

# National Protection Zone for Rapeseed Production and Industrial Cluster of Rape in Hubei Province

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**Abstract** Hubei Province is the main winter rapeseed producing area in China, and has the national advantage and characteristic industrial cluster of rape. The protection zone for the production of important agricultural products of rapeseed in Hubei Province also ranks first as that in Hunan Province. This paper studied the winter rape industry, the important agricultural product production protection zone of rapeseed, the provincial double-low high-quality rape protection zone and the industrial cluster of rape in Jiangnan Plain in Hubei Province, and analyzed the main problems existing in the development of rapeseed production protection zone and industrial cluster of rape. Finally, it came up with strategies including promoting national rape varieties, overcoming the problem of rape "agricultural chip", promoting the "rice + rape" rotation model, and strengthening the protection of intellectual property rights of brand marks.

**Key words** Winter rape, Rapeseed, Protection zone for the production of important agricultural products, National advantageous characteristic industrial cluster, Hubei Province

## 1 Introduction

In recent years, the consumption of edible vegetable oil in China has been increasing, the demand gap has been expanding, the degree of dependence on foreign countries has increased significantly, and the security of edible vegetable oil has become increasingly prominent<sup>[1–2]</sup>. The rapeseed oil accounts for about 50% of the domestic edible oil. As the largest oil crop in China, rape occupies the core position in ensuring the safety of China's edible oil supply. According to *China Rural Statistical Yearbook* (2022), the total yield of China rapeseed was 1 471.4 ten thousand t, the planting area was 6 991.6 thousand ha, the average yield per unit area was 956.0 – 3 111.4 kg/ha, and the national average was 2 104.5 kg/ha.

The *Guiding Opinions of the State Council on Construction of Grain Production Functional Areas and Important Agricultural Product Production Protection zones* issued on March 31, 2017 stated that 46 666.67 km<sup>2</sup> of the rapeseed production protection zone would be designated with the emphasis on the Yangtze River Basin as the main area, including 40 000 km<sup>2</sup> of the rice and rapeseed multiple cropping area. Subsequently, nine major provinces and cities have designated 43 333.33 km<sup>2</sup> winter rapeseed production protection zones. Among them, Hubei and Hunan separately had 10 000 km<sup>2</sup>, Sichuan designated 6 666.67 km<sup>2</sup>, Anhui

and Jiangxi separately designated 4 666.67 km<sup>2</sup>, Chongqing had 1 666.67 km<sup>2</sup>, and Guizhou and Henan designated 1 333.33 km<sup>2</sup>.

The Ministry of Agriculture and Rural Affairs and the Ministry of Finance launched the construction of the national advantageous characteristic industrial cluster in 2020<sup>[6–7]</sup>, and a total of 140 construction lists have been released in three batches so far. Among them, winter rape includes industrial cluster of rape in Jiangnan Plain of Hubei Province, early maturing industrial cluster of rape in Hunan Province, industrial cluster of rape in Sichuan Province, and industrial cluster of rape in mountainous areas in Guizhou Province; spring rape has the industrial cluster of rape of Qinghai Province. Hubei Province is the main production province of winter rapeseed in China<sup>[8–9]</sup>. The protection zone of important agricultural products of rapeseed ranks first as that in Hunan, the total yield of rapeseed accounts for the second place in China, and the planting area accounts for the third largest province in China. In view of these, we discussed the development strategy of national protection zones of rapeseed production and industrial cluster of rape in Hubei Province.

## 2 Winter rape industry in Hubei Province

**2.1 Cultivars of rape** The rape cultivars in China mainly include *Brassia campestris* L., *Brassica napus* L., and *Brassica juncea* (L.) Czern. et Coss.<sup>[10–12]</sup>. Rape cultivars in Hubei Province are mainly the first two varieties, and the third variety is rare. *B. campestris* can be used as both vegetables and oilseeds. *B. napus* is a special oil crop planted in protection zone of rapeseed production and provincial protection zone of double-low high-quality rape.

**2.2 Main promotion varieties of rape** In recent years, varie-

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ties of rape promoted in Hubei Province are as many as 66, such as Huayouza 62, Huayouza 9, Zhongshuang 9, Yangguang 2009, Huashuang 5, Zhongyouza 7819, Huayouza 12, Huayouza 13, Zhongshuang 12, ZhongShuang 10, Huashuang 4, Heshengyou 868, Heshengyou 555, Zhongyouza 12, Fuyouza 108, Huayou 6, Fengyou 701, Fengyou 520, Deyou 8, Huayouza 14, Fengyou 5103, Zhongyouza 11, Zhongyou 589, Xiwang 528, Zheyou 28, Nanyouza 1, Huayouza 10, Dexinyou 59, Huayouza 15, Tianyouza 3, Fuyouza 2000, Guangyuan 58, Luoyouza 101, Mianyou 12, Shengguang 127, Fuyou 668, Dadi 55, Wenyou 99, Xiwang 699, Hanyou 301, Youyan 10, Shengguang 87, Mianyou 19, Zhongnongyou 2008, Fengyou 737, Dingyouza 4, Chuyouza 910, Zhongnongyou 6, Huayouza 8, Huyouza 1, Rongyou 10, Youyan 50, Xiangzayou 2, Zhongyouza 16, Zhongyouza 7, Zheyou 601, Huaxiangyou 12, Huahang 901, Huayouza 95, Xiangzayou 5, T2159, Fengyou 679, Fengyou 958, Yuhuang 2, Tongyouza 2, and Zheyou 50.

There are 26 rape varieties in the *National Catalogue for the Promotion of Excellent Crop Varieties* (2023). Among them, (i) there are 9 backbone varieties: Fengyou 737, Fengyou 730, Huayouza 62, Zhongshuang 11, Huayouza 9, Yangguang 2009, Qinyou 10, Zheyou 50 and Qingza 5; (ii) there are 6 growth varieties: Qingyou 3, Zhongyouza 19, Dadi 199, Huayouza 50, Ganyouza 8 and Qingza 12; (iii) 6 young varieties: Zhongyouza 501, Fangyou 777, Chuanyou 81, Qinyou 1618, Ningza 182, Baoyou 150; (iv) 5 special-type varieties: Yangguang 131 (short growth period rape), Fengyou 320 (short growth period rape), Huayouza 62R (clubroot resistant rape), Huayou 2129 (high oleic acid rape) and Kangyou 3 (yellow seed high oleic acid rape). Except Qingza 5 and Qingza 12, which are spring rape varieties, all other varieties have been promoted in Hubei.

