

PRECISION FARMING

Towards Second Green Revolution...



Dr. E. Vadivel, Ph.D.,

Project Officer (Precision Farming & e-Extension)
Tamil Nadu Agricultural University, Coimbatore - 641 003

PRECISION FARMING

Towards Second Green Revolution...

Dr. E. Vadivel, Ph.D.,

Project Officer (Precision Farming & e-Extension)
Tamil Nadu Agricultural University, Coimbatore - 641 003

MY DREAM CAME TRUE...

Dr. G.Rangaswami

First Vice-Chancellor (1972-1978)

Tamil Nadu Agricultural University



Dr. G.Rangaswami with Precision Farmers, Somanahalli, Dharmapuri

Preface

An innovative Precision Farming Project was contemplated for the Dharmapuri district during 2004-05 with an objective to enhance the productivity of crops and promote the rural farm economy. The Dharmapuri has been one among the most backward and drought prone districts in the State. Of the total 18 blocks of the districts, 13 blocks are declared either as 'Backward' or 'Most backward'. Paddy, Cholan, Mango, Tapioca, Coconut, Cotton, Sugarcane, Pulses, Groundnut, Ragi and Samai are important crops of the district. Low literacy has resulted in over dependence on agriculture for employment. The productivity was poor in all the crops and the migration of farm families, abandoning agriculture was rampant. This is one among the reasons for the economic backwardness of the district. The surfacing of naxal groups also was evident in many blocks owing to the resource poorness of the rural area.

Tamil Nadu Agricultural University had implemented the Precision Farming Project between 2004-05 and 2006-07 on turnkey mode and empowered the farming community *technically, economically and socially*. The Dharmapuri district has now become the training ground on precision farm technology for the farmers across the State. Equally the district has now gained a place in agricultural map of India as there are visiting farmers from across the country.

The scientists of TNAU have actualised the concept of precision farming into field reality and changed the backwardness character of the district into a sound rural economy. ***The farmer first approach, cluster level associations, producer companies, wisdom to blend Indigenous Technical Knowledge (ITKs) with science, transparency in dealing with budget, the capability to grow with the crops and growing with farmers and the willingness to get themselves renewed*** are the innovative and creative elements introduced by the scientists to go on the **extra mile** to achieve the greatest success in implementation of the project and brought a qualitative and quantitative change in the livelihood system of the farming community.

Compared to the state and national average yields, the yield of crops under precision system was doubled in 45 crops in the project area and in few crops like brinjal, banana and rose, the yield was almost fourfold. The whole hearted involvement of farmers in day to farm activities and their cooperation through out the crop period sustained the interest of the field scientists over three years. Besides the yield and economic benefit, the farmers were convinced of the stress free farming. Many of the schemes and projects are predominately **subsidy driven**, or some times **technology driven** but the scientists have made the precision farming project as “**farmer driven**”. The precision farmers expressed a sense of relief and stated that after country's independence, they have experienced a scheme packed with economic benefits for the first time. The agronomical benefits of drip and fertigation was explicitly brought out through the project and now it has created mind set among the farmers that without drip and fertigation, there is no farming. The peasant farmers have incorporated *three producer companies* out of which two are for input sales while the third one on the making is for sale of farm produces and thus paved the way for the establishment of Farmers' Corporate in future.

The success at Dharmapuri was disseminated through unrelented campaigns to communicate the message of success and sensitised the farmers, extension officials, bankers and policy makers. By this way, nearly 1,25,657 persons were covered directly and many more through web portal and video conferencing.

London School of Economics and Political Sciences, UK, studied this project and declared it as “**The Second Indian Green Revolution**” and published it in their website in as much as the farmers were able to generate exceptional profit and their livelihood system and social status have gone up simultaneously.

The project was scaled up to the dimension of **53,885** ha in the state. Now that the government has declared the concept of precision farming and producer company in their electoral manifesto 2011 and the scheme is to be implemented with greater strength and make the second green revolution - a reality in Tamil Nadu.

