***Original Research Article***

**Impact of Pashu Bhagya Scheme on Farmer’s Livelihood status in Vijayapura district of Karnataka State**

ABSTRACT

**Background:** Animal husbandry plays an important role to improve the livelihood status of farmers. The Pashu Bhagya Scheme was formulated based on the guidelines of Central Government Schemes viz., Dairy Entrepreneurship Development Programme (DEDP) and National Rural Livelihood Mission (NLRM). It was started during 2015 to enhance the livelihood status of small and marginal farmers, agricultural labourers, widows, devadasis and distressed women through livestock.

**Methodology:** The study was conducted for systematic measurement and comparison of Pashu Bhagya Scheme beneficiaries and non-beneficiaries’ livelihood status in the year 2022. Research was carried out by randomly selecting 90 beneficiaries and 30 non-beneficiaries of Pashu Bhagya Scheme from Vijayapura and Indi taluks using Expost-facto research design.

**Results:** The overall livelihood status of Pashu Bhagya Scheme beneficiaries was quite higher than that of non-beneficiaries. More than half of the beneficiaries had medium level of livelihood status (51.11 %) while, 53.33 per cent of the non-beneficiaries had low level of livelihood status. Among the beneficiaries, 47.78 per cent had medium level and among the non-beneficiaries 60.00 per cent of the had low level of assets Majority of the beneficiaries (82.22 %) and non-beneficiaries (63.34%) had medium and low level of food and nutritional status, respectively. More than half of the beneficiaries (62.22 %) and non-beneficiaries (56.67 %) had average level of coping strategies to overcome crisis.

**Conclusion:** Hence, there is a need to improve the livelihood status of non-beneficiaries by creating awareness about existing programmes, motivating them to utilize the programmes, providing required facilities like technical guidance, inputs, employment opportunities and marketing to carry out farming effectively.

**Keywords:** *Assets, Activities, Capabilities, Coping strategies, Food and nutrition, Livelihood status*

1. **INTRODUCTION**

Animal husbandry is the scientific management of farm animals by humans for their benefits as well as studying and developing the genetic qualities and behavior that are advantageous to humans. It plays a major role in livelihood of landless agricultural labourers, small and marginal farmers to alleviate poverty by supplementing family income and generating gainful employment. India is having the world’s largest livestock population with 535.78 million during the year 2019-2020. Livestock sector contributes 4.11 per cent GDP and 25.6 per cent of total agriculture GDP towards Indian economy (Anon., 2019).During 2019-20, the share of Animal Husbandry in Karnataka’s Gross State Domestic Product (GSDP) of agriculture and allied activities was 21.8 per cent (Anon., 2021)**.**

This study laid emphasis on the Pashu Bhagya Scheme, which can be held as one of the prominent livestock unit fixation schemes for small, marginal farmers, landless agricultural labourers, women (widows, devadasis and also distressed) to promote their livelihood assurance through credit linked back-end support. With this concept, the Pashu Bhagya scheme framed its objectives as following:

* To assist marginal and small farmers, agricultural labours, widows, destitute and devadasi women in setting up of Dairy, Sheep and Goat or Piggery and Poultry unit, aiming at livelihood security
* To increase income from livestock activities through production, productivity enhancement and employment creation and to promote nutritional status of beneficiaries

To throw the light on one such livestock development programme’s role in improving the livelihood of landless labourers, small and marginal farmers, the present study has been taken up with the following objectives:

* To know the livelihood practices of beneficiaries
* To study the assets, capabilities, activities, food & nutritional status and coping practices to overcome crisis of both beneficiaries and non-beneficiaries
* To assess the livelihood status of beneficiaries and non-beneficiaries

Jayashree (2013) defined livelihood status as the “status of tribal people with reference to capabilities, assets and activities required for jhum cultivation which in term ensure livelihood security”. Charita (2017) stated that livelihood comprises of the capabilities, assets and activities required for means of living and livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain capabilities, assets of the farmers in present and future.

Livelihood status is operationally defined as the status of farmer under Pashu Bhagya scheme with reference to assets, capabilities, activities, food and nutritional status and coping strategies to overcome crisis.