**2.3 Rapeseed planting area** According to the data in *Rural Statistical Yearbook of Hubei Province* (2022), the planting area of rapeseed in the whole province was 1 094.02 kha. Among them, Jingzhou City, Huanggang City, Jingmen City, Xianning City, Yichang City and Xiaogan City had larger planting areas, which were 203.49, 155.49, 128.78, 88.30, and 84.78 kha, respectively (Table 1).

The top 15 counties of planting area were Jianli City, Xiantao City, Shayang County, Tianmen City, Zhongxiang City, Gonggan County, Huangmei County, Xian'an District, Wuxue City, Honghu City, Dangyang City, Xishui County, Chibi City, Qichun County and Macheng City, which were 76.69, 53.80, 47.24, 38.46, 34.95, 34.55, 30.74, 26.76, 26.49, 26.28, 23.76, 23.67, 22.27, 22.12, and 19.16 kha, respectively (Table 2).

**2.4 Rapeseed yield** According to the data in *Rural Statistical Yearbook of Hubei Province* (2022), the total yield of rapeseed in the whole province was 2 517 789 t. Among them, Jingzhou City,

Huanggang City, Jingmen City, Xiaogan City, Yichang City and Xianning City had larger total yield, which were 498 554, 369 005, 322 104, 195 650, 191 077 and 151 154 t, respectively (Table 3).

Jianli, Xiantao, Shayang, Gonggan, Tianmen, Zhongxiang, Honghu, Huangmei, Wuxue, Jiangling, Xishui, Dangyang, Qichun, Macheng and Jingshan were the top 15 counties in total rapeseed yield, which were 137 578, 122 930, 122 828, 103 961, 91 738, 85 102, 79 406, 71 423, 67 143, 57 101, 55 980, 52 972, 49 959, 45 887.8 and 45 449 t, respectively (Table 4).

**2.5 National "one village, one product" demonstration villages and towns** There are 28 national "one village, one product" demonstration villages and towns of grain and oil in Hubei, whose leading products involve rape only in Xianjian Village, Hongshan Residential District, Hongshan District, Wuhan City, and Wangjiashawan Village, Anju Town, Suixian County, Suizhou City, which are separately Hongshan Caitai (flowering Chinese cabbage) and *Brassica juncea* var. *foliosa* L. H. Bailey.

**2.6 Geographical indications of rape** Geographical indication (GI) is an intellectual property right mainly for special products<sup>[13-14]</sup>, which indicates that a commodity comes from a certain region, and the specific quality, reputation or other characteristics of the commodity are mainly determined by the natural or human factors of the region. There are 3 kinds of rape geographical indication products in Hubei: Wuxue rapeseed oil, Hongshan Caitai, Suizhou rapeseed oil (Table 5); 11 geographical indication trademarks: Xiangyang rapeseed oil, Xiangyang rapeseed, Zhongxiang rapeseed oil, Babao rape, Maocao Red Caitai (registration No. : 13833910), Maocao red vegetable moss (registration No. : 14229283), Ehongshan vegetable mosses (registration No. : 3958379) Hongshan Caitai (registration No. : 12861108), Hongshan Caitai (registration No. : 49743971), Suizhou Paopaoqing, and Zhongxiang Paopaoqing (Table 6); 4 kinds of geographical indications of agricultural products: Jingmen rape, Wuxue double low rape, Hongshan Caitai, and Suizhou Paopaoqing. Among them, Caitai (*Brassica parachinensis* L. H. Bailey) and Paopaoqing *Brassica juncea* var. *foliosa* L. H. Bailey are mainly used for vegetable, and Wuxue double low rape, Wuxue rapeseed oil, Xiangyang rapeseed oil, Xiangyang rapeseed, Babao rape, Zhongxiang rapeseed oil, and Jingmen rape are originated from *Brassica napus* L.

**2.7 China's well-known trademarks and Hubei's advantageous trademarks** A famous trademark refers to a registered trademark that has a high market reputation and commercial value, is well known to the relevant public, and is recognized according to law<sup>[15]</sup>. Hubei rapeseed oil-related products have 22 well-known trademarks in China (Table 8) and 17 advantageous trademarks in Hubei Province (Table 9).

Table 1 Rapeseed planting area in cities and prefectures of Hubei Province

kha

City/prefecture	Planting area	City/prefecture	Planting area	City/prefecture	Planting area
Jingzhou City	203.49	Xiantao City	53.80	Tianmen City	38.46
Huanggang City	155.49	Shiyan City	46.84	Suizhou City	25.12
Jingmen City	128.78	Enshi Prefecture	46.68	Qianjiang City	15.76
Xianning City	88.30	Xiangyang City	39.94	Ezhou City	12.24
Yichang City	84.78	Wuhan City	38.74	Shennongjia Forest Area	0.20
Xiaogan City	78.65	Huangshi City	36.74	Total of Hubei Province	1 094.02

