Agri-Technologies and Travelling Facts: Case Study of Extension Education in Tamil Nadu, India

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Abstract

This paper is motivated by two broad questions: how is technology transferred from academia to non-academic domains, and how well do facts within these technologies travel? These questions are explored in the context of a particular extension education program in Tamil Nadu, south India. The paper explores the extent to which fertigation technologies (drip irrigation) and other farm and post-harvest technologies travelled from the Tamil Nadu Agricultural University to the farming community in two districts of north Tamil Nadu. The extension effort, involving direct scientist to farmer interaction, sought to push facts about such technologies – termed 'precision farming' – to the larger community through demonstration effects. We conclude that although facts about precision farming travelled well, the technologies themselves travelled once certain institutional barriers were overcome. This involved not only overcoming the farmers financial inability to invest in a relatively expensive technology, but also fostering cooperative behaviour and improving individual bargaining power through the formation of local farmers associations. This model of an extension education had an strong demonstration effect that encouraged the travel of critical facts about precision farming.

1. Introduction

This study arose out of a larger project which is investigating the nature of evidence and, in particular, how 'facts' are used in the construction, and communication of evidence. In this context, the project team is investigating 'How *well* do facts travel?'[1] This travel of facts can occur across various domains and disciplinary boundaries, as well as through time. From our perspective, technologies constitute facts or embody facts (technical, procedural, scientific, etc.) and therefore the travel of technologies was one of the several instances of travelling facts that came to be studied.

[1] The project is known as "The Nature of Evidence:

Technologies emerging from biological or agricultural sciences offer a rich source of study material as they often transcend disciplinary, social and temporal boundaries. In this context, extension education in developing aware of these technologies once they were introduced. Some of the non-participating farmers have since adopted these technologies, either entirely or selectively.

From this material we want to try and address our two broad questions. First how and to what extent did specific facts such as fertigation techniques, water and labour saving methods, etc., travel from university scientists to the agricultural community? Second, if the wellness of travel is reflected by the adoption of various precision farming technologies, did the facts embodied within TNPFP travel well? We conclude that facts about precision farming, and about TNPFP, travelled widely within the target audience, and beyond. We further conclude that facts that were ‘new’ to the audience travelled well; newness in this case was the lack of expert knowledge or prior experience with a particular technology, technique or practice. We also conclude that facts travelled well when certain institutional barriers were overcome, such as financial ability, expert supervision, cooperative behaviour, demonstration effects, etc. In order to put the questions and the main conclusions of the study in perspective, it is helpful to consider the TNPFP in some detail and specifically what we perceive to be the different facts travelling within this project.

practices. Further, Dharmapuri district is considered to be the ‘Horticultural district of Tamil Nadu’: the largest producer of tropical, sub-tropical and arid zone fruit crops like mangoes, banana, papaya, sapota, guava and grapes, and vegetables such as, tomato, brinjal, chillies, cabbage, etc. About 10% of the floriculture industry in the state is concentrated in Hosur area of Krishnagiri district.

The stated objectives of the TNPFP can be classed into two broad types. First, promoting hi-tech horticulture through the use of precision technology that involved transferring the latest cultivation and post-harvest technologies to the farmers. Second, promoting market-led horticulture by encouraging farmers’ forums and associations and increasing the overall value accruing to the farmers.[3] The project was concentrated around clusters with 200 farmers being selected in each of the two districts to make a total of about 400 farmers. The absorption of farmers into the scheme happened progressively in three stages: by the end of the first stage 100 farmers were recruited, by the second 200 farmers were part of the scheme, and by the third 100 additional farmers were part of the scheme (table 1).

Table 1: Applications and selection of TNPFP farmers by districtage, /TT8 1 Tf-14.673

cost package was estimated to range between Rs. 75,000 and Rs. 150,000.[7]

participating farmers have experienced from a transition to hi-tech farm management.

