

Straw Marketization in China-Trend and Status

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Abstract

China is one of the countries that hugely depends on agriculture and boasts an abundant availability of straw most of which is unutilized. Since its founding, China has been reforming its market which has had a profound impact on the straw industry. This review was conducted to give a trend and status of straw marketisation, review the challenges faced by stakeholders and point the pathway to straw marketization. The review was informed by data that was extracted online from different sources such as peer reviewed journals, university online websites, government websites etc. The results of the review have indicated that China, as an economy, has managed to improve some of market practices through the implementation of many policies in different sectors of the economy and this completely revolutionized the market environment. However, despite the laudable improvement, the review still found that they are need of consistency and more improvement in order for the dream of free market economy to be realized. This review recommends that the government should make an all-out effort to incorporate other vital stakeholders in crafting future policies before implementation to give them a sense of ownership. Furthermore, this review proposes that the authorities should continue to support and work to incentivize the industry, through careful and systematic interventions that augment the free market mechanisms.

Keywords: Straw Marketization, Agriculture Straw, Straw Utilization, Straw Recycling

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INTRODUCTION

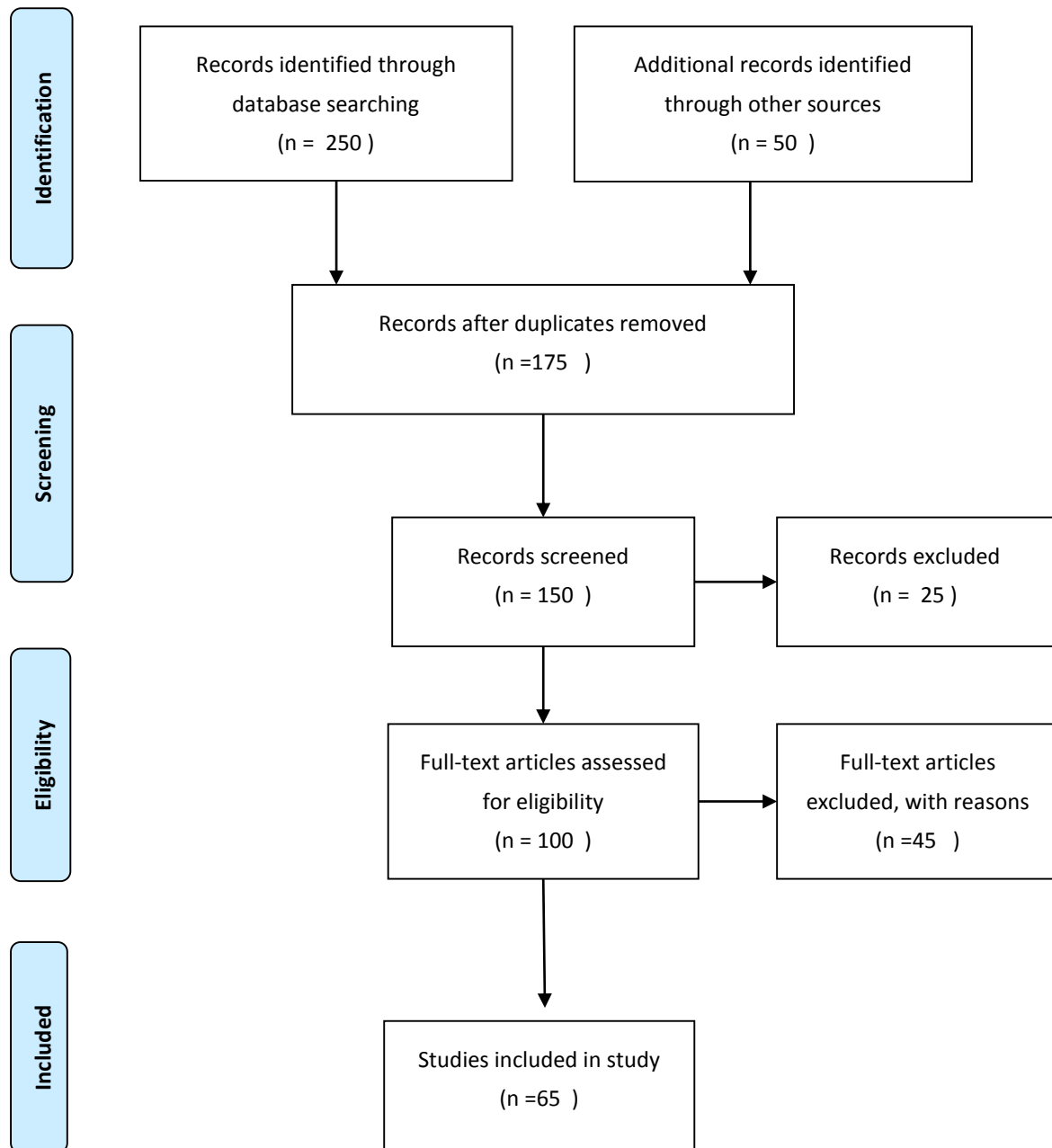
Many countries in the world, especially developing economies, depend on agriculture as the chief contributor to their Gross Domestic Product (GDP), an anchor of national food security and a source of food security (Cervantes-Godoy & Dewbre, 2010; Dalrymple, Southworth, & Johnston, 1970; Dong-yang, n.d.; L. Qu, Zhang, & Lu, 2014). Much as there are many positive impacts of agriculture activities within economies excessive dependence on agriculture has brought about its own negative impacts on the environment, which in turn poses a threat to human health through the use of chemical fertilizers, pesticides, burning and open disposal of agriculture residuals or straws in open fields whereby causing land and air pollution, etc. (Lee, den Uyl, & Runhaar, 2019). China is an agriculture country with its origins dating back to ancient times (W. M. Wang, Ding, Shu, & Chen, 2010). Like other developing countries, China has for the past three decades been depending on agriculture to feed its huge population which is estimated at 1.4 billion, which roughly translates to 20% of the total global population as at the end of the year 2019 (Beibei Liu, Wu, Wang, & Zhang, 2019) with limited approximate of 9% of the total world arable land and limited water bodies to be used for farming which also keeps on reducing due to industrialization and pollution respectively (R. Li & Lin, 2014; Mukhopadhyay, Thomassin, & Zhang, 2018). Despite having the problem of limited or scarce resources coupled the pressure of feeding its huge population, China's economy has undergone several reforms in all of its sectors of development with special interest in its agriculture sector. Within the agriculture sector, there have been such reforms as the new land reforms, market mechanisms and other incentives etc. (Gale, 2013; G. Huang et al., 2019; C. Xue & Wang, 2017). With the implementation of these different types of reforms in the agriculture sector, China for the past years has registered huge volumes of agriculture grain with an average rate of 2.6% since 1949 which includes rice, wheat, corn, barley, sorghum, buckwheat, oats, etc. (Ghose, 2014). China is approximately producing 800 million tons of straw 40% of which is being burned in the open field (Clare et al., 2015; Ren, Yu, & Xu, 2019). From the preceding discussion, it is clear that the problem of underutilization of straw has not left alone China, for many years' straw has been discarded or left in the fields and burned in the open ground in many areas by rural farmers with many different reasons given by the farmers. Farmers do this because they want to get rid of straw fast enough in preparation for the upcoming season (Ren et al., 2019), while some farmers who use rented land deliberately lack care and ownership of what happens after harvesting (Mei, 2017). Furthermore, other farmers fail to manage the straw collection due to financial constraints that may be involved in purchasing the machinery which to use for collecting straw in the fields (Wen & Zhang, 2015). On the other hand, other farmers look at the opportunity cost of the time wasted in straw in comparison to their

