organic farming. Following KSBB's organic farming policy 2010, State Horticulture Mission (SHM), in 2011, distributed 30,000 grow bags for rooftop farming for helping make Kerala kitchens free of pesticide-laden vegetables and fruits. After a year, in 2012-13 SHM launched Polyhouse Farming Policy and other measures to support Hi-tech farming in the state for achieving self-sufficiency in vegetable consumption.

Polyhouse farming is a type of closed precision farming which involves cultivation of crops in a controlled atmosphere, under ultraviolet film roofing and nets to keep pests out. Though polyhouse farming has been attracting Kerala's population towards agriculture and contributing in vegetable production, there is a clear contradiction in the objectives and measures pursued since hi-tech agriculture has not been using organic methods of cultivation and facing marketing and technical difficulties. *In this study, it has been argued that farmers who have made high investments in poly-house farming are finding it difficult to get sufficient income from their ventures. Meanwhile, local growers, including organic growers, are not getting enough market support for their produces.*

Additionally, there is turmoil over different varieties of standards and certifications. Kerala Agriculture University (KAU), in 2015, initiated "safe-to-eat" and "pesticides-free" certifications which reveal a shockingly callous attitude towards the safety standards of food available in the market. KAU is providing safe-to-eat certificates to polyhouses farmers. Consequently, farmers are getting benefits of huge subsidy and high premium prices on 'safe-to-eat' branded products which are technically 'inorganic'. As an illustration of Polyhouses Farming in Thiruvananthapuram district, this study examines the design of the scheme to check significance of government policies on self-sufficiency in agriculture and explores the divergence from organic farming targets. *Though individuals and groups promoting organic farming share a common view on the environmental and health toll of the farming methods*

depending on the use of chemical inputs, there is no unanimity among them over the methods and objectives. They often come under different garbs with different slogans.

Although it is true that to address agricultural issues and to attain "self-sufficiency in vegetable production", *technology driven farming or precision farming* is an alternative to deriving high income from small size holdings. Nevertheless, government could have made efforts to ensure a common ground among stakeholders, training institutes, agencies and farmers to achieve its objectives of organic farming along with an increasing share of agricultural output in GSDP. When the state government promises to convert Kerala into fully organic state by 2016 (Scheme on Organic Farming, 2016), Kerala's perspective plan 2030, without mentioning organic farming policy 2010, conjures up a vision of Hi-tech modern commercial agriculture structure in Kerala. *This study thus argues that following current path, there is no clear vision of the future of agriculture in Kerala, but could take several paths.*

2. *Need and Significance of the study*

Despite the substantial number of researches that supports organic farming, existing organic farms and all on-going methods of farming in Kerala are yet to be studied. There is no organized study done on the status, prospects and problems of organic farming in Kerala. The data generated by Economics and Statistics Department, Kerala on organic farming available with Directorate of Agriculture, Kerala is the compilation of reports coming from different districts. According to agricultural officials, this data is not confined to 'certified organic area, output and farmers' but includes non-certified and 'safe-to-eat' output as well. Therefore, data seems to be unreliable. Moreover, there is no separate data source for greenhouse/polyhouse farming on a national level. Study has to be done on the various organic farming methods being practised for organic farming and also on closed & open precision farming. Even when polyhouse/greenhouse farming is one of the very kind methods of precision or technology driven farming that Kerala has been promoting on a large scale since 2012, there has been no publicly available research done on the viability of polyhouses.

There are many justifications to consider polyhouses farming as a case study for this report- According to officials at SHM, this mode of plantation is extremely useful since it helps in reducing the dependency of purchase of food products from other states. Also, it ensures a complete *'pesticides-free'* purchase of vegetables and fruits. Farmers who are involved in polyhouse cultivation can also get better value for the vegetables that are being sold through this method. Also, poly house cultivation is a technology in which more production (even up to 10 times) can be achieved from a unit area. In a state where the Agricultural land is declining too fast, this technology can be resorted to for enhancing the production of at least some crops. Moreover, HTF (Hi-tech farming) can be viewed as a commercial activity utilizing limited land. Because of the design, the chance of pest infestation can be reduced to a great extend thus *limiting* the use of hazardous chemical pesticides.

Though output generated from polyhouses is not fully organic unless done on purpose by the farmers, polyhouse farming has been considered to be an appropriate move towards achieving Good Agricultural Practices (GAP) by some farmers and officers. To explore the place of polyhouses farming in Kerala's organic farming movement, it is important to see the picture from the perspective of both stakeholders and farmers.

3. Research Objectives and Methodology

3.1 Objectives

This qualitative study focuses on two objectives-

- *To analyse the differing perception of self- sufficiency and sustainability in agriculture in Kerala*
- *To explore the place of poly-house farming in Kerala's organic farming movement***.**

3.2 Methodology

This study is based on qualitative research and parts of grounded theory which uses a variety of data sources, including qualitative data review of records, interviews and observations.

All the arguments and claims are based on informant interviews with stakeholders of government organizations and other related agencies, observations from some farmers' meetings, educational and training institutes, local NGOs, secondary documents and primary survey of polyhouses. In order to achieve the first objective, structured interviews were conducted with the various stakeholders including State Horticulture Mission, Thanal Trust, Kudumbashree, Kerala Agricultural University, and Department of Agriculture Kerala. The information has been collated to bring out the differing perceptions of the different stake holders for organic farming in Kerala state. Different questionnaires were designed to investigate all required details from the stakeholders to know their own and their departments' perceptions on organic farming and sustainability in Kerala.

In order to achieve the second objective a primary survey among 20 Poly-houses in Thiruvananthapuram district was conducted through one-to-one visits and telephonic conversations. The motive for taking up polyhouse farming, the economic viability of it in the absence of government subsidy, overall profitability, problems faced by farmers, training and technical support given by SHM, marketing and supply chain issues were probed. Using this case study, some main problems have been identified. The list of farmers and poly-houses along with the information on amount of subsidy given to each farmer, actual implementation cost per polyhouse, phone numbers, block and panchayat name and crops produced was obtained from the State Horticulture Mission.

