Structural strength of loess in mountainous areas and optimization of rural public management services based on 5G Internet of Things

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Abstract
This article introduces the current status of cellular IoT technology and demonstrates the evolution from C-IoT to the fifth-generation mobile communication system, including key technologies such as network function virtualization, software-defined networking, and mobile edge computing and big data. A detailed analysis of key technologies and solutions shows that 5G C-IoT can effectively expand the business functions of C-IoT. As we all know, loess is widely distributed in Northwest China. Due to the large-scale development of the western region and the development of the "One Belt, One Road" project, the special structure and degradability of loess has more and more significant impacts on the project, which is essential for maintaining structural strength in all directions. The opposite sex is essential. Research shows that with the development of rural revitalization strategies, the demand for public products and services in rural areas will also increase. Therefore, there is an urgent need to improve the level of rural public administration. On this basis, this article analyzes the current situation of public products and services of rural public organizations in China. The rural government is currently city-oriented, but the grassroots government lacks long-term planning, the management scope of rural autonomous organizations is narrow, and the governance capabilities in rural areas and terrain insufficient. This article provides appropriate optimization suggestions and finds effective methods to improve the level of rural public management. When building a new situation, problems such as low public administration efficiency, lack of management talents, and imperfect management systems have become obstacles to the construction of a new rural economy. Therefore, this article puts forward suggestions on the current dilemma of public management in China’s new agricultural construction to ensure the development of new rural economic construction.

Keywords 5G Internet of Things · Structural strength of loess in mountainous areas · Rural public management · Service optimization

Introduction
The cellular Internet of Things is a low-power wide-area Internet of Things with cellular networks as the main access method. It is an important path for the development of the Internet of Things after 10 years. It includes commercial Internet of Things 2G, 3G, and 4G and modern machines for commercial purposes. It supports mobile edge computing and network separation technology by freezing the first version of the standard for the fifth-generation mobile communication system for quasi-communication and narrowband Internet of Things (Mo et al. 2014). It has the best network skills and can provide technical guidance for the further development of C-IoT and the foundation (Ouyang et al. 2019). Based on the analysis of the C-IoT Live network deployment plan, this article introduces the 5G-based network architecture in detail (Paton et al. 2010). Loess is widely spread around the world. Chinese scientists have conducted a lot of research on loess and have obtained rich research results (Peng et al. 2001). In the early days of the founding of New China, China was undergoing a large number of engineering designs, and 5G was about to be commercialized. 5G fully considers the trend of communication and computer integration and introduces the concepts of software-defined networking and network
function virtualization (Ramos-Vázquez and Armstrong-Altrin 2019). The research on loess in this article mainly focuses on the formation and basic physical and mechanical properties of loess (Ritts et al. 2001). Previous scientists have conducted more in-depth research on the structure and degradability of loess (Santosh 2010). However, in most studies, vertical samples are used exclusively for engineering structures, such as loess foundations under vertical loads (Tao 2003). The relationship between the structural strength of loess and the scanning angle is U-shaped, but the U-shaped structural strength of the undisturbed loess is more obvious than the U-shaped broken structure, indicating that it is a submerged structural strength (Wan et al. 2013). The structural strength of the undisturbed loess is lower, and the anisotropy is stronger than that of the damaged structure (Wang and Guo 2017). As the water content increases, the anisotropy of the strength of the two structures decreases. Rural public administration mainly refers to the management and regulation of rural issues by local rural governments and other nongovernmental organizations in accordance with laws, regulations, and village rules and regulations, the reasonable allocation of rural collective land use rights, other rural community resources, and the provision of community products and the provision of public services (Wang et al. 2001). The rural government is an important tool for China’s grassroots work, but the rural government is more complicated, difficult, and arduous than other governments. After summarizing, analyzing, and reflecting on the abovementioned problems, this article puts forward some suggestions for improvement to effectively solve the problems of rural public management, improve the level of rural public management, and optimize the quality of rural public products and catering supply (Wang et al. 2012). The main goal of rural public administration is to provide comprehensive public products and services, and this must be achieved by relying on a large amount of financial and material resources (Wang et al. 2013).

Materials and methods

Research data

The test soil was taken from the loess at the edge of the loess plateau in the geopark, and the original soil sample was obtained from the exploration well using the soil extraction method, with a depth of 2.5 to 4.0 m. The soil is loose. The soil samples are gray-yellow wormholes with large holes, rare plant roots, white-spotted salt films, and a few granular calcium nodules scattered on the ground. The relative density of soil particles is 2.72, the moisture content in the natural state is 20.5%, the density in the dry state is 1.18–1.22g/cm³, the porosity in the natural state is 1.26, and the saturation is 44.25%. As shown in Table 1.