involvement in conducting other businesses (Fang, Xu, Guo, & Hong, 2020). Many scholars have written on reforms' impact on the agriculture system of China with a special focus on how China is managing to feed its population, with some of the ancient popular book entitled 'who will feed China' written by Lester R. Brown. Though many scholars have tried to write on the utilization of straw and come up with a number of good proposals in addition to the existing knowledge of literature, the majority of the scholars have mainly focused on straw utilization part through its competing uses. Throughout their studies they have highlighted some of the main uses of the straw including its use as a natural fertilizer when its retained or incorporated into the land (Beibei Liu et al., 2019; Sun, Ge, & Zhou, 2019), as a means of generating electricity, as feeds for domesticated animals and as an important ingredient for fungi production etc. (Adding, 2015; Garas, Bakhoun, & Allam, 2015; Guzmán A, Delvasto A, & Sánchez V, 2015; Beibei Liu et al., 2019; Lu, Yu, Ma, & Huang, 2018; Y. jing Wang, Bi, & Gao, 2010), while others have sought to dwell on the main motives driving the choice among the competitive uses (K. He, Zhang, & Zeng, 2018; Wu, 2020; Yang, Cheng, Yin, Lebailly, & Azadi, 2018) which have given a foundation of straw marketization in China. Premised on this informed understanding, this paper will analyze the available literature with an aim of highlighting or try to find out way straw market is being operated by looking at the trends and current status of the reforms that have affected the straw utilization since China founding, the challenges faced in straw marketisation through its main players or stockholders in straw industry or market, suggesting the path way towards straw marketisation in China and giving the recommendations to the policy makers.

2. MATERIALS AND METHODS

This literature review drew on the information on the internet, the researcher stressed that the main sources of primary data that was required to inform the research and augment its incalculable value. Some of the important sources included the peer reviewed scientific journals, university online libraries or websites, reputable organization websites and official government websites. After these sources were identified, in order to come up with a vast body of sources of knowledge, the researcher started at the global stratum, then the search was narrowed down to the developing countries which helped to give background on the focus area, from there then moved to Asian developing countries which also helped to give some vital insights into the continental trends on the subject area and finally the researcher zeroed in on China as the main geographical focus area of the review. Afterwards, the researcher used the following string words: straw marketisation, straw utilisation, agriculture straw, China reforms". Then, the researcher limited the timeframe of search from 1949-2020, grain

crop was used as the main crop on which agriculture straw was based.