To conduct this research, initial information through different media (The Hindu, New Indian Express, Krishi Keralam, Kissan Kerala, official orders and reports, government websites and other important links) was collected to know the overall perception shown by the media and government through voice of internet. After getting substantial overview, questionnaires were generated to know the real picture to an extent and getting their 'perceptions' on what has happened and planned to happened for '100% organic state target'. Since some of the government policies were doubted to be not in sync with the objective of achieving organic policy target, one such policy 'polyhouse farming policy' has been taken as a case study as discussed above. Thus, telephonic interviews and field visit to some polyhouses farmers and periodic meetings with State Horticulture Mission (SHM) have been most significant for this study.

3.3 Limitations

Though, even after conducting multiple interviews and finding a consensus between the respondents' thoughts, with all the exploration, one can still not be completely certain about their responses being completely accurate. Understanding that not everything said in the interviews can be taken as *'fact'* and realizing the unavailability of reliable data and other caveats, this study tries best to deliver documented information as well.

For conducting surveys of polyhouses farmers, it was managed to visit only 3 polyhouses and interviewed 21 out of 59 registered farmers in the district. This number doesn't seem to be an adequate representative of the population but open-ended questions in survey raised the importance of the study.

Also, given the kind of information that has been given which can affect their future at different government organizations and to respect their request for anonymity, the officials as well as farmers will not be named.

4. Analysis and Interpretation

4.1 Organic farming in Kerala: An overview

History has played a major role in organic farming movement given by commodification of the agrarian environment in Kerala which led to some destructive outcomes in Kerala's agricultural community in the 1990s: suicides, fungal diseases and pesticide poisoning from Endosulfan. The campaign for organic farming policy started in 2007 by chief of Kerala State Biodiversity Board and it took four turbulent years to come to fruition (Thottathil S. E., 2014). As per the **Kerala State Organic Farming Policy 2010**, the government, under the aegis of the National Horticulture Mission (NHM), had planned to popularize organic farming in the entire state (around 2,000,000 hectares) in a phased manner. The district of Kasaragod has been declared fully organic in 2012 (Scheme on Organic Farming, 2016). Though government has allocated funds for organic farming in later years from 2012-2014, there was no official mandate for fast-tracking the process in state for domestic consumption but preferably for export purposes during these years.

According to agricultural officers, estimates as of 2013 suggest that over 15000 farmers in Kerala were already or in the process of being certified organic for export to the United States and Europe; that is, they meet the legal standards that define organic farming on a national level, as determined by a third-party certifier. According to the International Federation of Organic Agriculture Movements (IFOAM), a non-profit umbrella organization promoting sustainable agriculture globally, certified organic products are "those which have been produced, stored, processed, handled and marketed in accordance with precise technical specifications (standards) and certified as 'organic' by a certification body" (IFOAM, 2009a). In India, these technical specifications are called the National Standards for Organic Production (NSOP), which are set by the Agriculture and Food Products Export Development Authority (APEDA) of the Ministry of Commerce. APEDA has accredited twenty-four institutions in India to carry out organic certification, many of which are located outside of the country. The first indigenous organic certification body in India, Indocert (Indian Organic Certification Agency), is based in Kerala, indicative of the leadership role Kerala is playing in South India's organic farming movement.

SHM under the aegis of NHM is entrusted with implementing organic farming and certification in Idukki, Wayanad and Kasaragod districts of Kerala during 2014-2015. NHM is providing financial assistance of Rs.5.00 lakh per group of farmers covering an area of 50 hectares for certification of organic process. Assistance is being given over a period of three years in the ratio of 30:30:40. Agencies provide inputs, create awareness, impart training for organic farming, provide organic certification and coordinate procurement of food products to be exported or sent to retail shops. Organic retail shops are created at Adimali in Idukki and Kalpetta in Wayanad. SHM has partially funded 200 vermi composting units. Under Rashtriya Krishi Vikas Yojana (National scheme for improvement of farming sector), 500 hectare from each district was adopted and helped from the start for organic certification via agencies. SHM is currently providing Rs.10000 for conversion and Rs.10000 for certification.

After a long gap, in 2015, Agriculture department started seeking to achieve Organic State objective gradually by first introducing **GAP (Good Agricultural Practices)** for 'safe to eat' output with an allocation of Rs.106.7 Lakhs for that year. GAP(s) are "practices that addresses environmental, economic and social sustainability for on-farm processes, and result in quality food and non-food agricultural products" (FAO-COAG2003). Kerala state has 152 total blocks in which 6 are in Kasargod. GAP is implemented for 146 blocks. Government is now trying to build PGS (Participatory guarantee system) for organic certification in which farmers certify each other. This type of certification incurs no additional cost and mainly concentrates on domestic organic consumption Products from GAP certified agriculture fields would be branded as "safe to consume".

However, GAP allows the use of pesticides as "nationally authorized (by FSSAI in India) safe and judicial uses of pesticides under Maximum Residual Limit (MRL) necessary for effective and reliable pest control". International Federation of Organic Agriculture Movements has compiled various counter-arguments on the misconceptions about organic farming and says that legally defined "maximum residue limits" (MRL) are not a guarantee of "zero health risk." MRLs set by governments are not always set on the basis of health criteria (Criticisms and Frequent Misconceptions about Organic Agriculture, 2008).

Going by the same strategy of limiting the use of chemicals and promoting safe-to-eat scheme, in 2015, Agriculture department aims to have 297 clusters (group of farmers) by March 2017 in which one cluster should have minimum 5 farmers with minimum 15-20 hectares of land per cluster. These clusters are being trained by elicit farmers by KAU on voluntary basis. A subsidy amount of Rs.75000/cluster for common activities and Rs.25000 for old clusters is being provided. Also, In 2016, Vegetable and Food Promotion Council of Kerala (VFPCK) has announced to give 'organic food' certificates to farmers' groups for domestic sale of produces.