3. What is travelling?

There were many different facts travelling within the TNPFP and for functional reasons we classify them into four types: technological facts which were embodied in physical objects, technical facts that reflected expert (i.e. scientific) advice, facts about claims which we term as experiential facts, and institutional facts.[9] Some facts were combinations of two or more of these. In terms of agency, we will differentiate between the expert knowledge of the TNAU scientist and the experiential knowledge of the farmers.[10] Finally, we will also differentiate the travelling process in terms of three spaces or domains: the core technology domain, the secondary technology domain, and the enabling institutions. These domains are overlapping and interactive. The *core technology domain* encompasses *fertigation technologies* that include the drip irrigation and fertigation equipment, WSF, and the fertigation schedule. The first two are technological facts (in economic terms one is a fixed cost and the other a variable cost) whilst the latter is a technical fact (it provides a procedural schedule that embodies the research and recommendation of the scientific experts). All three of these elements were non-negotiable, and monitored carefully by the scientists, in the first year that a farmer was part of the project. The financial subsidy ensured that the drip irrigation and fertigation equipment did travel and it is highly unlikely that a farmer would abandon this technology after the first year as, at a most basic level, it ensured a better delivery of water and fertiliser than had previously been possible. However, the other two elements can only be judged to have travelled successfully if farmers continued to use them after the first year. This, in turn, would be dependent on another element of the core technology

[9] For an example of physical objects as important vehicles and embodiments of travelling facts see Valeriani (2006).
[10] For a discussion of experiential knowledge see Epstein (2005, pp.3-4); for an Indian agricultural technology context see Foster and Rosenzweig (1995).

The enabling institutions space is less clear cut than the other two spaces but we believe that in terms of travelling facts it is important to discuss this as a separate entity – in particular we believe it can help to explain the ‘wellness’ or travel. This space encompasses the subsidy, post harvest management, and the farmer associations. It may be obvious that the financial subsidy was necessary for these relatively poor farmers to adopt the core technology, and hence it was a key enabler. But less obviously the most important fact travelling in this case was an institutional and experiential fact (as will be shown below) – would the subsidy be delivered? We have classified post harvest management as an enabling institution because the facts that TNAU were encouraging to travel in this instance were about the way modern commodity markets operated – if the farmer had a better

Krishnagiri (31 farmers). Of the interviewees, 34 were beneficiary farmers and 18 were non-beneficiary farmers. Altogether 17 clusters were covered as shown in table 2.

Table 2.
Profile of Farmers Interviewed

	Non-beneficiary Farmer
Cluster	

The beneficiary farmers interviewed were spread over all the three years of joining, although the bulk of them were 2nd define this as prior knowledge i.e. knowledge about precision farming prior to its adoption. Altogether, there are two possibilities. Farmers were either aware of precision farming before they heard of TNPFP, or they heard of precision farming at the same time that they heard of TNPFP. In the latter case, a pertinent issue is whether they hear of TNPFP before contact with TNAU or Horticulture Department extension workers from other sources. These different possibilities constitute different types of prior knowledge – in essence, whether knowledge about precision farming travelled before contact from scientists/extension workers.

About one-third of the farmers interviewed had prior knowledge of precision farming before they heard about the TNPFP. Just over half of these gained their knowledge from existing demonstration schemes in other states. Newspapers and the television were another important source of knowledge for these farmers.[11] In our sample, there were also three farmers who were using drip irrigation before the arrival of the TNPFP. One of the latter was a farmer who grew mulberry and had heard about drip irrigation from the Silk Board. He had adopted drip irrigation (without the use of WSF) because of a subsidy provided by the Silk Board.

In addition to these farmers, if we also include farmers who heard about precision farming at the same time as they heard about TNPFP, then the proportion of farmers with prior knowledge in our sample increases from one-third to 75%.[12] All of these additional farmers gained their knowledge about precision farming from other farmers. Therefore, an overwhelming proportion of our sample had gained their knowledge about precision farming by observing demonstration schemes, including the TNPFP.[13] Demonstration schemes are predicated on the belief that if farmers actually see precision

[11] According to a 2003 national survey, 29.3% of farmer households in India accessed information 11h o

farming in operation and see the benefits it brings then they are more likely to adopt those techniques. Whilst the evidence that farmers independently adopted precision farming is very weak, there is support for the notion that the demonstration schemes help the fact that precision farming can be beneficial to travel to a wider community (see below) – the demonstration schemes may not have aided the travel of the technological or technical facts associated with precision farming but they did aid the travelling of the experiential facts, i.e. the benefit of precision farming.