Flow Diagram 1: shows the PRISMA flow diagram on data collection (*Summitted Separate*)

2.0 THEORETICAL FRAMEWORK

2.1 Dependent Variables

This review puts straw marketisation as a dependent variable. It is worth noting that

due to the vitality of straw marketisation, much literature may not be available to put straw marketisation as dependent variable within China as our geographical focus area of the review. In trying to understand this dependent variable, the researcher tried to analyze the two attributes behind it; thus, the concepts of straw and marketisation. In this review straw is conceptualized as the by-product or remains of agriculture cereal crops that are left over after the cultivation or harvesting the crops. Some of these crops in focus include rice, wheat, sorghum etc. (W. M. Wang et al., 2010; Y. jing Wang et al., 2010). Marketization is defined as the process by which the economy is consciously metamorphosed from planned economy to free market economy which demands that the market forces of supply and demand be the main determinant of the market outcomes. (Baylis, Fan, & Nogueira, 2019; X. Wang, Fan, & Zhu, 2007). In other words, the concept of marketisation entails all the reforms undertaken within a particular economy to achieve a free market participation. Just like any other developing countries in the world, China has also carried out innumerable reforms which have significantly helped to revolutionize its economy for the better since its founding in 1949 when it was a complete closed economy with notable changes which started in 1979 (Dong-yang, n.d.; Mcmillan, Whalley, & Zhu, 1989; Ngok & Zhu, 2007; W. Yu & Hepburn, 2017).

2.2 Independent Variable

In deciding on the independent variables, the researcher focused on a slew of factors that affect straw marketization as independent variables. In identifying these factors, the researcher considered the impact that they have on straw marketization. Some of these prominent factors are government policies and reforms, dizzying technological advancement attained by the country and the legal framework of the country. Based on the available literature, this review has also identified three key stakeholders that are directly affected by the actions of the independent variables which have a two-way impact on straw marketization and utilisation in return. Firstly, there are the rural famers as stakeholders. As is the common case with many developing countries, China's agricultural system also depends on rural local famers as the chief source of cheap available labour for agricultural production and this leaves famers with the discretion or choice on how to use or dispose of the straw after they have harvested their crops and finished the farming season (K. He et al., 2018; S. Xue et al., 2020; Yang et al., 2018; L. Zhang & Wu, 2018). The second stakeholders are enterprises which act as the agents that facilitate the straw trade on the market. Their primary role is that of helping farmers in collecting and selling their straw in bulk to buying companies. They are allowed to do this as most of the rural local famers hardly have the capacity to do it

on their own (Q. Li, Chen, Zhu, & Hu, 2012; Nader & Robinson, 2010). And then the last stakeholders involved in the straw industry are the buying manufacturing companies which use straw as a raw material in such secondary industries as the energy production, brick manufacturing, hardwood production, electricity generation, etc. The government becomes indispensable in all this in that it gets negatively affected if the straw is improperly used and produced bad effects on people's healthy through different forms of pollution. Government also stands a huge opportunity to economically benefit if the straw is properly utilized. It is worth mentioning that the stated twentieth century goal as regards the straw marketization is to improve straw utilisation which has proved in many ways that it has a whole host benefits both within and outside an economic territory. Consequently, in this review the researcher also looked at straw utilisation improvement as one of the ways of marketisation indicators. Straw utilisation is conceptualized as an effective use of the straw or crop residual in the way that will bring economic value to the stakeholders (K. He et al., 2018), improve soil fertility and conservation when used as fertilizer (J. He & Zhuang, 2013; Beibei Liu et al., 2019), used for energy and power generation (H. Liu, Ou, Yuan, & Yan, 2018; Yao, Xu, & Liang, 2016; Z. Yu, Fang, Lin, Liao, & Ma, 2015; Zhao et al., 2017), the use of straw for human and animal feed production (Bakker, Elbersen, Poppens, & Lesschen, 2013; Kühner, 2013; Lu et al., 2018), etc., other than being burned or disposed on open ground where no economic value is attributed (Fang et al., 2020; C. Qu, Li, Wu, & Giesy, 2012; Z. Wang et al., 2019).