4.2 Perceptions of stakeholders-

According to the officials, organic farming policy 2010 was implemented only for Kasargod district by VFPCK and then in 2014-15 Agriculture Department included other districts as well. There was no formal policy/scheme for organic farming from 2011 to 2013 barring awareness campaigns. After 2010 policy, state officials claimed that organic farming with "*limited use of synthetic inputs such as chemical fertilizers and pesticides*" could be the solution to the innumerable agrarian problems the state was facing. This attitude of using chemicals within prescribed limits or limited use had resulted in all agricultural policies for

"safe-to-eat" and GAP rather than for 'organic' products. Following are some views and perception for organic farming in Kerala collected from interviewing official stakeholders responsible for agriculture in Kerala-

❖ 100% organic state is impractical target and not achievable because of the way "Organic farming" has been defined. In 2000, the Government of India released the National Standards for Organic Products (NSOP) under the National Programme for Organic Production (NPOP). It stipulates that inspection and certification by a nationally accredited certification body is mandatory for labelling and selling products as "organic." It takes around 3 years for an area to be called 'organic' after certain rounds. Since these norms are strict for size of land and zero use of chemicals, Kerala has been engaging itself in complete organic farming mainly for meeting export needs.
❖ Organic farming (as envisaged by the developed countries) is a good way to earn better price for farmer's produce. But two questions are there. (1) Whether the common people of Kerala can afford to pay premium price? (2) How far it is possible to convert the homestead farms of a state like Kerala which is largely covered by paddy, coconut, plantations and other cash crops and not just fruits & vegetables?" Therefore, instead of going for organic farming, it is better to think about 'Safe to eat' concept which, can be easily adopted by the farming community and the common man. KAU gives a free package of practice for one year which includes standards for safe to eat farming.
❖ The spectrum of organic farming movement in the State has groups and individuals advocating either extreme or moderate versions of organic farming. The philosophy of organic farming is not based on output. If cultivation in a farm is to be completely organic, soil has to be conditioned for that and it requires time. The organic farming in the past was successful because farmers in those days had animal components. Also, organic farming may not be practical for large scale cultivation essential for feeding the population. According to agricultural scientists, food grain production rate should either match or exceed the population and thus even KAU recommends use of safe chemicals if extreme situations warrant it.
❖ Dr. S. Narayana in his report in 2005, very optimistically showed that given the availability of organic infrastructure, minimum efforts for conversion due to the low use of chemical farming methods and the limit of the public investment, organic farming can be progressively introduced. There are some groups who are positive about this movement considering keep-up with some challenges. They believe that organic farming cannot be done with a commercial aspect and business mind keeping *priorities* to Food security and Health.
❖ There is a perception among some farmers that 'organic' food is equivalent to 'pesticide-free food' and using organic manure to make food organic is a myth. But the easy availability of chemical fertilizers at subsidized rates and the scarcity of organic manure in the commercialized areas encouraged the transition to chemicals. Most of the experiments conducted after 1980s during the period of transition comparing organic and chemical fertilizers proved that chemicals were at best equivalent, if not inferior, to organic materials (Santhakumar & Rajagopalan).

As we have seen, there has been a secret and gradual movement from *organic revolution* to *GAP* and thus all official stakeholders have been moving in different directions. KAU, SHM and Department of Agriculture have been promoting the agenda of organic farming and also working for it but at the same time moving in a gradual manner. Some give justifications for adopting safe-to-eat practices and only 'limiting' the use of chemicals and call them a gradual process for achieving 100% organic state target. Howerver, some denies the possibilities of achieving this target and would suggest to work only for 'moderate type of organic farming' even in the long term. Such a contradiction of Kerala's organic farming movement could have a deleterious effect on the commendable aspiration within the policy to convert the entire Kerala to chemical-free agriculture.

4.3 Poly-house farming in Kerala: An Overview

Initially, unprepared, without questionnaire, without even knowledge of linking organic farming with hi-tech farming, it was expected that SHM's project of polyhouses is a major movement towards organic farming in the state. But it was told that the purpose was to *lure people towards agriculture for the attainment of vegetable sufficiency, getting significant income through agriculture sector for the state and improving standard of living of the farmers.* This changed the objective of this study from "Hi-tech farming in Kerala: a move towards attainment of complete organic state" to "*the place of poly-house farming in Kerala's organic farming movement***".** Also, it was realized that even after Organic Farming policy made in 2010, agriculture department has been implementing some schemes without any purpose of keeping organic farming in their framework.

4.3.1 Background-

Polyhouse farming was made popular by The Netherlands and Israel — two countries which face extreme weather and soil conditions — involves cultivation of vegetables in a controlled atmosphere, under ultraviolet film roofing and nets to keep pests out. Polyhouses also deploy precision farming methods such as water soluble fertilizers and micro-managed irrigation, helping save on water, labour, fertilizers and pesticides. Precision farming is a concept of using the new technologies and collected field information, *doing the right thing, in the right place, at the right time*. Collected information may be used to more precisely evaluate optimum sowing density, estimate fertilizers and other input needs and to more accurately predict crop yields.

While greenhouses have existed for more than one and a half centuries in various parts of the world; in India, the use of greenhouse technology started only during 1980's and it was mainly used for research activities (Tamilnadu Agriculture University). The first poly house in India was established at IARI, New Delhi assisted by Israel as part of Indo-Israel project[1]. In Kerala, the preliminary write up for the budget schemes of Agriculture Ministry are usually prepared at Directorate of Agriculture in consultation with the

State Planning Board. First plan started with the adoption of naturally ventilated greenhouse technology for increased productivity in vegetables and cut flowers (2011-12) under RKVY (Rashtriya Krishi Vikas Yojana Kerala) scheme. Then, farmers were getting assistance under Vegetable Development Programme (VDP). However, the Hi-tech Agriculture Scheme was first announced in the budget speech for the year 2012-13[1].

