Evaluation of the effectiveness of tobacco leaf harvesting and curing quality improvement measures and study of influencing factors

Liping Chen\textsuperscript{1,a}, Guanglei Li\textsuperscript{1,b}, Yu Peng\textsuperscript{1,c}

\textsuperscript{1}Guizhou Province Company of China Tobacco Corporation, Guizhou

\textsuperscript{a} 53424855@qq.com, \textsuperscript{b} 591481246@qq.com, \textsuperscript{c} 1010263394@qq.com

Abstract. Promoting the implementation and consolidation of the tobacco harvesting, drying and quality improvement action, continuously improving the level of tobacco harvesting and drying, and promoting the quality and efficiency of tobacco production can contribute to the high-quality development of tobacco production. Based on data from 12 cities and prefectures in Guizhou Province, this article analyzes tobacco harvesting and drying loss rates, team construction, technology, and facility status, and evaluates the effectiveness of the tobacco harvesting and drying quality improvement action from multiple angles, and explores the factors influencing this action. The results show that the tobacco harvesting and drying quality improvement action carried out in Guizhou Province has significantly improved the overall quality of tobacco harvesting and drying. Further analysis shows that the loss rate of harvesting and drying, team construction, and facilities have all improved significantly compared to before. However, the core technology that plays a crucial role in tobacco harvesting and drying has not developed rapidly, providing certain reference for further improving the quality of tobacco harvesting and drying in the future.

Keywords: Tobacco leaf picking and roasting Picking loss rate, Technology and facilities.

1. Literature Review

Currently, research on the evaluation of the effectiveness of tobacco leaf harvesting and curing quality improvement measures and the study of influencing factors mainly focuses on two aspects, which are the harvesting and curing methods and process analysis. In terms of harvesting and curing methods, Chen Maojian et al. (2011) conducted field experiments to analyze the impact of one-time and split-time harvesting on the appearance quality and grade selection of the top six tobacco leaves. The results showed that one-time harvesting can significantly improve the quality of the upper tobacco leaves. Liu Yang et al. (2011) relied on field experiments to group and treat Yunyan 87 species according to maturity and adopt a three-stage curing process. The results showed that the samples obtained by cutting and curing with stems once for level 4 maturity had good effects in terms of appearance quality, tobacco leaf grade, etc. Du Weiwen et al. (2011) also obtained similar research results by studying the impact of one-time mature harvesting on tobacco leaf quality under the same cultivation measures. Xie Yishu et al. (2012) found that one-time harvesting and scattered leaf stack curing can improve tobacco leaf quality and reduce economic costs. In addition, Liu Hongguang et al. (2015) analyzed the harvest of different leaf ages and found the specific time for the best harvesting age for different varieties. Regarding process analysis, Wei Jianyu et al. (2014) compared the new tobacco leaf harvesting and transportation integration device with the traditional step-by-step curing method, and the results showed that the integrated harvesting and transportation device significantly improved the tobacco leaf quality while achieving a significant cost reduction. Liu Jiuyu et al. (2014) found that the integrated curing room with hanging basket curing method can promote the coordinated transformation of tobacco chemical components, reduce the cost of curing, and improve the proportion of top-quality tobacco leaves. Mu Qing et al. (2018) proposed that by changing operation processes and on-site management, applying process operation procedures, and achieving organizational management, the standardization of tobacco leaf harvesting can be achieved, and tobacco leaf curing quality can be accurately grasped. Huang Yonghui et al. (2021) compared the new production organization mode with the traditional self-curing mode based on the
research data of six counties in Longyan, Fujian. They carefully examined the differences in every process from production to finished products for tobacco leaves and analyzed the results to help achieve an increase in yield and profitability in tobacco production and management.