Research methods

Key technologies of 5G Internet of Things

In the context of the Internet of Things, sufficient network bandwidth and transmission speed must be used to support the development of all areas of life. As an example of an existing mobile communication system, the frequency range of the system is basically in the 3GHz range, which can meet simple daily needs. In busy online activities, the number of uses increases rapidly in a short period of time, and bandwidth resources will be insufficient. Network overload will affect how users use it. However, in high-frequency transmission technology, broadband access can reach 284.7 GHz, which is twelve times the total microwave bandwidth. In other words, although the names of microwave and millivolt are similar, the ranges are quite different. Compared with microwave, the frequency of millimeter wave is lower, and the frequency of millimeter wave is usually between 27.3 and 350GHz. Due to their small size, they can be miniaturized, which allows the production of devices with smaller volumes and fewer consumables. In addition, ultra-speed communication and short-distance communication can be achieved, and the compatibility with 5G is also very good.

Calculation of structural strength of loess

Considering the convenience of sample preparation and the consideration of using existing equipment for geotechnical testing, as well as the sample preparation size of unconsolidated and nonderivatized triaxial samples, the samples used for this test were determined as cylinders and triaxial cross sections. The sampler cuts out an undisturbed loess sample with a height of 10 cm and a diameter of 3.91 cm. Many studies have shown that the aspect ratio of the sample is a factor in the test results. The sample test result is not significant, and the aspect ratio of the sample is 2.56. During the tensile test, both ends of the sample were fixed with clamps. The construction clamp keeps both ends of the sample within 2 cm, so the effective length of the sample is 6 cm. According to Saint-Venant’s principle, the clamp only has a significant effect on the end with a boundary, but the effective length is very small and can be ignored. It is planned to conduct tensile tests on samples with different moisture content and prepare two samples for each moisture content. Moisture content configuration: Because there are 0 tests, they are 5%, 10%, 15%, 20%, and 25%, respectively. For a total of 60 soil samples, there are 3 test conditions, namely 1 and 3 wet and dry cycles. For tensile strength, there are unsaturated undisturbed and modified loess samples. For the undisturbed loess sample with a dry-wet cycle of 0, the test uses the water film transfer method and the air-drying method to control the moisture content of the sample. This formula is used to calculate the
amount of water required to increase or decrease the sample. The calculation formula for increasing or decreasing the amount of water is as shown in formula (1):

\[ m_w = \frac{0.01 \times (w - w_0)}{1 + 0.01w_0} \times m_0 \]  

(1)

When the water content in the soil sample is high, the slope of the curve will slow down, indicating that as the water content increases, the soil tensile strength is less affected by changes in the water content, but when the water content decreases, the tensile strength will also increase. This occurs rapidly at high water content, which indicates that the tensile strength changes of soils with low water content are more sensitive than soils with high water content. In the same dry-wet cycle, the tensile strength of undisturbed loess and improved loess is highly dependent on the soil moisture content, and both increase with the decrease of moisture content, showing an obvious nonlinear upward trend; Eq. (2) is exponential function ratio and its matching ratio:

\[ \sigma_t = a e^{-k w} \]  

(2)

Therefore, the following conclusion can be drawn: the difference in tensile strength between the original loess with a dry-wet cycle of 0 and the original loess with a dry-wet cycle of 3 should be equal to the structural strength of the loess plus 0 times of remolded loess and improved loess is highly dependent on the soil moisture content, and both increase with the decrease of moisture content, showing an obvious nonlinear upward trend; Eq. (2) is exponential function ratio and its matching ratio:

\[ \sigma_0 - \sigma_3 = \Delta \sigma_{olt} \]  

(3)

\[ \sigma_{rt} - \sigma_3 = \Delta \sigma_{rlt} \]  

(4)

\[ \sigma_0 - \sigma_3 = \sigma_{rt} - \sigma_3 + q_t \]  

(5)

The above formula shows that the difference between the tensile strength of 0 times wet and dry cycles and the tensile strength of 3 times wet and dry cycles, kPa, the first letter of the subscript is similar to the previous definition, and the second and third letters represent the tensile attenuation Meaning.