4.3.2 SHM's Hi-tech agriculture scheme 2012-13 and 2013-14-

Initially, 21 hi-tech greenhouse demonstration units (demo models) with a total financial assistance of 96.77 lakhs (see appendix) were prepared by adopting the design prepared by Kerala Agriculture University (KAU). Kerala Agro Industries Corporation Ltd (state PSU) was entrusted with the work of construction of the demonstration units. Under this programme sanction has been accorded to establish 3 units of naturally ventilated poly house units of size 400sq.m in each Grama Panchayat of the state.

As per the norms of National Horticulture Mission (NHM), the total cost for construction of highly ventilated greenhouse structure is Rs.935/sq.m.[2] In the budget proposal of 2012-13, the recommended unit size for the construction of naturally ventilated[3] green-house structure is 400sq.m. *Hence an amount of Rs.3.74 lakh is the total cost of green house of 400sq.m unit as per the NHM norms* (see appendix for cost). Subsidy given by centre (50%) and state (25%) is fixed according to area of the land. Rest 25% has to be incurred by beneficiaries. For that, they have the option of taking loans (12-13% interest). According to Department of Agriculture, Kerala government spent around 10crore on subsidy in 2012-13 and has spent around 70-80crore till 2016 on subsidies.

4.3.3 Case study- polyhouses in Thiruvananthapuram District-

There are presently around **1200 polyhouses**[4] in Kerala, out of which 617 are registered in SHM's GIS[5] system. To get an understanding of what has actually been happening, it was decided to visit some of the nearby polyhouses farmers in Trivandrum. In Trivandrum, starting with 6 polyhouses under VDP 2012-13, and 13 under Hi-Tech Farming 2013-14 there are around 60 polyhouses by May 2016 out of which some are under construction. This survey found some crucial observations after conducting telephonic and in-person interviews with 21 polyhouses farmers in Trivandrum district. (See Appendix for the entire list of beneficiaries in Trivandrum and those selected randomly for the interviews).

[1] GOK Circular No. 80/SHM/2012 with subject Hi-tech Farming – Operational Guidelines – Issued – Reg.
[2] Unit rate differs as per size of the land. Also, rate of assistance is different for hilly regions and there is a separate package for Wayanad
[3] Naturally ventilated polyhouses- These polyhouse do not have any environmental control system except for the provision of adequate ventilation and fogger system to prevent basically the damage from weather aberrations and other natural agents
[4] Constructed and under-construction both. Numbers given by SHM official estimates
[5] Geographic Information System in collaboration with Kerala State Remote Sensing Agency

Table 1 Number of registered polyhouses in Kerala

District	units in VDP 2012-13	Hi-tech farming 2012-14	No of PH (till May, 2016)	Area (sq m) till 2016
TVM	6	25	62	38895.60
KLM	1	15	25	17852.00
PTM	11	11	31	17200.00
ALP	3	14	32	15666.27
KTM	14	20	43	15441.83
IDK	1	34	41	23563.98
EKM	13	58	88	34951.81
TSR	5	55	72	35277.58
PKD	2	34	56	34656.00
MLM	1	27	43	20732.00
KZD	15	18	20	10093.00
WYD	50	28	73	41162.40
KNR	2	13	21	22704.00
KSD	1	5	10	7938.00
	125	357	**617**	**336134.47**

Source: State Horticulture Mission (Updated by April 2016)

Results and problems-

- Dysfunctional polyhouses and huge investment- Out of 21 polyhouses, 2 are not functional because one of them faced construction issue and later on quit working due to the lack of time and planning to get back to polyhouses farming after couple of years. The other one is a proper example of 'failure' because of the huge amount of implementation cost the farmer had to bear. For a 640sq.m polyhouse, he incurred around Rs.10 lakhs as initial implementation cost after hiring a private agency for construction. Under RKVY scheme, he got 50% of the cost decided by NHM as per Rs.935/sq.m. (640*935= Rs.598400 approx.). He got 50% of this amount that is Rs.299200. To meet rest of the expenses, he took a loan. As per the general consensus in all the interviews, the investment on hi-tech farming is about 10 times more than that required for open-field cultivation.

- Profitability- 6 out of 19 farmers (19 polyhouses are functional) accepted that they are generating enough profits, 8 of them are making marginal profit and rest 5 are either making losses or are not making profit at all. Those who are satisfied and minting money give credit to their own agricultural and technical knowledge and skills to establish a proper market channel over time. However, non-profitability was due to several reasons including marketing linkages, technical issues, lack of agricultural knowledge, high labour cost, no premium price on organic products and huge implementation cost.

- Lack of market linkages- The failure of the government to provide market linkage for vegetables produced in polyhouses was pointed out as a major issue. Out of 19

farmers in Trivandrum district, 17 of them initially faced marketing problems and an14 of them are still facing marketing issues.

It is difficult to find a local market for non-pollinated crops like salad cucumber and capsicum that are ideally suited for polyhouse cultivation. In Trivandrum district, 35 out of 59 farmers produce cucumber or salad cucumber. According to a farmer, there is oversupply of salad cucumber in the district and thus are getting very less price. Among a list of objectives set by SHM, one objective was to promote production of off-season crops to get marginal price. Cultivation of high value off-season vegetables under low cost protected structures were found a viable technology for growing vegetables and hence fetch higher prices in the market (R.K. Yadav et al., 2014). But SHM and farmers forgot to see if there is demand for off-season crops in the region or not. Many of them were unaware of other crops which may give them good yield and profit and hence have been producing "typical most viable crops".

Most of the farmers are dependent on State shops "Horticorp" but farmers are not getting fair price for their products. According to one farmer, Horticorp

- Market for imported items: One farmer said- "In my region, same crops from Tamilnadu state are being sold at much cheaper rate. For example, organic cucumber is supposed to be sold at minimum Rs.40/kg but I am selling it at Rs.30 and Tamilnadu cucumber is only Rs.20". According to growers, many times, produces from poly-houses do not fetch prices that are proportionate to the investment. According to the officials, polyhouse farming is extremely useful since it helps in reducing the dependency of purchase of food products from other states. Also, it ensures a complete pesticides-free purchase of vegetables and fruits. Farmers who are involved in polyhouse cultivation can also get better value for the vegetables that are being sold through this method. But, this is possible only when they get proper market for their products.