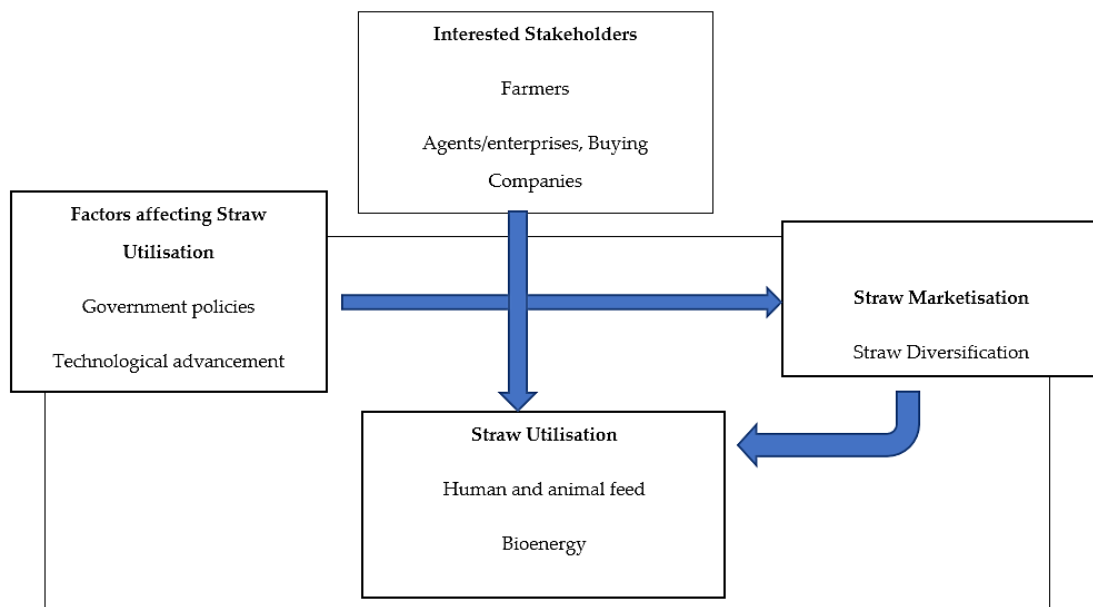


Figure 2: shows relationship between different variables in the study.

3.0 RESULTS

3.1 Global Overview of straw marketisation

Many countries in the world depend on agricultural production which leaves straw as a by-product after harvesting. The utilisation of the straw has been improved a lot in many developed economies, unlike the developing ones. Some of the striking examples of these advanced economies include the USA, Canada and the Netherlands which have witnessed a high efficient use of straw that has been made possible through the use of cutting edge technologies in the utilization of straw. These technologies in question have drastically reduced cases of improper use of straw (Nader & Robinson, 2010). Unlike the success story in developed countries, most of the developing countries have continually grappled with the problem of managing straw effectively and efficiently which in the end has posed environment and human health threat through pollution it has caused. Some of the notable examples of developing economies are India, China, Japan, Vietnam, Egypt, etc. (37). Straw Marketisation is now an issue which has been brought to the attention of many economic policy makers because of its profound impact that it has on sustainable development, greenhouse effect and general economy of a particular economy. Many countries now, especially those that are ranked behind on straw marketisation, are instituting measures that will help them to improve and be able to reap maximum the benefits from straw utilization and meet the set global environmental protections (Z. Liu, Xu, & Long, 2011).

3.1.1 Straw Marketisation in China

Marketisation in the economy brings about the process that the factors of production and policies are deliberately changed from the central command or planned system of economy to the free market thereby allowing players in the market to exercise their powers in decision making through the market forces of supply and demand (X. Wang et al., 2007). In other words, marketisation entails pronounced freedom to the market circle through the application of such market mechanisms and incentives (Fu, 2020; Ngok & Zhu, 2007). A free market economy has a positive relationship with the economic growth of an economy through its impact that it brings by allowing reformed policies to determine the market activities (Młokosiewicz & Misiak-Kwit, 2017). China as an economy has benefited enormously from the reforms especially in the agricultural sector as it has seen its production output spike year in and year out since its founding and starting of the reforms (Dong-yang, n.d.; W. Yu & Hepburn, 2017). With the adoption, of these reforms in China, many policies have been implemented in different sectors of development that have had direct or indirect relationship with straw utilisation. This review has grouped these reform activities into four categories as seen

below:

3.1.2 First Stage

Firstly, central planned economy from 1949-1978, in this period the planning was done at central government stratum which was mainly modelled the structure of Soviet Union (Chow, 2004; Mcmillan et al., 1989). This means that during this period the government had a complete monopoly and decided on what to produce, how to produce and how much to produce. Though agricultural activities involved the cultivation of rice, wheat and other cereal and staple crops (W. M. Wang et al., 2010), under this period not much is known or said about the straw utilisation because of the political system which the country was operating on. With the available literature, as the economy was under the initial reform stage much of the straw is believed to would have been burned and discarded on the open ground with some being used by households for heating, some ploughed back into the soil and the other used as animal feed. Furthermore, we also learn from this period indicates that straw marketisation carried out at a minimal scale that prevented the involvement of private enterprises from participating as everything was dictated the central government.

3.1.3 Second stage

Secondly, translation period which span from 1979 to 1996. During the aforementioned period, reforms were initiated and begun to be implemented and this resulted in a marked increase in the overall China GDP by 9.6 % for the subsequent years in a row within this period (Chow, 2004). Gradually the market began to be transformed from the planned economy to a market-based economy through a host of notable reforms. One example of such reforms within the agricultural was that of House Holders Responsibility Systems (HRS) which was implemented to reward famers according to their performance on the field rather than collective work which was there before. After the application of the HRS reform, its results were that that the farmers grew richer, happier and more satisfied for being rewarded for their hard work in the fields. This reform helped the economy as it also increased the agricultural output tremendously since many famers were willing to work a lot harder than before in order for them to be handsomely rewarded afterwards (Yang et al., 2018). High production output of grains resulting from the reforms in the economy meant also high availability of the straw in the country as a by-product of agriculture output. With the stage of the reforms that were implemented during this time not many policies were implemented to deal with straw utilisation because many famers were young and, as the results, still straw was mainly used for heating and cooking in their respective homes, for bedding and feeding

animals while the other amount of straw was burned in the open air or discarded (Baylis et al., 2019; May, 2001 *Land Rental Market Development and Agricultural Production in China** Bryan Lohmar, Zhaoxin Zhang and Agapi Somwaru**, 2001; Rahman, 2000).