Dr. E. Vadivel, Ph.D.,
Nodal Officer, Tamil Nadu Precision Farming Project

Content

Sl.No	Particulars	Page Number
01.	Nature of Project	1
02.	Objectives	1
03.	Methodologies	1
	i. Collaboration	1
	ii. Technologies	2
04.	Scale up and Diffusion of Technology	3
	i. Tamil Nadu State	3
	ii. States in South India	3
	iii. States in North India	4
	iv. Other Countries	4
05.	Impact of the Project	4
	i. Rural Livelihood System	4
	ii. Premium Price	6
	iii. Irrigation Water Economy	6
	iv. Farmer Empowerment	6
	v. Beyond Production	7
06.	Expertise Shared and Experience Gained	7
07.	Research Methodologies	8
08.	Summary Report of Impact Assessment Study	8
	i. Prof. G Chidambaram, Member, State Planning Commission	8
	ii. Monitoring and Evaluation Report Govt. of Tamil Nadu	9
	iii. London School of Economics and Political Science	9
	iv. Voice of the Village	10
09.	Scale up of Precision farming under NADP	11
10.	Future Action Plan	12
	i. Tamil Nadu Precision Farmers Producer Company Ltd.,	12
	ii. Farm Eco Tourism	12
	iii. Promotion of Participatory Farming or Farmers Corporate	12
	iv. Capacity Building of the Farmers	13
	v. Restoration of Soil Fertility	13
	vi. Development of Horticultural Corridors	13
11.	Awards and Honours	13
12.	Research Publications	14
13.	TNAU Scientific Team	14

Precision Farming

Nature of Project

Tamil Nadu Precision Farming Project was introduced as **Turnkey Project** during 2004-05 and TNAU was the first Agricultural University to undertake such assignment among the Indian Agricultural Universities. The Scientists of TNAU had accepted the challenging task of raising the first crop in *400 ha in the farmer's field under precision system and to enhance the livelihood system of the farming community*. Further technical support was extended to the farmers for the next three years to raise five more crops in the precision mode. The project was awarded on competitive basis; When Israel firm had quoted Rs.17.5 crores, the lowest quote of the TNAU was Rs.7.20 crores. Based on the phenomenal success, the project was scaled upto 53885 ha across Tamil Nadu State and sensitized the policy makers of all other States of India to adopt the precision farming system.

Objectives

Dharmapuri District was backward district by all standards and required project interventions for the development of the rural farming community and to upgrade the quality of the life of the small farmers. The Precision Farm demonstration in 400 ha had to be implemented in farmer's holdings with mandate (i) to enhance the productivity of crops by 40-50 per cent (ii) to train the farmers for hi-tech production system (iii) to transform production driven agriculture to market driven agriculture (iv) establish the direct link between the farmers and consumers and promote direct marketing. *The first two objectives were mandatory as per the Government Order and MoU while the next two objectives were incorporated during the course of implementation by the Scientists as special initiatives after personally witnessing the distress sale of quality produces at the market.*

Methodologies

Collaboration: There were three partners viz., Farmers, Project Implementing Agency and State Department of Horticulture and there was a tripartite agreement defining the responsibility for each; The District Administration had identified the beneficiary farmers with the help of State Department of

When I flood irrigate my 15 acres of land, my well and the wells of my neighbouring farmers also shall dry up during summer every year as my well happens to be the deepest in the area. But when I started doing Precision Farming, I do have adequate water in the well and my neighbours are also having minimum water during summer. The usually envious neighbours are now expressing the gratitude to the project.

Shri. P.M. Chinnasamy, Farmer, Somanahalli Village, TN

Horticulture. The Scientists of TNAU as implementing agency undertook the cultivation of crops; The State Department staff and farmers had to undergo hands on training. The farmers within 20-30 km radius in the block have been brought under a cluster and each cluster was registered under Societies Act; the cluster serves as a platform for all kinds of interactions, transactions and functioned like a commodity group. *The cluster concept, which was not in the Government Order and was introduced by the Scientists to ensure neutrality in all our dealings with the farmers.* The target was covered @100 ha during the 1st year (2005-06), 200 ha during 2nd year (2006-07) and 100 ha during third year (2008-09). The daily farm activity record was maintained and signed both by the farmers and Scientists at the field level. This mechanism helped to maintain the transparency in implementation of the project. The farmers were thus trained to account for the expenditure and the income for the first time in their generations. The analysis of the details in the record helped the farmers to manage and control the finance and ensured financial discipline in the farm family. The project was up scaled to 53,885 ha subsequently by the State Government, following the success of demo precision farming project.

Technologies: The prime technologies in precision farming package were Remote Sensing and Geographic Information System (GIS), Chisel Plough, Community Shade Net Cum Pro Tray Nursery, Innovative Crop Geometry, Drip and Fertigation, Integrated Pest Management (IPM) and Post Harvest Management (PHM). The terminology '**Precision Farming**' means predominantly the variable rate of fertilizer application for each Cubic Centimeter of soil in the temperate countries where all other cultural elements are almost precisely accurate under highly mechanized system which need little attention. Further the slow soil weathering process and winter cum autumn for six months in a year favour formation of moderately homogenous soils in temperate regions and GIS and Remote Sensing Technology could be appropriately applied for the full advantage; where as in tropical countries like India, the seasonal variations are extreme, soil profile is Kaleidoscopic, fertility and physical and chemical characters are extremely varying in every kilometer, the GIS and Remote Sensing technology has got only limited use.