- Organic produces- 8 out of 19 farmers produce crops completely organically and 8 of them are producing 'pesticides free but with chemical fertilizers' and 3 are using inorganic methods. They did not get any training from KAU or SHM on the use of organic methods in polyhouses. Rather, according to farmers, KAU advises the farmers to use fertilisers and pesticides to some extent. Even then they are producing organic products as per their will, some with the motive of getting premium prices and some consciously thinking about health and environment. Summing up, it is clear that it's possible to use polyhouses scheme to promote organic farming. Other issue is they don't see a place where we can sell it for a decent price worth for an organic products. Generally, Certified organic and Fair Trade farmers in Kerala have received up to double the price for their products compared to conventionally-grown foodstuffs. Farmers who only have organic certification typically receive around 30% more for their products. (Thottathil S. , 2012). But none of the organic farmers surveyed for this study found to be certified or satisfied with their markets.

- High input and labour cost- NHM gives subsidy on a fixed per unit cost that is Rs935/sq.m. But for one polyhouses of an area of 130sqm with Rs240000 as total cost of implementation, unit cost was Rs.1847/sq m (240000/130 which is double of 935- and thus in effect subsidy is only 25%). This is because of high labour cost and high material cost.

For material cost, SHM provides one more kind of subsidy - Planting subsidy for seeds, materials like GI pipe, sheets, and nets and for pesticides and fertilizers as assistance for three consecutive years- 70rs per sq.m (actual cost of materials is 140, basically 50% of Rs140 in 2015). In a 1000sq m PH, they can claim for a subsidy for bill amount exceeding Rs.14000. Krishi bhawan reimburses 50% of the bill for continuous 3 years. *One seed of cucumber costs around 5-6rs because it's being imported (most of them from Netherlands).* Similarly, all other construction materials are also being imported and there is no industry based in Kerala.

Labor cost has not been taken care of which seems to be very high. Labour cost is around Rs.1.35 lakhs for 30 days on a contract basis for 4 labourers. Some farmers are incurring Rs.1250/sq which is around Rs.700-800 per sq m in other states. Even after getting subsidy, their out of pocket expenditure is high.

- Technical training and Support- 5 out of 21 farmers did not require training, 8 got proper training (every second Saturday by SHM and KAU), 4 went to some 3-4 workshops and rest 4 did not get training and guidance at all. Though SHM has been giving continuous technical support and training to the farmers, there are instances when farmers felt that this support work is only on papers. Also, farmers found the training less practical and more theoretical.

  One of the main objectives was to lure people towards agriculture and this objective seemed to be achieved because most of the farmers belong to non-agriculture background and thus a need for proper training is must. Farmers who contact krishi bhawan to get technical support get disappointed with their lack of knowledge about hi-tech farming. The main difference between conventional and hi-tech farming is climate control and farmers did not get proper training on this factor.

- Incentive given by Subsidy- 75 per cent subsidy announced by the State Government for growers is the main factor that attracts farmers to poly-house farming, rather than the output. If there is no subsidy, it will be difficult for farmers to stay afloat. 12 out of 21 farmers would have not invested in polyhouses had they have not gotten the subsidy.

Suggestions for polyhouses farming-

1. Agencies, experts in this field, had been identified by the Agro Industries Corporation. The farmers can choose the agency for implementing the project. The details of the agencies have been given to the farmers. State government must rethink to provide construction materials and construction support through public sector undertaking.

2. If farmers are to generate sustainable profits, the government has to step in to provide an assured market. Since investment is huge, it is important to identify a niche market for polyhouse crops. The solution is one- provide a **"sustainable agri-business".** A great technological movement works best when other integrated factors such as market, organization and infrastructure interact and coordinate properly.

3. SHM has been already planning to provide bio-control measures and supply organic inputs with the help of an expert group of retired agriculture officers and those who have completed vocational higher secondary agricultural courses. For using polyhouse technology to sync with the objective of organic farming, farmers should be trained in such a manner. As mentioned above, there is a great potential in using this technology to provide organic goods to consumers in Kerala.

4. Profitable venture is possible only if farmers are aware of the condition of soil, the climate and the quantum of fertigation. With proper training and consult it is possible. Polyhouse cultivation should not be taken up without proper knowhow as scientific administration of fertilisers and proper monitoring of climatic conditions is essential for its success.

5. Conclusion

Though individuals and groups promoting organic farming share a common view on the environmental and health toll of the farming methods depending on the use of chemical inputs, there is no unanimity among them over the methods and objectives. They often come under different garbs with different slogans. Without any approach towards organic farming, government launched hi-tech farming scheme. In this study, it has been argued that farmers who have made high investments in poly-house farming are finding it difficult to get sufficient income from their ventures. Meanwhile, local growers, including organic growers, are not getting enough market support for their produces. This study thus argues that following current path, there is no clear vision of the future of agriculture in Kerala, but could take several paths.

Through proper integration and interaction, State government should decide one definition of organic farming and work towards one direction. This transition from organic to safe-to-eat should focus to achieve organic farming in the long run in gradual manner.

This survey took a very small number but a study of all the polyhouses in the state need to be done considering all the factors in the survey. If a majority of the farmers are burdened with heavy debts and poor return on investment, government needs to think of switching back to open field cultivation. Technology has been adopted to completely change the cultivation methods. Instead, technology and hi-tech methods could be adopted in open field cultivation as precision farming.

- Reaching technology to farmers in a timely manner, providing market intelligence and helping farmers plan and time crops are better than providing subsidy support. Virtual classrooms for technology transfer, more efficient plant care clinics and help at farmers' doorsteps too are needed to help the farm sector. For these objectives to be achieved, agricultural offices, the first point where farmers came face to face with the departmental machinery, need to be improved to make them like *new generation business centres*.