**Results**

**Loess structural strength test results**

In the test, 0, 1, and 3 cycles of dry and wet undisturbed loess and modified loess were carried out. Due to the large number of dry and wet cycles, the stress-strain curves of loess with different dry and wet cycles and different water contents were obtained. This paper analyzes the stress-strain curves of the original and improved loess of two and three dry-wet cycles. The analysis of the test results shows that the moisture content, and the number of dry-wet cycles significantly affect the tensile properties of the original loess, while the moisture content at this depth is mainly concentrated between 5 and 25%. Therefore, the range of the dry and wet loess test cycle will be in the range of 5 to 25%. Perform 0, 1, and 3 wet and dry cycles, respectively. Taking a test sample with a moisture content of 10% as an example, the dry-wet cycle process is shown in Figure 1. The sample drying process uses natural air drying, and the humidification process uses the water film transfer method. Dry to 5% and then moisturize after 25%. The soil sample is sealed and aged for 24 hours to ensure sufficient moisture transfer; then the sample is dried and moisturized again. After the number of drying and drying cycles required for the test is reached, the soil sample is air-dried or moisturized to the moisture content in the test, and the soil sample that reaches the moisture content of the sample is sealed and cured for 24 hours, and then a tensile test is performed.

![Fig. 1 Schematic diagram of the dry and wet cycle process](image-url)

**Experimental design**

According to the soil moisture test results of the leased site and taking into account the soil depth, it is assumed that the loess

| Soil sample | Dry density g/cm³ | Natural moisture content % | Soil gravity Gs | Plastic limit w/ % | Liquid limit wL/ % | Plasticity index Ip | Void ratio e |
|-------------|------------------|---------------------------|----------------|-------------------|------------------|-------------------|-------------|
| Loess       | 1.18–1.22        | 20.5                      | 2.72           | 19.5              | 28.8             | 9.3               | 1.26        |

| Table 1 Basic characteristic parameters of test soil | Soil sample | Dry density g/cm³ | Natural moisture content % | Soil gravity Gs | Plastic limit w/ % | Liquid limit wL/ % | Plasticity index Ip | Void ratio e |
|------------------------------------------------|-------------|-------------------|---------------------------|----------------|-------------------|-------------------|-------------------|-------------|
| Loess                                           | 1.18–1.22   | 20.5              | 2.72                      | 19.5           | 28.8              | 9.3               | 1.26              |             |
and dry the difference between the numbers of wet cycles affects the load. The curve of the deformation coefficient of the loess sample in the stretching process is obviously different, as shown in Figure 2.

Figure 3 shows that whether it is loess that has undergone multiple drying and wetting cycles or undisturbed loess, the tensile stress of the soil sample increases with the increase of the tensile stress, and the curve is uniform during the entire tensile process of the soil sample. Show it. This is an obvious type of work hardening. The step of the stress-strain curve is more obvious in the process of loess stretching; especially when the water content is low, the step of the curve is particularly important, which can be divided into three typical the step, such as water content. Taking 5% of the soil sample as an example, the first straight line is the stage of elastic deformation.

According to the relationship curve between the initial state and the restored loess in Figure 2 and Figure 3, the tensile strength data of the loess is classified, and the tensile strength of the loess is plotted along the ordinate, and the moisture content is plotted on the ordinate. The abscissa represents the relationship between moisture content and tensile strength; see Table 2.

After cycling, the tensile stress and tensile stress of the original loess and modified loess with the same moisture content are less than or equal to 0 times the tensile stress and tensile stress of the wet cycle and dry cycle, especially the tensile stress of the soil sample is greatly reduced. The stage of elastic deformation is shortened, and when the moisture content is 5%, the tensile stress and tension of the soil sample drop the most. When the moisture content is 25%, the tensile stress and tension of the soil sample decrease less, dry and wet cycles will increase the tensile stress, and the tension of the changed soil sample decreases, but the decline of the two was mainly affected by the water content of soil samples. As the moisture content decreases, the tensile stress of the soil sample decreases, and the tensile stress decreases. The relationship between moisture content and tensile strength is shown on the abscissa, as shown in Figure 4.

Among them, is the tensile strength, kPa is the moisture of the soil sample, and and are parameters that vary according to the soil type and test method. Of course, for the number of wet and dry cycles, the relationship between soil tensile strength and moisture content is also different. See Table 3 for details.