2. Research Status

2.1 Status of Curing Loss Rate

The annual tobacco planting area in Guizhou Province is about 1.8 million acres, among which Zunyi, Bijie, and Qianxinan have the largest tobacco leaf planting area, accounting for about 70% of the province's tobacco leaf planting area. According to the statistical data of tobacco leaf harvesting loss in 2022, the average harvesting loss rate in the province is 6.37%, a decrease of 0.34 percentage points compared to 2021. Zunyi, Liupanshui, and Qianxinan three cities have the lowest curing loss rates among the nine regions in the province. The curing loss rates in Guiyang, Anshun, Tongren, Qiannan, and Qiangdongnan are higher than the average curing loss rate in the province. These five cities account for 23.23% of the total amount of cured tobacco leaves in the province. Therefore, there is still a great room for improvement in tobacco leaf curing technology in the entire province. The decrease in the average curing loss rate in the province was mainly due to the formation of a service team and the choice of tobacco leaf harvesting practices. In terms of the formation of the service team, the entire province has centralized training to create two teams: professional curing experts and tobacco leaf harvesting and compiling teams. Based on the clustering curing rooms, outstanding professional curing experts have been selected and cultivated young talents through tutoring. Additionally, one tobacco leaf harvesting and curing service team has been set up for roughly every 10 curing rooms and 200 mu, and professionalized operations have been fully promoted to improve the efficiency and quality of operations. As of 2022, the entire province has trained 8,126 professional curing experts and formed a professional tobacco leaf harvesting service team consisting of 71,400 people. The issue of difficult hiring of workers and poor quality of hired labor has been effectively resolved during the tobacco leaf harvesting period. In terms of choosing the right mode, the entire province has comprehensively considered the level of scale and cluster of tobacco leaf production in each region, the service ability of the cooperatives, and the level of business management to guide farmers to choose the appropriate professional curing modes. The entire province has created 1,363 professional curing demonstration sites and realized professional harvesting of 3.76 million piculs (1 picul is equal to 133.33 pounds) of tobacco leaves, accounting for 91.5% of the total amount of cured tobacco leaves by promoting the integration of tobacco leaf harvesting and curing and "1+N" specialized curing methods. Meanwhile, various regions have implemented professional harvesting technologies and team management regulations that are consistent with the local situation. Bijie City has further promoted the improvement of tobacco leaf harvesting and curing quality, minimized tobacco farming curing loss, and increased tobacco farmers' tobacco income by building a professional curing team, implementing field classified picking, pre-curing classification, implementing the curing process curve, and strengthening the process assessment. Zunyi City uses the "1+N" professional curing as a lever to subdivide tobacco leaf processing, mature harvesting, classified compiling tobacco on the drying rack, "442" curing process, tobacco leaf harvesting and curing loss target tasks to the stations, groups, and technicians to continuously improve curing quality. Anlong County, Qianxinan, has comprehensively promoted the "1+5+N" team-based tobacco leaf harvesting and curing integration mode, significantly improving the quality of tobacco leaf harvesting and curing and reducing the curing loss rate to a historical low of 4.75%. Tongren has effectively improved the service efficiency by launching the "1211" assembly line classification and compiling mode through the pilot conveyor belt.
2.2 Current Status of Team Building

In terms of team building, Guizhou Province is accelerating the establishment of sound incentive mechanisms to enhance the leading role of the tobacco leaf picking and curing talent team. Guizhou Province has a good "first-mover advantage" in tobacco leaf picking and curing and needs to fully combine sustainable and high-quality development of tobacco leaf picking and curing with talent leadership in light of the local situation. Utilizing the basic role of the local tobacco leaf picking and curing innovation platform to provide support for talent to carry out tobacco leaf picking and curing innovation, increasing education and training efforts, establishing a tobacco leaf picking and curing talent team system that leads by example, building a good professional talent training channel, and improving the overall professional talent competence are necessary steps to be taken.

Further deepening the talent team building, upgrading skills and service level, is of great significance for improving tobacco yield and maintaining the picking loss rate in a reasonable range. The drying team is the key support for the quality improvement of tobacco picking, which requires focusing on team building, skill training, and technical service, to drive the improvement of tobacco leaf picking and curing quality. The relative shortage of high-tech tobacco leaf picking and curing talents is an important factor that restricts the quality improvement of Guizhou Province's tobacco leaf picking and curing. The uneven distribution of "provincial experts" and "municipal experts" in various regions and the existence of areas that have not introduced or cultivated talents have to some extent impeded the high-quality development of tobacco leaf picking and curing in the region. In recent years, tobacco leaf picking and curing has faced many new problems and challenges, and Guizhou Province's tobacco leaf picking and curing also shows new characteristics and phenomena. Therefore, comprehensive and high-quality tobacco leaf picking and curing teams have received a great deal of attention. They are a key factor in promoting the comprehensive quality improvement and efficiency enhancement of tobacco leaf picking and curing in the province.