3.1.4 Third stage

Dynamic development period was the third period and it stretched from 1997 to 2006. During this period in focus, a lot of reforms were implemented in all sectors of the economy and the result was incorporation of China into World Trade Organization (WTO) by the end of 2001. This helped China's development immensely by opening its channel of trade to the global market (Chen & Duncan, n.d.; Donglin, 2005; Jiang, n.d.; S. Li & Zhai, 2000). This period also saw a lot of government interventions being instituted to improve straw marketisation. Some of these are highlighted below as follows:

- i. In 2000 the Chinese government passed the 'People's Republic of China Air Pollution Control Act' which stipulates fines for the people found burning straw on open ground amounting to RMB 500-2000 with those that have caused much damage having criminal investigation and detention of 5 to 15 days in custody if found guilty.
- ii. Though its yearly issues on Number 1 document, which stipulates some of the policies that help in agriculture production and straw utilisation and marketisation.
- iii. In 2005 the Government introduced subsidies programmes to the farmers with an aim of helping them in straw collection and improving straw utilisation.

During this period the rural population started to decline, farmers started to get old, large quantities of straw were being burned or discarded in the open air as the amount of output in grain production was continuing to grow, the quantity of straw also continued to grow and that the reforms and the policies implemented by the government through its central committee and other local governments began to be aggressively enforced. For instance, farmers were being fined if they were found burning straw and penalties were given accordingly (Adedipe, Sridhar, & Verma, 2005; Y. Jing Wang et al., 2010).

3.1.5 Fourth stage

Perfect boom period from 2007 to 2020 (Current). From the moment when China got incorporated into the WTO, she has carried on with reforms as she considers itself a developing country and that she feels the bounded duty comply with the internationally-

binding WTO fair competitions policies (Donglin, 2005) . This, in return, has helped to transform the straw industry either directly and indirectly by allowing some competition within the market. Many scholars, however, have argued that despite China's incorporation into the WTO, the country still intervenes in the market system whereby affecting the marketisation process (Donglin, 2005; J. Huang & Rozelle, n.d.). Despite these scholarly arguments the policy changes that have been taking place in China have significantly contributed to China's economic growth in all of its sectors of development and the international trade community's recognition of China as one of the largest exporters and importers of the consumable goods and services. Policy changes have significantly helped the inside change of the Chinese economy especially changes in agriculture sectors that have helped the rural peasant farmers to work hard and get rewarded in accordance with to their performance (S. Li & Zhai, 2000). As a result, China has been well able to able to maintain food security and its economy has grown tremendously (Baylis et al., 2019; JIAO, Mongol, & ZHANG, 2018). Despite the changes in the market structure we can't ignore the fact that there is still a lot of the work that is needed to be done by the authorities in order to have total market liberalization in agriculture and other areas especially with regard to policies that affect farmers directly. Some of the laudable policies that the country has put in place within this period in focus are as follows:

- i. Through No 1 document the government issued yearly. The Chinese government has been emphasising on policies that improve agriculture and straw utilisation in reverse, and some improving international trade.
- ii. In the year of 2007 the government on its 5-year plan for the development of biogas in rural areas also emphasised in the utilisation of straw as a raw material.
- iii. Implementation of other Laws like 'Atmospheric Pollution Prevention and Control Law of the People's Republic of China 'which was introduced on January 1, 2016. This law aimed at reducing open air straw burning.
- iv. Government through its local governments has been implementing policy on straw utilisation at Provincial levels in different provinces.
- v. The government has also been implementing in direct financial support to the farmers, agents and companies like tax cut, etc.
- vi. The funding of 50 million USD Ar Horqin Banner Project in Inner Mongolia which uses close to 500 Million tons of straw per year
- vii. The funding and subsidising of 200 pellets straw fuel factories.

Currently the government in China aims at 100% straw utilisation rate across the country, with some of the policies highlighted above and others. The statistics through studies show that the utilisation rate is to increase to meet the current valuable uses of straw as the grain projections may also be reducing due to diminishing scarce resources and change in preference of diet due to urbanization (Ghose, 2014). Despite this, there is a debate among scholars who contend that with the introduction of genetically modified seeds, advanced irrigation systems and other technological factors the grain production will still increase in China for the projected future in order to cater for the growing population and livestock feed demands (Dong-yang, n.d.; Bing Liu & Wang, 2018; J. Yu & Wu, 2018). On the part of policies formulation, the problem of small scale single farm is still not reasonable for straw utilisation, the policy on land scale management and straw diversification are the foundation of straw utilisation marketization in China (Xu et al., 2020).