1. **METHODOLOGY**

The study was conducted in Vijayapura district (Vijayapura and Indi taluks), Karnataka state, India during 2021-22. Three villages were selected from each selected taluk based on the highest number of beneficiaries and livestock population. Fifteen beneficiaries and five non-beneficiaries from each village i.e., 45 beneficiaries and 15 non-beneficiaries were selected from each taluk randomly, comprising total sample size up to 120.

‘Livelihood status’ was identified as the dependent variable with five major dimensions viz., assets, capabilities, activities, food and nutritional status and coping strategies to overcome crisis. Scale developed by Bharathkumar (2018) with suitable modifications was administered for the study. 35 statements were considered to assess the livelihood status of farmer respondents. The statistical tools used here were frequency, percentage, mean, z- test and chi-square test.

1. **RESULTS AND DISCUSSION**

**3.1 Distribution of Livelihood Practices of Beneficiaries**

Table 01 reveals that before enrolling to Pashu Bhagya Scheme, 31.11 per cent of the beneficiaries followed agriculture +livestock, but after enrolling to the scheme 82.22 per cent of them were found to follow agriculture + livestock. In the past years, nearly 20.00 per cent were doing labour + agriculture, while none at present. About 6.67 per cent were doing business along with agriculture + livestock by selling of milk by-products, small shop of sweets, oil and also sold animal dung. Only 2.22 per cent were continuing their occupation as labour out of 18.90 per cent who were labour earlier. Similar results were reported by Savitha *et al*. (2011).

**Table 01: Distribution of livelihood practices of beneficiaries (n1=90)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sl.No.** | **Livelihood Practices** | **Before** | | **After** | |
| **f** | **%** | **f** | **%** |
| 1 | Agriculture + Livestock | 28 | 31.11 | 74 | 82.22 |
| 2 | Agriculture | 22 | 24.44 | 00 | 00.00 |
| 3 | Livestock | 04 | 04.44 | 08 | 08.89 |
| 4 | Agriculture + Livestock +Business | 01 | 01.11 | 06 | 06.67 |
| 5 | Labour+ Agriculture | 18 | 20.00 | 00 | 00.00 |
| 6 | Labour | 17 | 18.90 | 02 | 02.22 |

f- Frequency, % - Percentage

Before enrolling to the scheme and claiming the benefits of the scheme many of them followed only agriculture, some of them were labourer, but due to animal units, beneficiaries were able to follow the practices as shown in Table 01.Rearing animal paved way to the labourers to shift to livestock/ animal farming that helped them in gaining profit. Some respondents continued to be labourers, as they were forced to sell their animals due to financial crisis. Those respondents who followed only agriculture were able to reap the benefits from animal farming along with efficient resource management.

**3.2. Statement-wise analysis of the components of Livelihood status**

**3.2.1 Assets of respondents**

Table 02 reveals that both beneficiaries and non-beneficiaries ranked maintaining harmony with neighbouring group higher and participation in animal and farmers development programs was ranked last.

**Table 02. Analysis of Assets of respondents (n=120)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sl. No** | **Statements on Assets** | **Beneficiaries (n1=90)** | | **Non-beneficiaries (n2=30)** | |
| **Mean** | **Rank** | **Mean** | **Rank** |
| 1. | Involving women in decision making | 03.12 | VI | 02.20 | VII |
| 2. | Maintaining harmony with neighbouring groups | 03.52 | I | 03.12 | I |
| 3. | Owning a comfortable house | 03.38 | II | 02.79 | II |
| 4. | Possession of vehicle (bullock cart, tractors etc.) | 03.26 | III | 02.32 | V |
| 5. | Access to livestock and animal products | 02.99 | VIII | 02.00 | VIII |
| 6. | Access to animal products for domestic use | 03.22 | IV | 02.22 | VI |
| 7. | Credibility among the fellow villagers | 02.98 | IX | 1.95 | IX |
| 8. | Participation in animal and farmers development programs | 02.35 | X | 01.54 | X |
| 9. | Income from agriculture and livestock | 03.16 | V | 02.42 | IV |
| 10 | Income from livestock and animal products | 03.10 | VII | 02.51 | III |

Both beneficiaries and non-beneficiaries had harmonious relation with the neighbors, owned comfortable house, easy transport facilities towards cities and possessed the vehicles like bullock cart, two wheelers, tractors, pump sets. Majority of the beneficiaries possessed landholdings and livestock units with timely trainings on scientific management of animals, which encouraged them to practice the scientific methods of animal rearing and gained income from agriculture, livestock and animal products. Beneficiaries were only provided with the facilities like animal units, training and animal insurance, but not with any livestock equipment and machinery.