How did farmers gain their knowledge about the TNPFP? Half of the 52 farmers interviewed gained their knowledge from existing beneficiary farmers[14] whilst more than a third first heard about the scheme at meetings organised by TNAU; only one farmer cited the Horticulture Department as their source of knowledge. There was, however, a significant difference between the beneficiary and non-beneficiary farmers in the sample: 16 of the 18 non-beneficiary farmers gained their knowledge about TNPFP from neighbours who were beneficiary farmers whilst half of the beneficiary farmers learnt about the project by attending a TNAU meeting.

What about the precision farming or TNPFP was travelling prior to contact or adoption? This could be gauged from the reasons given by farmers for adopting precision farming techniques. It was clear from the general tenor of the interviews that most, if not all, beneficiary farmers would not have joined the project without the generous subsidy. This is discussed in some detail in a following section. The important issue here is that the fact that precision farming techniques from TNAU came bundled with a generous subsidy was an important fact that reached the farmers. Two-thirds of the beneficiary farmers also explicitly mentioned other factors that influenced their reason to join the TNPFP and by far the most important of these were technology seemed to be convenient and easy to use. One farmer said that it would allow him to watch television whilst it irrigated! In terms of successful travelling this latter reason should not be under-estimated. We observe that simple facts will find it easier to travel in this sort of environment than more complex facts, although with the fertigation tanks it probably needed an expert to explain just how easy the technology was to operate to allow ease of travel.

6. Core technology space and adoption of fertigation techniques

In trying to assess the extent to which beneficiary farmers adopted, or adapted, the core drip irrigation and fertigation technology interviews with farmers was supplemented by inspection of detailed farm records. These were records that were kept by the TNPFP office and which contained detailed information for the first year

labour savings one farmer stated that ‘a single labourer, who could previously only work on three acres, can now work on eight acres’ and another farmer said that he was able to reduce the number of labourers that he had to employ from fifty to twenty five. Yet another claimed that he could irrigate his crops himself and did not require any additional labour whilst others cited the labour savings either in monetary terms (‘120 rupees per day’; ‘10,000 rupees per crop’) or percentage terms (ranging from 50% to 80%). Reasons given for labour saving effects were fairly unanimous: drip irrigation reduced labour needs both for irrigation itself and for weeding whilst the more porous soil engendered by drip irrigation made it easier to work and to plough, again reducing labour needs. Similar savings were experienced in the case of water requirements: ‘for the same amount of water I needed previously to irrigate 1 acre, I can now irrigate 3 acres’. The signals on fertiliser costs were mixed: as mentioned above, some farmers had taken steps to reduce the costs associated with using the recommended water soluble fertilisers but several farmers said that although water soluble fertilisers were more expensive the fertigation system meant that they used less fertiliser than previously and that the result was that overall their fertiliser costs had declined. Another aspect of the core technology that impressed several farmers was its impact on soil aeration: this was put best by a farmer from Moolayinur who explained how older methods, such as channel and flood irrigation, left the soil hard while fertigation left the soil loose which in turn promoted growth through better root condition and better yield.

In terms of the impact of precision farming on yield the quantitative evidence that is available is unambiguous: precision farming increased output obtained by the farmers by several fold and the average yield obtained by the beneficiary farmers was also several times that of the national average.[15] For example a preliminary study of nine of the crops grown by samples of TNPFP farmers (tomato, brinjal, banana, chilli, bhendi,

[15] The sample of farmers used varied by crop and these samples are not the same as the interview samples. We do not report the data in detail here but it is available upon request.

watermelon, muskmelon, cassava and cabbage) showed that, apart from cassava, all crops yielded multiple harvests which implied a lengthened crop duration and increased harvest period using precision farming techniques. In addition to the increased harvest period, the average tonnage obtained in one season was also considerable: for example, the average TNPFP yield for tomato, brinjal and banana were at least 3 to 12 times higher than the national average. Such findings were corroborated through conversations with individual farmers, the majority of whom were willing to testify to the positive impact that precision farming had upon the yield and quality of their crop and the income they derived from this. Some of the increases reported by individual farmers were more modest than some of the numbers reported above but were still significant. The smallest increase reported in the interviews was a 20% increase in yield. Other relatively low increases reported included: a cabbage farmer who said that he had 1 hectare under precision farming and 1 hectare using non-precision farming techniques and that the precision farming land gets 50% more output; a farmer who grew a mixture of cabbage, cauliflower and tomato and who said that he got 35 tons per acre with drip irrigation compared to 15-20 tons without drip irrigation. Generally, however, the reported increases (for a greater proportion of the beneficiary farmers interviewed) were much higher.