-Looking at the alarming growth rate of agriculture in Kerala and lack of self-sufficiency in vegetable production, Hi-tech methods seem an appreciable step but the model should be viable enough. Government has spent huge amount on subsidy and other related expenditure on polyhouses and there are successful cases throughout the state. However, there are stories of complete wastage of funds as well. In that case, is there any next best alternative for public expenditure to revive agriculture sector's condition in state?

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Appendix

Interview Questions-

Questions asked in conversations with Government or non-government organizations- **Thanal, Kudumbashree, Directorate of Agriculture (Tvm), State Horticulture Mission, Agriculture officer (Dept. of Agriculture, Thrissur), Kerala Agriculture University**

Set 1 (SHM, KAU)-

1. When was this idea of polyhouses initiated in India (at centre level) and who initiated this idea of Polyhouse farming in Kerala? I read somewhere that it was initially suggested by finance minister and not the agriculture department. Please clarify.
2. What was the need and objective of polyhouses farming in Kerala?

3. What is SHM's perception for organic farming and safe to eat farming, perception of self- sufficiency and sustainability in agriculture in Kerala? Why do some people think Kerala cannot achieve level of 100% organic farming?
4. Who is responsible for incurring expenses related to technical support and other services to polyhouses farmers? At the Panchayat level, there are supervisors and some technicians as you said. Please tell me who are they appointed by?
5. Data on polyhouses farming in the state- polyhouses farmers, subsidy, actual cost, crops, yield, background, government financial outlay and other.
6. Do farmers more yield in polyhouses as compared to conventional farming?
7. Modern with organic? Why can't polyhouses produce organic? How many polyhouses produce safe to eat or chemical free products?
8. Is there any government agency/undertaking to do construction of polyhouses structures? Do you make sure that farmers go to the right place to get the construction done? Where are the farmers getting materials from?
9. On what basis do you select the farmers?
10. On what basis do you make list of construction agencies?
11. What kind of training do you provide to the farmers?

Set 2 (Agriculture Department, Directorate, other Agriculture Officers)-

- All the measure, steps and schemes implemented, proposed and planned for future for organic farming, sate to eat, vegetable sufficiency and hi-tech farming in Kerala. (Year wise). Also, the allocation of fund year wise on organic farming and hi-tech farming separately.
- Is there any subsidy on organic farming? If yes, what kind? Any subsidy on organic manure? Any income guarantee to the farmers?
- What is the role of agriculture department? And how all the stakeholders get in sync with each other? (SHM, VFPCK, KAU, Agri Dept, planning board, ATMA)
- What is your perception for organic farming in Kerala? Can we achieve the target of 100% organic state?
- KAU for research, schemes, technological support, certifications; VFPCK; department of Agriculture, Kudumbashree, KSBB. What all places should I visit to get perceptions about organic farming in Kerala?
- How will you tackle the demand side factors because not everybody is willing to pay high even for organic items? Can you make sure prices will not hike too much?
- What are the measures taken by GOK in last decade which are not in sync with the target of complete organic farming? Like subsidies on chemicals, promotion of conventional farming for higher exports, polyhouses.
- Data on organic farming- government expenditure, area, farmers, allocation of fund, crops, production, yield, subsidies?
- What is the future strategy to meet the objective of making Kerala fully organic? Is it possible?
- Many parties have stated their interest in promoting organic farming. In this regard, development of organic farming techniques**,** *extension services for farms* and post-harvest storage will be crucial for finding appropriate affordable market price for these products. How can Kerala ensure all of that?

- How will you make sure that Kerala achieve organic cultivation of all the crops like paddy and cashew and flowers and not just vegetables? Dairy?
- When Kerala talks about being 100% organic state, they talk about 100% organic consumption or production or both?
- As per your knowledge, can you tell me a broad sequence of events, policies and schemes happened in favour of organic farming and safe to eat in Kerala?

Set 3 (Organizations like Thanal Trust and Kudumbashree)-

- What are your previous and current projects in Trivandrum and in entire Kerala state?
- Which districts are you concentrating? Are your programs extending across multiple districts? If so which districts?
- How long has the agency been promoting Organic farming?
- Which are the areas you are concentrating on and to what extend?
- Training – Which area: manure production/conversion/marketing/Provide manure/financial assistance/fertilizer/market/help in marketing
- Please tell me something about Organic Bazaar? Do your farmers get assistance in getting premium price? Do you think that your customers find your products expensive?
- What are the schemes and programmes implemented by agency for organic farming?
- Do you promote individual farmers or cluster of farmers?
- On what criteria is farmers selected for financial support?
- What is the list of farmers benefitted from schemes? Total number of farmers in Trivandrum? In Kerala?
- What are the other departments/organizations with whom you are coordinating to meet the objective?
- What do you think how viable polyhouses are? And rooftop gardening?
- What are the appreciations for Organic farming?
- What are the challenges faced?
- Farmers who sell to Thanal are not certified? Then why is certification needed? What certification norm Kerala follow?
- What more do you think can be done to improve the situation?
- What are the best practices observed in the field?
- What is the future strategy to meet the objective of making Kerala fully organic? Is it possible?
- Many parties have stated their interest in promoting organic farming. In this regard, development of organic farming techniques**,** *extension services for farms* and post-harvest storage will be crucial for finding appropriate affordable market price for these products. How can Kerala ensure all of that?
- How will you make sure that Kerala achieve organic cultivation of all the crops like paddy and cashew and flowers and not just vegetables? Dairy?
- When Kerala talks about being 100% organic state, they talk about 100% organic consumption or production or both?
- As per your knowledge, can you tell me a broad sequence of events, policies and schemes happened in favour of organic farming and safe to eat in Kerala?
- The programme (PH) assumes importance as the State is not able to meet even half of the demand of vegetables. But how long will it go? Are we consuming safe to eat, organic or inorganic?