The data is classified according to the curve between the tensile strength of loess and the number of wet and dry cycles. Figure 5 shows that the tensile strength of loess and modified loess with the same dryness decreases with the increase in the number of wet and dry cycles, but the damping the amplitude gradually decreases with the increase in the number of wet and dry cycles, and the tensile strength mainly tends to be stable. After one wet-dry cycle, the tensile strength of loess changes the most, and the tensile strength decreases by about 50%. After three wet-dry cycles, the extent of the weakening of the tensile strength decreases, and the tensile strength is usually stable.

The data in Table 2 are classified according to the relationship between the tensile strength of loess and the number of wet and dry cycles. It can be seen from Figure 6 that the increase in the number of dry and wet cycles, the tensile strength of undisturbed loess and loess with the same water content, the intensity decreases with the increase of the number of dry and wet cycles, and the attenuation amplitude
gradually decreases with the increase of the number of dry and wet cycles. The tensile strength value of the wet cycle usually tends to be stable. After a dry-wet cycle, the tensile strength of the loess changes the most, and the tensile strength decreases by about 50%. After three wet-dry cycles, the tensile strength of the loess decreases after 50%, the amplitude of the tensile strength is weakened, and the tensile strength is usually stable.

**Experimental results of the mechanical mechanism of the strength of the loess structure**

This article mainly describes the tensile damping value of the original loess and the improved loess under the dry-wet cycle and determines the tensile damping value of the loess. The tensile damping value of the loess under the dry-wet cycle is defined as 0. Tensile strength during wet cycle times the tensile strength minus the tensile strength after N wet cycles and wet cycles is the damped tensile strength value, and $N_{dtq}$ is used to represent the damped tensile strength value. The superscript $N$ represents the number of dry and wet cycles, and the subscript represents loess. The importance of damping tensile strength is analyzed, and the difference between the tensile strength of loess after one dry wet cycle and that after three dry wet cycles is listed, but it is not represented by an icon. Using the data in the table, classify the relationship between the tensile damping value of the original loess and regenerated loess and the number of dry and wet cycles, and then perform the tensile damping value of the original loess and regenerated loess that have undergone different drying and humidification cycles. Using Table 4, it can be seen that the tensile strength of loess decays more after the dry-wet cycle of loess and after three dry-wet cycles, the difference between the loess and the other layer of dry-wet cycles gradually becomes equal, basically less than 3kPa. In principle, it can be assumed that after three wet-dry cycles, the tensile strength of loess tends to stabilize, and even after several wet-dry cycles, its tensile strength is only slightly weakened. This corresponds to the change in the hardness of loess in its natural state, because natural loess always

| Table 2 | Tensile strength of undisturbed loess under the effect of dry-wet cycle |
|---------|------------------------------------------------------|
| Type of soil | Moisture content/% | 0 | Undisturbed loess | Cycle times/time | 3 | 0 | Reshape loess | Cycle times/time | 3 |
| Tensile strength /Kpa | | | | | | | | | |
| 5 | 23.72 | 14.53 | 11.56 | 20.44 | 13.12 | 10 |
| 10 | 18.24 | 10.98 | 8.6 | 15.83 | 9.24 | 7.8 |
| 15 | 12.5 | 6.74 | 5.06 | 15.83 | 5.5 | 4.55 |
| 20 | 8.14 | 4.65 | 2.88 | 6.5 | 3.94 | 2.53 |
| 25 | 5.71 | 2.95 | 2.12 | 4.83 | 2.6 | 1.86 |

Fig. 3 Stress-strain curve of reshaped loess
experiences a long dry-wet cycle, but its hardness should be stable after the first dry-wet cycle. Otherwise, the soil strength in the loess area will not be able to maintain the current strength value.

The structural strength of loess is the adhesion strength formed during the formation of the soil structure. It depends on the structure of the soil. The destruction of the soil structure leads to the disappearance of the structural strength. As far as the strength component of loess is concerned, the structural strength of loess is the result of enhancing the cohesion of the material. The structural strength of loess can be quantified by the difference between the final stress of undisturbed loess and remolded loess under 0 dry-wet cycles, and the symbol $t_q$ is used to express the structural expression of its tensile strength. It can be seen from Table 4 and Figure 7 that the structural tensile strength of loess is very low, generally less than 5kPa, but when the water content is low, the structural tensile strength of loess is higher when the water content is low. The strength of loess is affected by water content and gradually increases with the decrease of water content and shows a nonlinear upward trend.

The data summary formula in Table 5 can be used to obtain the relationship between the weakened value of the tensile strength of the undamaged loess and the structural strength.