Apart from yield, the quality and consistency of produce obtained was also reported to be high. For example, one farmer claimed that his tomatoes had ‘good personality and were very attractive’, another said he now produced ‘shiny tomatoes’, whilst a cabbage farmer reported that the average size of cabbage produced had increased from 2.5kg to 3.5kg. Consistency was seen to be linked directly with fertigation: one farmer reported that due to fertigation the ‘quality and size of the product was maintained, and there was uniformity in yield.’ This farmer also compared the results of the precision farming techniques to older methods: he said that for tomato, in precision farming, every 4-5 days there is equal application of fertilizers, leading to even growth through the life of the crop; he also claimed that this resulted in an

as the improvements in yield and market value were directly attributable to such case during our conversations with both beneficiary farmers and non-beneficiary farmers.

7. Secondary space and adoption of other farm technologies

Our initial assumption was that because the secondary technologies operated in a space in which scientific expert knowledge had to compete with practitioners experiential knowledge there would be more resistance to facts travelling and this was what was found. The farmers were keen to experiment and innovate with the *associated* technologies. For instance, several farmers mentioned that they experimented with the spacing between the crops to ascertain the 'optimal' distance and crop density. This was a deviation from the 'standard' distance recommended by the scientists for each crop. This was often done without consultation with the TNAU scientists. For instance, a farmer from the Somanhalli cluster experimented with 6ft and 3ft spacing for sugarcane instead following the 5ft recommended by TNAU. He told us that he discovered that 3ft was a more optimal distance than 5ft. for sugarcane. Similarly a farmer from Paperetipatti thought that the spacing for his banana should be 4 ft instead of recommended 5 ft. In this manner, he could use a single row system rather than the double row system and consequently was thinking of changing the existing system. He told us that he heard about this when some farmers in Krishnagiri district made this modification. Another example of deviation was provided the farmer who wanted to extend the 'trailing' system he was using for tomatoes to bitter gourd after consultation with two other farmers both following precision spacing. He also told us that before adopting precision farming techniques, when he had used flood irrigation, he used 1 feet spacing.

Thus, beneficiary farmers were far more willing to deviate from the recommendations of the TNAU scientist when it came to the associated technologies than they were with the core technologies. As far as the associated technologies were concerned, the farmers did use their initiative and introduced changes that they felt were either necessary to their particular situation or improved it. Despite what farmers said we cannot be certain that the changes they made, or the advice they ignored, did lead to a more optimal outcome but this is perhaps not the important aspect of what happened in the secondary technology space. Given the strong control of the experts of the core technology space it was perhaps important that the project included another space in which the farmers could exercise their own judgement, a space where their expertise was allowed the same, if not more, validity as that of the scientists.

8. The Enabling Institutions Space

In discussing the enabling institutions it is worth noting that the mode of delivery in this project was relatively unusual for state sponsored projects in India. Most modes of technology transfer in India follow the researcher to development officials to farmer mode, a three-step process that might be mediated by state officials, or by an NGO, or by a private body. However, the TNPFP followed a simpler and more direct mode, that of researcher-to-farmer. This reduced the chance for error in the transmission of facts or knowledge as it ensured that scientist has high costs for the scientist but it is potentially one of its most important innovations of the TNPFP and undoubtedly played an important part in its success.

It was mentioned before that many farmers had prior knowledge of

name for the products grown under the TNPFP. The idea is that precision farming products are now been branded which will help with market recognition: ‘the brand name helps buyers to identify the source of the product and therefore that it is of better quality (because they are associated with precision farming techniques) and this helps with price.’

