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科技组织制度与

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农业技术进步

研究

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中 文 摘 要

农业技术进步程度是农业发展水平和市场竞争力的决定性因素，解决农业的种种问题最根本的是要依靠科技进步。开展农业技术进步研究，有着重要的理论和实践意义。农业发展将长期面临两个不可逆转的趋势，一方面，经济和社会发展对农业的要求越来越高，迫切需要农业发展水平及其功能的不断增进和拓展，从衣食之源，到提供工业原材料，再到生态环境的改善；另一方面，农业发展所赖以存在的资源基础却日趋紧缩，尤其是水、土资源的供需矛盾必将愈加尖锐。要缓解这些矛盾，必须依靠技术进步。这是农业发展的根本之计和长远大计。但农业技术进步问题远比人们想像的复杂。农业技术进步的实践和过程涉及到人们的创新行为和合作行为，涉及到技术进步相关主体之间的交易和互动，涉及到技术进步的经济和社会环境，绝不是一个简单的技术问题，而更多地表现为经济行为和社会行为，亟须用新的理论和方法展开深入研究。

本研究立足于建立和完善社会主义市场经济体制的制度背景，立足于农业发展进入新阶段和日趋市场化、国际化的产业背景，立足于农业科技体制由计划经济向市场经济转变的历史演进背景，采用和借鉴产业组织理论“结构—行为—绩效”的分析框架，综合运用经济学、管理学的理论和方法，对农业技术进步中的组织制度问题、对科技组织制度与农业技术进步的关系进行了系统地分析和深刻解剖，力求以新的视角和方法研究探索农业技术进步的相关问题，讨论确立加快农业技术进步的对策，为成功推进农业科技体制改革、加快实现新的农业科技革命做出贡献。本研究的主要观点如下：

(1) 把科技组织制度定义为有关农业科技进步的各行为主体之间的相互关系。认为,农业科技作为农业科技人员的智力创新性活动,众多科技机构及其人员之间表现出特有的分工协作和竞争对立关系,把农业科技作为一个“产业”,研究农业科技活动的组织结构、规模效益、协作关系、产业政策等问题,不仅可行,而且具有重要的理论和实践意义。

(2) 科技组织制度在推动农业技术进步中起着基础和决定性的作用。通常意义上的农业科技体制改革包含三个层次,一是技术层面的改革,如研究方向的调整、研究重点的转移、投入力度的增加等;二是机制层面的改革,如用人制度、分配制度和运行管理制度等;三是体制层面的改革,如新型农业科技创新体系的建立,不同层次、不同领域的科技机构之间协作关系的构建等。其中后两个层次的改革属于组织制度创新的内容。传统农业科技体制的弊端很大是由不合理的组织制度引致的,不仅影响技术创新效率,而且影响到技术转化和应用效率。农业科技体制改革的目的很大程度上是推动科技组织制度的合理化。

(3) 19世纪末,农业科研活动从农事操作中独立出来,出现专业化、规范化的农业科技机构,为研究农业科技进步的科技组织制度问题提出了重要命题。从历史演进看,农业科技组织制度与国家社会制度、政治文化形态有着密切关系,政治制度的演替与起伏对农业科技组织制度发展产生重大影响。

(4) 整个农业发展史就是农业科技发展史,农业技术进步在对农业发展做出巨大贡献的同时,农业发展又对农业技术进步不断提供新的方向和动力。科学发现和发明、重大基础理论的突破是农业技术进步的源头,促使农业技术进步发生质的飞跃。农业科学作为应用科学,加之农业较强的区域适应性和生产分散型,农业科技成果转化在农业技术进步中有着重要的地位和作用。

(5) 目前我国农业技术创新组织结构,一是规模较大,二是传统管理惯性较强,三是对政府依赖度较高。在政府表现为“多

部门、分层次、分散式”的管理体制，在研发机构表现为“纵向归口、横向分割”的松散式结构，在研发机构与政府之间表现为行政隶属和指令服从关系。总体上看，行政关系重于市场关系，属“自然结构”的非正式关系在农业技术创新的组织管理中起到格外重要的作用。明确政府有关部门的职能和责任，加强相互沟通和衔接，建立磋商与合作机制是今后行政体制改革的重要内容；在研发机构之间建立主体平等的竞合关系、在研发机构与政府之间建立宏观指导下的委托代理、合同契约关系是今后农业科技体制改革的重要内容。