### Loess compressive strength results

Due to the unlimited compression test, under the influence of dry and wet cycles, the 5 different moisture contents of the original and modified loess samples are 5%, 10%, 15%, 20%, and 25% of the original loess and modified loess, respectively. So strictly follow the “geotechnical characteristics.” The “standard 1999” test method obtains the stress-strain curve of the compressive strength of the loess that is not disturbed and restored under 0, 1, and 3 dry-wet cycles. Here, only 0 and 3 are undisturbed and restored. After sorting the data, choose the following conclusions.

As can be seen from Figure 8, regardless of the original sample or the converted soil sample, after several drying and drying cycles, the compressive stress of loess first increases nonlinearly, then reaches the peak, then decreases, and finally tends to reach a certain stability value. Under different water content, the deformation curve of loess under dry and wet cycle conditions shows different fracture characteristics. If the moisture content in the soil is less than 10%, the stress-strain curves of the original sample and the modified sample will show obvious brittle failure, and the stress will drop sharply after reaching the final strength, the soil sample will collapse, and there is no obvious step.

### Table 3 The relationship between the tensile strength and moisture content of loess under dry-wet cycles

| Loess type       | Number of wet and dry cycles/time | Relation          | Correlation coefficient |
|------------------|----------------------------------|-------------------|-------------------------|
| Undisturbed loess| 0                                | $\sigma_t = 35.99e^{-0.07w}$ | 0.995                   |
|                  | 1                                | $\sigma_t = 23.36e^{-0.08w}$ | 0.978                   |
|                  | 3                                | $\sigma_t = 19.11e^{-0.09w}$ | 0.987                   |
| Reshape loess    | 0                                | $\sigma_t = 31.12e^{-0.07w}$ | 0.99                    |
|                  | 1                                | $\sigma_t = 19.00e^{-0.08w}$ | 0.986                   |
|                  | 3                                | $\sigma_t = 16.85e^{-0.09w}$ | 0.983                   |
Discussion

Structural strength analysis of loess

From the tensile test of the loess, the influence of the moisture content, and the number of dry-wet cycles on the tensile strength of the loess and the value of the damping value and the tensile strength, the tensile curve of the loess is obtained. Under the influence of wet and dry cycles, the relationship between the structural strength of loess and the following findings is as follows:

In the influence of moisture content and the number of wet and dry cycles, the tensile stress-strain curve of loess is obviously different, but they are all brittle defects (Wang et al. 2017). This curve mainly refers to the type of strain hardening, the lower the moisture content in the soil. The state of the stress-strain curve of loess is more obvious (Wu et al. 2006). The number of wet and dry cycles does not change the law of the stress-strain curve of loess under the same water content, but it reduces the stress and pressure (Xia et al. 2006). Under different moisture content, the tensile strength of loess is very low (Xu and Zhao 2005). As the moisture content decreases, the tensile strength of loess increases nonlinearly, and the fitting is an exponential function, while the moisture content is at low moisture (Xu et al. 2011). It is more sensitive to higher moisture content, and the tensile strength of loess is significantly affected by the number of dry and wet cycles. As the number of wet and dry cycles increases, the damping amplitude of its tensile strength decreases (Xu et al. 2013a). After the dry-wet cycle, the attenuation amplitude of loess is reduced, and the tensile strength of loess is the largest. After the second wet and dry cycle, it becomes stable (Xu et al. 2013b). In the same dry and wet cycle, the tensile damping capacity of loess is also affected by soil moisture (Xu et al. 2015). The influence of the dry-wet cycle under low moisture content is greater than that of the tensile strength. When the moisture is more sensitive, the tensile damping strength of loess will be higher (Yan et al. 2000). Under the same moisture content and the same dry-wet cycle, the weakened value of tensile strength of undisturbed loess is greater than that of reformed loess (Yuan and Wang 2006). The main reason is that the cycle of dry and wet loess reduces the cohesion of its reinforcement and adsorption strength, and the cycle of dry and wet plastic loess reduces its adsorption capacity (Zeng et al. 2008). The tensile strength of loess is less than 5 kPa, and it increases nonlinearly with the decrease of water content, and at low water content, the tensile strength is sensitive to higher water content. By analyzing the tensile strength composition of the original loess and reformed loess during the dry-wet cycle, the enhanced cohesion and adsorption strength of the original loess during the dry-wet cycle can usually be reduced (Zhai and Peng 2007). The decrease in adsorption strength is due to the following fact: After the wet harvest, the soil strength is basically stable, combined with the structural strength of the loess and the damping value of the tensile strength of the undisturbed loess (including 0 dry-wet cycles). The undisturbed loess after 3 dry-wet cycles is considered to be the damping value. Subtracting the attenuation value of the tensile strength of the loess whose dry-wet cycle is 0, and the
loess whose three dry-wet cycles are restored represents the structural strength of the loess, and the theory shows that the dry soil is finally degraded in the data under dry and wet conditions. It’s effective. The structural tensile strength of wet cycle loess, that is, the loss of enhanced cohesive force in undamaged loess, is similar to the structural breaking strength of undamaged loess through artificial compaction.

