关于建立保护性耕作长效机制的实践与思考

Practice and Pondering on the Establishment of the CTLasting Effect Mechanism

保护性耕作技术是一项促进农业可持续发展的先进农业耕作技术。建立保护性耕作长效机制，是促进保护性耕作持续、健康发展的一个根本性问题。今天，借助“亚太地区保护性耕作发展国际研讨会”这个机会，围绕“如何建立保护性耕作长效机制”这个问题，结合我省保护性耕作实践，谈几点个人看法。

CT technology is an advanced agricultural tillage technology which can promote the agricultural sustainable development. The establishment of lasting effect CT mechanism is a basic issue of promoting CT sustainable and sound development. Today I would like to take the chance of the International Seminar on CT Development in Asia-pacific Region and give my own opinions combining the CT practice in our province under the question of “How to establish lasting effect CT mechanism”.

- 1、什么是保护性耕作长效机制
- 2、建立保护性耕作长效机制的必备条件
- 3、如何建立保护性耕作长效机制
- 4、结论

- **1.What’s the lasting effect CT mechanism?**
- **2.Necessary conditions for the mechanism establishment.**
- **3.How to establish the lasting effect CT mechanism?**
- **4.Conclusion**

1、什么是保护性耕作长效机制

建立保护性耕作长效机制是我们政府和推广部门推动保护性耕作技术示范、推广的最终目的。那么，什么是保护性耕作长效机制呢？所谓保护性耕作长效机制，是指保护性耕作技术应用的长效机制，也就是借助行政力量的督导作用、资金的引导作用、技术推广部门的技术支撑作用，建立健全社会化、市场化运行机制，保护性耕作项目结束后，农民和农机手在利益的驱动作用下，能够自觉长期应用保护性耕作技术。

1.What’s the lasting effect CT mechanism?

The final aim of promoting the standards and application of CT technology by our government and extension departments is to establish lasting effect CT mechanism. Then, what’s its definition ?The so-called lasting effect CT mechanism is the permanent mechanism of the application of the CT technology. That’s to establish healthy social and marketing mechanism under the government supervision and guidance, the capital and the technological support from the technology extension departments. Under the profit driving, farmers and machine drivers can permanently use the CT technologies by themselves after the end of the project.

2、建立保护性耕作长效机制的必备条件

我省保护性耕作技术试验示范推广6年来的实践表明：保护性耕作长效机制的建立，必须同时具备以下几个方面的条件：

2.1 成熟的技术模式和合理的工艺路线

2.2 优质的保护性耕作机具

2.3 农户对保护性耕作技术的充分认识和接受

2.4 机手良好的经济效益

2.Necessary conditions for the mechanism establishment.

The five-year long practice of the experiment and demonstration of CT technology in our province indicates that the establishment must have the following conditions at the same time:

2.1 Mature technological mode and proper working process

2.2 High quality CT machineries

2.3 Enough awareness and recognition to no-till technology by farmers

2.4 Good economic profit for the machine drivers

2.1 成熟的技术模式和合理的工艺路线

河南省是全国农产品主要产区，农业生产对于国民经济发展起着重要作用。主要粮食作物以小麦、玉米为主，小麦种植面积7600万亩，玉米种植面积3900万亩，小麦产量位于全国第一位，以一年两季种植模式为主。小麦、玉米一年两熟地区产量高、秸秆量大。如何在小麦秸秆覆盖地完成玉米免耕播种、在玉米秸秆覆盖地完成小麦免耕播种是“小麦、玉米两茬轮作周年保护性耕作技术模式研究与应用的核心内容。我省从2002年开始分别在安阳、郑州、商丘、洛阳、三门峡等地建立了多个对比试验测试点，进行多种技术模式的对比试验研究。最终研究探索出了适合我省小麦、玉米两茬连作区的保护性耕作最佳技术模式和工艺路线：