There are vital precision elements like preparation of the soil, nursery, crop geometry, nutrition, regulation of growth, flowering, fruiting, plant protection, support systems and post harvest management which are important in tropics .

There was a family feud within my four brothers over the use of irrigation water from the common well as water won't be sufficient during summer and frequent quarrels occur. We were not in talking terms this far. But now all my brothers have joined the project and adopted precision system the water usage became drastically less and we have enough water to all even during summer. The enmity started vanishing soon and there is a possibility for family get together in the near future.

Shri. Subramanian, Farmer, Needamangalam, TN

More than the quality inputs and the technologies, the way the farmers (social capital) were organised viz., repeated interactive meetings (collectively and individually) at farm level, exposure visits, buyer-seller meets, supply chain management meets and field workshops contributed for the success of the project.

Scale up and Diffusion of Technology

Tamil Nadu State: On successful completion of the turnkey project in 400 ha in Dharmapuri district involving 400 farm families, the same was up scaled with the funding support of National Agricultural Development Project (RKVY), GOI, to 12,800 ha during 2007-08, 9400 ha during 2008-09, 8000 ha during 2009-10 and 12,500 ha during 2010-11, and 20,000 ha has been contemplated during 2011-12. Altogether an area of 53,885 ha was brought under Precision Farming Project in the Tamil Nadu State; As each farmer was allotted one unit of one ha only (i.e., 53,885 farm families), almost all the farmers have extended the Precision Production System with their own investment for the rest of the land they possessed after availing the subsidy under micro irrigation scheme. Many of the projects are **subsidy driven** and few are **technology driven** but the Precision Farming Project became the 1st project to be termed as **farmer driven since the farmers started exerting pressure to District Collectors and Ministers in every district to make more precision farm project target allotment to the district**. Under Irrigated Agriculture Modernization and Water Bodies Restoration and Management (IAMWARM), a world bank funded project, nearly 5000 ha was covered under precision farming system in 19 sub basin rivers of the state after witnessing the success at Dharmapuri district

States in South India: Governor and Chief Minister of Puducherry visited the project area and immediately planned to implement the project in 1000 ha. Government of Kerala invited the Precision Scientists to make presentations on precision farming during official meetings and Farmers Conferences and developed a plan for implementation in Kerala. The Department of Agriculture, Kerala had sent nearly 3000 farmers and 200 officials for two days training on Precision farming to Dharmapuri.

Andhra Pradesh Government has sent a team of officers to Project site to understand the intricacies of the project and implement the same in Andhra Pradesh. The farmers of Karnataka visited the project site incidentally during the personal family visit and pressurised the Government of Karnataka through the Director of Extension Education of the University, Bangalore and got sanctioned for 2000 ha under precision farming.

We have handled one lakh currency by raising several crops over the years in the past but it was a pleasant experience to handle few lakh currency with harvest of one crop. I was surprised to see for the first time that one lakh currency was bundled by ordinary jute thread...in bank.

Shri.M. Varadarajan, Farmer, Katharpatti, TN

Key Technologies



1. Shade Net Protray Nursery



2. Chisel Plough



3. Drip and Fertigation



4. Farmers : The Social Capital

The quality inputs and advanced technologies certainly contributed for doubling the productivity. But the vital element of success is the *cluster approach* which enhanced the managerial capability of the farmers to efficiently use the inputs and technologies.

Measurable Outputs...



1. Brinjal (500 mt/ha in 18 months)



2. Banana (120 mt/ha)



3. Turmeric (110 qtl/ha)



4. Tomato (85mt/ha)



5. Snake Gourd (40 mt/ha)



6. Water Melon (60 mt/ha)

Measurable Outputs...



7. Tapioca (54 mt/ha)



8. Green Chilli (30 mt/ha)



9. Rose Blooms (10,00,000/ha)



10. Cotton (30 qt/ha)



11. Sugarcane (250 mt/ha)



12. Maize (7.50 mt/ha)

From Producers' Company...



1. First Farmer Owned Producer Company in Tamil Nadu



2. Farmers ad AGM Meeting



3. Supply Chain Management Workshop



4. Precision Farmers Producer Company, Erode

...Towards Farmers' Corporate

VIP's Field Interactive Sessions



Dr. Mangalarai, DG, ICAR



Dr. K. Arulmozhi IAS, Zonal Secretary



Dr. C. Ramasamy, Vice-Chancellor, TNAU



**Dr. Peter Howlette
London School of Economics, UK**

Farm Leadership Award (2009 - 10) for Precision Farming Project



States in North India: Farmers from Maharashtra, Orissa, North Eastern States have visited the project site and had hands on training on the project. The NABARD has prepared a project document with new financial guidance exclusively for crops under precision farming system. Union Planning Commission has identified the precision farming project as a *flagship project* for promotion across all the States in India.

