The growth and performance of grafts are better for Panniyur-1 than Karimunda. The incidence of virus disease is not seen for Panniyur-1 grafts. The vines should get maximum vegetative growth by three years initially and thereafter integrated nutrient management should be followed for ensuring regular bearing nature and good growth.

Successful Farmer Research in Pepper Grafting

The saying, ‘Scientist is born not created’ holds good for Mr. Jose, Manganthanath of Chemperi village in Kannur district. In his two plots situated about one kilometre apart, he has managed to build a model grafted pepper garden in about two and half acres with an array of other crops during the last 44 years of turmoil and adventure for experimenting with new ideas.

Embodied with strong determination and down to earth humbleness Mr. Jose had the passion for agriculture by virtue of his birth in an agrarian family background of his parents. He learned the skills of grafting and budding during his high school days by visiting departmental farms and nurseries in Government sectors.

It was in late 90’s that he happened to hear about pepper grafts from a local nursery. After purchasing three grafts he started caring them well. Astonished by the better performance of these plants over normal vines he started exploring more on these line and approached the research institution nearby from where the response was not encouraging. Taking the superior growth of the graft vines as a positive sign he started his own trial by increasing the number of grafts using Piper colubrinum as rootstock and Paniyur-1 as the scion in his 2.5 acre land.

Understanding the importance of irrigation, he dug a borewell about one kilometre away from his residence for storing water in a 1,20,00 litre tank atop his

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hilly plot. Hose irrigation is followed in the garden. A cover crop of *Mucuna bracteata* is maintained in the garden to prevent erosion and weed growth to sustain soil fertility with two to three times topping and mulching in basins during rainy season. The vines have put up excellent growth of over 30 feet height on *Erythrina indica*, the most commonly used standard.

The standards are being replaced with Mahagony, Jack and Teak as the gallfly infestation is getting serious on *Erythrina*. The yield of vines are almost stabilized and he gets an average of 10 quintals of black pepper from his 500 yielding vines with a mean yield of 2 kg dry pepper per vine. Many of the vines in the garden have yielded about eight kg green berries per vine.

In his opinion the growth and performance of grafts are better for Panniyur-1 than Karimunda. The incidence of virus disease is not seen for Panniyur-1 grafts.

The vines should get maximum vegetative growth by three years initially and there after integrated nutrient management should be followed for ensuring regular bearing nature and good growth.

The addition of organic manures like 10 kg dry cow dung per vine need not be incorporated by raking soil as it may damage root system of pepper, but friability of soil should be maintained by mulching. Fertilizers to provide NPK are applied by broadcasting around the vines thrice following harvest, pre-monsoon and mid monsoon in equal splits. He uses about 400 gm of Factamfos and 100 gm of potash thrice when the moisture level in the soil is not too less or high.

Irrigation is also a critical operation to sustain the vigour and yield of pepper in Mr. Jose’s words. He is of the traditional belief that a period of moisture stress of about two month is essential to induce uniformity of flowering of grafts at monsoon. So he advocates only life saving irrigation for vines at 7-10 days interval with thick mulching of basins till April. However after top dressing at pre monsoon the vines should not suffer moisture stress till continuous setting of monsoon rains are ensured.

Spraying of 1 percent Bordeaux mixture twice is a routine necessity for safe guarding against fungal polli and leaf fall during heavy monsoon. He has also designed a 30 feet high fabricated ladder made of galvanised iron with more safety settings for climbing on vines for harvest and plant protection operation Mr. Jose always acknowledges the efforts and guidance of scientists from IISR and KVK, Peruvannamuzhi.

In fact he is one of the innovative farmers encouraged by the IISR institute and the KVK for his pioneering progress in the grafted pepper cultivation in an unfavourable sloppy topography. The recent patronage of scientists of KVK Kannur in the nutrient management has helped him to achieve higher bulk density of about 540 g/litre, says Dr. Jayaraj, a renowned soil scientist and Programme coordinator of the KVK.

In the 14-year old pepper graft garden he had lost few vines due to damage of standard on account of gallfly and not due to quick wilt. Planting of ordinary runner vine is a futile exercise for a new pepper farmer in his opinion as the vines will start showing slow decline or quick wilt once it starts bearing.