(6) 农业技术创新同样具有规模经济性，农业科技机构存在自己的适宜规模。但计划经济体制下，其规模完全是“刚性”的，是政府规制的结果，不是市场竞争的结果。必须加大市场机制对农业技术创新机构内部科技资源的引导和配置，增强内部联系和机制互动，提高规模经济性。在信息高度不对称、农户辨别能力差的情况下，广告宣传是农业技术创新机构创造产品差别化的重要手段。

(7) 农业技术创新主体在行为上具有明显的行政化（科研单位行政化）、社会化（院所办社会）、短期化（缺乏长期规划）、封闭化（与技术应用主体、与周围的研发机构缺乏联系）和提供无偿服务的特征。这些行为特征多数不是市场竞争的结果，而是现行管理体制规范和诱导的结果，表现出明显的非价格行为。表现在绩效特征上，多数国有农业研发机构呈现财务“紧运行”状态；科研条件设施的重复购置严重，共享率、利用率偏低；科研人员的流动性差，“单位人”特征明显，积极性和创造性发挥不够；农业科研单位及人员的产权意识淡薄，成果的转化率较低；科技与农业产业的结合度不高，支撑能力不强。同时，还存在明显的 X-低效率现象。

(8) 现有国家农业技术推广机构是一个多层次、多专业、规模宏大、关系复杂的庞大体系，呈现两头综合、中间分设的“纺

锤体”结构，乡镇以下出现“断层”。国家农技推广机构隶属同级的农业行政部门，呈行政层级关系，不同层次的国家农技推广机构是业务指导关系，但随着专项经费减少，和受层次、专业分割，这种关系趋于弱化。国家农技推广机构与农业科研单位、农业高校体制分割，关系松散。民营农业技术转化机构多数是涉农企业的功能延伸，主要通过市场机制进行协调，呈现松散型结构，与国家农技推广机构的关系较弱，但有走强趋势。

(9) 国家农技推广机构在行为上表现出“准行政化”、脱离农户实际需求、被“边缘化”、无偿有偿服务相结合、缺乏绩效考核等特征。在行为绩效上呈现“有钱养兵，无钱打仗”，专项经费短缺；农技人员素质偏低，知识老化；农业技术推广手段落后、方法单一；形成“技术棚架”和“最后一道坎”现象；对农业产业发展的支撑能力降低，在农户心目中的地位降低和社会评价不高。

(10) 农户是农业技术应用最主要的主体，由农户进一步衍生出科技示范户、农民合作组织等新的技术应用主体。涉农企业在促进农业技术应用中发挥着越来越大的作用。农户群体呈现松散和弱势的结构状态，农民组织化程度低，农户与其合作组织、与涉农企业之间关系不规范，是当前农业技术应用主体组织结构的主要特征。

(11) 农业技术应用的主体行为表现为：对新技术需求乏力，农户“兼业化”比较普遍，农业技术采用的“模仿性”强，科技示范户的带动性和示范性突出，农民潜在的主体意识与有限“表达”并存，小富即满与创新意识不足，均衡陷阱与逆向淘汰等。行为绩效表现为：农民素质不高，获取知识和技术能力不强，科技入户率低和技术更新缓慢，农业“副业化”和农产品竞争力不强，农民增收困难和持续增收长效机制的缺乏。