### Analysis of the necessity of optimizing rural public management services

At present, most rural areas are far away from cities and have inconvenient transportation. They lag behind urban areas in terms of life concepts, consumption levels, and cultural education. Judging from the current situation, most of the functions of public administration in rural areas are insufficient, especially due to the lack of a complete administrative system in medical and health care, education and culture, and transportation. In addition to outdated infrastructure, rural residents also find it difficult to obtain high-quality public management services. If the current governance difficulties are not resolved, the quality of life of farmers will be impaired, and the economic level of rural areas will not be improved. In the construction of a new situation, public management must play an important role, must strengthen the protection of farmers’ legitimate rights and interests, and must effectively stimulate rural economic development. Building a new rural economy is a long-term and arduous project that requires the active participation of all sectors. The government, the market, and the country must jointly assume the responsibility of public administration and establish a public management model based on the government, the market as the operator, the farmers as the main participants in the economy and society, rural development and the actual needs of the people and establish public administrative services system. Currently, public investment in rural public utilities is mainly concentrated on the ecological environment, while investment in public

### Table 4  Tensile attenuation value and structural strength of loess under dry-wet cycles

| Type of soil | Moisture content/% | Cycle times/time | Undisturbed loess | Difference between 1 time and 3 times | Reshaped Loess | Difference between 1 time and 3 times | Structural strength of loess |
|--------------|--------------------|-----------------|-----------------|-------------------------------------|---------------|--------------------------------------|-----------------------------|
| 5            | 9.18               | 12.18           | 3               | 8.3                                 | 10.42         | 2.12                                 | 3.3                         |
| 10           | 7.26               | 9.64            | 2.38            | 6.59                                | 8.03          | 1.44                                 | 2.41                        |
| 15           | 5.76               | 7.44            | 1.68            | 4.9                                 | 5.85          | 0.95                                 | 2.1                         |
| 20           | 3.49               | 5.26            | 1.77            | 2.56                                | 3.97          | 1.41                                 | 1.64                        |
| 25           | 2.76               | 3.59            | 0.83            | 2.23                                | 2.97          | 0.74                                 | 0.88                        |

Fig. 7 The relationship between the tensile structure strength of loess and the moisture content
infrastructure for rural people’s lives continues, which will have a negative impact on the trend of urbanization investment. The rural grassroots administrative departments and the general public should realize the positive significance of public administration, increase farmers’ income by integrating different policies such as agriculture and high-quality agriculture, and grasp the development context of new rural areas and the integration of various rural areas.

Analysis of the dilemma of rural public management

Unclear government functions

Building a new rural economy requires not only the support of farmers but also the leadership of the government. At present, state functions in rural areas have not been fully implemented. The main administrative unit in rural areas is still the village. In the execution of public administration tasks, administrative divisions at all levels are superficial and play an important role. There are also some public administrative decisions that are inconsistent with the actual situation in rural areas, leading to social instability in rural areas and hindering the development of the new rural economy. Many decision-making departments do not understand the work content in rural areas, and some measures are difficult to implement in rural areas. In addition, some employees have low-quality and low service consciousness, which makes it difficult to effectively protect the interests of farmers, which makes the situation of the rural government more complicated.