As an enabling space, farmers associations appear to perform two vital roles in the dissemination and success of precision farming technology. They serve as nodes for exchanging knowledge and information and they help farmers obtain better value for produce as well as inputs. Although, the extension model used in the TNPFP relies upon direct scientist-farmer interaction to transfer key precision farming technologies, the associations perform a vital support function as information nodes. According to the president of the Moliyanur Precision Farmers Association they hold regular monthly meetings to discuss marketing and other issues on the 2nd day of every month. Regular meetings such as these help beneficiary farmers to raise, clarify and solve cultivation, marketing and farm management issues. Often TNAU scientists attend these meetings and are able to offer expert advice, but even in their absence local issues are raised and resolved multi-laterally. Many association meetings are also attended by non-beneficiary farmers, which not only raises the profile of the TNPFP, but substitutes for the lack of direct scientist-farmer interactions in this case. The associations act as vehicles to disseminate both knowledge and information about the about new technology.' Yet another farmer felt that associations were very helpful in disseminating information about the use of technology. For example, he was better informed about plant protection measures through the associations. Another farmer felt that the benefit of association was the regular meetings 'on how to improve individual farms, use technology, and discuss marketing.' A non-beneficiary farmer who attended local association meetings, said that he learnt a lot about precision farming methods in these meetings. He said that he 'got to know how the drip irrigation system can save water' through regular interactions with precision farmers at such meetings. He further said that the farmer meetings and discussions 'have taught [me] about plant protection measures, what chemicals to use and how much to spray'. Thus, when 'representatives of pesticide companies visited me, I was able to make up my own mind about what is [good] for my crops.' Another non-beneficiary farmer claimed that he continues to receive 'new knowledge' through association meetings and field visits to precision farms.

The associations also seem to help the farmers obtain better value by improving their negotiating position vis-à-vis buyers or input providers: they 'bring unity among farmers will give them better bargaining power'. Organized markets increasingly prefer to deal with farmer associations as it helps to eliminate risks of delivery failure while providing a greater assurance of quality. This is also beneficial to the farmers as it helps them to secure better value by costing out delivery failures and in-transit damage to produce out of the revenue. By assuring minimum quality through proper grading and sorting, associations help farmers obtain better average prices than comparable produce sold without the association's involvement. The associations also help the farmers in many other ways: to negotiate better prices for inputs such as fertilizers, pesticides, seeds, etc. by guaranteeing minimum quantity; to negotiate for or arranging *timely* supply of inputs; and by helping to pool together resources to transport produce to the market, saving time and effort, and guaranteeing delivery.

The marketing aspects of the farmer associations have also been appreciated. One farmer said that the role of the association was vital in facilitating in the marketing of the produce. Another said the several precision

evident that several non-beneficiary farmers had adopted some of the precision farming techniques. This was primarily due to their interaction with beneficiary farmers, wh financial circumstances – they needed the subsidy.[21] Given the significant financial returns generated by precision farming this suggests a very conservative attitude to risk either by farmers or by those who could extend credit to them.[22] One beneficiary farmer suggested that there was an overall reluctance to adopt precision farming because 'people in this area are not well educated and are very tied to traditional crops and methods'. Nevertheless, there were some cases reported where such a conservative attitude was overcome. One farmer reported that 'some people with 50% subsidy have adopted precision farming although they have only adopted drip irrigation and not water soluble fertilisers.' According to another, in a statement loaded with both precision and vagueness, that 'just 5% of people outside [the TNPFP] scheme have adopted precision farming'. The most impressive example of travelling related by our beneficiary farmers did not relate to the core technology. A floriculturist told us that he tried the 'open system' of Dutch rose cultivation on advice on university staff and that as a result of its impressive impact on his yield and income, 50 farmers in his area (only 5 of whom are in the TNPFP) abandoned their traditional system of cultivation and had adopted the open system.

Officially eight of the non-beneficiary farmers interviewed had applied to join the TNPFP and been rejected, while one other had been rejected when applying in the name of his father. When asked why they did not apply to join the TNPFP, of the remaining eight non-beneficiary farmers who gave comprehensible answers, three had not heard about the project until quite recently, one was waiting to see how his brother (a beneficiary farmer) did, and the remaining four had wanted to join but were prevented from doing so, each for a different reason (lack of adequate water or electricity or land or, in one case, incapacitation - he was in hospital). We then asked them if, having

[21] Access to credit is well-known to be a major problem facing many small-scale farmers in India. See, for example, J. Harriss (1977) and Binswanger *et al* (1993).
[22] The reasons for slow adoption, and the role of risk and uncertainty, has been noted by, among others, classic articles by Ryan and Goss (1943) and Griliches (1957); for a Tamil Nadu perspective see B. Harriss (1977).