Table 2 Rapeseed planting area in counties of Hubei Province

kha

City/prefecture	County	Area	City/prefecture	County	Area	City/prefecture	County	Area
Wuhan	Wuhan jurisdiction area	0.31	Xiangyang	Gucheng County	3.42	Huanggang	Huangzhou District	2.46
	Hannan District	0.40		Baokang Couty	5.34		Tuanfeng County	4.32
	Caidian District	2.23		Laohekou City	1.09		Hong'an County	8.41
	Jiangxia District	8.91		Zaoyang City	4.00		Luotian County	11.36
	Huangpi District	14.00		Yicheng City	15.01		Yingshan County	6.70
	Xinzhou District	12.89	Ezhou	Liangzihu istrict	3.94		Xishui County	23.67
Huangshi	Huangshi jurisdiction area	0.14		Huarong District	4.61		Qichun County	22.12
	Yangxin County	18.73		Echeng District	3.69	Xianning	Huangmei County	30.74
	Daye City	17.86	Jingmen	Dongbao District	13.35		Macheng City	19.16
	Maojian District	0.02		Duodao District	15.24		Wuxue City	26.49
Shiyan	Zhangwan District	0.11		Shayang County	47.24		Xian'an District	26.76
	Yunyang District	9.20		Zhongxiang City	34.95		Jiayu County	8.42
	Yunxi County	5.60		Jingshan City	17.99		Tongcheng County	11.99
	Zhushan County	11.11	Xiaogan	Xiaogan jurisdiction area	0.28		Chongyang County	12.39
	Zhuxi County	10.19		Xiaonan District	15.01		Tongshan County	6.47
	Fang County	6.78		Xiaochang County	14.44		Chibi City	22.27
Yichang	Danjiangkou City	3.83		Dawu County	5.40	Suizhou	Zengdu District	4.25
	Yichang jurisdiction area	1.17	Jingzhou	Yunmeng County	9.60		Sui County	9.58
	Yiling District	10.18		Yingcheng City	12.81		Guangshui City	11.30
	Yuan'an County	6.81		Anlu City	8.20	Enshi	Enshi City	7.73
	Xingshan County	4.25		Hanchuan City	12.92		Lichuan City	4.41
	Zigui County	6.04		Jingzhou Development Zone	0.10		Jianshi County	6.53
	Changyang County	7.12		Shashi District	2.67		Badong County	13.34
	Wufeng County	2.22		Jingzhou District	9.30		Xuan'en County	2.32
	Yidu City	7.70		Gongan County	34.55		Xianfeng County	5.40
	Dangyang City	23.76		Jiangli City	76.69		Laifeng County	5.03
	Zhijiang City	15.53		Jiangling County	18.19		Hefeng County	1.92
Xiangyang	High-tech zone	0.47		Shishou City	17.64	Provincial level district	Xiantao City	53.80
	Xiangcheng District	1.30		Honghu City	26.28		Qianjiang City	15.76
	Fancheng District	1.35		Songzi City	18.06		Tianmen City	38.46
	Xiangzhou District	2.30		Huanggang	Longgan Lake Farm	0.07	Shenlongjia Forest Area	0.20
	Nanzhang County	5.67						

Table 3 Total yield of rapeseed in cities and prefectures of Hubei Province

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City/prefecture	Total yield	City/prefecture	Total yield	City/prefecture	Total yield
Jingzhou City	498 554	Xiantao City	122 930	Huangshi City	84 553
Huanggang City	369 005	Xiangyang City	99 979	Suizhou City	54 031
Jingmen City	322 104	Shiyan City	93 018	Qianjiang City	37 600
Xiaogan City	195 650	Tianmen City	91 738	Ezhou City	29 235
Yichang City	191 077	Enshi Prefecture	89 908	Shenlongjiang Forest Area	236
Xianning City	151 154	Wuhan City	87 017	Total of Hubei Province	2 517 789

Table 4 Total yield of rapeseed in counties of Hubei Province

City/prefecture	County	Total yield	City/prefecture	County	Total yield	City/prefecture	County	Total yield
Wuhan	Wuhan jurisdiction area	471	Xiangyang	Gucheng County	7 728	Huanggang	Huangzhou District	5 535
	Hannan District	1 133		Baokang Couty	9 763		Tuanfeng County	10 580.4
	Caidian District	7 404		Laohekou City	2 868		Hong'an County	19 351
	Jiangxia District	20 490		Zaoyang City	11 550		Luotian County	27 224
	Huangpi District	26 481		Yicheng City	37 212		Yingshan County	15 768
	Xinzhou District	31 038		Liangzihu istrict	9 710		Xishui County	55 980
Huangshi	Huangshi jurisdiction area	338	Huarong District		11 218	Qichun County		4 9959
	Yangxin County	42 045		Echeng District	8 307		Huangmei County	71 423
	Daye City	42 170		Jingmen			Macheng City	45 887.8
Shiyan	Maojian District	85	Duodao District		35 732	Wuxue City		67 143
	Zhangwan District	350		Shayang County	122 828	Xianning	Xian'an District	44 053
	Yunyang District	14 812		Zhongxiang City	85 102		Jiayu County	14 641
	Yunxi County	8 696		Jingshan City	45 449		Tongcheng County	21 160
	Zhushan County	24 476	Xiaogan	Xiaogan jurisdiction area	733		Chongyang County	19 165
	Zhuxi County	26 361		Xiaonan District	35 957		Tongshan County	13 803
	Fang County	14 643		Xiaochang County	36 605		Chibi City	38 332
	Danjiangkou City	8 595		Dawu County	10 578	Suizhou	Zengdu District	9 766
Yichang	Yichang jurisdiction area	2 494	Yunmeng County		25 912		Sui County	16 953.2
	Yiling District	21 797		Yingcheng City	32 603		Guangshui City	27 312
	Yuan'an County	14 772		Anlu City	20 325	Enshi	Enshi City	16 891
	Xingshan County	8 863		Hanchuan City	32 937		Lichuan City	8 882
	Zigui County	12 506	Jingzhou	Jingzhou Development Zone	274		Jianshi County	13 883
	Changyang County	11 498		Shashi District	7442		Badong County	21 700.6
	Wufeng County	3 702		Jingzhou District	29 555		Xuan'en County	3 768
	Yidu City	19 247		Gongan County	103 961		Xianfeng County	13 981
	Dangyang City	52 972		Jiangli City	137 578		Laifeng County	7 582
	Zhijiang City	43 226		Jiangling County	57 101		Hefeng County	3 220
Xiangyang	High-tech zone	1 527	Shishou City		44 186	Provincial level district	Xiantao City	122 930
	Xiangcheng District	4 645		Honghu City	79 406		Qianjiang City	37 600
	Fancheng District	3 862		Songzi City	39 051		Tianmen City	91 738
	Xiangzhou District	6 337	Huanggang	Longgan Lake Farm	154		Shenlongjia Forest Area	236
	Nanzhang County	14 487						