2.1 Mature technological mode and proper working process

Henan is the main province for producing agricultural products in the whole country. Agricultural production plays an important role in the development of economy. Wheat and corn are the chief crops. There are 76 million mu for wheat plantation and 39 million mu for corn. The wheat production ranks the first in the whole country. The main growing method is two crops rotation in a year. Wheat and corn in the regions of two crops a year have high yields and large amount of straw. How to finish no-till corn in the wheat straw retention fields and how to finish the no-till wheat in the corn straw retention fields are the core contents of the annual CT technological model research and application of wheat and corn two crops rotation .Many comparative experimenting sites have been set up respectively in the cities of Anyang ,Zhengzhou, Shangqiu, Luoyang, Sanmenxia in our province since 2002, and comparative experimental researches on technological modes have been taken on. The optimum technological mode and proper process which are suitable for the CT of wheat and corn two crops rotation in our province have been explored and found out. Here are the followings:

玉米收获同时秸秆粉碎还田→免耕覆盖播种机施肥播种小麦→机械植保→联合收割机收获小麦→机械深松（3-5年一次）→免耕覆盖施肥播种机施肥播种玉米→机械植保→收获玉米同时秸秆粉碎还田。

通过五年来对小麦、玉米两茬轮作周年保护性耕作技术体系研究与应用，取得了显著的经济效益：示范应用面积达到86.4万亩，平均小麦增产29.2公斤/亩，节本37.74元/亩；玉米平均增产30.9公斤/亩，节本22.7元/亩。

Harvesting corn by the combine harvester (or picking up by manual) and returning the chopped residues to the fields simultaneously →fertilizing and sowing wheat by no-till retention planters →mechanical plant protection →wheat harvesting by the harvester →mechanical deep tillage (once every three to five years) →fertilizing and sowing corn by no-till retention planters →mechanical plant protection →corn harvest and returning straw to fields by chopping simultaneously. Through five years research and application on annual CT technological system of wheat and corn two crops rotation, marketable economic benefits have been achieved. The applying demonstration areas have reached 702.5thousand mu .An average of 30.8 kg per mu has been increased for wheat.35.7yuan per mu in the cost has been saved. And an average of 30.9 kg per mu has been increased for corn, and 22.7 yuan per mu in the cost has been saved.

2.2　优质的保护性耕作机具

保护性耕作机具是保护性耕作技术的有效载体，机具能否完成小麦秸秆覆盖地免耕施肥播种玉米和玉米秸秆覆盖（直立）地免耕施肥播种小麦是实施小麦、玉米两茬连作保护性耕作技术的核心内容。经过近五年的研究、改进和完善，重点研究解决了如下两个问题：

2.2 High quality CT machineries

CT machines are the efficient vehicles of CT technology. Whether they can finish the no-till fertilizing and corn sowing in wheat straw retention field and no-till fertilizing and wheat sowing in corn straw retention field (standing) is the core contents of carrying out annual CT technologies of wheat and corn two crops rotation. After researching, improving and perfecting for five years, the following two problems have been primarily solved.

（1）小麦秸秆覆盖地免耕施肥播种玉米

近年来，由于小麦联合收割机的推广普及，使得小麦留茬普遍偏高，秸秆成行堆放，致使玉米免耕播种作业时秸秆壅堵，阻力增大，作业质量差。针对这些问题我们提出了“秸秆粉碎+凿式开沟+强制排种（肥）+可调株、行距”等技术原理，进行了如下几个方面的改进完善：①小麦联合收获机后增设秸秆粉碎装置，使小麦秸秆较均匀分布；②改箭铲式开沟器为凿式开沟器，减少机具阻力，提高播种稳定性；③增加强制排种（肥）装置，克服卡、压、堵现象；④变固定株、行距为可调株、行距，增加机具的适应性。经过五年来的试验应用，改进后的机具完全满足了保护性耕作的技术要求。

(1) No-till fertilizing and sowing corn in the wheat straw retention field.

In recent years, with the extension and popularization of wheat combine harvester, much wheat stubble has been left and the straws are piled in rows. These problems result in straw blocking, resistance increasing and poor working effect in no-till corn sowing. In response to these problems we put forward the technological theories of “chopping straws +chisel ditching +compulsory drilling +adjustable seedling spacing and rows spacing”, etc. and improved and perfected the followings:

①adding a chopping residue equipment at the back of the combine harvester and spreading evenly the wheat residue .