Other Countries: National Institute of Rural Development (NIRD), Hyderabad has brought international delegates who work on rural development to the project site for exposure visit to understand how the farming has been made profitable and tackle adverse situations and how the farmers have been linked to market for better share in the profit. Dr. Peter Howlett, an expert on Economic History, London School of Economics and Political Science, has identified the project for the global study on How do well the facts travel? and later evaluated the project and published it in their official website as **India's Second Green Revolution** at <http://www2.lse.ac.uk/newsAndMedia/videoAndAudio/research/theSecondIndianGreenRevolution.aspx>.

Impact of the Project

Rural Livelihood System: The doubling of productivity of the crops equally doubled the profitability and helped to retain the farm families in agriculture and thus substantially minimised the migration of the farm families looking for better life system elsewhere in the urban areas of the State. Many of such families have in-fact invited their distant relatives to come and settle in the villages. Though the project was permitting only one ha per farmer, the area under precision farming was extended to the rest of the land owned by the farmers with their own investments making use of the surplus income. A few farmers have purchased additional land for cultivation.

The status of “*Loanee Farmers*” was transformed to “*Deposit Farmers*” within the two years of the project. Many of the farmers have put their sons and daughters in quality schools and allowed them to pursue higher education. The investment was also made to deepen the wells, renovate the farm structures, build new houses and buy new vehicles. The social ceremony and family functions were held with newfound enthusiasm in every village.

I was about to leave the village as I was not able to save crops out of drought. The precision farming project came as life saver.

Shri.Mahendran, Farmer, Jarugu, TN

Farmers learnt the art of growing together by sustaining the welfare associations and producers companies like *i. Dharmapuri Precision Farmers' Agro Service Limited, ii. Erode Precision Farming Producers' Company Limited and iii. Tamil Nadu Precision Farmers Producers Company Limited, Coimbatore.* Many of the enterprising precision farmers have become resource farmers to offer paid consultancy to rest of the farmers across the country. Two of the resource farmers (Mr. P. Ramareddy and Mr. C. Boopathi) have made presentation to the Agricultural Production Commissioners and Secretaries of 32 States in India during Rabi Campaign Meeting held at New Delhi. Both of them are regular resource farmers for offering Guest Lectures at NIRD, Hyderabad. The Dharmapuri district has become the technical training ground for nearly 1, 25,657 farmers (60 per cent within the State and 40 per cent from outside the State) and carved a place in the Indian Agricultural Map. The National and International attention was drawn by the farmers of the Dharmapuri district for their economic revival through precision farming.

All the district and block level institutions have started extending the voluntary support to the precision growers associations and involved them in all their developmental programmes. The cattle wealth of the block also has gone up and has provided gainful employment for the women folk in the rural sector. Almost 40% of the rural farming community started attending the workshops and conferences on supply chain management and buyer-sellers meets to gain hold over the marketing of the produces. The multinationals and departmental stores have approached the cluster level associations demanding the precision produces for their market. There was evidence that the diet habit of the farmers also changed to quality food. They were quite convinced that their produces were free of residual toxins. The more visible impact is the increased consumption of protein in the form milk and milk products and meat. The labour population also upgraded their skills in hi-tech agriculture and went into contractual mode of labour supply by which they got their wages doubled. Thus benefits of precision farming project were shared by all sections of rural population.

Productivity had been enhanced up to 60-80% in 45 different agricultural and horticultural crops cultivated so far. In the case of brinjal, an amazing single crop yield of 500 MT/ha in duration of 16 months was recorded.

I was about to abandon agriculture, sell my land to conduct daughter's marriage. The dept burden was too much and I lost hope. The Precision Farming Project came to my village. I was drawn in during 1st year with 100% subsidy. The crop was abundant and rescued my life. Now after three years, the land value also gone up and I am comfortable. I got my life back. Thanks to the project

Shri. Chandrasekara Reddy, Farmer, Saragapalli, TN

Sugarcane yielded 250 MT/ha, Banana 200 MT/ha; 90-95 per cent of produce were of first quality. In fact SAFAL Market, Bangalore had to introduce a new '**Super Grade**' for bananas from precision farming fields over and above the 1st grade. Sago industries started paying Rs.50.00 extra per bag because of 30 per cent starch content. The Dutch Rose has made the history. The green house Dutch Rose was grown in the open in one ha for the first time against the protected cultivation under shade net under the project and the phenomenal success had made even the non-project farmers to go for open field cultivation of Dutch Rose to the tune of 300 to 400 ha.

Premium Price: The produces enjoyed premium price in all the markets owing to the extended shelf life and eventually emerged as '*Precision Farm Brand*' produces. The weight of produce per unit volume was 25 per cent more. It had attracted the retailers who buy by volume and sell by weight, as there were double advantages. The *extended harvest* in precision crops made the produce available during lean seasons into market, which fetched double the price many a times.