Table 5 GI products of rape in Hubei Province

Product	Announcement date//YMD	GI protection scope
Wuxue rapeseed oil	2014 – 07 – 09	12 townships and towns ( residential districts ) involving Wuxue Residential District, Kanjiang Residential District, Tianzhen Residential District, Wanzhanghu Residential District, Meichuan Town, Yuchuan Town, Huaqiao Town, Dajin Town, Siwang Town, Shifosi Town, Dafasi Town and Longping Town of Wuxue City
Hongshan Caitai	2005 – 12 – 31	3 townships and towns in Hongshan District of Wuhan City, involving Hongshan Township, Jiufeng Township, and Huashan Town
Suizhou Paopaoqing	2014 – 07 – 09	28 townships and towns ( residential districts ) involving Dongcheng Residential District, Xicheng Residential District, Nanjiao Residential District, Beijiao Residential District, Wandian Town, Hedian Town, Xihe Town, Luoyang Town and Fuhe Town in Zengdu District, and Anju Town, Lishan Town, Xinjie Town, Huantan Town, Junchuan Town, Wanhe Town, Shangshi Town, Tangxian Town, Liulin Town, Wushan Town, Hongshan Town, Changgang Town, Sanligang Town, Wanfu Town, Yindian Town, Huaihe Town, Caodian Town, Xiaolin Town and Gaocheng Town in Suian County of Suizhou City

Table 6 GI trademarks of rape products in Hubei Province

GI trademark	Registration entity	Registration No.	Registration time//YMD
Xiangyang Rapeseed Oil	Xiangyang City Xiangzhou District Rapeseed Planting and Processing Association	17011803	2016 – 12 – 06
Xiangyang Rapeseed		17011802	2016 – 11 – 06
Zhongxiang Rapeseed Oil	Zhongxiang City Specialty Product Association	26327614	2019 – 02 – 20
Babao Rape	Songzi City Lusheng Local Industry Development Center	17189441	2018 – 02 – 27
Maocao Red Caitai	Hubei Ezhou Urban and Rural Famous and Specialty Products Association	13833910	2014 – 09 – 06
Maocao Red Caitai		14229283	2015 – 03 – 27
Ehongshan Caitai	Hongshan Caitai Industry Association, Hongshan District, Wuhan, Hubei	3958379	2008 – 04 – 06
Hongshan Caitai		12861108	2014 – 04 – 20
Hongshan Caitai		49743971	2023 – 02 – 20
Suizhou Paopaoqing	Hubei Suizhou Paopaoqing Technology Research Center	9813083	2012 – 03 – 27
Zhongxiang Paopaoqing	Hubei Zhongxiang Traditional Food Research and Promotion Center	33986481	2020 – 10 – 06

Table 7 GI of rape products in Hubei Province

Agricultural products	Registration entity		GI protection scope	Registration year
Jingmen rape	Jingmen Agricultural Technology Extension Center		8 counties and districts in Jingmen City , including Dongbao District , High-tech-nology Zone , Duodao District , Shayang County , Zhongxiang City , Jingshan Coun-ty , Qujialing Management Area , and Zhanghe New District , involving 53 towns and townships , residential districts	2020
Wuxue double low rape	Wuxue Agricultural Technology Ex-tension Center		12 double low rape planting areas in Meichuan Town , Yuchuan Town , Dajin Town , Dafasi Town , Siwang Town , Shifosi Town , Huaqiao Town , Longping Town , Wuxue Residential District , Kanjiang Office , Tianzhen Residential District and Wanzhanghu Residential District in Wuxue City	2015
Hongshan Caitai	Hongshan Caitai Industry Associa-tion , Hongshan District , Wuhan , Hubei		T towns and townships ( residential districts ) in Hongshan District of Wuhan City , namely , Hongshan Residential District , Jiufeng Residential District , Qingling Res-idential District , Huashan Residential District , Bajifu Residential District , Zuoling Residential District and Tianxing Township , involving 59 villages	2018
Suizhou Paopaoqing	Suizhou Paopaoqing Farmers’ Spe-cialized Cooperative		16 towns and townships in Dongcheng , Xicheng , Nanjiao , Beijiao , Wandian , He-dian and Xihe in Zengdu District and Anju , Lishan , Xinjie , Huantan , Junchuan , Wanhe , Shangshi , Tangzhen and Liulin in Suixian County , Suizhou City	2010

Table 8 China’s well-known trademarks of rape and rapeseed oil products in Hubei Province

Application No.	Trademark	Certified products	Trademark class	Applicant	Location
5797593	Jiefu	Edible oil such as rapeseed oil , bean curd products , <i>etc.</i>	Class 29	Wuxue Fukang Oil Co . , Ltd.	Wuxue City , Huanggang
7933283	Shendi	Edible oils such as rapeseed oil	Class 29	Hubei Shendi Agricultural Science and Trade Co . , Ltd.	Jingshan City , Jingmen
6379432	Changxiangyuan	Edible oils such as rapeseed oil	Class 29	Hubei Jiyijia Grain and Oil Co . , Ltd.	Shayang County , Shayang
8121790	Manyicun	Edible oils such as rapeseed oil	Class 29	Hubei Xinyu Agricultural Development Co . , Ltd.	Gongan County , Jingmen
4290082	Tianzhu	Bean curd products , rapeseed oil and other edible oils	Class 29	Hubei Hongkai Industry and Trade De-velopment Co . , Ltd.	Jiangling County , Jingzhou
5393868	Xisong	Edible oils such as rapeseed oil	Class 29	Hubei Xisong Foodgrain & Cooking Oil ( Group ) Co . , Ltd.	Qianjiang City
7936086	Zhouheiya	Salted duck , bean curd products , rapeseed oil and other edible oils.	Class 29	Hubei Zhouheiya Enterprise Develop-ment Co . , Ltd.	Dongxihu District , Wuhan
3182629	Ruyiqing	Bean curd products , rapeseed oil and other edible oils	Class 29	Ruyiqing Biotechnology Co . , Ltd.	Dongxihu District , Wuhan
3182631	Tuxing	Bean curd products , rapeseed oil and other edible oils	Class 29	Ruyiqing Biotechnology Co . , Ltd.	Dongxihu District , Wuhan
1530562	Fudangfang	Peanut butter , peanuts , bean curd products , rapeseed oil , <i>etc.</i>	Class 29	Wuhan Fuda Edible Oil & Seasonings Co . , Ltd.	Hanyang District , Wuhan

( To be continued )

(Continued)