Table 1 The situation of talent team construction for tobacco harvesting and curing in Guizhou Province.

<table>
<thead>
<tr>
<th></th>
<th>2021</th>
<th>2022</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Backbone of baking technology</td>
<td>Masters and students</td>
</tr>
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<td>Guiyang</td>
<td>21</td>
<td>12</td>
</tr>
<tr>
<td>Zunyi</td>
<td>230</td>
<td>178</td>
</tr>
<tr>
<td>Liupanshui</td>
<td>34</td>
<td>14</td>
</tr>
<tr>
<td>Anshun</td>
<td>7</td>
<td>20</td>
</tr>
<tr>
<td>Bijie</td>
<td>191</td>
<td>66</td>
</tr>
<tr>
<td>Tongren</td>
<td>147</td>
<td>38</td>
</tr>
<tr>
<td>Qiandongnan</td>
<td>9</td>
<td>90</td>
</tr>
<tr>
<td>Qiannan</td>
<td>63</td>
<td>92</td>
</tr>
<tr>
<td>Qianxinan</td>
<td>47</td>
<td>37</td>
</tr>
</tbody>
</table>

Table 1 shows that since 2021, Guizhou Province has been continuously promoting important measures to improve the quality of tobacco leaf picking and curing in the whole province, and the organization management and team building of tobacco leaf picking and curing have gradually achieved good results, striving to promote a more balanced team building and more scientific and rational organization management. This requires focusing on cultivating skilled technicians, technical backbone personnel, mentor-apprentice relationships, and professional roasters through the quality orientation, gradually increasing the number of professional talents and achieving scientific growth. In 2021, the talent team building for tobacco leaf picking and curing in Guizhou Province has made initial achievements, and the talent inventory in various regions has remained within a reasonable range. Among them, Zunyi and Bijie have significant talent reserves, which have a strong attraction for talents in the province, but there are also regions with insufficient reserves of tobacco leaf picking and curing talents. For example, Anshun only has 7 technical
backbone personnel, 20 mentors, and 30 professional roasters, and Qiandongnan only has 9 technical backbone personnel, 90 mentors and 300 professional roasters. These regions still have large room for improvement in their talent reserves for tobacco leaf picking and curing. In 2022, Guizhou Province will further implement the technical backbone personnel of roasting by adding 459 personnel, fully exerting the "passing, helping and mentoring" roles of the technical backbone personnel, and training 747 apprentices, organizing each apprentice to roast or follow the process of tobacco leaves roasting, improving the apprentices' roasting practical skills, continuously strengthening the roasting team, and expanding the depth of the talent reserve. Among them, the technical backbone personnel of roasting in Qiandongnan will be increased to 72, and the number of mentors and professional roasters will be increased to 136 and 362, respectively. The advantages of talent will gradually emerge.