Wedge grafting is followed on six month old rooted *P. colubrinum* using runner shoots as scion material. Initially
Cometh the Hour Cometh the System

Agricultural extension system is very vital in disseminating technology, knowledge and advice to farmers for raising the productivity of any crop. The delivery of public extension services is based on a supply driven, top down approach rather than a demand driven approach. The farm extension services in India predominantly operated by the public sector, are beset with many limitations such as ever growing population, low manpower (farmer: extension official), inadequate budget provisions, bureaucratic delays, outdated policies and are consequently blamed for being inefficient and out of touch with the needs of the stakeholders.

At present, there are many opportunities as well as challenges for the stakeholders of Indian agriculture. The role of private extension service providers may be significant in this context. Or at least a convergence of extension services through public-private partnership may be highly relevant in this context. However, the entry of private sector in the field of extension service delivery, augmented by intensive information/technology based venture, is of recent origin in the country. Though the scale of operations of such private sector agencies is smaller at present, they have been able to make a significant impact in many crops providing information, goods and services.

The farmer centric individual approach focus on high impact technologies and the direct accountability of the firm providing the service are among the factors which increase the effectiveness of private institutions in delivery of extension services.

The trend in investment in agriculture in India reveals an increasing share of private investment than public. Hence the private sector efforts in extension can play an important role in case of high value commodities, specialty products,
technology intensive production methods, new crops and commodities, etc. There are various models of private extension services practiced in different crops based on the nature of services offered, terms of service, cost, extent of coverage, business model adopted, etc. ranging from person(s) to organizations. Here in focus is an innovative private extension service model in ginger in Medak district of Telangana State which may be rated as resource poor area.

The Plunge

The story of a farmer turned extension service provider that unfolded before us during a field visit to ginger growing regions of Medak district was both intriguing and heartening. When Mr. Sashikant Patil, a middle aged farmer cum local politician along with Mr. Anil Kumar Bajpai floated the Rapid Seeds Ltd., the duo were not expecting that they are sowing the seeds of a silent movement to bring in the dry lands of Singthan Village, Raikode (Mandal), Medak under ginger cultivation! Hailing from a family with active political participation, socio-economic issues of the region and their potential solutions were always close to the heart of Mr. Sashikanth Patil.

Sugarcane was the mainstay of the farm economy of Medak district until recently. The crop year of 2007-08 saw the highest ever area under sugarcane in Medak district. The production glut led to low price realization for the sugarcane farmers. Mr. Patil, who was also the chairman of the cane development council of Zahirabad, could sense that crop diversification was the only logical solution.

It was while he was on the lookout for alternate crops that he visited a private seed firm in Chhattisgarh on a mission to learn about improved technologies in agriculture. He saw ginger farmers getting much higher yield and profit in Chhattisgarh than in his native Medak district. The circumstances and opportunity was there for the taking and the astute mind in Mr. Patil did not miss the chance for a creative intervention in ginger cultivation in Medak.
Educated at Bidar in Karnataka, Mr. Patil was well connected with farmers in both Bidar region in Karnataka and across Telangana. He organized a technical seminar for ginger farmers in Medak and Bidar by bringing experts from the private firm in Chhattisgarh during 2008. His stated mission was to improve the paltry ginger yield in Medak (about 50 quintals fresh ginger per acre) to respectable levels through adoption of improved technology especially introducing the raised bed system of cultivation with drip irrigation.

The enthusiastic farmer response to the extension effort, the need for continuing advisory support, and the demand for marketing assistance from the farmers thus prompted Mr. Patil and Mr. Bajpai to establish Rapid Seeds Ltd., as a registered seed company. Mr. Anil Kumar Bajpai, is an agricultural professional with more than 15 years of experience in agricultural marketing.

The Extension Model

The firm maintains close collaboration with 300 ginger farmers located mainly across Andhra Pradesh, Telangana, Karnataka and Tamil Nadu. The company provides good ginger seed material to these farmers and detailed guidance on crop management practices starting from land preparation, bed making, planting geometry, fertilizer application, drip system layout, irrigation scheduling, etc.

The farmers maintain a direct contact with the firm during the crop season and get real time advice on plant protection and other constraints in production. The firm assures the farmer, a minimum level of production by following the technology package. The assured productivity raises the confidence of the farmer in the technology package.