Insufficient funds for rural public utilities

As far as China’s current social conditions are concerned, the economic development of most rural areas is in a backward state, and some areas are even an important goal of China’s poverty reduction. At present, due to various reasons, the government’s investment in rural public utilities has decreased, and it is difficult to meet the actual needs of rural areas. As a result, the daily needs of farmers, such as hydroelectric power generation and the Internet, cannot be met. The imperfect

| Moisture content/\(\%\) | (1) \(\frac{\Delta\sigma}{\Delta\sigma_{\text{dry}}^{\text{dry}}}\) | (2) \(\frac{\Delta\sigma}{\Delta\sigma_{\text{dry}}^{\text{dry}}}\) | (3) \(\frac{\Delta\sigma}{\Delta\sigma_{\text{dry}}^{\text{dry}}}\) | (1)+(2) \(\frac{\Delta\sigma}{\Delta\sigma_{\text{dry}}^{\text{dry}}}\) |
|--------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| 5                        | 3.3                             | 10.42                           | 12.18                           | 13.72                           |
| 10                       | 2.41                            | 8.03                            | 9.64                            | 10.44                           |
| 15                       | 2.1                             | 5.85                            | 7.44                            | 7.95                            |
| 20                       | 1.64                            | 3.97                            | 5.26                            | 5.61                            |
| 25                       | 0.88                            | 2.97                            | 3.59                            | 3.85                            |

Fig. 8 Compressive strength stress-strain curve of undisturbed loess
configuration of public facilities directly leads to poor living conditions of farmers, and their living standards have not improved significantly, and the social environment in rural areas is far behind the ecological environment.

Absence of the rural public management legal system

Although China has a basic government legal system, it is currently unable to adequately protect the basic interests and needs of farmers through laws. Currently, the rural market environment in China is relatively chaotic. Some enterprises are spontaneously established by farmers, and they are prone to disputes when doing business. In the face of the difficult agricultural trade market, the government lacks effective intervention and supervision measures, which will hinder the development of enterprises and aggravate the contradictions among farmers, which not only hinders the pace of economic development but also reduces the quality of farmers.

Lack of talents in rural public management

With the political support and encouragement of the Chinese government, the social prospects and economic conditions of rural areas have undergone tremendous changes, and some public infrastructures have gradually improved. However, due to the macroeconomic downturn in rural areas, it is difficult to retain professionals for public administration work. Rural college students generally think that there are no job opportunities in rural areas, and most of them like to develop in the city. Public administration is facing a huge shortage of talents. Currently, the employed talents in public administration are too old, their ability to accept new things is weak, and the lack of correct innovative measures and governance countermeasures makes it difficult to solve the problem between rural economic development and farmers’ lives. Contradiction, the lack of rural human resources is the main obstacle to rural economic development.

Strategy for optimizing rural public management services

Optimize the functions of grassroots government agencies

Only by placing grassroots rural cadres with farmers can they understand the real challenges facing farmers and make targeted governance decisions. The grassroots government departments must ensure fair and just recruitment, and the internal staff of the organization can use the old cadres to lead the new cadres and the new and old shared training methods to improve management experience. Transfer management information, transfer rights to farmers, serve farmers as the main standard, supervise farmers, perform government functions, safeguard farmers’ legal rights, and create an administrative environment for rural governments. On this basis, government departments should speed up reforms and gradually promote the openness and transparency of government work through the establishment of a work supervision system and personal accountability system, so as to promote the supervision of farmers and at the same time establish a sense of responsibility among all managers.

Realize the diversification of public utilities

In order to further develop the new rural economy, China needs to increase capital investment in rural public utilities, and the focus of capital investment is shifting from rural green buildings to social buildings. Eliminate gaps in rural education and training, medicine and health care, public services, and social order, so that farmers can afford to get sick and go to school. The government should increase investment in rural public service infrastructure to effectively solve the “three rural” issues. Maintaining rural social order is an important part of public services and provides a prerequisite for rural economic development. In view of the current weak public services and backward infrastructure in rural areas in China, the government needs to make adjustments in agricultural development, farmers’ income, rural health, educational environment, and cultural development. The government must eliminate the rural poor and backward social image as soon as possible through a variety of public utilities. Taking into account the current situation in rural China, the payment system for government fiscal transfer payments is not yet ideal. In order to narrow the gap between urban and rural living standards, it is necessary to strengthen the development of the public financial transfer payment system and improve the level of public services. The government can do its own work, integrate the transfer payment system, and increase investment in agricultural development to continuously improve the quality of life and living standards of farmers.