**3.2.2 Capabilities of respondents**

Table 03 reveals that beneficiaries ranked Credit management ability as first and ability to provide assistance during crisis as last. Based on the mean score of non-beneficiaries’ capabilities; credit management ability and ability to adapt innovative livestock production technologies were recorded as first and last rank, respectively.

**Table 03. Analysis of** **Capabilities of respondents (n=120)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sl.No.** | **Statements on Capabilities** | **Beneficiaries**  **(n1=90)** | | **Non-beneficiaries (n2=30)** | |
| **Mean** | **Rank** | **Mean** | **Rank** |
| 1. | Access to common property resources | 02.94 | II | 02.43 | II |
| 2. | Ability to utilize the services of rural institutions | 02.72 | IV | 02.24 | III |
| 3. | Ability to protect and develop animals by participation in animal development activities | 02.54 | VI | 02.13 | IV |
| 4. | Credit management ability | 03.24 | I | 02.56 | I |
| 5. | Ability to adopt innovative livestock production technologies | 02.80 | III | 01.26 | IX |
| 6. | Ability to establish contact with development departments | 02.32 | VIII | 02.00 | VII |
| 7. | Ability to represent local organizations | 02.48 | VII | 02.10 | V |
| 8. | Ability to pursue higher education | 02.61 | V | 01.84 | VIII |
| 9. | Ability to aid during crisis | 02.30 | IX | 02.05 | I |

Though both beneficiaries and non-beneficiaries had credit management ability, non-beneficiaries lagged to invest in income generating activities, by following only agriculture+ livestock or only livestock practices. The age, education level, risk orientation, economic motivation, along with credit orientation and scientific orientation played a greater role in managing the capabilities. The ability to use the resources, contacts and participation in animal development activities differed greatly between beneficiaries and non-beneficiaries.

* + 1. **Activities of respondents**

In table 04, based on the mean scores of the respondents, protect family from all kinds of threats is ranked first by both beneficiaries and non-beneficiaries. Participation in village meetings, Discussion etc. and practicing scientific animal management practices are ranked last by beneficiaries and non-beneficiaries, respectively.

**Table 04. Analysis of** **Activities of respondents (n=120)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sl.No.** | **Statements on Activities** | **Beneficiaries**  **(n1=90)** | | **Non-beneficiaries (n2=30)** | |
| **Mean** | **Rank** | **Mean** | **Rank** |
| 1. | Participation in village meetings, Discussion etc. | 02.28 | V | 01.91 | III |
| 2. | Practicing scientific animal management practices | 02.31 | IV | 01.40 | V |
| 3. | Participation in animal and veterinary development activities | 02.82 | III | 01.73 | IV |
| 4. | Performing the duties as responsible family member | 03.21 | I | 02.43 | II |
| 5. | Protect family from all kinds of threats | 02.98 | II | 02.87 | I |

Things start and end with the family. Hence, there is a need to protect and nourish the family and it’s the duty of family head. Both beneficiaries and non-beneficiaries gave importance to their family, but non-beneficiaries lacked in terms of social activities and gatherings. Beneficiaries with their contacts participated in village meetings, development programs and scientific management practices that made them socialistic.

* + 1. **Food and Nutritional Status of respondents**

Food availability throughout the year and Utilization of own family farm produce for balanced nutrition were ranked first and last by beneficiaries, whereas food availability throughout the year and affordability of balanced food to all family members were ranked first and last by non-beneficiaries (Table 5).