②changing the spade ditching machine to chisel ditching machine to reduce machinery resistance and improve sowing stability.

③adding the compulsory drilling equipment and get rid of the jam and press.

④changing the fixed seedling and rows to the adjustable and improve machines suitability .The improved machines completely meet the CT technical requirements after five years’ experiment and application.

（2）玉米秸秆覆盖（直立）地免耕施肥播种小麦

玉米秸秆覆盖（直立）地免耕施肥播种小麦存在玉米秸秆量大、作业时秸秆壅堵、根茬难处理等技术难题，针对这些问题，我们提出了“带状浅旋+宽窄行沟播+自动监控防堵塞”技术原理，进行了如下几个方面的研制、改进和完善：①在小麦播种开沟器前加设旋耕刀，使其能够完成12cm宽10cm深的浅旋带，解决秸秆壅堵和玉米根茬影响开沟的难题，同时完成秸秆部分切碎、浅旋、开沟、播种、施肥和镇压六个作业工序；②12cm宽浅旋带播2行小麦，2行小麦中间施1行化肥，浅施带间隙为26cm,也就是26cm宽为免耕带，这样就实现了宽窄行沟播和秸秆覆盖技术；③由于玉米秸秆覆盖（直立）地小麦免耕施肥播种作业条件差，虽然经过上述两种方法解决壅堵问题，但种、肥堵塞还有可能发生。为解决种、肥堵塞难以及时发现的问题，我们在种、肥开沟器下端装设红外线传感器，使种、肥堵塞能及时报警，及时处理。经过五年来的试验应用，改进后的机具完全满足了玉米秸秆覆盖（直立）地免耕施肥播种小麦的技术要求。

(2) No-till fertilizing and sowing wheat in the corn residue retention (standing) field.

No-till fertilizing and sowing wheat in the corn residue retention (standing) field have technical problems such as large amount of corn residues ,straw blocking, difficult management of corn stubble ,and so on. For these problems, we propose the technical theory of “band spinning +sowing in wide and narrow rows +preventing block by supervision automatically” and make researching, improving and perfecting of the followings: ①adding rotary slash in front of the wheat-sowing ditcher to finish the spinning band of 12cm in width and 10cm in depth and solving the problem of affecting ditching by straw blocking and corn stubble. And also finishing the six working procedures of chopping part of straws, spinning, ditching, sowing, fertilizing and pressing. ②two rows of wheat are sown in the shallow sown band of 12cm width .One row of chemical fertilizer is used between 2 rows of wheat .The gap in the shallow sown band is 26cm,namely the band of 26cm in width is no-till area. By this way ditch sowing in wide and narrow rows and residue retention technologies can be achieved. ③because no-till fertilizing and sowing conditions in corn retention field are poor, fertilizer blocking still happens though the above two methods are taken to solve the blocking problem. In order to solve it and find problems in time, we fix an infrared rays sensor beneath the sowing and fertilizing ditch machine so that it can report an alarm timely when sowing and fertilizing block happens and the problem can be solved immediately .The improved machine fully meets the technical requirements of no-till fertilizing and sowing wheat in corn retention (standing) field after five years’ experiment and application.

2.3　农户对保护性耕作技术的充分认识和接受

农户是应用保护性耕作技术的主体。农户对保护性耕作技术的充分认识和接受是建立保护性耕作长效机制的关键。近年来，我们借助媒体的力量，加强了保护性耕作的宣传报道，通过各种媒体的宣传，让社会各界更加了解保护性耕作的重要意义，不断提高农民的认知和接受程度，转变农民传统耕作观念，树立科学种田意识，让农民消除对这项技术的不安全感，形成良好的社会氛围。但农民的传统耕作观念根深蒂固，想要完全改变非一朝一夕之事，需长期的宣传、培训、示范、引导。根据我们的调查：实施保护性耕作技术3年的项目区，三分之一的农户能够接受，三分之一的农户被动接受，三分之一的农户不接受。