Irrigation Water Economy: Water Economy (30-40%) and Electricity economy (50%) were very much visible. The farmers are able to take up the sowing right in the season with the little available irrigation water in the wells even if monsoon rains get delayed. The dependence on labour was less considering the non-availability of labour for agriculture and this was greatly enjoyed by every farmer when they were relieved from the problem of acute labour shortage; Instead of five weeding, hardly two weedings were adequate; even for one weeding, the number of labourer required was only two thirds.

Farmer Empowerment: There was **technical empowerment** in that, not only the farmers but also the farm women and workers developed expertise in activities like Pro Tray Nursery, Fertigation, Crop Geometry, IPM and PHM. There were instances that farmers themselves refined the technologies to suit their specific needs. There was **economic empowerment** (minimum net profit of rupees one lakh/ha and maximum Rs.8.50 lakhs per ha) due to the higher production and successful marketing strategies adopted and equally there was **social empowerment** as they have become resource farmers not only to train 53,885 fellow farmers within the state but also several thousand farmers from other states. The cluster level association efforts have drawn the attention of all development agencies in the district, like the Panchayat, district administration, banks and line departments .

I have cleared all my bank loans accumulated over the years and invested in shares ; Few others extended the precision system over the rest of the land area they own; There are farmers who have purchased new vehicles, built new houses, conducted marriages, renovated the houses

Shri.Samikannu, Farmer, Moulayanur, TN

Beyond Production: The farmers were taken on exposure visit to markets like SAFAL Bangalore, Cochin, Chennai, Azad Nagar market New Delhi, Pune and Nasik to get them sensitized on market forces. Repeated buyer-seller meets conducted during the tenure of the project and the farmers were sensitized on all issues of Supply Chain Management (SCM). Based on the learning on SCM, the cluster level associations took the responsibility of collective buying of inputs and collective bargaining of the price for the produces at various markets. Corporate firms '**Dharmapuri Precision Farmers Agro Services Ltd and Erode Precision Farm Producers Company Ltd**' were incorporated to deal with trading of quality inputs for farmers; A new corporate firm '**Tamil Nadu Precision Farmers Producers Company Ltd**' was incorporated under Company's Act exclusively to take up marketing of the farm produce on all four lane roads of the state with branding of the produce.

Thus, the peasant farmers are now shareholders of Ltd Company; do conduct AGM and plan for better marketing like a Corporate. The virtues of corporate have been transferred on to the peasant farmers and in real sense we can call the project as **Farmers Corporate**.

Expertise Shared and Experience Gained

Besides the expertise shared from University to the farmers, the scientists also gained experience for further fine-tuning the technologies to a greater extent. The integration of technology and traditional wisdom had really paid the dividend. The Transfer of Technology (ToT) process has three integral elements viz., Technology, Transfer mechanism and the user (farmers). Since from the First Five Year Plan, the policy and budget support were much for the first two elements, while the third element, the issue of capacity building of the farmers to use the technology had received no attention at all. The success of Precision Farming Project was made possible simply by repeated interactions with the farmers rather than the technology and extension *per se*. The social capital, the farmers have accepted the Scientific Community as '*friend, philosopher and guide*' and developed an emotional and moral linkage with the Scientist and the University.

Ordinary farmer has become Directors in the Board of the Ltd Company (Dharmapuri Precision Farmers Agro Services Ltd) and is the 1st producer company in the Tamil Nadu State with 166 farmers as share holders. 'We know how to run the company, conduct Annual General Meeting (AGM) and how to manage finance'.

Shri. C. Boopathy, Farmer, Morappur, TN

Research Methodologies: The technologies from different disciplines of agriculture were efficient individually but when they are blended in the real field situations, hardly 30 per cent of technologies alone synergies. Hence a message was communicated to the research community, that multi-disciplinary and farmer participatory research programmes alone could deliver relevant and blendable 'technology package' to the farmer and time is not too far when farmers are to ask for '**Customized and Packaged Technology**' for each situation, crop and variety rather than individual technologies. The *technology use efficiency, input use efficiency and farmers' managerial efficiency* are to be attended simultaneously; only then, the expected growth rate in agriculture can be enhanced beyond the magic per cent of four across the country. The developmental focus of the scientists and extension workers is the need of the hour as experienced through the Precision farming Project over five years.

Summary Report of Impact Assessment Study

The Member - State Planning Commission, Monitoring and Evaluation Unit of State and London School of Economics have done the evaluation. All the three evaluations were done independently. Besides many IIMs have deputed their PG scholars to study the impact of the project.