Both beneficiaries and non-beneficiaries had access to the food throughout the year. This may be due to the agricultural produce and income that they obtained from agriculture and other sources. One of the objectives of Pashu Bhagya Scheme was to promote nutritional status of beneficiaries with easy access to animal products like meat, milk and milk by-products, egg along with the production for their livelihood. Hence, the beneficiaries were able to afford quality and nutritionally balanced food to all the family members throughout the year, either from own farm or through other means. While, non-beneficiaries lacked nutritionally balanced food as majority of them were not in a good financial position to afford all nutrition-based food regularly.

**Table 05. Analysis of** **Food and Nutritional Status of respondents (n=120)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sl.No.** | **Statements Food and Nutritional Status** | **Beneficiaries**  **(n1=90)** | | **Non-beneficiaries (n2=30)** | |
| **Mean** | **Rank** | **Mean** | **Rank** |
| 1 | Food availability throughout the year | 03.62 | I | 03.00 | I |
| 2 | Quality and nutritional balance of available food | 03.10 | III | 02.54 | II |
| 3 | Affordability of balanced food to all family members | 03.14 | II | 02.24 | IV |
| 4 | Utilization of own family farm produce for balanced nutrition | 02.89 | IV | 02.37 | III |

**3.2.5 Coping Practices to overcome Crisis of respondents**

A glance at Table 06, revealed that beneficiaries ranked adequate savings maintained to meet unforeseen expenses and working as labour for getting additional income as first and last, respectively.

**Table 06. Analysis of** **Coping Practices to overcome Crisis of respondents (n=120)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sl.No.** | **Statements on Coping Practices to overcome Crisis** | **Beneficiaries**  **(n1=90)** | | **Non-beneficiaries (n2=30)** | |
| **Mean** | **Rank** | **Mean** | **Rank** |
| 1. | Adequate savings maintained to meet unforeseen expenses | 03.21 | I | 02.36 | III |
| 2. | Working as labour for getting additional income | 02.68 | VII | 02.10 | IV |
| 3. | Borrowing feed and fodder from fellow villagers during crisis | 02.90 | IV | 02.80 | I |
| 4. | Collection and marketing of animal products for getting supplementary income | 03.13 | II | 01.92 | V |
| 5. | Borrowing money from SHGs/thrift groups etc., for undertaking income generation activities | 02.85 | V | 01.81 | VI |
| 6. | Labour sharing with neighbours during scarcity of labour | 02.95 | III | 02.62 | II |
| 7. | Pledging jewellery at time of crisis | 02.78 | VI | 01.41 | VII |

While, non-beneficiaries ranked borrowing feed and fodder from fellow villagers during crisis as first and pledging jewellery at time of crisis as last based on the mean scores obtained.

The reason might be the increased income or supplementary income through the scheme that helped beneficiaries to save for further use. As many of the beneficiaries shifted from labour to livestock/ agriculture + livestock practices they are able to take income generating activities rather than going to labour work again. Due to the credibility among the neighbourhoods, respondents were able to share feed and fodder, labour at the time of crisis.

**3.3 Categorization of respondents based on components of Livelihood Status**

Results in Table 07 and Figure 1 show that 47.78 per cent of beneficiaries have medium level of assets whereas, among non-beneficiaries 60.00 per cent have low level assets. Majority of the beneficiaries belonged to medium level of capabilities category (57.78 %), activities category (68.89 %), food and nutritional status category (82.22 %), while majority of the non-beneficiaries, belonged to low level capabilities (53.33 %) and food and nutritional status category (63.34 %), whereas in activities category, 43.33 per cent belonged to medium level. Both beneficiaries (62.22 %) and non-beneficiaries (56.67 %) had average level of coping strategies to overcome crisis with no significant difference (4.39NS). Asset status (8.93\*), capabilities (6.21\*) and food & nutritional status (9.11\*) are significant at 5 per cent level and there is no significant difference in activities (5.87NS) of beneficiaries and non-beneficiaries.

Credit management ability of beneficiaries was high due to willingness to take risk and enthusiasm to achieve, which motivated them to invest in innovative supplementary income generating activities. Participation in various village meetings, discussions, development programs made the contacts of beneficiaries grow stronger and larger.