2.3 Current Status of Technology and Facilities

In terms of technology application, the province focuses on key points, takes harvest maturity as the core, sorting and packaging as the focus, and process execution as the key, and effectively implements technology quality improvement. In terms of harvest maturity, the "345" harvest method has been comprehensively promoted, and training and guidance on field-ripened tobacco leaf harvest have been strengthened, increasing the proportion of fresh tobacco leaf harvested when mature to 90%. Due to high temperatures and drought in the middle and late stages, the upper leaves of tobacco had low water content, resulting in phenomena such as green roasting and hanging grey tobacco. To reduce roasting difficulties and picking losses, production areas such as Tongren, Zunyi, Qiannan, and Qiandongnan have vigorously promoted upper leaf ripening by stem cutting and roasting. After roasting, the quality of the upper leaf has significantly improved. As shown in Figure 1, in 2022, the province's one-time roasting technology for upper leaves amounted to 1.35 million mu, accounting for 83% of the province's tobacco planting area. Among them, one-time stem cutting and roasting accounted for 29%, and one-time picking and roasting accounted for 54%. In terms of sorting and packaging, tobacco classification by rods and layered loading of stacks have been reinforced to compensate for the harvest problem, thereby reducing roasting difficulties, reducing roasting losses, improving tobacco quality after roasting, and reducing the amount of unripe leaves used. In terms of process execution, the province has scientifically set up roasting processes based on variety and part of the tobacco leaf to achieve one strategy per category, with a focus on guiding the roasting process of rainy and little sunlight tobacco, drought-yellow tobacco, and roasting by stem cutting, reducing roasting loss to 6.4% in 2022.

![Graph](image)

Fig. 1 Harvesting and curing upper leaves in one time.
In terms of curing facilities, the province has invested in 95,500 intensive curing barns with a curing area of 1.5678 million acres and a curing quantity of 3.9582 million dan of tobacco, accounting for 90.45% of the total. In order to promote the concept of green development and upgrade the curing barns as the basic project to improve tobacco quality, the province vigorously promotes green and lightweight curing technologies. As shown in Figure 2, in 2022, the province will promote the use of 42,700 new energy curing barns, accounting for 52% of the total number of barns, including 42,300 biomass curing barns and 406 air source heat pump curing barns. Among various regions, Qiannan is the main application area of biomass curing barns with 8,793 barns in total, accounting for 65.65% of the total curing quantity in the whole area, while Zunyi has newly built 135 electric heat pump curing barns, providing a new clean promotion model. In addition, the province also promotes the use of 17,000 tobacco hanging barns (including 6,000 spring-loaded tobacco poles). Meanwhile, each production area actively builds lean demonstration curing workshops. The province has selected 79 curing workshops with complete facilities and good foundations (an increase of 38 from last year) and 3,309 curing barns with a curing area of 62,000 hectares. According to survey and statistical data, the lean curing workshops save 1.8 laborers and reduce costs by 220 yuan per mu.

![Fig. 2 The total number of biomass/heat pump drying facilities and the number of drying facilities for cigarette clips and spring tobacco rods in the whole province.](image)

### 2.4 Overall development status of tobacco leaf picking and curing

In 2021 and 2022, the province of Guizhou has conscientiously implemented various conference spirits, worked hard to overcome the adverse factors caused by frequent extreme abnormal weather, and vigorously implemented the consolidation and deepening of tobacco leaf picking and curing to improve quality action, continuously improving the level of tobacco leaf picking and curing, promoting the improvement of quality and efficiency of tobacco production, and assisting in the high-quality development of tobacco production. By adhering to the problem orientation, taking loss reduction and quality improvement as the core, organizational management and team building as the key points, and implementing professional picking and curing as well as light and simple picking and curing technologies, the level of tobacco leaf picking and curing has been continuously consolidated and improved to promote the improvement of quality and efficiency of tobacco production.

Overall, the planned purchase of tobacco leaves has been completed to a high degree, with a reasonable proportion of high-grade tobacco and central high-grade tobacco. The province's investment in curing rooms has achieved steady growth, and the tobacco loss rate during picking and curing has once again been controlled within 7%. A new type of harvesting method has been
fully implemented, with the maturity of tobacco leaves as the core and strengthened training and guidance for harvesting, to improve the proportion of mature tobacco leaves harvested and overcome unfavorable climatic conditions such as high temperature and water shortage. A classification and packaging system with a focus on stratified packaging has been implemented, greatly reducing the difficulty of curing and becoming an effective method for reducing tobacco loss during picking and curing. A type of one policy for one drying based on process implementation has been carried out by variety and position to further reduce drying losses. Team building and talent attraction have been continuously strengthened, with each production area increasing the appointment of drying technology positions, continuously strengthening the drying team and expanding the depth of skilled talent reserves. Normalized drying skill training has been carried out comprehensively, with position training focusing on practical operation. Comprehensive technical services have been fully implemented. At the technical and facility level, professional picking and curing has been extensively promoted to improve the efficiency of picking and curing operations. Process-oriented, standardized operations have been widely promoted, and the picking and curing integrated model has been extensively implemented, resulting in a noticeable improvement in the quality of tobacco leaf picking and curing. At the level of picking and curing system and management supervision, assessment methods have been developed in a layer-by-layer manner and assessment measures have been refined to improve the level of organizational management of the picking and curing work with strong regulations. Special inspection teams have been established in each production area to effectively improve the execution of work.