(12) 产业组织理论的横向一体化、纵向一体化和混合一体化同样能够运用到农业科技组织的整合升级上来。通过一体化整合优化，可以促进农业科技组织效率的提高。

本研究提出的推进我国农业技术进步的組織对策，可以概括为：一是理顺政府与科技机构的关系，促进政府宏观调控与市场机制调节的协调统一。二是依法确立农业科技机构的地位，加强其科技主体与市场竞争主体的作用。三是加强农业科技组织管理，以人为本，提高组织效率。四是建立多元化的农业技术转化体系，多渠道、全方位解决农业技术转化问题。五是重点建设基层的国家农技推广机构，着力提高技术推广和服务效率。六是加强农民教育培训和转移就业，优化农民素质结构和就业结构。七是培育科技示范户和农民科技协会，提高农民应用技术的组织化程度。八是依法建设农业科技投入的稳定增长和分配机制，提高政府投入的使用效率。九是优化农业科技资源整合，推进国家和区域农业科技创新体系建设。

本研究的创新点和主要贡献有：一是研究方法上的创新，首次采用产业组织理论的“结构—行为—绩效”框架研究农业科技组织制度问题，分析了农业科技的产业属性，论述了农业技术进步中的组织制度对策，对丰富农业技术进步的研究方法有重要理论和实践意义。二是首次提出了农业科研机构的“适度规模”和农业科技创新产品的“差别化”概念，并运用产业组织理论分析了其内涵外延和政策意义，对于推进我国的农业科技创新体系建设、提高农业科研效率、优化农业科研机构之间的竞争协作关系有着深远意义。三是从产业组织的角度，研究了农民庞大群体的组织结构和组织化问题，剖析了农民组织结构“松散”的原因，描述了农民在组织松散的情况下采用技术的行为和绩效特征。这不仅对推进农业技术应用有很强的指导意义，而且对破解“三农”中的核心农民问题有借鉴价值。四是以体制转型期和农业发展新阶段为背景，对现行农业科技体制进行实证研究，研究结论的指导性强。

关键词：组织制度 农业技术进步 产业组织 规模经济

ABSTRACT

The agriculture technological progress level is basically the agriculture development level, decisive for market competitiveness and is the basis on which scientific and technological progress can solve all sorts of problems of agriculture. So it is significant to promote agriculture technology research. Agriculture development faces two irreversible trends for a long time, on one hand, there are more and more high expectations for agriculture, more need for constantly gradual progress of the agricultural function and urgent expansion in economic and social development, from source of basic life necessities, industrial raw materials to ecological environment improvement; On the other hand, resource foundation, the essence of agricultural development, is tightened daily, especially the imbalance between supply and demand of the water and soil resources will be sharpened. Here technological progress rise to alleviate this contradiction. This is a basic and long-term orientation for fundamental importance of agriculture development. But the issue of agriculture technological progress is far more complicated than imagined. The practice and process of agriculture technological progress involve human innovation, cooperative behaviors, trade, interaction between relevant subjects of technological progress, economic and social environment of technological progress, so it is not a definitely simple technological issue, but increasingly shown as both economic and social behavior, thus badly needing further investiga-

tion with new theory and method.

This research bases on the system background of establishing and perfecting socialist market economy system, the industry background of agricultural development entering a new stage of marketization and internationalization as well as the historical evolution background of agricultural science and technology system transforming from planned economy to market economy in an effort to adopt and draw lessons from the analysis frame of "the structure-the conduct-the performance" of the industrial organization theory. Through using the theory and method of economics and management synthetically to tackle the problem of organization system, the present dissertation systematically analyses the relation between sci-technological organization systems and agriculture technological progress, in an attempt to study and explore the relevant problems of agriculture technological progress from a new perspective. Establishment of the proposed countermeasures are capable to accelerate the agricultural technological progress and to make a contribution to advancing the reform of agricultural science and technology system, thus accelerating a new agricultural revolution in science and technology. The main view of this research is as follows:

① The present research defines organization system of science and technology as the interaction between behavior subject of agriculture scientific and technological progress. It holds that agricultural science and technology, regarded as an innovative activity of agriculture scientific intelligence and technical staff, demonstrate coordination through division of labor and competition between numerous scientific and technological organizations and the related staff. Consequently, if we regard agricultural sci-

ence and technology as an "industry", to study such problems as institutional framework, scale efficiency, cooperative relation as well as the industrial policy of agricultural scientific and technological activities, etc, it is not only feasible, but carries more theoretical and practical significance.