**Table 07. Categorization of respondents based on components of Livelihood Status (n=120)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Characteristics** | **Level** | **Beneficiaries**  **(n1=90)** | | **Non-beneficiaries (n2=30)** | | **Chi-square value** |
| **f** | **%** | **f** | **%** |
| **Assets** | Low (<21.64) | 29 | 32.22 | 18 | 60.00 | 8.93\* |
| Medium (21.64-32.50) | 43 | 47.78 | 08 | 26.67 |
| High (>32.50) | 18 | 20.00 | 04 | 13.33 |
| **Capabilities** | Low (<19.62) | 20 | 22.22 | 16 | 53.33 | 6.21\* |
| Medium (19.62-22.95) | 52 | 57.78 | 09 | 30.00 |
| High (>22.95) | 18 | 20.00 | 05 | 16.67 |
| **Activities** | Low (<10.65) | 09 | 10.00 | 12 | 40.00 | 5.87 NS |
| Medium (10.65-12.75) | 62 | 68.89 | 12 | 43.33 |
| High (>12.75) | 19 | 21.11 | 05 | 16.67 |
| **Food and Nutritional Status** | Low (<11.00) | 09 | 07.78 | 19 | 63.34 | 9.11\* |
| Medium (11.00-11.95) | 74 | 82.22 | 09 | 30.00 |
| High (>11.95) | 07 | 10.00 | 02 | 06.66 |
| **Coping Strategies to Overcome Crisis** | Poor (<16.36) | 22 | 24.44 | 11 | 36.67 | 4.39 NS |
| Average (16.36-19.16) | 56 | 62.22 | 17 | 56.67 |
| Good (>19.16) | 12 | 13.33 | 02 | 06.66 |

f- frequency, %- percentage, \*-Significant at 5%, NS- Non-significant at 5%

With active participation and exposure, they were able to hold membership in local organizations and involve themselves more in extension and social activities. In enhancement of nutritional security of the beneficiaries, scheme played a major role. With easy access and affordability to nutritionally balanced food throughout the year, beneficiaries’ food and nutritional status was medium to high level unlike non-beneficiaries.

Due to the credit management ability, beneficiaries were able to effectively use the resources like land, water and animals and take up subsidiary activities to handle the crisis better than non-beneficiaries. Similar findings were recorded by Bharathkumar (2018).

* 1. **Dimension-wise significance of Livelihood Status**

Table 08 depicts that there is significant difference in the Assets, Capabilities and Food and nutritional status dimension of beneficiaries and non-beneficiaries. There is no significant difference in the Activities and Coping strategies of beneficiaries and non-beneficiaries to overcome the crisis. But there is significant difference in the overall livelihood status of the beneficiaries and non-beneficiaries (Z value=1.73\*). The findings are in line with the study of Kowsalya (2017).

**Table 08. Dimension-wise significance of Livelihood Status (n=120)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sl. No.** | **Category** | **Beneficiaries**  **(n1=90)** | | **Non-beneficiaries (n2=30)** | | **‘Z’ value** |
| **Mean** | **SD** | **Mean** | **SD** |
| I | Assets | 31.08 | 05.67 | 23.07 | 5.20 | 1.74\* |
| III | Capabilities | 23.95 | 03.40 | 18.61 | 03.23 | 1.85\* |
| II | Activities | 13.60 | 02.17 | 10.34 | 02.02 | 1.10NS |
| IV | Coping strategies | 20.50 | 02.57 | 15.02 | 03.02 | 1.43NS |
| V | Food and nutritional status | 12.75 | 0.58 | 10.15 | 01.39 | 1.67\* |
| **Livelihood Status** | | **102.40** | **15.12** | **76.75** | **14.81** | **1.73**\* |

\*-Significant at 5%, NS- Non-significant at 5%, SD- Standard Deviation

Interest, confidence and knowledge level to use the available resources/ facilities effectively make a person to turn his living in a better way. It may include education, health care facilities, involvement of women in decision making, owning house and machineries, social status of the respondents, access to land, livestock etc. There was no significant difference in activities and coping strategies to overcome crisis, because both beneficiaries and non-beneficiaries were able to use the service from same areas, but the benefits differed due to interest and extent of involving themselves in extension and other activities.