3. Research Design

3.1 Model Design

(1) Cluster Analysis

Cluster analysis is an efficient classification method. This method continuously optimizes the classification scheme, and the final classification has a clear distinction, which can maximize the characteristics of each class. The K-means clustering algorithm is used in this paper. Given an observation set \( \{x_1, x_2, \ldots, x_n\} \), where each observation is an m-dimensional real vector, the K-means clustering algorithm aims to divide these \( n \) observations into \( k \) sets \( (k \leq n) \) so that the sum of squares within each set is minimized. In other words, the clustering requirements are as follows:

\[
\min \sum_{i=1}^{k} \sum_{x_i} \|x_i - \mu_i\|^2
\]

Where \( x_i \) is all the points included in class \( i \), and \( \mu_i \) is the mean of all the points included in class \( i \).

4. Empirical Analysis

4.1 Evaluation Analysis of the Effect of Tobacco Picking and Curing Quality Improvement Action

Before conducting cluster analysis, this paper first used entropy weighting method to process the data of four indicators: picking and curing facilities, technology, personnel and loss rate in each prefecture-level city of Guizhou Province to obtain the quality improvement index of tobacco picking and curing in Guizhou Province. After obtaining the entropy value index data of the picking and curing quality improvement, this paper applied SPSS software to conduct K-means clustering analysis with clustering categories ranging from 3 to 5. The results showed that when the total sample was clustered into 3 categories, the result was the most optimal, and the number of each
clustering category was relatively moderate. The clustering center results are shown in Table 2 below:

Table 2 The number and proportion of collection, curing, and quality-enhancing clusters for 2021-2022.

<table>
<thead>
<tr>
<th>Year</th>
<th>Center 1</th>
<th>Proportion%</th>
<th>Center 2</th>
<th>Proportion%</th>
<th>Center 3</th>
<th>Proportion%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021</td>
<td>0.1195</td>
<td>44.44</td>
<td>0.3447</td>
<td>22.22</td>
<td>0.7498</td>
<td>33.33</td>
</tr>
<tr>
<td>2022</td>
<td>0.0665</td>
<td>22.22</td>
<td>0.2450</td>
<td>55.56</td>
<td>0.6420</td>
<td>22.22</td>
</tr>
</tbody>
</table>

According to the clustering results in Table 2, clusters 2 and 3 have relatively high proportions, accounting for 55.56% and 77.78% respectively in that year. This indicates that significant progress has been made in the improvement of tobacco picking and curing quality in Guizhou Province. In combination with the actual situation, this is mainly due to the gradual realization of lean, specialized, efficient and precise tobacco picking and curing management, team building, operations and technology throughout the province. In the past two years, various areas in Guizhou Province have focused on reducing baking losses and improving tobacco quality, around the overall goal of "innovation-driven, management efficiency improvement, team support, precise technology, and facility guarantees". Meanwhile, they have strengthened organizational management and team building, implemented professional tobacco picking and simple tobacco picking technologies, overcome adverse factors caused by frequent extreme abnormal weather, and continued to improve tobacco picking and curing levels, thus promoting the improvement of tobacco production quality and efficiency.