The central government in China has been at the center coordinating with other provincial, county and township governments in making policies and implementing them on straw utilisation and this has for the past decades helped to increase the utilisation of straw in the country.

Table 1: Shows Policies implementation involvement in China

	Laws & Regulations	Guidance & Demonstration	Notifications	Financial Support	Work Plan	Execution & Inspection
Central government	Tick	Tick	Tick	Tick		
Provincial government				Tick	Tick	
County government				Tick	Tick	Tick
Township government				Tick	Tick	Tick

Source: (Adapted from Ren et al 2019 Page 8)

3.3 Straw utilization in China

China has been at the center of producing high quality agricultural produce. For instance, in 2014 China was ranked as the first grain producing country in the whole world, the large amount of output each and every year gives China a huge abundance of straw availability at its disposal to utilize. Through the government support, China has been improving its straw utilisation with the help of innovations of new uses of the straw till to date though still some of the straw is discarded and burned on open air ground

in some areas within the country (Ren et al., 2019; Y. jing Wang et al., 2010; Yang et al., 2018). Currently, in China straw is utilized in many different ways. The following are some of the competing uses of straw that are being practiced in the country.

3.3.1 Used as fertilizer to improve soil fertility

Previous studies conducted have shown and proved that there is a high percentage of nutrient components in straw that can help to increase crop production output if incorporated into the soil (J. He & Zhuang, 2013). The available literature reveals that straw through biochar, mulching and incorporation or burying on the ground of the straw is reported as one of the simplest methods of disposing of it by the local farmers in China. This method is seen as cost effective to the famers since they just bury the straw into the ground and enjoy the increased production output which the straw incorporated in the soil brings afterwards without incurring any additional costs which may be needed if the straw is about to be transferred from the field (Quilang et al., n.d.; J. Wang, Fu, Sainju, & Zhao, 2018). The level of nutrients varies among different kinds of the straw and, as a result, farmers are advised to know exactly the kind of the straw contains adequate nutrients before putting it to use. This is premised on the understanding that some straw takes a lot more time to decompose than the other, something that has direct bearing on the amount yield that farmers get at the end of the growing season.

Table 2: Showing Organic ingredients of straw

Organic Ingredient	N	P	K	Ca	Mg	Na	Si
Rice Straw	0.6	0.2	1	0.14	0.12	0.02	7.99
Wheat straw	0.5	0.2	0.73	0.14	0.02	0.003	3.95
Corn stalk	0.6	1.4	0.9	0.39	-	-	-
Soybean straw	0.93	0.26	1.55	-	-	-	-
<u>Rape straw</u>	<u>0.56</u>	<u>0.5</u>	<u>0.5</u>	<u>0.42</u>	<u>0.05</u>	<u>0.004</u>	<u>0.18</u>

(Source: adapted from He. et. al 2013 page 3)

3.3.2 Used in the production of energy and power generation

China is a country that has been experiencing power shortages in the energy sector, especially in the rural areas, for a protracted period of the time now. As such, for many years the rural local famers in the countryside have had to rely almost solely on the use

of straw as the main source of energy for such domestic activities as cooking and heating in their respective homes (S. Xue et al., 2020). Recently much attention by the whole world has been given to renewable energy by using straw because of its environmental friendliness as compared to fossil fuel which causes a lot of ecological damage. As a result of this development, the renewable energy generation sector has attracted much of the government support in order to boost its energy capacity to cover the shortfall in the rural areas where the majority of its local farmers contribute enormously to the development through farming. This has had a huge positive impact on China's quest to diversify the straw usage which has led to the emergence of competitive usage of straw in bioenergy industry between different methods (Clare et al., 2015; Z. Liu et al., 2011; Tschirner, Barsness, & Keeler, 2007; R. Zhang & Jenkins, 2009; Zhao et al., 2017). Some notable examples are:

- i. Biomass energy, this is the major source of energy especially in rural areas (Z. Liu et al., 2011) in China where straw is used as renewable fuel ([IRRI], 2016).
- ii. Biogas which can also be used as gas from straw wastes (Adding, 2015).

3.3.3 Used as animal and human feeds

Raw straw or processed straw in China is also used in the production of animal feeds, especially the livestock. Recently there has been an increase in the demand for animal feeds from straw which is reported to have a high percentage of nutrients and energy ingredients. This makes it an ideal feed for the livestock production (R. Zhang & Jenkins, 2009). This demand is felt both within China and outside of China as well especially in the USA. Furthermore, the availability of the high concentrations of nutrients in some kind of straw has provided a conducive environment for the production of edible fungi or mushrooms. This industry has grown and a lot of small scale famers have been lured to get involved in this burgeoning economic activity (Lu et al., 2018).

3.3.4 Used as raw materials for building

Through the prudent application of the ultra-modern technologies and innovation, studies have revealed that straw from certain agricultural crops contains properties that are strong and hard that can withstand heat and pressure and that they can be used to make bricks, plywood and other building materials that are hard to break (R. Zhang & Jenkins, 2009).