**3.5 Livelihood Status of respondents**

The results in Table 09 and Figure 2 shows that 51.11 per cent of the beneficiaries were having medium level of livelihood status, followed by low (28.89 %) and high (20.00 %) level livelihood status. Among the non-beneficiaries, 53.33 per cent were having low level, followed by medium (36.67 %) and high (10.00 %) level of livelihood status. There is significant difference between the livelihood status of beneficiaries and non-beneficiaries (7.92\*).

**Table 09: Livelihood Status of respondents (n=120)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Characteristics** | **Level** | **Beneficiaries**  **(n1=90)** | | **Non-beneficiaries (n2=30)** | | **Chi-square value** |
| **f** | **%** | **f** | **%** |
| **Livelihood Status** | Low (<144.80) | 26 | 28.89 | 16 | 53.33 | 7.92\* |
| Medium (144.80-159.78) | 46 | 51.11 | 11 | 36.67 |
| High (>159.78) | 18 | 20.00 | 03 | 10.00 |

f- frequency, %- percentage, \*-Significant at 5%, NS- Non-significant at 5%

**Fig 1: Categorization of respondents based on components of livelihood status**

**Fig 2: Livelihood status of the respondents**

The categorization of respondents was based on dimensions considered to determine livelihood status. After claiming the benefits from Pashu Bhagya Scheme, the beneficiaries were able to uplift their livelihood status through increase in their income, social and financial status and also were able to afford nutritional food like meat, milk, egg etc. throughout the year. Similar findings of the study were reported by Kowsalya (2017).

1. **CONCLUSION**

The study was carried out to compare the livelihood status of beneficiaries and non-beneficiaries of Pashu Bhagya scheme. The Pashu Bhagya scheme played a major role in changing the lives of beneficiaries in all the aspects, but there is also need to focus on the condition/situation of the non-beneficiaries. According to the study, majority of the beneficiaries were having medium level of livelihood status whereas, the non-beneficiaries were having low level of livelihood status. Hence, there is a need to improve the livelihood status of non-beneficiaries by creating awareness about existing programmes, providing required facilities like technical guidance, inputs, employment opportunities and marketing to carry out farming effectively. Study revealed that combination of livestock and agriculture resulted in better income and employment generation. Hence, farmers should be motivated to take up integrated farming approach with suitable subsidiary occupation.

**REFERENCES**

Anonymous. (2019). *Report on 20th Livestock Census*, Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture and Farmers Welfare, Government of India.

Anonymous. (2021). *Economic survey of Karnataka 2020-21*, Planning, Programme Monitoring and Statistics Department, Government of Karnataka, 43:197-216.

Bharathkumar, T. P. (2018). *An analysis of livelihood status of tribal youth in selected districts of Karnataka.* *Ph.D. Thesis (Unpub.),* Univ. Agric. Sci., Bangalore.

Charita, V. G. (2017). *Impact of National Innovations on Climate Resilient Agriculture (NICRA) on the rural livelihood security of farmers of Chikkaballapura district.* *M.Sc. Thesis (Unpub.),* Univ. Agric. Sci., Bangalore.

Jayashree, D. (2013). *Sustainability of jhum cultivation as perceived by tribal people of Tripura and their livelihood status.* *M.Sc. (Agri.) Thesis,* Univ. of Agric. Sci., Bangalore.

Kowsalya, K. S. (2017). *Impact of Integrated Farming System Demonstration (IFSD) programme on livelihood and nutritional security of farmers of Mandya district. Ph.D. Thesis,* Univ. Agric. Sci., Bangalore.

Sampraja, B. (2022). *Impact analysis of Pashu Bhagya Scheme on livelihood status of the farmers in Vijayapura district of Karnataka state. M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Bangalore.

Savitha, M. G., Munidinamani, S. M., Dolli, S. S., Naik, B. K., Patil, B. L. AND Megeri, S. N. (2011). Livelihood systems for rural community in Chitradurga district of Karnataka state. *Karnataka J. Agric. Sci.*, 24 (3), 325-330.