Application No.	Trademark	Certified products	Trademark class	Applicant	Location
3958379	Ehongshan Caitai	Caitai (rape)	Class 31	Hongshan Caitai Industry Association, Hongshan District, Wuhan, Hubei	Hongshan District, Wuhan
1219788	Hesheng	Rapeseed and other grain and oil seeds	Class 31	Hubei Seed Group Co. , Ltd.	Jiangxia District, Wuhan
6270869	Bencaotianxiang	Bean curd products, rapeseed oil and other edible oils	Class 29	Hubei Huangpaoshan Green Products Co Ltd	Tongcheng County, Xianning
7196583	Atangsao	Sesame paste, bean curd products, rapeseed oil and other edible oils.	Class 29	Xianning Haochilao Food Co. , Ltd.	Xian'an District, Xianning
1534484	Renrenkang	Edible oils such as rapeseed oil	Class 29	Hubei Renrenkang Trading Co. , Ltd.	Gucheng County, Xiangyang
5807804	Aoxing	Edible oils such as rapeseed oil	Class 29	Hubei Aoshi Double Low Rapeseed Oil Marketing Co. , Ltd.	Laohekou City, Xiangyang
5342943	Juxiangda	Edible oil such as rapeseed oil, sesame paste, <i>etc.</i>	Class 29	Hubei Yuanda Grain and Oil Technology Co. , Ltd.	Xiangzhou District, Xiangyang
384982	Wanba	Edible oils such as rapeseed oil	Class 29	Wanbao Grain and Oil Co. , Ltd.	Xiangzhou District, Xiangyang
3859226	Kongmingcai	Fermented bean curd, rapeseed oil and other edible oil	Class 29	Xiangyang Kongming Food Technology Co. , Ltd.	Xiangzhou District, Xiangyang
3041026	Xiangzhiyuan	Edible oils such as rapeseed oil	Class 29	Hubei Xiangzhiyuan Green Food Co. , Ltd.	Zaoyang City, Xiangyang
3309113	Tianxia	Edible oil such as rapeseed oil, bean curd products, <i>etc.</i>	Class 29	Hubei Tianxia Sturgeon Industry Co. , Ltd.	Yidu City, Yichang
8003584	Tuxing	Edible oil such as rapeseed oil, fish food, <i>etc.</i>	Class 29	Hubei Huayi Wood Oil Co. , Ltd.	Changyang County, Yichang

**Table 9 Advantageous trademarks of Hubei Province related to rape and rapeseed oil**

Advantageous trademarks of Hubei Province	Registration No.	International classification	Main commodities	Trademark registration entity or user of special mark	Location
Xiangyang Rapeseed Oil	17011803	Class 29	Rapeseed oil	Xiangyang City Xiangzhou District rapeseed Planting and Processing Association	Xiangzhou District, Xiangyang
Liyuanchun	9089622	Class 29	Edible oils such as rapeseed oil	Hubei Tianfeng Modern Agriculture Co Ltd	Zengdu District, Suizhou
Tianheqing and graphics	10776450	Class 29	Edible oils such as rapeseed oil	Hubei Wulonghe Food Co. , Ltd.	Yunxi County, Shiyan
Hongshan Caitai	12861108	Class 31	Caitai	Hongshan Caitai Industry Association, Hongshan District, Wuhan, Hubei	Hongshan District, Wuhan
Suizhou Paopaoqing	9813083	Class 31	Paopaoqing ( black cabbage with wrinkled leaves)	Suizhou Paopaoqing Technology Research Center	Suixian County, Suizhou
Renrenkang	1534484	Class 29	Edible oils such as rapeseed oil	Hubei Renrenkang Trading Co. , Ltd.	Gucheng County, Xiangyang
Atangsao	7196583	Class 29	Edible oils such as rapeseed oil	Xianning Haochilao Food Co. , Ltd.	Xian'an District, Xianning
Luoshifu	30782545	Class 29	Edible oils such as rapeseed oil	Zhongxiang Luoshifu Grains, Oils and Foodstuffs Co. , Ltd.	Zhongxiang City, Jingmen
Duheyuan	8655096	Class 29	Edible oils such as rapeseed oil	Hubei Bashan Food Co. , Ltd.	Zhushan County, Shiyan
Jiefu	5797593	Class 29	Edible oils such as rapeseed oil	Wuxue Fukang Oil Co. , Ltd.	Wuxue City, Huanggang
Chuhuaxiang	18571460	Class 29	Edible oils such as rapeseed oil	Hubei Modern Agriculture Co. , Ltd.	Suixian County, Suizhou
Bencaotianxiang	6270869	Class 29	Edible oils	Hubei Huangpaoshan Green Products Co. , Ltd.	Tongcheng County, Xianning
Fudanfang	1530562	Class 29	Edible oils such as rapeseed oil	Wuhan Fuda Edible Oil & Seasonings Co. , Ltd.	Hanyang District, Wuhan
Juxiangda	5342943	Class 29	Edible oils such as rapeseed oil	Hubei Yuanda Grain and Oil Technology Co. , Ltd.	Xiangzhou District, Xiangyang
Yongxiang	1139193	Class 7	Oil press	Hubei Yongxiang Food Processing Machine Co. , Ltd.	Anlu City, Xiaogan
Dongfanghong	330251	Class 7	Oil press	Dongfanghong Group ( Hubei ) Grain Machinery Co. , Ltd.	Anlu City, Xiaogan
Anliang and graphics	11618887	Class 7	Oil press	Anlu Tianxing Food and Oil Processing Machinery Equipment Co. , Ltd.	Anlu City, Xiaogan

**2.8 Rape seed industry** Hubei Province has two national regional rape breeding bases in Xishui County and Gucheng County, a national oil seed enterprise in Zhongken Jinxiu Huanong Wuhan Science and Technology Co. , Ltd. , and a national oil crop germplasm resource medium-term bank ( Wuhan ), National Crop Germplasm Resource Bank (Nursery) , and has obtained 357 national invention patents and one national new utility patent in rape breeding field (international patent IPC A01H).

*B. napus* , *Brassica juncea* , and *B. campestris* were included into the second, sixth and tenth batches of the *List of New Varieties of Agricultural Plants of the People’s Republic of China* separately on March 7, 2000, May 20, 2005 and April 16, 2016<sup>[16]</sup>. Hubei has obtained 39 new agricultural plant variety rights of *B. napus* , involving 11 variety owners (Table 10) , but has not obtained the new agricultural plant variety rights of *B. juncea* and *B. campestris*.