Questions asked in interviews with farmers

- Name of the farmer-
- Age-
- Name of the poly-house-
- Type of polyhouses-
- Year of establishment-
- Area of land-
- Crops cultivated-
- Type of farming- (Organic/inorganic)-
- Yield-
- Actual Cost of implementation-
- Subsidy amount-
- Is your poly-house functional? If no, why? If yes, are you facing any problems?
- Is it profitable? If no, why?
- Whenever you face technical problem who do you contact?
- If there was no subsidy, would you have still invested in it? Did you go after subsidy or output?
- Did you consider taking loan for rest of the amount?
- Do you already know agriculture?
- Did you get training initially? Or do you get training?
- Are your products 'safe to eat' or organic?
- What is your market for the products? Do you sell your products to Horticorp?
- What agency did you choose for construction?
- The materials like GI pipe and fillip for the constructions are being imported or produced in Kerala?
- Are you getting any other financial support apart from initial implementation subsidy?

Table 2 Details of Rate of Assistance under Hi-tech farming scheme 2014-15

Sl. No.	Area	Total Assistance per sq. m.	Beneficiary share per sq. m.	Unit cost per sq. m.
1	Up to 500 m^2	795.00	265.00	1060.00
2	501 to 1008 m^2	701.25	233.75	935.00
3	1009 to 2080 m^2	667.50	222.50	890.00
4	2081 to 4000 m^2	633.00	211.00	844.00

Source: State Horticulture Mission internal circular 2014-15

Table 3 Financial outlay for Green House (Poly House) demonstration units 2012-13

Sl.No.	Particulars	Total assistance (Rs. In lakh)

	Establishment of Demonstration units	
1	18 units with 100% assistance (500 sq.m. x Rs. 935/ sq.m. x18 Nos.)	84.15
2	3 units with 90 % assistance (500 sq.m x. Rs. 935/ sq.m. x90 % x 3 Nos.)	12.6225
	Total	**96.7725**

Source: State Horticulture Mission Scheme Circular 2012-13

Table 4 Cost and Material Specifications for Construction of 504 Sq.m (28m X 18m X 5m) Polyhouse with GI Pipe Structure (*as per GoI norms*)

Sl.No.	Material Description	Quantity	Rate(Rs.)	Amount(Rs.)
1	GI pipe 60 mm x 60 mm with 2mm thick for end frames and main poles	562 m/1687 kg (wt. 3kg/sq.m.)	69/Kg	116403
2	GI pipe 48 mm x 48 mm with 2mm thick for trusses	423m/956 kg (wt.2.07kg/sq.m.)	69/Kg	65964
3	GI pipe 42 mm x 42mm with 2 mm thick for purlins	150m/233kg (wt.1.56 kg/sq.m.)	69/Kg	16077
4	GI pipe 33/2 for purlins members	308m/480kg (wt 1.56 kg/sq.m.)	69/Kg	33120
5	UV stabilized 200 microns film	925 sq.m.	45/sq.m.	41625
6	Insect proof net	82 sq.m.	38/sq.m.	3116
7	Fixtures/Fittings	LS		70000
8	Shadenet	500 sq.m.	28/sq.m.	14000
9	Irrigation/Fogging/Misting system	1 Unit	55000/unit	55000
10	Civil work-pole, grouting, brick boundary, flooring			16000
11	Labour charges			40000
	TOTAL			**471305**
	Cost/unit			**935/sq.m.**

Source: State Horticulture Mission Scheme Circular 2012-13

Table 5 Financial outlay for establishment of naturally ventilated green-house units (2012-13)

Sl.No.	PARTICULARS	Amount (Rs. in lakh)
a.	Amount for 400sq.m unit area (one unit)	3.74
b.	Total amount for one Panchayat @3 units per Panchayat=3xRs.3.4 lakh	11.22
c.	Total amount for the state=3xRs.3.74 lakhx978	10973.16
d.	Govt. of India share	5486.58
e.	State Govt. share	2743.29

Source: State Horticulture Mission Scheme Circular 2012-13

Table 6 As per the norms of NHM, the total cost for constructing naturally ventilated green-house structure is Rs. 935/ sq.m. Assistance to the tune of 75% of the unit cost will be provided as follows-

NHM Share (50% assistance)	Rs. 467.50 / Sq.m
State Share (25% assistance)	Rs. 233.75 / Sq.m
Total Assistance (75% of Unit cost)	Rs. 701.25 / Sq.m
Beneficiary contribution	Rs. 233.75 / Sq.m

Source: State Horticulture Mission Circular 2013-14

Table 7 Details of Rate of Assistance under Hi-tech farming scheme for Hilly Regions in 2014-15 (in Rupees)

Sl. No.	**Area**	**Total Assistance per sq. m.**	**Beneficiary share per sq. m.**
1	Up to 500 m^2	914.25	304.75
2	501 to 1008 m^2	806.43	268.80
3	1009 to 2080 m^2	767.65	255.90
4	2081 to 4000 m^2	727.95	242.65

Source: State Horticulture Mission Circular 2014-15

Table 8 Polyhouse beneficiaries in Trivandrum District

Sl.No.	**Code**	**Block/ Municipality**	**Area (sq.m.)**	**Crops sown (Data in process)**
1	321401001	ATHIYANNOOR	447	SALAD CUCUMBER
2	321402001	CHIRAYINKEEZHU	384	CHILLI, COW PEA, BITTER GOURD
3	321402002	CHIRAYINKEEZHU	384	TOMATO, COW PEA