3. 4 Challenges of straw marketisation

Despite the incredible improvement highlighted in the preceding discussion on marketisation in China in all sectors of development as indicated by using the NERI Index of marketisation as cited by Fan et al. 2007 in (X. Wang et al., 2007) the straw marketisation still faces palpable challenges that need to be acknowledged and worked on. To start with, there is a lot of government intervention in the straw market which makes it difficult for the market forces of demand and supply to determine the market outcomes through the exercise of its monopoly over such things as straw prices, the amount to be sold and bought etc. This can be attributed as the primary reason that held back China's straw industry for many years now. The government finds its way through the funding to purchase straw utilization technologies that individuals and small enterprises cannot manage on their own as they are prohibitively expensive. As a result, the government feels obliged to come in and intervene financially to fund those projects in order to boost the industry or to provide any kind of support which in return contradicts with the market mechanism of free market economy. This challenge is very difficult to completely get around because the straw utilisation has macroeconomic interest attached to it due to its ecological and environmental negative impact it has if there is low straw utilisation rate. As a result the government and other authorities will always still come in to act whenever and wherever its necessary to take an action in order to protect the its own people and the world as well from the negative impact that may be directly imputed to poor straw utilisation (Fang et al., 2020; J. He & Zhuang, 2013; Song, Song, & Zhang, 2016). Furthermore, the problem of vague legal framework continues to stand in the way of the straw industry. In China there are no clear legal or regulatory laws that are implemented to deal with straw utilisation and marketization. This review has found that currently China relies on policies that are put in place which are mainly administrative in nature that they lack strict legal enforcement in order for them to be conformed to as is the common scenario with crafted laws in other sectors of the economy (Ren et al., 2019). This lack of sound legal framework is a big challenge which will need to be addressed by the policy makers. Additionally, China is a very big economy with 23 provinces, 5 autonomous regions, 4 municipalities and 2 special administration that they are able to form and implement some of the policies that are applicable and applied for their own jurisdiction only and that may not be applied even across the country, this brings a problem of uneven distribution of straw policies which affect straw marketisation among the provinces and regions within China. That is the reason why some areas are major producers of corn or grain abundant straw in return which make them more interest in implementing policies on the straw as compared to other provinces which may not be producing grain in abundance (Sun et al., 2019), The other reason is that with these differences in regional production, it is

found that the straw-related industries in some areas where the straw is in abundance in another different province which does not have the same policies as they have in the province where the straw is in abundance and is being collected from (B. Wang et al., 2018; S. Xue et al., 2020).

4.0 DISCUSSION

4.1 Straw Utilisation status

There are many reasons currently that encourage and motivate economies in the utilisation of straw. Some of these include the knowledge that the economies have of the economic value that straw can provide, the energy generation or power capacity and the global environmental protection influences (Song et al., 2016). Many countries in the world have taken a step further in the utilisation of the straw with increased rates of the well-developed countries like the USA where the rate of unutilized straw is low as compared to the developing economies. Despite the abundant availability of straw in China, which currently stands at 800 Million tones, and used in many ways to develop the economy, there is still some percentage of straw close to 40% per year which is being discarded and burned on an open air ground throughout the country which has caused environmental and health problems. However, this review has found out that there are stiff competitive uses of straw currently in China with some being used as fertilizer when straw is incorporated into the soil to increase soil fertility, some used in mulching, some for animal feeds and fungi production, some being used as raw materials in the construction industry to make bricks, cement and fallboards, while some other straw is used as a source of renewable energy in biogas and biomass production (Clare et al., 2015; R. Zhang & Jenkins, 2009). In this twenty first century, where the human activities have consistently posed a great threat to the environment and put the planet in great peril, the utilisation of straw is now a global issue where one economy's negative use of straw will also affect the other economies. As a result, there is much pressure on countries from within and outside their borders if the straw utilisation issues are not taken seriously.

4.2 Straw Marketisation

The straw industry has been evolving with a lot of changes since China pugnaciously embarked on its economic reforms in order to open up its market to global trade (Jiang, n.d.; Kim, 2015). These reforms have been implemented with inside and outside influence especially the trade associations like the WTO. Therefore, to some extent, it is argued that China straw marketisation has been influenced by the outside forces a lot

more than the inside ones that would leave China with no option but to abide by them order to continue being retain its membership in them. It is worth noting that while these changes have been taking place in China, on the other side has been also intervening in the market which has been seen as a violation by the other member countries of the WTO policies (Chen & Duncan, n.d.; Donglin, 2005) which to some extent its reasonable because some of the infant industry, famers and other sectors where the government intervenes would not manage to compete and survive in the industry on their own without government help. On the aspect of straw utilization, this review corroborates with other studies done p previously on the same by other scholars who equally pointed out that through the highlighted market reforms China has for the decades tried to help directly or indirectly in implementation of the policies that could have positive impact on straw marketization. This review also found out that there is indeed an overarching relationship between marketisation, straw utilisation and economic growth of an economy (Młokosiewicz & Misiak-Kwit, 2017).