Prof. G Chidambaram, Member, State Planning Commission. The Extract of the report is given below: The overall assessment of TNPFP in excellent on the basis of: Productivity increase; quality improvement in the produce; income increase; marketing efficiency; negotiating and bargaining power; cost of cultivation; retention of soil fertility; water saving; energy conservation; farmers confidence level, farmers' proficiency in cultivation practices and related activities; seeds and seedlings usage; duration of crops and familiarity with the project officials. It should be said to the credit of the project consultant viz., Tamil Nadu Agricultural University that TNPFP has been very imaginatively designed. A well-conceived project should also do well on ground. The project life and phasing are clearly spelt out. Projects cost and benefits are well defined, in measurable terms. Organization is well structured, delivery system is clearly defined and linkages- backward and forward are very well established. The project is doing extremely well and is proceeding on chartered lines. No mid-term course correction was necessitated.

Precision Farmers were the first to inform the Secretary and Agriculture Production Commissioner that water soluble fertilizer are classified under chemicals and made the request to reclassify under fertilizers to reduce the 300 % import duty. Secretary and Agriculture Production Commissioner took up the matter with Fertiliser Ministry, GOI, presented a white paper to Government of India and made the ministry to reclassify under fertilizer

Shri. Govindarajan, Farmer, Marandahalli, TN

Incidence of failures and dropouts is negligible. The success story of TNPFP as in implementation in Dharmapuri and Krishnagiri Districts can be safely commended to be used as a case study in training programme intended for young agricultural officers.

Monitoring and Evaluation Department of Govt of TN: The extract of the report is given below:

Precision farming seems to be a successful one, which is liked by the farmers. Mainly the cost of crop cultivation gets reduced by input saving, Drip Fertigation, adoption of need based plant protection measures, timely availability of technical guidance, follow up by the officials, water saving measures all put together increases the glory of the precision farming. From the survey finding, the farmers may be trained maintenance and management of drip units and in drip fertigation. The distance between the drip units may be maintained as 4 feet instead of 5 feet. As per the farmers liking, subsidy may be given for soluble fertilizer as of straight fertilizer. Further more water saving technologies may be taught.

Since more number of farmers are willing to adopt precision farming, the scheme may be operated in larger area, covering more number of farmers. Crop based farmers interest groups, farmers' federation may be made by the department / NGO's which will be helpful to the farmers to improve their economic status. The development of infrastructures like cold storage, collection centre, transport facility will reduce the farmers anxiety and induce them to produce more quality products of export standard.

London School of Economics and Political Sciences. The true extract is given hereunder:

This report has evaluated the TNPFP in two broad terms: the manner in which the precision farming technologies travelled from TNAU to the farming community and the impact they had on the farmers. In terms of the travel of technologies, the evidence presented here suggests that the core technology – fertigation – travelled unmodified from the producing domain (TNAU) to the receiving domain (beneficiary farmers). The extent of travel was complete in the sense that all beneficiary farmers adopted and continue to use this technology. The associated technologies, field preparation, plant protection,

The guide line value for installing one hectare of Drip system was Rs.57,600 only . Based on that the government has to provide 50% subsidy which amounts to Rs.28,800 only. The precision farmers invited Mr. T.Nandakumar IAS., the then Secretary Agriculture GOI, to visit their fields and made him to understand that the actual cost of installation of drip system in one hectare was nearly Rs.1,00,000 and the subsidy should have been Rs.50,000. The GOI has revised the Guidelines for the Year 2011-12 accordingly. The benefit has now been extended to all the farmers in the country.

Shri. Aswath Reddy, Farmer, C.R. Palayam, TN

hybrid seeds, post harvest practices, etc., also travelled well between TNAU and the beneficiary farmers. The farmers did make marginal changes to these technologies, but to a large extent they remained unmodified. Reasons that explain this effectiveness of travel are the close supervision of TNAU staff during the duration of the Precision Farming Project and the reputation of the TNAU and its scientists among the farming community. The dense and close supervision by TNAU staff ensured that during the critical first year of introducing PF techniques the knowledge and skill deficit was bridged effectively. In subsequent periods, there was no incentive for the farmers to deviate from PF protocols as the impact of technologies on farm yields and income was considerably more than was expected. This helped to solidify TNAU's reputation, giving credence and weight to their suggestions; this further created incentives to follow PF protocols. This process seems to have made this extension model highly effective.

The impact on the beneficiary farmers in terms of improvements in yield and generating high revenue appears to be significant. Evidence presented here suggests that PF techniques are economical even though the initial cost of conversion is high. This raises an important limitation of the PFP: the extent of spread of precision farming technology beyond the beneficiary farmers is likely to be limited by the quantum of initial financial assistance that is available to the farmer. This is underscored by the evidence from non-beneficiary farmers, most of whom were convinced that the technology worked and adopted some of the associated technologies, but were largely unable to make the initial investment required to install the fertigation system. This institutional aspect could limit the scalability from a demonstration project to a generally accepted method of farming.