(2) The scientific and technological organization system is playing a basic and decisive function in promoting agriculture technological progress. In a normal sense, the agriculture scientific and technical structural reform can be analyzed at three levels: first, a reform of techniques, such as adjustment of study orientation, shifting of research stress and enhancement of research investment, second, a reform of the mechanism, such as employment system, distribution system and operation management system, etc.; Third, a reform of system, such as establishing new system of agriculture scientific and technical innovation, construction of cooperative relation between scientific and technological organizations at different levels, in different fields, etc.. Among them reforms of the last two belong to the content of organizational system innovation. The drawbacks of traditional agriculture science and technology system, mostly caused by unreasonable organizational system exert an influence on not only technological innovation efficiency, but also effectiveness of technology transformation and utilization. To a large extent, the purpose of agriculture scientific and technical structural reform is to promote rationalization of scientific and technological organization system.

(3) At the end of the 19th century, the agri-scientific research activity was separated operating from farming operation, with appearance of specialized and standardized agricultural sci-

ence and technology organization, thus putting forward the important proposition for studying the issue of scientific and technological organization system in agriculture technological progress. From the perspective of history evolution, the organizational system of agriculture science and technology has been closely related with national and social system, political and culture configuration. In addition, rising and falling performance of political system also exerts a great influence on organization system development of agriculture science and technology.

(4) The whole agriculture development history is basically of agricultural science and technology. The agriculture technological progress has made enormous contribution to agricultural development, which in turn is constantly developing and offering a new direction and motive force to agriculture technological progress. The break-through of scientific discovery and invention, great basic theory both is the source of agriculture technological progress, thus a qualitative leap occurring to impel agriculture technological progress. Agricultural science, as an applied science, together with its stronger regional adaptability and production dispersing type, benefited considerably from transformation of agriculture scientific and technical fruits.

(5) At present, innovational institution framework of agriculture technique in our country is characteristic of the following: first, with larger scale, second, traditional management inertia being relatively strong, third, largely relying on the government. Management system is shown as "multiple departments, divided into different levels, dispersed for different types" in government, while in research and development organizations, it is shown as the "vertical structure under the same cat-

ABSTRACT

egory, horizontally separated loose structure", and in between the institutions and the government, shown as administrative. On the whole, administrative relation is more important than market relation, the unofficial relation, belonging to "natural structure", plays an important function in organizational management of agriculture technological innovation. Consequently, to define function and responsibility of government's related departments, strengthen communication and link up with each other, set up and consult with the cooperative mechanism, are important content of administrative system reform in the future. To establish competition and cooperation of the main equal body between research and development organizations is also an important content of agriculture scientific and technical structural reform in future with no exception to establishing entrusted agency under macroscopic guidance and contract agreement relation between research and development organization and government.

(6) Agriculture technological innovation also has scale economy effect as agriculture science and technology organizations have their own scale of adaptability. But under planned economic system, whose scale is totally "rigidity", a result of government's structure, not of market competition. So it is a necessity to strengthen market mechanism instruction and disposition of scientific and technological resources inside agriculture technological innovation organizations, and enhance inner inter-dynamic connection and mechanism, thus fundamentally improving scale economy. In a situation with asymmetric information system and farmers' poor distinguished ability, advertisement is an important means of publicizing differentiated products by agriculture tech-

nological innovation organizations.

(7) Agricultural technology innovation subjects are typically characterized with obvious administrative relations (R&D institutions under administration), socialization (the given society run by institutes), a short term (lacking long-term planning), being obturated (with little communication with technical application subject and research and development organization) and offering free service. Most of the behavior characteristics are not result of market competition, but of current management system normalization, thus demonstrating obvious non-price behavior. When reflected in performance, most state-run agriculture research and development organization encounter financial affairs "close operation", together with such problems as serious repetition of scientific research facility purchase, low sharing and utilization ratio; poor mobility of scientific research staff, ill display of enthusiasm and creativity; faint consciousness of agricultural R&D institution and staff property right, low conversion ratio of the achievements; low combination degree of science and technology as well as obvious X-inefficient phenomenon.