**Table 10 Agricultural plant new variety right of Brassica napus in Hubei Province**

Variety owner	Number	New varieties of agricultural plants
Hubei Fuyue Agricultural Development Co. , Ltd.	1	Fuyou 2
Hubei Gushen Technology Co. , Ltd.	1	Gushenyou 5
Jingzhou Jinghua Seed Technology Co. , Ltd.	1	You 201
Wuhan Huihua Sannong Seed Co. , Ltd.	1	T2159
Wuhan Liannong Seed Technology Co. , Ltd.	1	616A
Wuhan Zhongyou Technology New Industry Co. , Ltd.	1	1019A
Wuhan Zhongyou Sunshine Times Seed Industry Technology Co. , Ltd.	1	12X26
Wuhan Zhongyou Sunshine Times Seed Industry Technology Co. , Ltd.	1	Zhongshuang 6
Huazhong Agricultural University	4	Bing 409, Huashuang 409, Huashuang 4, Huashuang 5, and Huayouza 62
Hubei Lizhong Seed Technology Co. , Ltd.	5	Liyou 618, Liyou 718, Liyou za 108, Liyou za 168, and Liyouza 178
Oil Crops Research Institute, Chinese Academy of Agricultural Sciences	22	6019A, OR88, ZYP77, Dadi 195, Xiwang 122, Xiwang 699, Yangguang 1601, Xiwang 1602, Xiwang 2009, Zhongshuang 10, Zhongshuang 11, Zhongshuang 3370, Zhongyou 589, Zhongyoubaihua 1, Zhongyou Weitai 1, Zhongyou Xitai 1, Zhongyou Xitai 2, Zhongyou Xitai 3, Zhongyou Xitai 4, Zhongyouza 13, Zhongyouza 39, and Zhongyouza 7

**3 Rapeseed important agricultural product production protection zone of Hubei Province**

There are 10 000 km<sup>2</sup> rapeseed important agricultural product production protection zones in Hubei Province. The protection zone is distributed in 16 cities and prefectures (including 3 county-level

cities directly under the jurisdiction) except the Shenlongjia forest area. Among them, Jingzhou City, Huanggang City, Jingmen City, Yichang City, Xianning City and Xiaogan City have relatively large protection zones, which are 2 100.00, 1 766.67, 1 013.33, 720.00, 666.67, and 633.33 km<sup>2</sup>, respectively (Table 11).

**Table 11 Distribution of protection zone of rapeseed production in cities and prefectures of Hubei Province**km<sup>2</sup>

City/prefecture	Area of protection zone	City/prefecture	Area of protection zone	City/prefecture	Area of protection zone
Jingzhou City	2 100.00	Wuhan City	493.33	Qianjiang City	266.67
Huanggang City	1 766.67	Tianmen City	433.33	Ezhou City	206.67
Jingmen City	1 013.33	Xiantao City	400.00	Xiangyang City	200.00
Yichang City	720.00	Shiyan City	366.67	Suizhou City	100.00
Xianning City	666.67	Huangshi City	333.33	Shenlongjia Forest Area	0.00
Xiaogan City	633.33	Enshi Prefecture	300.00		

The protection zones for rapeseed production are distributed in 74 counties (including three districts of Ezhou City) , of which the top ten counties are Jianli City, Tianmen City, Xiantao City, Shayang County, Gongan County, Songzi City, Zhongxiang City, Macheng City, Honghu City and Xishui County, and the areas are 666.67, 433.33, 400, 366.67, 333.33, 300, 300, 300, 266.67 km<sup>2</sup>, respectively (Table 12).

**4 Provincial double-low high-quality rape protection zones**

The double-low rape with low glucosinolate and low erucic acid is a high-quality rape variety<sup>[17]</sup>. The content of erucic acid in rapeseed oil is less than 3% , and the content of glucosinolate in rapeseed is less than 30 micromol/g. According to the deployment of the *Guiding Opinions on the Construction of Double Low Quality Rape Protection Zones issued by the General Office of Hubei Provin-*

*cial People’s Government* (E Zheng Ban Fa[2016] No.21) , Hubei has built Jianli, Gongan, Songzi, Honghu, Shishou, Jiangling, Jingzhou, Macheng, Huangmei, Xishui, Wuxue, Qichun, Hongan, Shayang, Zhongxiang, Jingshan, Duodao, Xinzhou, Huangpi, Yangxin, Daye, Dangyang, Zhijiang, Yicheng, Ezhou, Hanchuan, Yingcheng, Xiaochang, Xiaonan District, Xian’an District, Chibi City, Badong County, Xiantao City, Tianmen City and Qianjiang City. These 35 counties (cities, districts) planted more than 133.33 km<sup>2</sup> double-low rape, and initially realized the pattern of " double-low varieties, full mechanization, functional diversification, service socialization, processing standardization and brand quality". The area of rapeseed production protection zones in these 35 counties (cities, districts) ranked first in the province, all larger than 100.00 km<sup>2</sup>, and the total area of national protection zones of rapeseed production was 8 013.35 km<sup>2</sup>, accounting for 80.13% of the province.