4.2 Analysis of the Overall Effect Evaluation of the Tobacco Harvesting, Drying and Quality Improvement Action

4.2.1 Evaluation based on picking and curing loss rate

As an important factor affecting the improvement of tobacco production quality and efficiency, the picking and curing loss rate of tobacco determines the effect of improvement. Generally speaking, tobacco maturity, tobacco classification execution, and mastery of baking technology in the tobacco picking and curing process will all cause tobacco baking losses. From the clustering analysis results in Table 3, the clustering center of the tobacco picking and curing loss rate has significantly improved, especially in cluster 2. Looking at the past two years of tobacco picking and curing work in Guizhou Province, in the specific implementation of work, various areas have set up baking technology based on tobacco variety, tobacco quality, and baking location to achieve tailored baking policy and improved baking losses. In particular, in 2022, guidance on three tobacco baking technologies was emphasized: rainy season tobacco, drought-prone tobacco, and stem-cutting tobacco. This has significantly reduced the picking and curing loss rate.

Table 3 The number and proportion of collection and curing loss rate clusters for 2021-2022.

<table>
<thead>
<tr>
<th>Year</th>
<th>Center 1</th>
<th>Proportion%</th>
<th>Center 2</th>
<th>Proportion%</th>
<th>Center 3</th>
<th>Proportion%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021</td>
<td>5.97</td>
<td>44.44</td>
<td>6.35</td>
<td>22.22</td>
<td>7.93</td>
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</tr>
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<td>2022</td>
<td>5.2833</td>
<td>33.33</td>
<td>6.6163</td>
<td>55.56</td>
<td>8.3600</td>
<td>11.11</td>
</tr>
</tbody>
</table>

4.2.2 Evaluation based on team building

As the foundation of tobacco picking and curing quality improvement action, team building plays an important guiding role in this action. The clustering centers and proportions of team building scores in each prefecture-level city in Guizhou Province from 2021-2022 are shown in Table 4. Clusters 2 and 3 have relatively high scores in team building. In 2021, one-third of the nine prefecture-level cities in Guizhou Province had a relatively high level of team building, with only Liupanshui, Anshun, and Qiannan having more complete team building. Compared with 2021, in 2022, except for Qiannan and Anshun, all other prefecture-level cities in Guizhou Province had a relatively high level of team building, with a significant improvement from before, accounting for 77.78%. This indicates that various prefecture-level cities in Guizhou Province have always
regarded strengthening the baking team as a key support for tobacco picking and curing quality improvement action and are committed to improving tobacco picking and curing quality.

Looking at the results of Guizhou Province's work from the previous year, in 2022, the province implemented baking technology backbone personnel of 465, carried out "teacher-student" work with 747 people, organized 124 baking technology backbone personnel to carry out baking skills training and selection competitions, 60 outstanding players participated in the second provincial tobacco adjustment vocational skill competition, and trained 3 industry technical experts and 9 provincial tobacco technical experts. In terms of skill training, relying on the tobacco drying and baking practical skill training base, they have fully carried out normalized baking skill training, and achieved full coverage of baking training. In terms of technical services, in response to the impact of the COVID-19 pandemic, they have made full use of network communication tools such as WeChat and phone calls to implement remote services and provide guidance from afar. Based on the joint efforts of all regions in the province, there has been a qualitative leap in team building, which has laid a good foundation for further optimizing tobacco picking and curing quality.

4.2.3 Evaluation based on technology and equipment

In the face of difficulties in picking and curing, such as incomplete harvesting methods, difficult baking, and high baking losses, technology, as the core support for tobacco picking and curing, affects the final effect of the tobacco quality improvement action. The clustering center and proportion of technology are shown in Table 5. From the results, cluster 1 has a relatively high proportion, indicating that the core technology of most prefecture-level cities in Guizhou Province is not yet complete enough to support the progress of tobacco picking and curing quality improvement action. However, looking at the results of the past two years, one-third of the prefecture-level cities had higher levels of technology development in 2021, and this proportion increased to 44.44% in 2022. However, in response to the urgent demands of tobacco picking and curing quality improvement action, combined with the actual situation of each prefecture-level city, even though the implementation of key technologies has significantly improved compared to previous years, there are still phenomena such as insufficient maturity during harvesting, inaccurate tobacco classification, and inappropriate process settings. In the future, it is necessary to further focus on the development of core technologies.

Table 5 The number and proportion of technical clusters for 2021-2022.