4.3 The path way to straw marketization

Following ecological and environmental impact that straw open air burning and discarding poses, it calls for the course of an action among economies in the world for straw marketisation that will have positive effects and lead on the straw utilization. This review has generated salutary suggestions that would help the economies as one of the pathways towards straw marketisation. The pathways are grouped into three categories, namely, consultation and involvement in policy formulation, government intervention through market mechanisms and incentives and evaluation of competitive uses of straw. To start with, formulating and implementing reform policies on straw marketisation only does not give a an effective path on straw marketization, but to have effective policies that will not end up in total failure there is need of consultation and involvement of famers and other stakeholders within straw industry ([IRRI], 2016). This involvement will add trust and ownership of the policy instrument which will help in straw marketisation and its utilisation at the end (K. He et al., 2018). Furthermore, there is need of positive political will from the policymakers to act positively towards ways that could see help the straw marketisation to grow (Donglin, 2005; H. Liu et al., 2018; C. Xue & Wang, 2017). If ala levels government would have the same keen interest in the straw industry by implementing reforms that would help to improve straw marketisation with the aim of developing it, the straw industry would develop with their support. This means that still the government should come in, the authorities would come in the form of making market mechanisms and incentives, the authorities should be able to formulate and implement policies that will be able to leave the market forces

of supply and demand to determine itself as a market mechanism. Furthermore, the authorities should do this by continuing providing incentives like subsidies which should be given to the farmers and other players involved in the straw industry in order to boost it, these subsidies would come in the form when buying machinery used to collect and store straw (Q. Li et al., 2012; C. Xue & Wang, 2017; S. Xue et al., 2020), tax benefits and tax rebates these will encourage investing campaigns to invest in the straw industry with an aim of enjoying this tax reliefs (CHEN, YU, CHANG, & HSU, 2008; Hansen, Tuan, Somwaru, & Seeley, n.d.) , and financial incentives like bonus which could be given to the farmers that have proved to utilized the straw depending on the criteria's that could be put on place (Fang et al., 2020). Another area is that the government and the international community that have interest in utilisation of straw should help in the evaluation of the best uses of the straw among its different competitive utilisation methods (Clare et al., 2015; Song et al., 2016), with an understanding that different uses of straw have different impacts on stakeholders could help to evaluate the best use, for example if its best to return straw into the ground to add soil nutrients or to use for gasification to help to boost the energy industry. Careful consideration should be taken when evaluating these alternatives and special attention or support should be given where the government thinks it need to be given especially to other stakeholders who may have low voice in the industry like rural famers.

4.5 Recommendations to Policymakers

From this review it is indicated that China, as a developing economy with huge population, will keep increasing each year and that it needs enough grain to feed its population as staple food, the increase of production of grain will always increase straw availability which is and will still be giving a problem if it's not utilized. Despite all the interventions by the authorities to promote straw utilisation industry, there is need for improvement on their policies of the straw utilisation as the current policies are not efficacious enough for farmers to be able to abide by them. They have a lot of loopholes that make it easy for farmers to evade them. It is advisable, therefore, that the authorities should start to formulate policies that will only leave famers to utilize straw and not deciding in other ways. Furthermore, when formulating these policies it is also advisable that authorities should at least involve the lower level participation by including other interested parties in straw industry so that these polices should have a sense of ownership from the perspective of the other stakeholders who will be using, the ownership of the polices is proved to be helpful in increasing trust and thereafter increasing the rate of straw utilisation. On the competing uses of the straw its recommended that the authorities should be in the forefront in helping to explore the

effective and efficient uses of the straw by supporting diversification methods especially with the technology advancement where its utilisation can bring the benefit to the whole economy at the large rather than at an individual level when utilized properly. Much attention should be given to those utilization ways that will have more environment positive impacts and having high economic values.

Although the authorities have demonstrated their support on straw utilization its recommended that these support should continue to be in place and be intensified, for instances the authorities should continue and increase the current subsidies programs that is giving the local farmers accesses to capital assets , bonus for them who utilize properly the straw and the manufacturing companies tax rebates and reliefs, it's also recommended that the government could build up centralized state of the art storage facilities for renting which many famers and enterprises could not manage to build, these high technologized storage facilities could be rented by the famers or agents at an affordable process which in return would increase straw utilisation rate. Lastly, the authorities should still continue further to fund researchers and institution that aim at projects which may help in designing and upgrading straw utilisation technologies that would use straw in an effective and efficient manner.

5. CONCLUSION

To wrap it all up, the preceding discussion has extensively reviewed the impact that marketisation in China has had on straw utilisation and the results are indubitable and unmistakable. It has been revealed that an agriculture-dependent country of China has for decades undergone a great change through the adoption and implementation of policies in the market structure without changing its political nature. Furthermore, it has been that there are still a lot of lingering challenges that stakeholders face in the straw industry and that they are not insurmountable. They can still be solved if at all the stakeholders involved in the industry amalgamate and take them head on. Lastly, the review has highlighted the fact that straw has emerged as a product that has multiple competitive use and that this demands the authorities' chip in to provide direction. Despite the regional focus of the review to China, the results reveal a general trend and the date generated can be aptly applied on the global scale.

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