(8) National agricultural technology popularization organization is a multi-level, multispecialization, large-scale and huge system with complicated relation, the "spindle body" structure with both ends synthesized and set up separately in the middle, while "the faultage" appears under the villages and towns. The agro-technical popularization organizations are under jurisdiction of agriculture administrative department at the same level, with a typical administrative subjection relation, and a professional guidance relation between agrotechnical extension organizations of different levels, but as a result of special funds reduction,

separation between different professions; this kind of relation tends towards weakening. The agro-technical popularization organizations are separated from agriculture R&D institution and agriculture university system and the relation is loose. The private agriculture technology transformation organizations mostly played the extended function of agriculture-related enterprises, mainly coordinated through a market mechanism with appearance of scattered structure. Its connection with the national agro-technology extension organizations is loose too, but possessing a tendency to go strong.

(9) The popularization organization is characterized with the following "quasi administrative behavior", breaking away from farmers actual demand, being "marginalized", a combination of free and paid service, as well as lack of performance examination. In terms of conduct performance, the fund for special expenditure is in shortage; with agro-technical staff quality relatively low possessing aged knowledge; the extension methodology lags behind, "technological rack" and "last bank" phenomenon. As a result, its support to agriculture industry is reduced, and status in farmers' mind is downgraded and social assessment not high.

(10) Farming households are most important subjects of agriculture technical application, as from them the sci-tech extension model and farmers' cooperative association can be derived. The agriculture-related enterprise is playing an increasingly great role in promoting agriculture technical application. The loose structure with weak tendency appears in farmers' colony, farmers' organization degree is low, and the relation between the agriculture-related enterprises is unstandardized in farmer households

and its cooperative association, which is a main characteristic of institutional framework of present agriculture technical application.

(11) The subject behavior of agriculture technical application is shown as: weak response to new technology demand, more generalized family concurrent property, strong imitativeness of agriculture technology adoption, outstanding demonstrativeness and driving characteristic of sci-tech model household, coexistence of farmers' potential subject consciousness and limited "expressiveness", farmers feeling satisfied after obtaining small scale wealth and insufficient innovative consciousness. The behavior performance is shown as: farmers relatively low quality, weak ability to obtain knowledge and technology, low registration rate of science and technology, slow innovation rate of technology, weak competitiveness of agoproduct and agriculture "sideline production", difficulty in raising farmer's income and lack of long-term mechanism of constant farmers' income rise.

(12) The horizontal, vertical and mixed integration of industry organization theory are equally adoptable in agri-tech organization conformity and upgrading, to facilitate raised efficiency of these organizations.

Organizational countermeasures of promoting agriculture technological progress in our country proposed in this thesis can be summarized as: firstly, to promote unity and coordination between government macro adjustments and market mechanism regulation, through putting the relation of the government and sci-technological organizations in order; secondly, to strengthen the function of scientific and technological subjects and market competition subjects, by defining the status of agriculture sci-

technology organizations in accordance with the law. Thirdly, to strengthen the organizational management of agriculture science and technology, under the guidance of “people first” and improve the organizational efficiency. Fourthly, to solve the problem of agriculture technology transformation, by setting up a pluralistic agriculture technology transforming system through multi-channels in omnidirections. Fifthly, the focus of construction is the grassroots agro-technical extension organizations in an effort to improve popularization service efficiency. Sixthly, stress should also be put to strengthen farmers’ education and training, to employment shift, optimized structure of farmers’ quality and employment. Seventhly, efforts are paid to foster sci-tech model, farmers’ scientific and technological association, to improve organizational degree of applied technology. Eighthly, attention should be paid to build up steady agriculture growth of input and distribution mechanism in science and technology in accordance with the law, to improve service efficiency of government investments. Ninthly, to advance country and construction of innovation system of regional agricultural science and technology, by means of optimize integration of agriculture science and technology resources.

The innovation and main contribution of this text is as follows, firstly, the innovation in terms of research approach by adopting the framework of “structure-conduct-performance” in industrial organization theory to study the organizational system of agriculture science and technology for the first time. It has analyzed the industry attribute of agricultural science and technology, described organization system countermeasure in agriculture technological progress. So it carries important theoretical and