Voice of the Village



During one of the visits to the project site, an old women with a head load, crossed the road and on seeing us casually made a mention that the village has changed too much! We enquired what change? She replied *“The black tube (drip laterals) had changed the agriculture of the village’*. What do you mean grand ma? We asked back. She replied *‘after the arrival of the tubes, everyone started earning in lakhs, bought new vehicles, constructed new houses, paid back bank loans and the life change was beyond imagination. We asked ‘do you have the black tubes in your field ma?’*. She calmly replied *‘I don’t do agriculture, I am into business’*.

Scale up of Precision Farming under NADP - National Agricultural Development Project (RKVY)

Sl. No	Source of funding	Area (ha)	Budget (lakhs)	Implementing agency	Remarks
01.	State Plan 2004-05 2005-06 2006-07	400	720	Nodal Officer Tamil Nadu Agri. University	Turnkey project Go.Ms.24 dt 23.01.2004
02.	State Plan	735	1000	Department of Horticulture	Demonstration by state Department of Horticulture
03.	State Plan	560	308	Nodal Officer TNAU	Demo at 28 districts @ 20 ha / district.GO.Ms.214 dt 1.6.2007
04.	NADP-GOI	12,800	10054	Department of Agriculture, Horticulture, TNAU	Nine focus districts @ 1000 ha and 19 Non focus districts @ 200 G.O Ms. 81 dt 03.03.2008
05.	NADP-GOI	9,400	6891	Department of Agriculture Horticulture, TNAU	Nine focus districts @ 800 ha and 19 Non focus districts @ 200 ha. G.O Ms. 340 dt 17.11.2008
06.	NADP-GOI	1,000	727	Department of Agriculture, Horticulture, TNAU	Mega precision cluster at a remote Hilly village G.O Ms 363 dt 15.12.2008
07.	NADP GOI	4,000 6,490	1088 1887	Department of Agriculture and Horticulture, TNAU	To cover all 30 districts G.O.Ms.202 dt 05.10.2009 (Horti) G.O Ms.172 dt 14.09.2009 (Agri)
08.	NADP GOI	Agri:4,000 Horti:8,500	1088 2737	Department of Agriculture, Horticulture TN Agri. University	To cover all 30 districts G.O Ms.35 dt 08.02.2011 G.O. Ms.37 dt 08.02.2011
09.	IAMWARM	6,000	1632	IAMWARM, World Bank Project	To cover nineteen sub basins in Tamil Nadu involving watershed associations
	Sub Total	53,885	28,132		

Future Action Plan:

Based on the Strength, Weakness, Opportunity and Challenges (SWOC) Analysis and the field level precision farmers workshop across the State, the following future plans have been identified by the scientists to improve the livelihood system of the rural community and to remove poverty.

- i. **Tamil Nadu Precision Farmers Producer Company Limited** has been incorporated by precision farmers at Coimbatore for direct marketing of the fresh produce. The four lane roads have been considered as extended city and direct retail outlets for sale of farm produce has been contemplated. Retailing at main shop, retail vans to cover apartments in the city, ten percent of hotels, marriage halls have been targeted at Coimbatore city. Bulk loads to Cochin market, Koyambedu market, Safal market have been planned. 1000 farmers shall be the stakeholders of the company and they shall be the producers. In the long run, produces will be branded and brand promotion shall be made to create an exclusive market for precision produce. Such ventures could be replicated by the farmers throughout the country.
- ii. **Farm Eco Tourism:** Scenic beauties and comfortable stay at natural surroundings are the luxuries meant for the city dweller. One hundred precision farms shall be identified for promotion of such Farm Eco Tourism which can generate additional income to the farmers.
- iii. **Promotion of Participatory Farming or Farmers Corporate:** Farm labour force has zeroed in and the next generation of farm owners are not willing to undertake agriculture as they prefer other available lucrative professional avenues. Farm mechanization is crippled by fragmented holdings and gradient nature of plots within field. The production sector is now really in cross roads as a result of this.

The proposed participatory farming project involves: Call for expression of interest from the group of farmers who are willing to pool minimum 100 ha of land; incorporate a limited company by the owners of the farm land within 100 ha; lease the land to the company for 30 years. Identify two directors as working executives to join the two scientists from the university, consolidate the land with common infrastructure and lay them into one ha plots for mechanisation and do mechanized farming in 100 ha. 50% area to be planted with perennials, 25% area under one year crops like, turmeric, tapioca and banana and 25% area under annuals. Adopt non-crop enterprises like piggery, goatery, fishery etc.,

Introduce farm ecotourism the dividend shall be declared every year. Government may sanction Rs.300.00 lakhs as soft loan and out of which Rs.150.00 lakhs shall be paid back after five years. The balance Rs.150.00 lakhs shall be retained as equity and there is no financial commitment to Government. After three years and achieving breakeven point, the scientists shall hand over the farm back to the company; Market driven and mechanised production is thus made possible. Besides dividend, the value of farm as 100 ha unit shall go up. This is a kind of **Farmers Corporate** to be promoted across the country.