Ginger production is carried out under input intensive management and the assured yield is much higher than the average yield level in the region. Both Mr. Patil and Mr. Bajpai travels extensively during the crop season to visit the plots and to recommend improvements in field management. During these visits, disease free ginger plots for collection of seed ginger are identified and the material from these plots alone are purchased from the farmers for meeting planting material demand in the next season.

The firm offers a price premium for the contact farmers from whom the seed material is purchased. The farmer is free to sell the produce either in the market or to the firm. The firm also offers technical advice and hand holding for farmers who are cultivating ginger for the first time. The ginger farmers have been with the firm for more than seven years now and the low attrition rate confirms the beneficial nature of the extension model for the farmers.

Ginger Production Technology

The land preparation for ginger cultivation starts during the month of January. Sun hemp (green manure crop) is sown at about 40 kg seeds/ acre and incorporated in the soil during March-April. Along with this 300 kg of Single Super Phosphate is added to the soil followed by ploughing and light irrigation. Soil is brought to the desired tilth by two to three ploughing using cultivator. During
May, farm yard manure at the rate of 15 tonnes per acre is added to the soil and mixed well using rotavator. The drip lines are deployed before planting and the beds are irrigated prior to planting.

Commercial micronutrient mixture is also applied on the beds before planting. Ginger is planted during May-June on raised beds of about 2.5 feet width 45 cm height and convenient length. Seeds treated with a combination of fungicide and insecticide is planted following a staggered or zigzag geometry.

The plant to pant distance within the row is maintained at about 20 cm. Three to four rounds of manual weeding is done during the initial stages of the crop. Fertigation through drip irrigation is provided on every third day from planting till crop maturity. Mechanical harvesters are employed for harvesting. The harvested produce is manually cleaned and packed in gunny bags. The total cost of cultivation is approximately Rs. 1.5 lakh per acre.

As the proof of the pudding is in the eating, Mr. Patil has been planting ginger in his ancestral property as a demonstration. During this year he has planted ginger in four acres of his dry land very successfully as a demonstration plot to the other farmers in the group.

The Impact

The firm has been able to bring about a gradual shift in the cultivation practices of ginger followed in the region. The productivity of ginger (dry ginger/ha) in Medak district has witnessed a sharp increase from 5.24 tonnes during 2006-07 to 12.04 tonnes during 2011-12! The direct and indirect influence of extension efforts of the firm might have played a role in this remarkable change. The farmer to farmer spread of the information has further helped in spreading of the production technology in the region.

The sample farmers in Medak district reported an yield range of 210-260 quintals fresh ginger
per acre (8-13 months duration). The water requirement of the ginger crop is much less than that of sugarcane and crop diversification in favour of ginger will economize the use of water resources for crop production. The scarcity of water in the region has led to a decline in sugarcane area by 23.6 per cent during the period 2007-08 to 2011-12. Thus the shift towards ginger, requiring less water, reduces the water demand while giving higher profit to the farmers.

The Outlook

Private extension services are a viable business opportunity for enterprising persons as their service is demand or need driven. Many countries now promote private extension agencies to improve the delivery of extension services including marketing. This is becoming imperative as India is experiencing a paradigm shift, akin to many other developing nations, from subsistence agriculture to commercialised agri-business in the post WTO era and the role of private extension agencies assumes significance in this situation.

Since the private extension agencies are profit oriented actors they will be responsible for its benefits as well as consequences. The different path treaded by Mr. Patil and Mr. Bajpai is scripting a new chapter in the evolving area of private extension in spice crops. Each farmer is personally known to the duo and more than a commercial linkage with the farmer, it is a relationship based on trust and mutual dependence.

The demand for extension services offered by the firm and the innovative mutual dependence highlight the unmet demand for such services among the farming community. Though the extensive reach and relevance of public sector extension cannot be replaced, the private sector can play a decisive complementary role in promoting scientific cultivation of spice crops. The success and acceptability of the services have encouraged Mr. Patil and Mr. Bajpai to dream bigger. There is ample scope for reducing the cost of cultivation through judicious use of inputs.

This can further enhance the returns from ginger cultivation. Mr. Patil and Mr. Bajpai now plan to go for genetically pure improved ginger varieties with judicious fertigation schedule. Towards this end they have already executed non-exclusive license agreement for popularization of the improved variety of ginger IISR Mahima availing the non-exclusive licensing option of the ICAR-Indian Institute of Spices Research.