Improve the legal system of public utilities management

Public administration can be implemented by improving the laws governing public service management. It can focus on improving the direction of agricultural investment, that is, encouraging foreign companies to invest through government functions, while ensuring the legitimate rights and interests of investors and farmers, and providing dispute resolution and the disputed framework. Legally, farmers will be allowed to actively process and transport agricultural products, so that agriculture will develop in the direction of modernization, intelligence, and industrialization. As part of the management of rural public utilities, it is necessary to formulate targeted laws and regulations to restrict everyone’s behavior, ensure that government work can be carried out, and ensure the sustainable development of economic development and
infrastructure construction in rural areas. In order to achieve this, in this case, the law must be obeyed. The order of fair competition and good public order must be implemented in accordance with the law. Rural areas can work with professional law firms to formulate village and community agreements, combining farmers’ cultural levels and incorporating legal ideas into government governance. In order for farmers to obey, abide by and understand the law, higher-level departments will jointly build a new socialist landscape, maintain good market and social conditions in rural areas, and achieve coordinated progress in governance and economic development.

**Optimize rural talent training and selection models**

In the context of the new rural economic construction, it is necessary to optimize and improve the overall quality of rural management groups. The state can take appropriate financing measures to improve the cultural level of existing management personnel, enrich management knowledge, actively introduce outstanding management talents, and form a complete government talent development chain. The first is to strengthen the construction of the talented leadership team, provide centralized management training and courses for existing cadres and leaders in rural areas, and hire management experts or agricultural experts to conduct management lectures or technical training for cadres and grassroots leaders. The existing difficulties in rural areas can be correctly understood. Leaders can learn advanced agricultural knowledge and technology, improve their cultural level and experience, combine regional and geographic advantages, use science and technology to innovate rural government services, and improve the accuracy of decision-making. Second, the talent reward system can be strengthened, combined with graduate education, and intensive management of talent management can be introduced, so that talents can enter the countryside and contribute to the economic and social development of the countryside. Rural areas should provide knowledge channels and channels for high-skilled and high-quality management talents, empower these talents with the ability to build and develop rural areas, enrich the initial labor force of rural labor, and implement highly feasible and health innovation, education, and training strategies.

**Pay attention to rural public service work**

With the construction of a new rural economy, the consolidation of rural compulsory education and the balance of urban and rural educational resources can not only provide rural students with better educational opportunities but also contribute to the healthy development of public administration. Adapt the ratio of rural teachers, school infrastructure, and school layout to the actual situation in the countryside. In order to optimize the resources and public management of rural compulsory education, the rural education and social environment should be designed so that teachers can focus on learning in a stable educational environment, and students can study earnestly in a stable social environment. Maintaining the social environment and stabilizing social order will improve the quality of life of farmers in rural areas, broaden their horizons, see more and more new things, and continue to provide innovative ideas for rural economic development. The government should support the development of rural education in terms of public administration and finance, effectively respond to rural education emergencies, create a high-quality education environment, solve farmers’ problems, and make rural education contribute to the social economy. In addition, the work of civil servants should also improve the rural medical and health system, pay attention to the formulation of scientific standards, establish an environmental protection system, improve the spiritual and cultural life of rural people, and thereby improve the rural social environment.

**Conclusion**

C-IoT, which focuses on eMTC and NB-IoT, will be promoted for commercial use, and 5G will be promoted on a large scale. Make full use of SDN, NFV, MEC, network segmentation, and big data analysis technologies supported by 5G networks and improve security design capabilities. 5G communication technology should improve its interoperability and expand communication bandwidth. At the same time, communication security protection needs to be strengthened to meet the communication needs of the Internet of Things era. Implementing C-IoT and 5G deployment in a single site and providing a flexible and unified access platform for a large number of heterogeneous terminals can effectively meet the needs of more decentralized and differentiated services. In the future, 5G C-IoT will develop towards smart open source and openness. The modernization of industrial structure will accelerate, the functions of IoT business applications will become more powerful, and a new era of applications is bound to come. Obviously, the strength of the underwater structure is higher than the strength of the damaged structure. The development of rural public administration is an important means to promote the rural restoration strategy, and the rural restoration strategy is an important guarantee for the rural government. With the rapid development of the rural economy and the continuous improvement of infrastructure, farmers’ desire for spiritual life and demand for community products and public services continue to grow. It has solved the current problems in rural public administration and solved many related problems in the rural public administration system. The inevitable problem is the improvement of the level of rural public administration. With the improvement of rural governance skills and the promotion of rural revitalization strategies, rural development is bound to change with each passing day, and the living standards of farmers
will get better and better. In building a new rural economy, government services still face many practical challenges. This is a major challenge for China’s rural economic development. Only by strictly controlling public administrative services and creating high-quality and high-quality rural public services can farmers lead a happy life, contribute to rural economic prosperity, and lay a solid foundation for the creation of China’s social and economic development.

**Declarations**

**Conflict of interest** The authors declare that they have no competing interests.

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