<table>
<thead>
<tr>
<th>Year</th>
<th>Center 1</th>
<th>Proportion%</th>
<th>Cente 2</th>
<th>Proportion%</th>
<th>Cente 3</th>
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</thead>
<tbody>
<tr>
<td>2021</td>
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<td>66.67</td>
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<td>55.56</td>
<td>0.2578</td>
<td>33.33</td>
<td>0.6701</td>
<td>11.11</td>
</tr>
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</table>

Under the background of deeply implementing the concept of green development, upgrading and transforming baking houses as the basic engineering for improving tobacco quality. From the clustering regression results of Table 6, compared with the facility level in 2021, there has been a significant improvement in 2022. The high and medium facility level after upgrading and transformation has leaped from 33.33% in 2021 to 88.89% in 2022. From the actual construction situation, the province has promoted the use of 42,700 new energy baking houses (accounting for 52%), and various production areas have actively built lean tobacco picking and curing demonstration baking factories. The province has selected 79 baking factories with complete facilities and good foundations (an increase of 38 from last year), with 3,309 baking houses and a baking area of 62,000 mu. From survey and statistical data, the lean tobacco picking and curing factories saved 1.8 workers per mu, and the cost was reduced by 220 yuan per mu.
5. Conclusion and Recommendations

5.1 Conclusion

By conducting cluster analysis on various prefecture-level cities in Guizhou province using SPSS, it can be seen that the tobacco curing and processing quality in Guizhou province has been improved to a certain extent through the tobacco quality improvement campaign. Combining with further analysis, improvements have been seen in curing and processing loss rate, team building, and facility aspects compared to before, however, the core technologies that play a crucial role in tobacco curing and processing have not seen significant development. Based on these conclusions, this paper will provide some recommendations from the following perspectives.

5.2 Recommendations

(1) Focus on improving key technologies. Key technologies have been improved compared to last year, but there are still phenomena such as immature harvesting, inadequate sorting and packaging, and improper technological settings in practice. In order to keep the curing and processing loss rate under 7%, it is important to focus on key technologies in curing and processing, tightly centering on improving tobacco quality. The key technologies, such as mature harvesting, stringent sorting and packaging, and efficient curing, should be emphasized to standardize, regulate, and optimize tobacco curing and processing actions, and to further promote the tobacco quality improvement campaign in Guizhou province. Secondly, promote green and simple technologies, and accelerate the research and promotion of tobacco light and simple curing technology around the direction of “green, simple, and efficient”, which can further reduce the cost of tobacco curing. In addition, it is necessary to conduct in-depth technical training services to ensure that the curing and processing technology can be implemented in every key link.

(2) Further strengthen the team building in tobacco curing and processing. From the analysis results above, there has been a certain level of quality improvement in team building in various prefecture-level cities in Guizhou province. However, there are still some urgent issues to be solved in practical work, such as the shortage of highly qualified talents who are able to speak and write, and have practical experience in curing and processing. Some production areas lack training instructors for curing skills and some technical staff members have insufficient practical experience. In the future, team building should focus on two aspects: first, building a strong technical service team for curing and processing; second, building a strong professional team for curing and processing services. Training activities with focus, stages, and levels should be carried out, based on practical operational abilities, to improve the practical operational abilities of production technical personnel and to effectively elevate the overall operational level.

(3) Actively promote new energy curing equipment. On the basis of existing progress, new energy curing rooms should be constructed with greater strength, and research on environmental protection facilities and intelligent curing facilities should be accelerated. Efforts should be made to actively promote the substitution of new energy for coal while enhancing supporting facilities and equipment such as power supply and backup power supply. Meanwhile, attention should be paid to technical training and guidance for the operators of new energy curing rooms to improve their skill levels. Cooperation should be strengthened to guide and support the establishment of biomass fuel processing plants by cooperatives and to ensure the supply of biomass pellets.

<table>
<thead>
<tr>
<th>Year</th>
<th>Center 1</th>
<th>Proportion%</th>
<th>Center 2</th>
<th>Proportion%</th>
<th>Center 3</th>
<th>Proportion%</th>
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<td>66.67</td>
<td>0.6070</td>
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Acknowledgement

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References