**Table 12 Distribution of protection zone of rapeseed production in counties of Hubei Province**km<sup>2</sup>

City/ prefecture	County	Area of protection zone	City/ prefecture	County	Area of protection zone	City/ prefecture	County	Area of protection zone
Wuhan	Caidian District	33.33	Shiyan	Danjiangkou City	33.33	Huanggang	Yingshan County	66.67
	Jiangxia District	86.67		Jingzhou District	100.00		Xishui County	266.67
	Huangpi District	186.67		Public Security County	333.33		Qichun County	233.33
	Xinzhou District	186.67		Jianli City	666.67		Huangmei County	266.67
Xiangyang	Gucheng County	33.33	Jingmen	Gangneung County	200.00	Xianning	Macheng City	300.00
	Baokang County	33.33		Shishou City	233.33		Wuxue City	266.67
	Laohekou City	33.33		Honghu City	266.67		Xian'an District	233.33
	Yicheng City	100.00		Songzi City	300.00		Jiayu County	66.67
Yichang	Yiling District	66.67	Xiaogan	Dongbao District	80.00	Suizhou	Tongcheng County	66.67
	Yuan'an County	33.33		Duodao District	100.00		Chongyang County	66.67
	Xingshan County	33.33		Jingshan City	166.67		Tongshan County	66.67
	Zigui County	33.33		Shayang County	366.67		Chibi City	166.67
Huangshi	Changyang County	66.67	Huanggang	Zhongxiang City	300.00	Enshi	Suixian County	33.33
	Wufeng County	33.33		Hyonam District	100.00		Guangshui City	66.67
	Yidu City	53.33		Xiaochang County	100.00		Enshi City	66.67
	Dangyang City	233.33		Dawu County	33.33		Lichuan City	33.33
Shiyan	Zhijiang City	166.67	Huanggang	Yunmeng County	66.67	Counties under direct provincial jurisdiction	Jianshi County	33.33
	Yangxin County	233.33		Yingcheng City	133.33		Padang County	100.00
	Daye City	100.00		Anlu City	66.67		Xianfeng County	33.33
	Yunyang District	66.67		Hanchuan City	133.33		Lai Feng County	33.33
Shiyan	Yunxi County	33.33	Huanggang	Huangzhou District	33.33	Ezhou	Xiantao City	400.00
	Zhushan County	100.00		Tuanfeng County	66.67		Tianmen City	433.33
	Zhuxi County	66.67		Hong'an County	166.67		Qianjiang City	266.67
	Fang County	66.67		Luotian County	100.00		Three districts *	206.67

Note: \* 3 districts in Ezhou City are Echeng, Huarong, and Liangzihu districts.

## 5 Industrial cluster of rape in Jiangnan Plain, Hubei Province

Located in the middle reaches of the Yangtze River and the middle and lower reaches of the Hanjiang River, the Jiangnan Plain is located in the south-central part of Hubei Province and is named after the alluvial plains of the Yangtze River and the Hanjiang River. It covers an area of about 4.6 million km<sup>2</sup>, mainly including Jingzhou District, Shashi District, Jiangling County, Gonggan County, Jianli City, Shishou City, Honghu City and Songzi City of Jingzhou City and Jingzhou Development Zone, as well as Xiantao City, Qianjiang City and Tianmen City directly administered by the province, Shayang County, Jingshan City and Zhongxiang City in Jingmen City, Hanchuan City and Yingcheng City in Xiaogan City, Caidian District in Wuhan City, Zhijiang City in Yichang City and Yicheng City in Xiangyang City, a total of 20 counties (cities or districts). The planting area of industrial cluster of rapeseed in Jiangnan Plain is 470.18 kha (Table 2), accounting for 42.98% of the province, and the total yield of rapeseed was 1 157 583 t, accounting for 45.98% of the province. Except Jingzhou Development Zone and Shashi District, other 18 counties (cities, districts) in Jiangnan Plain have rapeseed production protection areas (Table 9), with a total production protection area of 4 600.00 km<sup>2</sup>, accounting for 46.00% of the whole province. Except Jingzhou Development Zone, Shashi District and Caidian District of Wuhan City, the other 17 counties (cities and districts) in Jiangnan Plain are provincial double-low high-quality rape protection zones.

This industrial cluster has no geographical indication products (Table 5) and rape national "one village, one product" demonstration villages and towns, and only has three geographical indication trademarks: Zhongxiang rapeseed oil, Babao rape and Zhongxiang Paopaoqing (Table 6); one geographical indication of agricultural products: Jingmen rape (Table 7), five well-known trademarks in China: Shendi, Changxiangyuan, Manyicun, Tianzhu and Xisong (Table 8), and one advantageous trademark in Hubei Province: Luoshifu (Table 9).

The industrial cluster of rape in Jiangnan Plain has no rape national level regional seed breeding base, large seed production county and oil national seed production enterprises, and has obtained few national invention patents and national new utility patents in the field of rape breeding (international patent IPC A01H). There are only two new varieties of *B. napus* agricultural plants: Fuyou 2 developed by Hubei Fuyue Agricultural Development Co., Ltd. and You 201 developed by Jingzhou Jinghua Seed Technology Co., Ltd. (Table 10).

## 6 Main problems

**6.1 Low yield of rapeseed** The average rapeseed yield of counties in Hubei Province (including 74 counties involved in rapeseed important agricultural product production protection zones) was between 1 180.0 and 4 250.0 kg/ha, while the average rapeseed yield of the whole province was only 2 301.4 kg/ha. The average rapeseed yield of counties in industrial cluster of rape of Jiangnan Plain was between 1 794.0 and 3 320.2 kg/ha, while

the average rapeseed yield of the whole industrial cluster was only 2 462.0 kg/ha.

**6.2 Weak promotion of rape varieties** The low yield of rapeseed is directly related to the planting of rape varieties. In recent years, there are as many as 66 winter rape varieties promoted in the whole province, which have not achieved the expected results, and the promotion of rape varieties is weak.

**6.3 Backward development of rape seed industry** Hubei Province has only two national regional rape breeding bases, a national oil seed enterprise, and has obtained 357 national invention patents and one national new utility patent in rape breeding field. Hubei Province has obtained 39 *B. napus* agricultural plant variety rights, but no *B. juncea* and *B. campestris* agricultural plant variety rights. Among them, the industrial cluster of rape in the Jiangnan Plain does not have rape national regional fine seed breeding bases, seed production counties, and oilseed national seed industry formation enterprises, and has obtained fewer national patents in the field of rape breeding, only obtaining two rights to new varieties of *B. napus* agricultural plants.

**6.4 Slow development of rape planting in winter idle fields** Due to the low planting benefits, weak enthusiasm of farmers, poor agricultural infrastructure and backward traditional farming methods, insufficient attention, ineffective promotion of the "rice + rape" crop rotation model, Hubei Province has more winter idle fields, and the rape planting and development progress of winter idle fields is relatively slow, including the Jiangnan Plain and the 74 counties involved in the protection zones for rapeseed important agricultural product production.

**6.5 Few protection of geographical indications** There are only 3 geographical indication products, 11 geographical indication trademarks and 4 geographical indications of agricultural products in rape and its related industries in the whole province (including rapeseed production protection zones), and the protection of geographical indication intellectual property rights of products is less. Among them, Jiangnan Plain has fewer industrial clusters of rape, no geographical indications products, only three geographical indications trademarks and one geographical indication of agricultural products.