During their most recent visit to ICAR-IISR, Kozhikode, the duo also signed for the licensing option of the turmeric variety Prathibha, having visualised its potential in their tract and the growing global relevance of turmeric as a medicine!

The improvement of varietal profile and smart use of resources can make ginger (and turmeric) farming in this tract more attractive to the farmers.
Calendar of Operations for May

Timely planning and execution of farm operations based on agro climatic conditions of the area is important for successful farming for higher productivity and sustainability. To facilitate this a calendar of operations in respect of important spice crops for May 2016 is given below.

Cardamom

Agronomic measures

Nursery: Regular watering may be given to bed/polybag/sucker nursery based on necessity.

To control damping off/seedling rot diseases in nursery, soil drenching with 0.2% Copper oxychloride or 0.2% Mancozeb may be taken up. As bio-control measure, Trichoderma or Pseudomonas or Bacillus species may be applied in the soil.

For controlling leaf rot disease, spray 0.3% Carbendazim and for controlling leaf spots, spray 0.2% Carbendazim after noticing early symptoms. Clipping and destruction of severely affected leaves after spraying is to be done to avoid further spread to healthy leaves.

Main field: In densely shaded areas, regulate the shade selectively to provide more sunlight during monsoon period. It may be about 60% of filtered sunlight for better performance.

Likewise in open patches planting of shade tree saplings like Cedrella toona (Chandana viambu), Vernonia oxbergia (Karuna), Jack can be done to reduce the problems of root grub proliferation and better performance of cardamom.

During the end of May or early June, after the receipt of sufficient summer showers, planting of seedlings/clones can be started in the main field. Planting in a cloudy day with intermittent drizzling is very ideal for cardamom for its better establishment.
After planting, stake the plants with stick and mulch the plant base with dried leaves or weeded materials.

Always ensure that no water logging is there at the base of the plants, by providing better drainage. Just prior to monsoon showers, trash operation may be completed and make all the panicles be above the mulch materials.

Application of first round manure for irrigated areas can be done, after getting one or two good showers at the end of May or early June. This may be done with 90 kg urea, 207 kg rock phosphate and 137 kg muriate of potash per ha.(1/3rd dose of 125:125:250 NPK/ha/year).

For rainfed areas, apply @ 81 kg urea, 187 kg mussorophos and 125 kg muriate of potash as first round(1/2 of 75:75:150 kg NPK/ha/year).

The above two recommendations are made only if no soil test recommendations are available. If available, apply based on soil test results only.

The said inorganic fertilizers may be applied along with any one of the organic manures like FYM or compost 5 kg or neem cake 1-2 kg per plant in 20 cm wide circular band about 30-40 cm away from the plant base.

In the case of young plants, 1/3rd and 2/3rd of the recommended dose of the fertilizer may be applied for 1st and 2nd year respectively.

**Pest Management**

For Integrated Pest Management prune dry leaves without removing green leaf sheath. Apply Quinalphos @ 200 ml per 100 ltrs of water (spray may coincide shoot borer moth emergence).

**Disease Management**

Provide adequate drainage if water stagnation is noticed.

Integrated Disease Management against azhukal and rhizome rot in severely affected areas, phytosanitary measures and application of fungicides/bio-control agents may be taken up. 0.2 % COC drenching + 1% Bordeaux mixture spray is effective as prophylactic spray. 15 days later apply Trichoderma alone or with Pseudomonas fluorescens at plant base. Repeat bio agent application and foliar spray with 0.4% Potassium Phosphonate.

If bio-control measure is followed, basal application of Trichoderma harzianum alone or with Pseudomonas fluorescens is recommended.

Katte infected plants if found must be rouged and destroyed.

**Large Cardamom**

**Nursery:** Disease/pest infected suckers may be removed.

Each and every large cardamom farmer is necessary to raise his own large cardamom nursery for planting in his field at least 500 meter away from large cardamom field. Regular watering and weeding may be continued in the existing sucker nursery.

Nursery site meant for sucker multiplication may be cleaned by removing all the weeds; debris and soil may be brought to fine tilth.