2.3 Enough awareness and recognition to no-till technology by farmers

Farmers are the essential users of applying no-till technology. Farmers' recognition and acceptance to it are the key of establishing lasting effect CT mechanism. In recent years we strengthen the no-till publicity and report by means of news media. So that we can make all social sectors more aware of the significance, understand more of CT, constantly improve the level of farmers' recognition to it, and change their traditional tillage conception and have the awareness of the scientific farming, eliminating their sense of unsafe to the technology and forming good social environment. But because of deep rooted traditional tillage conception, there is a long way to go and the publicity, training, demonstrating and guiding are needed for long time .According to our investigation to the sites of implementing CT technology for three years ,one third of farmers can accept it, one third of them accept it passively and one third can't accept it.

2.4　机手良好的经济效益

机手是实施保护性耕作技术的主体，机手是否有良好的经济效益关系到能否建立保护性耕作长效机制的成败。如果机手2年能收回成本，那么，机手就有较高的购机积极性。根据我们的调查统计结果，机手购买一台小麦免耕播种机需9000元，按照机具正常作业效率，每季可作业500亩以上，作业费按35元/亩计，扣除作业成本18.1元/亩（油料10元/亩，机具折旧费3.6元/亩、维修费1.5元/亩、人员工资3.0元/亩），机手年纯收入为8450元，不足一年半就可收回购机成本。问题的关键是，因多数农户不愿使用保护性耕作技术，而使机手没有足够的作业量，同时机手还要不断更换地块，增加作业成本。通常情况下，机手一季只能作业200亩左右，这样机手收回购机成本就需两年以上时间，从而影响了机手的购机积极性。据调查统计，在我省实施保护性耕作3年的项目区，年作业面积三分之一机手达到500亩，三分之一机手200—300亩，三分之一机手不足200亩。

2.4 Good economic profit for the machine drivers

Machine driver is the main performer of implementing technology. The establishment of lasting effect CT mechanism rely on the economic profit the machine driver can obtain. If he can get back the cost in 2 years, he'll be active to buy the machines. According to the statistics we investigated ,9000 yuan is needed to buy a no-till wheat sowing machine, It can finish over 500 mu every season in terms of the normal working efficiency. The driver can get 8450 yuan of net income annually based on 35 yuan per mu of working fee, deducting 18.1 yuan per mu of cost (10 yuan of oil, 3.6 yuan of depreciation charge,1.5 yuan of repairing ,3.0yuan of salary per mu).He can get back the cost in less than one year and a half. The problem is that farmers are reluctant to use the CT technology. That leads to no enough work for drivers. And at the same time they have to change the fields constantly. The cost is increased then. Usually, the driver can only finish about 200 mu every season. Thus it takes more than two years to get back the cost. That affects the drivers' buying activity. According to the statistics in the areas of practicing CT for 3 years in our province, one third of drivers can finish 500 mu annually, one third 200-300 mu, and one third less than 2oo mu.

3、如何建立保护性耕作长效机制

综上所述，建立保护性耕作长效机制需4个必备条件，我们现在具备三个，只有保护性耕作技术的应用主题——农户需进一步提高认识和接受程度。如果广大农户应用保护性耕作技术的积极性得到提高，积极主动应用保护性耕作技术，那么，保护性耕作长效机制就能够健康发展。因此，在目前情况下，要建立保护性耕作长效机制需作好以下工作：

3.How to establish the lasting effect CT mechanism?

According to the above 4 necessary conditions are needed for establishing the mechanism. We finish three now, with improving the farmer's recognition and acceptance-the only applying theme of CT technology left. The CT lasting effect mechanism will develop smoothly if the farmers take the initiative to actively use CT technology with increased activity of applying it. Therefore, in this situation, the followings should be well done to establish the mechanism.

3.1　加强政府引导

政府以及具有公益性质的政府技术推广机构，应借助其特有的地位，发挥积极作用，采取行政、法律和经济等手段，积极推进耕作制度的变革。

3.2　实施项目带动

保护性耕作取得今天的成就，各级项目的示范带动作用功不可没，因此要进一步加大项目投入，扩大项目区域，增大示范带动效果。

3.1 Strengthening the government guidance

The government and its technology extending departments with public welfare should play the active role through their special positions and promote actively the tillage system reform by the means of administration law and economy.