**6.6 Weak brand influence** The branding of the whole rape industry chain in Hubei is weak. There are 22 well-known trademarks in China and 17 advantageous trademarks in Hubei Province in rape and related industries. Among them, the industrial cluster of rape in Jiangnan Plain is even less, with only five well-known trademarks in China and one advantageous trademark in Hubei Province.

## 7 Recommendations

**7.1 Promoting national rapeseed varieties and increasing rapeseed yield** According to *National Catalogue for the Promotion of Excellent Crop Varieties* (2023), combined with the promotion experience of rape fine varieties in recent years, it is recommended to consider the suitability and high yield characteristics of *B. napus*, vigorously promote the national fine varieties. In addition, it is recommended to combine high-yield farmland infrastructure construction and high-quality rapeseed cultivation technology

to increase rapeseed yields and increase farmers' income, especially in the important agricultural products rapeseed production protection zones, the provincial double-low high-quality rape protection area, and the industrial cluster of rape planting area in the Jiangnan Plain.

### 7.2 Tackling the problem of rape "agricultural chip" and promoting the upgrading project of modern seed industry

Relying on national oil crop germplasm resource medium-term bank (Wuhan), it is necessary to further improve the protection system of rape germplasm resources, greatly improve the ability of collection, preservation, identification, evaluation, distribution and sharing of rape germplasm, and maintain the diversity of rape biological genetic resources. It is recommended to establish the national and provincial seed enterprises of oilseeds, build national regional rape breeding bases and breeding counties, and use the modern biological breeding technology to overcome the problem of rape "agricultural chip", build a rape seed production base, form a rape seed industry development pattern of division of labor, cooperation and close connection among protection, breeding, and testing, and promote the upgrading project of modern seed industry.

### 7.3 Promoting the "rice + rape" rotation model and developing rape planting in winter idle fields

It is recommended to promote the concept of big food, the importance of diversified food supply system and food security strategy, and raise awareness of the safety of edible vegetable oil, improve agricultural production conditions, teach high-quality and high-yield rape cultivation techniques, vigorously promote the "rice + rape" rotation model, and develop rape planting in winter idle fields.

### 7.4 Strengthening the protection of intellectual property rights of brand labels and establishing regional public goods brands

Hubei Province needs to strengthen the protection of intellectual property rights for product indications such as geographical indication products, geographical indication trademarks, geographical indications of agricultural products, collective trademarks, certification trademarks, and design patents in the whole industry chain of rape. Besides, it is necessary to build a national demonstration zone for the protection of geographical indication products, build a well-known trademark in China and an advantageous trademark in Hubei Province, establish national and local standards for geographical indications, strive to obtain overseas geographical indication certification from the European Union and other countries, encourage new agricultural business entities such as large professional households, family farms, farmer cooperatives, agricultural enterprises and other market entities to use special indications of geographical indication products, geographical indication trademarks and geographical indications of agricultural products, and integrate and establish regional public brands with geographical indications.

### 7.5 Promoting the construction of double-low high-quality rape protection areas to help the national high-quality grain and oil project

It is recommended to adhere to new development concepts such as innovative development, coordinated development, green development, open development, and shared development, promote double-low excellent rape varieties, promote the construction of provincial double-low high-quality rape protection

areas, and realize the pattern of "double-low varieties, full-process mechanization, diversified functions, socialized services, standardized processing, and high-quality brands". In addition, Hubei Province should implement six major improvement actions, including green warehousing, variety quality brand, quality traceability, machinery and equipment, emergency support capabilities, saving and reducing healthy consumption, and actively participate in the "China Good Grain and Oil" and "Jingchu Good Rapeseed Oil" action plans to help the national high-quality grain and oil project.

## 7.6 Building rapeseed important agricultural production protection zones and implementing the food security strategy under the concept of big food

Hubei Province should build rapeseed important agricultural product production protection zones with high quality from the aspects of strengthening comprehensive production capacity building, developing appropriate scale operations, improving the level of agricultural socialization services, protecting according to law, implementing management responsibilities, strengthening dynamic monitoring and information sharing, strengthening supervision and assessment, and increasing investment in infrastructure construction, and implementing the national food security strategy under the concept of big food and ensuring the effective supply of rapeseed for important agricultural products.

## 7.7 Building the whole industrial chain of rape and the industrial cluster of rape in the Jiangnan Plain

Hubei Province should build the whole industry chain of rape from farmland construction, seed industry development, rape planting, rapeseed vegetable production, rapeseed processing, rapeseed biodiesel production, rapeseed storage, product marketing, agricultural culture inheritance, rural tourism, *etc.* It is recommended to combine the competitive enterprises in the whole industry chain of rape and cooperative enterprises, professional suppliers, service providers, related industrial manufacturers and related institutions that interact with these enterprises, and combine the construction of national modern agricultural industrial parks, national agricultural industry strong towns, rape-type national "one village, one product" demonstration villages and towns, to gather in the Jiangnan Plain and create an industrial cluster of rape.

## 7.8 Establishing a joint platform for scientific and technological innovation in production, universities and research institutions to build a new development pattern of rape industry

Relying on the scientific and technological innovation capabilities of the Institute of Oil Crops of the Chinese Academy of Agricultural Sciences, Huazhong Agricultural University, Hubei Lizhong Seed Industry Technology Co., Ltd., and Zhongken Jinxiu Huanong Wuhan Technology Co., Ltd., combined with new agricultural operation entities, rape national regional fine seed breeding bases, national oil crop germplasm resources medium-term bank (Wuhan), national protection zones of rapeseed production, *etc.*, Hubei Province should establish a scientific and technological innovation system and joint platform that deeply integrates production, universities and research institutions. It is also necessary to strengthen the construction of rape innovation chain and knowledge chain as well as the development of seed industry, construct the

pattern of "five-chain synergy" (industrial chain, value chain, supply chain, innovation chain and knowledge chain) and "nine-excellent linkages" (excellent core, excellent seed, excellent product, excellent purchase, excellent storage, excellent addition, excellent marketing, excellent culture and excellent education), and practice the idea of "three new developments"<sup>[13]</sup>, accelerate the construction of a new development pattern with the domestic cycle as the main body and the domestic and international double cycles promoting each other.

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