Trenches of 45 cm width and 30 cm depth may be opened at convenient length with an interspace of 30 cm well decomposed cattle manure or compost may be mixed with the soil and the trenches are filled. Disease free, high yielding, one grown up shoot with an emerging bud may be planted at 45 cms apart in the trenches during May-June, and then the base may be

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mulched with forest leaves. To support the suckers, bamboo/wooden stakes may be provided.

**Plantation:** One round weeding may be attended for easy movement of wild bees for better pollination and fruit setting.

The large cardamom fields may be visited regularly and chirkey/foorkey etc. diseased plants may be uprooted and destroyed by burning/burial in the soil.

For replanting/gap filling, the site may be cleared by removing all old & diseased plants and by clearing all weeds and debris.

Pits of 30 x 30 x 30 cm may be opened at a spacing of 1.5 x 1.5 meter on the receipt of rains and then the pits are to be filled with top soil/compost/cow dung etc.

The planting materials may be selected from high yielding sucker nurseries, free from pest & diseases for replanting/gap filling.

Suitable shade tree saplings may be selected and used for planting in the areas where the shade is less and to protect from hail storm damage.

Application of cattle manures/organic manures/fertilizers to cardamom fields will help in getting sustained production, improving productivity and better quality of the crop.

Application of 1% Bordeaux Mixture to the cardamom plants will help to control the fungal diseases before the one set of rains.

**Black Pepper**

**Nursery:** Watering may be continued in nursery based on necessity. Shade may be reduced in the nursery on receipt of 1 or 2 good summer showers.

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April 2016
Main field: Shade regulation may be done to reduce the shade intensity just at the onset of monsoon showers.

On receipt of good showers, the shade protection given to young vines may also be removed. Planting of standards for new planting may also be done now.

Apply FYM or compost @ 10 kg/vine. In areas where liming is not done last season, lime @ 600 g/vine may also be applied around the plant basin separately.

For controlling Phytophthora foot rot, phytosanitary measures, biological control measures and chemical control measures may be taken up.

Application of Trichoderma harzianum and Pseudomonas fluroseens would help in reducing intensity of the disease. Addition of organic mulches and oil cakes in the basins improves the texture of the soil and enhances the growth of antagonistic micro organisms.

If chemical control is resorted to, any one of the following can be adopted:

After the receipt of few monsoon showers all the vines are to be drenched with 0.2% COC @ 5 to 10 ltrs per vine. Foliar spray with 1% Bordeaux mixture.

Drenching with 0.3% Potassium Phosphonate @ 5 to 10 ltrs per vine. Foliar spray with 0.3% Potassium Phosphonate.

Drenching with Metalaxyl Mancozeb 0.125% @ 5 to 10 ltrs per vine and foliar spray with same concentration.

In case bio-control agents are applied only aerial sprays with chemicals is to be resorted and soil drenching should be avoided.

Ginger/Turmeric

Weeding may be done based on necessity.

For ginger fields, after 40 days from the date of basal dressing top dressing ginger with 80 kg of urea has to be done per ha and for turmeric fields, after 40 days from the date of basal dressing, top dressing with 65 kg of urea has to be done per ha. Earth up the beds after top dressing of fertilizer.

Repeat the mulching of beds with green leaves/ weeded materials 5 @ tonnes/ha.

Vanilla

Continue irrigation based on necessity, if monsoon rain delays.

Apply vermicompost @ 1 kg/vine or FYM or compost @ 2 kg/vine in the base of the vine and then cover with mulch materials like weed wastes or shade tree loppings and other plant residues.

If still flowering observed, continue pollination between 6.00 am to 12 noon with skilled labours.

Prophylactic spray with 1% Bordeaux mixture may be given or 2% spray with Pseudomonas sp. (in Talc base) (2 kg/100 l. water) or 1% spray with Pseudomonas sp. (in liquid culture) may be given.

Chilli

On completion of harvesting green manuring can be practiced by sowing pulse crops(pillipesara, cowpea or sunhemp) in the land proposed for next season cultivation.

Wherever chilli is intercropped with cotton, dried chilli and cotton plants(after harvest are to be uprooted and cut into small pieces and incorporated into the soil for enhancing the fertility and water holding capacity of the soil).

If needed soil testing can be taken up during the month.