4	321402003	CHIRAYINKEEZHU	400	BITTER GOURD
5	321402004	CHIRAYINKEEZHU	1007	
6	321403001	KILIMANOOR	640	COW PEA
7	321403002	KILIMANOOR	500	COW PEA
8	321404002	NEDUMANGADU	388	COW PEA
9	321404003	NEDUMANGADU	400	BITTER GOURD
10	321405001	NEMOM	1000	SALAD CUCUMBER
11	321405002	NEMOM	287	COW PEA
12	321405003	NEMOM	400	
13	321405004	NEMOM	376	COW PEA
14	321406001	PARASALA	385	CUCUMBER, SALAD CUCUMBER, COW PEA
15	321406002	PARASALA	1200	CAPSICUM, SALAD CUCUMBER
16	321406003	PARASALA	1200	SALAD CUCUMBER, COW PEA
17	321406004	PARASALA	400	SALAD CUCUMBER
18	321406005	PARASALA	1000	SALAD CUCUMBER, COW PEA
19	321406006	PARASALA	400	SALAD CUCUMBER
20	321406007	PARASALA	1343	
21	321406008	PARASALA	1343	SALAD CUCUMBER
22	321406009	PARASALA	400	CAPSICUM
23	321406010	PARASALA	747	YARD LONG BEEN
24	321407001	PERUMKADAVILA	866	SALAD CUCUMBER
25	321408001	POTHENCODE	2080	SALAD CUCUMBER, COW PEA
26	321408003	POTHENCODE	480	SALAD CUCUMBER, COW PEA
27	321408004	POTHENCODE	50	TOMATO
28	321408005	POTHENCODE	150	COW PEA
29	321408006	POTHENCODE	150	COW PEA
30	321408007	POTHENCODE	400	SALAD CUCUMBER
31	321408008	POTHENCODE	202	
32	321409001	VAMANAPURAM	1000	SALAD CUCUMBER, BEANS
33	321409002	VAMANAPURAM	400	COW PEA
34	321409003	VAMANAPURAM	1000	SALAD CUCUMBER
35	321409004	VAMANAPURAM	500	SALAD CUCUMBER
36	321409005	VAMANAPURAM	400	CHILLI, SALAD CUCUMBER
37	321409006	VAMANAPURAM	103	SALAD CUCUMBER
38	321409007	VAMANAPURAM	400	YARD LONG BEEN
39	321409008	VAMANAPURAM	575	
40	321409009	VAMANAPURAM	4000	
41	321409010	VAMANAPURAM	403	SALAD CUCUMBER
42	321410001	VARKALA	1000	SALAD CUCUMBER, AMARANTHS, COW

				PEA
43	321410002	VARKALA	400	SALAD CUCUMBER
44	321411001	VELLANADU	864	BEANS
45	321411002	VELLANADU	400	ORCHID
46	321411003	VELLANADU	778	SALAD CUCUMBER
47	321411004	VELLANADU	400	GERBERA
48	321411005	VELLANADU	1865	SALAD CUCUMBER
49	321411006	VELLANADU	729	SALAD CUCUMBER
50	803311001	NEDUMANGAD (M)	1000	SALAD CUCUMBER
51	803311002	NEDUMANGAD (M)	400	COW PEA
52	803312001	Tvm (M corp.)	123	COW PEA
53	803312002	Tvm (M corp.)	216.6	SALAD CUCUMBER
54	803312003	Tvm (M corp.)	400	COW PEA
55	803312004	Tvm (M corp.)	400	SALAD CUCUMBER
56	803312005	Tvm (M corp.)	291	SALAD CUCUMBER
57	803312006	Tvm (M corp.)	144	SALAD CUCUMBER
58	803312007	Tvm (M corp.)	430	SALAD CUCUMBER
59	803313001	NEYYATTINKARA (M)	865	SALAD CUCUMBER

Source: State Horticulture Mission (Updated by May 2016)

Table 9 Randomly Selected Polyhouses in Trivandrum for SURVEY

S. No.	Age	Block/ Municipality	Area (sq.m.)	Crops sown (Data in process)	Year	Schme	Actual Cost (In Rs.)	Subsidy (In Rs.)
1	59	CHIRAYINKEEZHU	400	BITTER GOURD, TOMATO	2013	Hi-tech Farming 2013-14	NA	NA
2	55	KILIMANOOR	640	COW PEA	2013	RKVY	9,49,000	2,99,200
3	42	KILIMANOOR	500	COW PEA	2015	Hi-tech Farming 2013-14	6,50,000	3,50,625
4	31	NEDUMANGADU	400	BITTER GOURD	2013	Hi-tech Farming 2012-13	6,50,000	2,80,500
5	48	NEMOM	1000	SALAD CUCUMBER	2012	RKVY	11,00,000	4,67,500
6	62	PARASALA	400	SALAD CUCUMBER	2014	Hi-tech Farming 2012-13	6,50,000	2,80,500
7	40	POTHENCODE	400	SALAD CUCUMBER	2014	Hi-tech Farming 2012-13	4,00,000	2,80,500
8	NA	VAMANAPURAM	1000	SALAD CUCUMBER	2013	RKVY	11,50,000	4,67,500
9	32	VAMANAPURAM	500	SALAD CUCUMBER	NA	Hi-tech Farming 2013-14	NA	NA
10	NA	VAMANAPURAM	575	NA	NA	Hi-tech Farming 2013-14	NA	NA
11	NA	VAMANAPURAM	4000	NA	NA	Hi-tech Farming 2013-14	NA	NA
12	42	VELLANADU	778	SALAD CUCUMBER	2013	Hi-tech Farming 2013-14	12,00,000	5,45,572

13	46	Tvm (M CORP.)	216.6	SALAD CUCUMBER	NA	RKVY	NA	NA
14	25	Tvm (M CORP.)	123	COW PEA	2013	VDP	2,15,000	57,502
15	51	VELLANADU	400	ORCHID	2012	RKVY	5,30,000	1,87,000
16	48	VARKALA	400	SALAD CUCUMBER	2014	Hi-tech Farming 2012-13	5,60,000	2,80,500
17	38	VAMANAPURAM	103	SALAD CUCUMBER	2014	VDP	1,25,290	62,645
18	38	Tvm (M CORP.)	400	COW PEA	2015	Hi-tech Farming 2014-15	5,20,000	3,18,000
19	37	Tvm (M CORP.)	400	SALAD CUCUMBER	2015	Hi-tech Farming 2014-15	6,95,000	3,18,000
20	58	NEYYATTINKARA (M)	865	SALAD CUCUMBER	2013	Hi-tech Farming 2012-13	11,00,000	4,04,387
21	74	VELLANADU	864	BEANS	2012	RKVY	6,02,000	4,03,920