- iv. **Capacity Building of the Farmers** through exposure visits to major markets in India. Updating with latest state of art technology, participation in buyer seller meets and supply chain workshop, strengthening the cluster level associations for welfare works and establishing producer companies for commercial gains.
- v. **Restoration of Soil Fertility** by introducing more of organic technologies, exploitation of microbial consortia for sustaining the better soil qualities, introducing biochars to enhance soil carbon level as well as reducing the carbon-dioxide load in the atmosphere.
- vi. **Development of Horticultural Corridors** like special economic zones along the four lane roads in the long run.
- vii. Transform **Production Driven** agriculture into **Market Driven Agriculture** by generating a 'para extension resource farmers' population from among the farmers community.

Awards and Honours

1. Farm Leadership Award at National level by Agriculture Today Magazine, New Delhi
2. Outstanding yield in Brinjal by Precision Farmers: National Award to the Precision Farmer by Mahendra and Mahendra
3. Union Planning Commission has identified Precision Farming Project as Flagship project
4. London School of Economics and Political Sciences (LSE) has captioned 'Second Indian Green Revolution'
5. 'For the Sake of Award' by Rotary Uptown, Coimbatore for enhancing the livelihood system of farmers in TN
6. Honorary title by the farmers: 'Father of Precision Farming in Tamil Nadu to Nodal Officer'

Research Publications

1. *Precision Farming Technology, Adoption Decisions and Productivity of Vegetables in Resource-Poor Environments*, R. Maheswari, K.R. Ashok and M. Prahadeeswaran *Agricultural Economics Research Review* Vol. 21 2008 PP 415-424.
2. *Evaluation of market led horticulture under TN precision farming Project* K.Rajeshkanna, R.K. Theodre and S.D.Sivakumar, *Journal of Extension Education* Vol 17 No 3&4, 2005.
3. *Tamil Nadu Precision Farming Project : A prelude to next green revolution*-E.Vadivel Invited lead paper presented at International Conference on Horticulture, Bengaluru, November 9-12 2009 PP 385.
4. *A successful model of market led small farmers corporate*, E.Vadivel and I.Muthuvel, International conference to link the farmers and market, New Delhi 2008.
5. *Technology transfer and traveling facts: A perspective from Indian Agriculture*, Peter Howlette and Ashish Velkar London School Of Economics, Cambridge University Press 2011 PP 273- 300.
6. *Corporate Farming vs Farmers' Corporate*, E.Vadivel, Dr.M.H.Marigowda Memorial Lecture Presentation, UAS, Bengaluru.
7. Participatory Operational Research in Tamil Nadu, Dr. E. Vadivel, invited Lead Paper in International Conference on Horticulture, Bengaluru, November 9-12, 2009 PP 364.

TNAU Scientific Team

Dr. E. Vadivel, Nodal Officer & Professor (Horticulture), TNAU, Coimbatore
tnpfp@tnau.ac.in / ev@tnau.ac.in

Dr. I. Muthuvel, Assistant Professor (Horticulture), TNAU, Coimbatore.

Dr. N. Sriram, Assistant Professor (Agrl. Extension), TNAU, Coimbatore.

Mr. R. Venkatachalam, Associate Professor (Horticulture), TNAU, Coimbatore.

Dr. N. Anandaraja, Assistant Professor (Agrl. Extension), TNAU, Coimbatore.

The effort of the TN State in Precision Farming was appreciated; the state should continue its endeavor of adopting scientific precision farming in major crops which has resulted not only in increase in productivity but also substantial decrease in the cost of cultivation which ensures higher returns at affordable rates

- Union Planning Commission

Precision farming in Dharmapuri becomes trendsetter...

- *The Hindu Daily*

Fresh produce at your doorsteps. The Precision Farmers in region set up a firm and a store to sell their crop. Consumers too will reap the benefit

- *The Times of India Daily*

Ploughing a new furrow...The benefit of precision farming are ploughing into the fields far and wide

- *The New Indian Express Daily*

How precise it is? A silent revolution without even the media noticing it at the beginning. Three years later, precision farming was highly talked about in the media...

- *Karsakashari, Malayala Manorama*

When I published the case study of brinjal grower who have harvested 170 mt out of 1.15 acre and bought a Scorpio car, I was bombarded that the message was a hoax by the public. The bombardment continued for days together. For all those who have bombarded, the reply from me was "I witnessed the whole process in person. I stood by my word..."

- *Shri. M.J. Prabhu, Farm Correspondent, The Hindu*