seen the benefits of drip irrigation, they would invest in this technology.[23] One farmer stated that he had already done so whilst three others said they probably, or possibly, would do so using their own money or by getting a loan. The TNPFP has now ended but the state planned to introduce a new

policy space. Building on the success of TNPFP project the precision farming protocol was scaled up to cover 12,800 hectares throughout the state (TNPFP2).[27] However, there are two significant differences between the two projects. Firstly, TNPF

The WSF and the fertigation schedule were both new in the experience of the farmers but both again travelled very well to beneficiary farmers. One of the major reasons for adherence of farmers to the fertigation schedule in the first year a farmer was part of the TNPFP appears to be the fact that TNAU scientists would be present during the mixing of WSF. This ensured that the correct dose was applied during fertigation, which also had a demonstration effect on the beneficiary farmers who could observe and learn the proper methods of mixing and applying the WSF, thus improving their experiential knowledge. In subsequent years, the farmer had a strong incentive not to stray from the fertigation schedule as the improvements in yield and market value in the first year of precision farming were directly attributable to the precision farming practices and fertigation. The apparent success in productivity and value improvements acted as strong motivators to maintain the schedules recommended by the scientists. Thus, in the first year the facts associated with WSF and the fertigation schedule travelled well because of expert supervision and monitoring but thereafter it was because the farmers accrued experiential facts that supported the expert claims and thus led them to believe in the core package. In terms of the non-beneficiary farmers, it seems that these experiential facts, as testified by the beneficiary farmers, did travel extensively but it seems that financial considerations again meant that very few adopted WSF. As to the fertigation schedules their travel beyond the beneficiary farmers is uncertain.

The secondary technology space encompassed many traditional concerns of extension education in India. As such many of the technologies in this space were, at least at a general level, familiar to both beneficiary and non-beneficiary farmers or dealt with issues, such as crop spacing, where farmers felt they had a lot of experiential knowledge. Thus, whilst these technologies did travel they did so with deviations. It could be argued that the dichotomy in the project between the core technology space and the secondary technology space was, either by design or accident, an important aspect of the project design that helped the fertigation technology to travel. In the core technology space, particularly in the crucial first year, the farmer had to follow what the scientists said. It is unlikely that any technology transfer project is going to be successful if it relies on the recipients giving up all independent thought or action in order to unquestioningly follow what outside experts tell them to do. However, in the TNPFP the farmer was allowed to exercise their own independence in the secondary technology space and this almost certainly made it easier for them to accept the control of the fertigation technology by the scientists. It should also be noted that even within the core technology space the scientists made great efforts to present the implementation process as a co-operative one. In this regard the 17 field scientists were crucial: they developed strong relationships on the ground with the individual farmers both explaining every aspect of the technology and its implementation carefully and listening to what farmers had to say and at times making adjustments to the implementation process on the basis of what the farmers told them.

Finally, many of the issues related to post harvest management were new to the beneficiary farmers and the farmer associations were, from their perspective, also an innovation. The post harvest management techniques appear to have travelled well to the beneficiary farmers, although it is less clear that they travelled to non-beneficiary farmers. It appears that facts about post harvest management travelled relatively well within the project because the other technological, scientific and experiential facts had already travelled well. This made beneficiary farmers more willing to accept claims by scientists that embracing the post harvest techniques would lead to a better market value of their produce. Being a part of a farmer association was one of the pre-conditions for a farmer being accepted into the project. The farmer associations have been both an important node for fact and knowledge transmission, embracing non-beneficiary farmers as well as beneficiary farmers, and a mechanism for improving the economic bargaining position of farmers. However, it is clear that this particular institution, and the facts it embodied, travelled better in Dharmapuri than in Krishnagiri; what is less clear is why this was so. The success of the farmer association in Dharmapuri cannot be under-estimated and the local associations have been joined by a new and significant institutional development, the DPF Agro Services. This re-enforces the commitment mechanisms for the precision farmers but more importantly has gone beyond what was envisaged by the project when it was first set up. In a similar vein, the development of a dedicated Precision Farmers brand demonstrates how successful the project has been in ensuring that facts about how modern commodity markets operate has travelled to the beneficiary farmers. Ultimately, whilst the TNPFP at one level was a technology transfer project, and did succeed in allowing important technological and technical facts to travel, perhaps in the longer term the most important facts it facilitated the travel of were those which have allowed farmers to more willingly embrace modern science in farming and modern markets and marketing.

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