3.2 Implementing the project

The present achievements should be attributed to the effect of the site’s leading of every program. Thus the further program investment should be made and the areas should be enlarged with more leading and demonstration.

3.3　抓好宣传培训

做好宣传工作是扩大保护性耕作影响和提高社会共识的重要途径，搞好技术培训是保证实施效果的重要保证。近年来，我们借助媒体的力量，加强了保护性耕作的宣传报道，通过各种媒体的宣传，让社会各界更加了解保护性耕作的重要意义，不断提高农民的认知和接受程度，转变农民传统耕作观念，树立科学种田意识，让农民消除对这项技术的不安全感，形成良好的社会氛围。农民和农机手对技术掌握的熟练程度，直接关系到保护性耕作实施效果的成败。我们注重加强对农民的培训，让机手熟练掌握保护性耕作技术要领和机具操作规程。技术推广人员深入田间地头，加强作业中的技术指导和服务。各级农机管理部门和技术推广机构，不但要做好项目区的宣传培训工作，而且要抓好项目区外农民的宣传培训工作。

3.3 Doing well in publicity and training

Doing well in publicity is an important way to enlarge the CT effect and improve the social awareness. Training is the important guarantee of ensuring effect. During these years, we make more publicity and reports of CT by means of media ,and give the public more understanding of CT significance, and constantly improve the farmer’s recognition and acceptance, changing their traditional tillage ideas and from healthy social environment by setting up the thinking of scientific farming and making them eliminate the sense of unsafe to the technology. The CT implementing effect depends on the technical experience grasped by the farmers and machine drivers. We pay more attention to farmers’ training and make them to be skillful in CT technological points and machine operating procedures. The extension persons go to the fields and providing more technical instruction and service. The machinery administrative offices and technology extending departments in all levels not only do well in the publicity and training in the program sites, but also do well in those outside the sites.

3.4 规范项目管理

要不断总结工作经验，加强保护性耕作项目管理的科学化、规范化和制度化建设。项目的确定，应当在自主试验示范一年以上的基础上设立省级示范县，在省级项目示范推广三年的基础上设立部级示范县，部级示范县要连续实施3年。这样部级项目结束时，该项目县已连续实施7年以上，农民的认知和接受程度已基本普及，建立长效机制的条件已基本具备。

3.4 Standardizing and regulating the program management

Working experience must be summed up continuously and the CT program management should be enhanced scientifically, regularly and systematically. The program selection is that province-level demonstration county should be set up on the base of self-experimenting demonstration for more than 1 year, and ministry -level county should be set up on the base of popularizing the province-level program for 3 years. The ministry-level county must continue to implement for 3 years. So when the ministry program ends, the county will constantly practice for more than 7 years. With popular recognition and acceptance the conditions of establishing lasting effect mechanism will be mature.

4、结论

保护性耕作长效机制的建立是个较漫长的过程，需同时具备4个条件，即成熟的技术模式和合理的工艺路线、优质的保护性耕作机具、农户对保护性耕作技术的充分认识和接受、机手良好的经济效益。目前，影响长效机制建立的关键因素是农民的认知和接受程度，因此，当前政府行为仍应占主导地位。在项目的示范带动下，连续实施7年以上的项目区可基本建立保护性耕作长效机制。

4.Conclusion

It’s a long process of establishing lasting effect CT mechanism and needs of 4 conditions at the same time. These are mature technological modes, proper working process, high quality of CT machineries, enough recognition and acceptance to CT technology by farmers and good economic benefits earned by the drivers .At present, the key factor affecting the establishment of lasting effect mechanism is the farmers’ recognition and acceptance. Therefore, the administrative behavior should still play a dominant role. Under the leading of program demonstration, the lasting effect CT mechanism can be set up in the areas of implementing the program constantly for more than 7 years.

祝各位代表

身体健康

万事如意